

**Action Plan Update  
for  
Manufacturing and  
Assembly Facilities**

prepared for

**Canada's Climate Change  
Voluntary Challenge and Registry**

prepared by

General Motors of Canada Limited  
Environmental Activities  
1908 Colonel Sam Drive  
Oshawa, Ontario

October 31, 2004



## General Motors Environmental Principles

As a responsible corporate citizen, General Motors is dedicated to protecting human health, natural resources and the global environment. This dedication reaches further than compliance with the law to encompass the integration of sound environmental practices into our business decisions.

The following environmental principles provide guidance to General Motors personnel worldwide in the conduct of their daily business practices:

1. We are committed to actions to restore and preserve the environment.
2. We are committed to reducing waste and pollutants, conserving resources and recycling materials at every stage of the product life cycle.
3. We will continue to participate actively in educating the public regarding environmental conservation.
4. We will pursue vigorously the development and implementation of technologies for minimizing pollutant emissions.
5. We will continue to work with all governmental entities for the development of technically sound and financially responsible environmental regulations.
6. We will continually assess the impact of our plants and products on the environment and the communities in which we live and operate with a goal of continuous improvement.



Michael A. Grimaldi  
Office of the President

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**General Motors of Canada Limited**  
1908 Colonel Sam Drive  
Oshawa, Ontario  
L1H 8P7

October 21, 2004

Mr. Bob Flemington, P. Eng.  
Canada's Climate Change Voluntary Challenge and Registry Inc.  
170 Laurier Avenue West, Suite 600  
Ottawa, Ontario  
K1P 5V5

Dear Mr. Flemington:

This submission represents General Motors of Canada Limited's (GMCL) ninth update to the Voluntary Challenge and Registry Inc. (VCR). We understand that this marks the end of VCR's existence, but we hope that the initiatives undertaken by VCR to sustain a GHG reporting registry in Canada continue in the future through a potential VCR relationship with the Canadian Standards Association (CSA). We believe baseline tracking from 1990 and securing annual improvements are important elements of environmental leadership in today's Kyoto climate.

Further to GMCL's original letter of intent and the submission of our Action Plan dated November 1995, I reiterate GMCL's strong support of the VCR's objectives and the voluntary approach to seeking reductions in GHG emissions. In addition to our original letter of intent and Action Plan, GMCL has submitted an annual update in 1996, 1997, 1998, 1999, 2000, 2001, 2002 and 2003. Our consistent and regular reporting record confirms our commitment to tracking and reducing our GHG emissions.

I am proud to report that with the commitment, creativity and innovation of our employees, GMCL has significantly reduced our emissions of CO<sub>2</sub>. From 1990 through 2003, GMCL's overall emissions of CO<sub>2</sub> from manufacturing facilities have been reduced by 42%. This achievement is based in part on the corporation's ongoing focus on the need to conserve energy in order to reduce environmental impact and reduce costs but also in part to the consolidation and rationalization of facilities across North America. Despite some plant closures, Canadian vehicle production is actually up by 33% relative to 1990 levels. This focus has led to the implementation of many large and small energy conservation projects as well as the review and incorporation of energy efficient technologies in our processes. We encourage all employees to find ways to implement the GM Environmental Principles in their daily responsibilities.

Our plan is to continue to reduce energy consumption compared to 1995 as a base year by at least 25% by 2005. This builds on our previous target of a 20% reduction by 2002, which the information in this Progress report illustrates we successfully achieved.

We are continuing to pursue new and additional production opportunities for a number of our facilities. We will endeavour to undertake these new opportunities without increasing total CO<sub>2</sub> emissions. However, if production volumes increase more rapidly than our ability to achieve offsetting energy savings then total energy consumption and GHG emissions may increase. In addition more stringent environmental requirements related to abatement of releases and discharges may actually increase our energy consumption. GMCL is striving for continuous improvement in the environmental performance of our facilities.

GMCL continues its commitment to the VCR with the submission of our 2004 update. In 2003, we were very proud to be recognized by VCR with our 5<sup>th</sup> consecutive "Gold Champion Level Reporter" status. In order to achieve success and assist industry in finding cost-effective ways to reduce our impact on the environment, voluntary initiatives need substantial participation and we hope that momentum gained by VCR over the last 10 years is not lost during this transition phase.

Sincerely,

A handwritten signature in black ink that reads "Michael A. Grimaldi". The signature is written in a cursive, flowing style.

Michael A. Grimaldi

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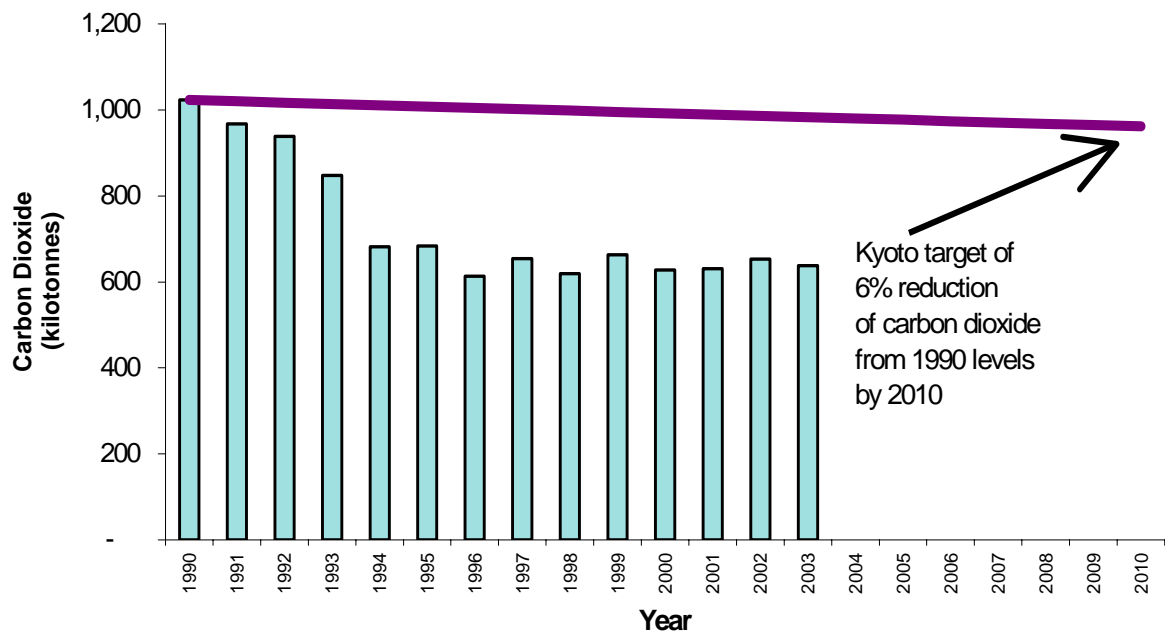
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## Introduction

GM has made the goal of reducing the environmental impacts of its products and processes a top priority. General Motors of Canada Limited (GMCL) recognizes Canada's international commitments related to climate change. In order to meet these goals, significant changes in the behavioural and consumptive patterns of all Canadians will be necessary. GMCL continues to be committed to the voluntary approach since it will encourage us to explore new and innovative technologies and assist in bringing them to our operations and to the customer in the most cost effective manner.

This submission is GMCL's ninth update to the VCR and highlights our progress in reducing greenhouse gas emissions from our facilities. As part of the report, we have shared a number of energy efficiency and conservation initiatives we have undertaken to help reduce emissions from our operations. In addition to energy efficiency and conservation projects GMCL has realized efficiencies through rationalization of production over this time period. While producing more vehicles today than in 1990, there are fewer plants in operation, which inherently lends to additional energy efficiencies. Significant progress has been achieved to date as can be seen in Figure 1 and Table 1.

**Figure 1: CO<sub>2</sub> Generation Including CO<sub>2</sub> Generated From Electricity Consumed**



**Table 1: CO<sub>2</sub> Generation for GMCL Manufacturing Facilities (kilotonnes)**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
On-site Generation	749	689	689	678	565	566	491	488	403	426	449	365	374	360
Including Electricity	1060	969	944	856	706	716	626	681	637	678	725	630	634	617

For the period 1990 to 2003:

- Total energy consumption has been reduced by 45% from 4928 MWh to 2706 MWh
- Energy intensity normalized to vehicle production has been reduced by 48% for car assembly and by 28% for truck assembly
- CO<sub>2</sub> emissions associated with GMCL energy consumption have decreased 42% over the period 1990 through 2003 and 52% if CO<sub>2</sub> from purchased electricity is not factored into the total.
- Energy efficiency initiatives at the Oshawa Autoplex for non-load demand improvements have saved 412 million kWh and avoided 152 kilotonnes of CO<sub>2</sub> emissions.

The automotive industry and GMCL specifically have made great strides in reducing greenhouse gas emissions from our products and our facilities and we are committed to seeking further reductions. GMCL has a clear and consistent track record of disclosing greenhouse gas emissions performance from our facilities and the story has been one of clear and consistent reductions. We believe this report will provide sufficient information to the VCR for GMCL to remain a “Gold Champion Level Reporter”.

## Organization Profile and Performance

General Motors of Canada Limited (GMCL) is Canada's largest industrial manufacturer of passenger cars, light trucks, locomotives and automobile components. GMCL is the country's largest exporter with a workforce of 22,000 employees operating vehicle assembly and component fabrication plants, as well as parts distribution, sales and service centers. Today, GMCL has the capacity to manufacture more than one million units annually, exporting 85% of this production primarily to the United States. Total vehicle assembly production for the 2003 calendar year was 939,832 cars and light duty trucks.

### Manufacturing Operations

#### Oshawa, Ontario

**Car Assembly Plant 1 & 2** – Chevrolet Impala sedans, Monte Carlo coupes, Buick Century and Regal sedans and the Pontiac Grand Prix. Plant 1 operates on 3 shifts, while Plant 2 operates on 2 shifts.

**Truck Assembly Plant** – GMC and Chevrolet extended cab version of the full-size, four-door, two-wheel and four-wheel drive light duty pickup trucks. The Plant operates on 3 shifts.

**Other Manufacturing Plants** – Exterior sheet metal stampings

#### St. Catharines, Ontario

**Engine Plant** – 4.8L, 5.3L and 5.7L Vortec V-8 engines, 3.6L HFV6 engines, V8 Aluminum Blocks, and V6 3.4L Camshafts.

**Components Plant** – Transmission final drive and differential assemblies, rear axles, front suspensions, gears and shafts

#### Windsor, Ontario

**Transmission Plant** – Four-speed electronic, front-wheel drive automatic transmissions, and components for other corporate transmissions.

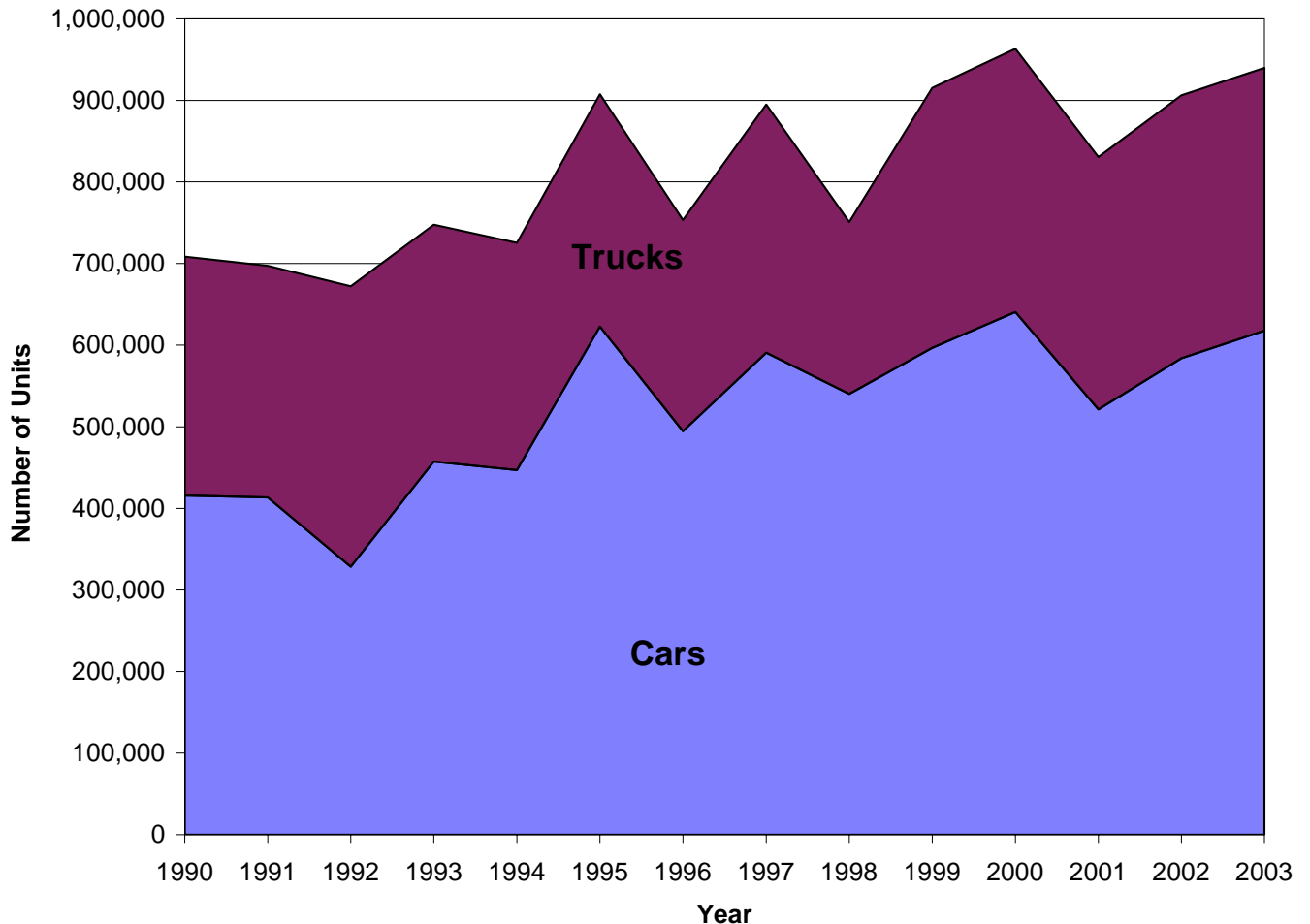
#### London, Ontario

**London Electro-Motive Division** – Diesel locomotives

## Vehicle Assembly Production

Vehicle assembly data given in Figure 2 reflect the production in Car and Truck Assembly Centres in Oshawa, Ontario and historically Ste.Thérèse, Quebec since 1990. Annual vehicle production has increased almost 33% through the 1990 through 2003 period. Production levels are a function of many factors including market conditions, work stoppages, downtime for reinvestment, and model changeover.

**Figure 2: Vehicle Assembly Production**



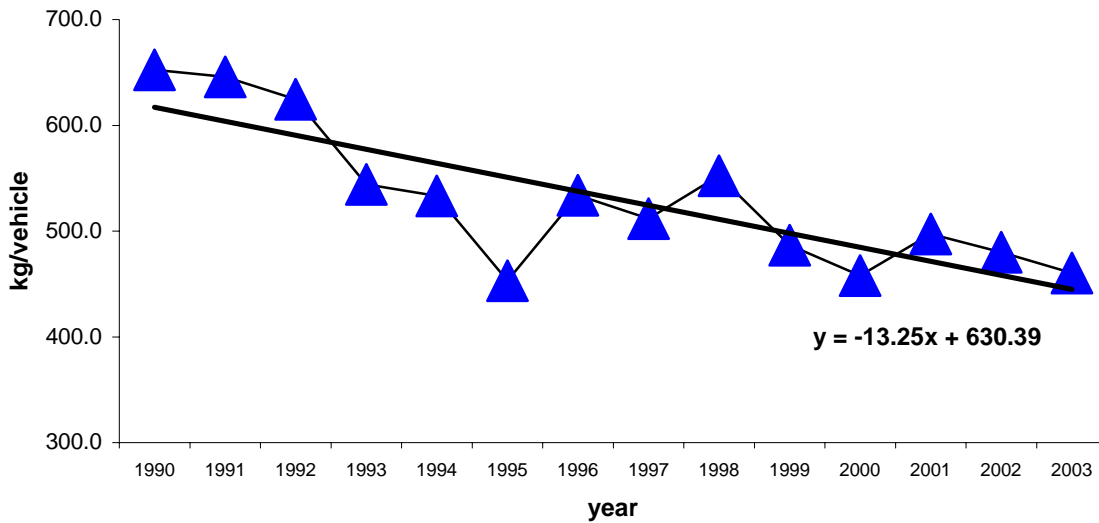
## Energy Consumption and CO<sub>2</sub> Generation Normalized to Vehicles Produced

In 2003, automotive assembly operations accounted for 70% of GMCL's energy consumption. How these operations perform on a consumption per unit basis is an essential indicator of our overall energy consumption and CO<sub>2</sub> generation performance. The energy consumption per vehicle dropped by 48% for car assembly operations and by 28% for truck assembly, for the period 1990 through 2003. The CO<sub>2</sub> production per

vehicle dropped by 37% for car assembly operations and by 15% for truck assembly, for the period 1990 through 2003. Detailed information is given in Table 2.

Figure 3 shows the kilograms of CO<sub>2</sub> produced per vehicle for assembly operations and the equation of a linear trend line (year 1 = 1990). The fitted line slope indicates a consistent performance of annual reductions from baseline of CO<sub>2</sub> intensity per vehicle.

**Figure 3: CO<sub>2</sub> Generation at Assembly Plants Normalized to Production**



**Table 2: Energy and CO<sub>2</sub> Intensity per Vehicle Produced**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Vehicles (thousands)	709	697	672	748	725	908	753	895	751	915	963	830	906	940
Energy Consumption (GWh)	2,427	2,312	2,240	2,344	2,306	2,425	2,254	2,471	2,109	2,284	2,354	1,975	2,011	1,888
Normalized Energy Consumption (MWh/vehicle)	3.43	3.31	3.33	3.13	3.18	2.67	2.99	2.76	2.81	2.49	2.44	2.38	2.22	2.01
CO <sub>2</sub> Emissions (kilotonnes)	462	450	420	407	387	411	402	458	415	445	441	413	435	433
Normalized CO <sub>2</sub> Emissions (kg/vehicle)	652	646	625	544	533	453	534	512	552	484	458	497	480	460

## Practices and Performance

### **Voluntary Approaches to Environmental Protection**

GMCL believes that greenhouse gas reductions can be achieved by encouraging a gradual shift in behavioural patterns and economic activities to less greenhouse gas emitting pursuits. This can be done most efficiently and with the lowest cost to the Canadian economy and society first by pursuing voluntary approaches and second broad-based market driven measures. Command and control measures should be undertaken only where there is overwhelming evidence that they are required and where voluntary approaches and economic instruments have been attempted but have failed to yield the necessary reductions in greenhouse gas emissions. We strongly support the voluntary approach and believe it must be the cornerstone of Canada's response to the climate change issue. We view the Voluntary Challenge and Registry Inc. (VCR) as a key element in Canada's response to the international climate change challenge. GMCL has also been an active participant in the Champions in Action activity.

### **GM Environmental Management System/ISO 14000**

GM has recognized the significant value of a structured environmental management system (EMS). GM is integrating its multiple, independently applied management systems into a common system that is applicable globally.

GM has defined its global EMS model for its facilities around the International Organization of Standardization (ISO) Standard 14001, an environmental management system comprised of seventeen elements which requires an organization to develop policies and procedures to manage its processes, products, and services that interact with the environment. These elements provide a common framework and specification for GM units to understand how their activities interact with the environment and to improve management of these activities in an ongoing cycle. This corporate EMS will enable GM to move more efficiently in implementing the GM Environmental Principles.

The management of energy is a part of this EMS and elements of this process have been the framework for our GM Canada energy management operations since the early 1990's. In 2001 all of GMCL's Ontario manufacturing sites had their environmental management programs third-party certified to be in conformance with the ISO14001 Standard for Environmental Management Systems. The facilities continue to improve their EMS and maintain their certification with regular third-party surveillance audits.

## **General Motors of Canada Limited Environmental Policy**

As a responsible corporate citizen, General Motors of Canada (GMCL) is dedicated to protecting human health, natural resources and the local and global environment, in accordance with the Environmental Principles of General Motors Corporation. This dedication reaches further than compliance with the law to encompass the integration of sound environmental practices into our business decisions. This policy is based on the integration of risk-based, cost effective management practices into site activities with the aim of continually improving environmental performance.

GMCL is committed to assess the environmental impacts of its activities, products or services as a basis for its environmental management programs and to reduce wherever practicable these impacts through the establishment of appropriate objectives and targets.

In particular, GMCL will strive to achieve the following objectives through continued execution of our Environmental Management System:

1. Comply with all applicable environmental laws and regulations, and other requirements.
2. Assign management responsibility for the environment in all areas of our facilities and ensure that all employees are aware of their individual responsibilities for acting in accordance with this policy, while providing effective information and training to encourage individuals to contribute effectively.
3. Practice effective prevention of pollution by seeking practicable ways to reduce energy and water consumption, and reducing discharges to air, water and land.
4. Maintain communications with our local community, legislators, regulators and other organizations with an interest in our environmental performance.

In accordance with our Environmental Management System (EMS) requirements, we will regularly review environmental performance and our facilities' objectives and targets to assess progress toward continual improvement. This policy statement will be periodically reviewed to ensure its continuing suitability, be available to the public and communicated to all GMCL employees.



Michael A. Grimaldi  
President  
General Motors of Canada Ltd.

## **Energy Use in Our Facilities**

Energy use in our manufacturing, testing and office facilities is a function of a number of factors: the capacity utilization of each facility; the age and efficiency of the facility and equipment, weather conditions, etc. GMCL facilities throughout Canada primarily utilize the following forms of energy: natural gas, coal, fuel oil and electricity.

In addition to the manufacturing and assembly operations which have been included in this report, GMCL also operates five parts distribution centers (PDC) located across the country (a sixth one was closed in the middle of 2002) and an administrative building, the Canadian Headquarters (CHQ), located in Oshawa. GMCL also owns and operates a fleet of vehicles used for company business. Emissions from these activities were evaluated and it was determined that they represent approximately 3% of the total greenhouse gas emissions reported from the manufacturing and assembly facilities. For this reason, emissions from these activities have been, and will continue to be, excluded from GMCL VCR report submissions.

CO<sub>2</sub> is the only greenhouse gas generated in significant quantities by our stationary sources and emissions are shown in Figure 1. CH<sub>4</sub> and N<sub>2</sub>O emissions are not significant. This report covers energy consumption and GHG emissions from GMCL manufacturing facilities located throughout Ontario as well as the historical consumption and emissions from a facility in Ste. Therese Quebec, excluding GMCL's joint venture, CAMI Automotive, in Ingersoll, Ontario.

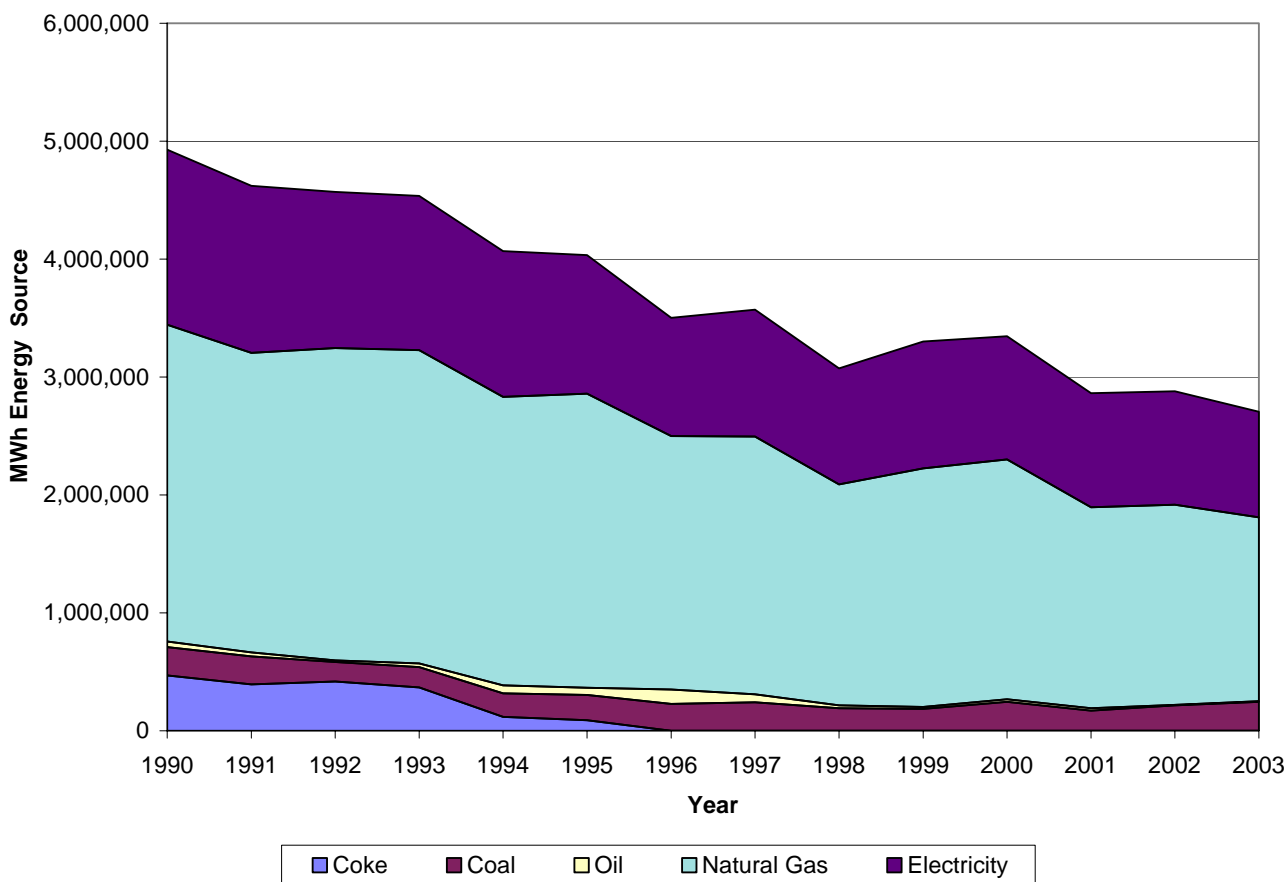
Monitoring GMCL's energy usage is not a new activity. GMCL has set energy reduction targets for our operations since 1974. Each Canadian manufacturing facility has an energy co-ordinator assigned to review the facility's energy usage and conservation planning. The Regional Utilities Operations Manager oversees GMCL's energy usage and programs.

GMCL is a participating member of the Canadian Industry Program for Energy Conservation, CIPEC, and we work closely with our industrial sector in promoting energy conservation. We have hosted energy conferences at our sites to exchange technical information and to share successful energy reduction projects.

## **Facilities Energy Input by Fuel and Source**

The total energy input into facilities by source is broken down in Figure 4. Table 3 shows the absolute values of these fuel source numbers. GMCL has achieved a 45% reduction in energy consumption over this period. Please note that data for 1990 has been revised as a result of an internal audit that indicated some facilities were not appropriately accounted for when they were closed or sold.

**Figure 4: Facility Energy Input by Fuel Source**



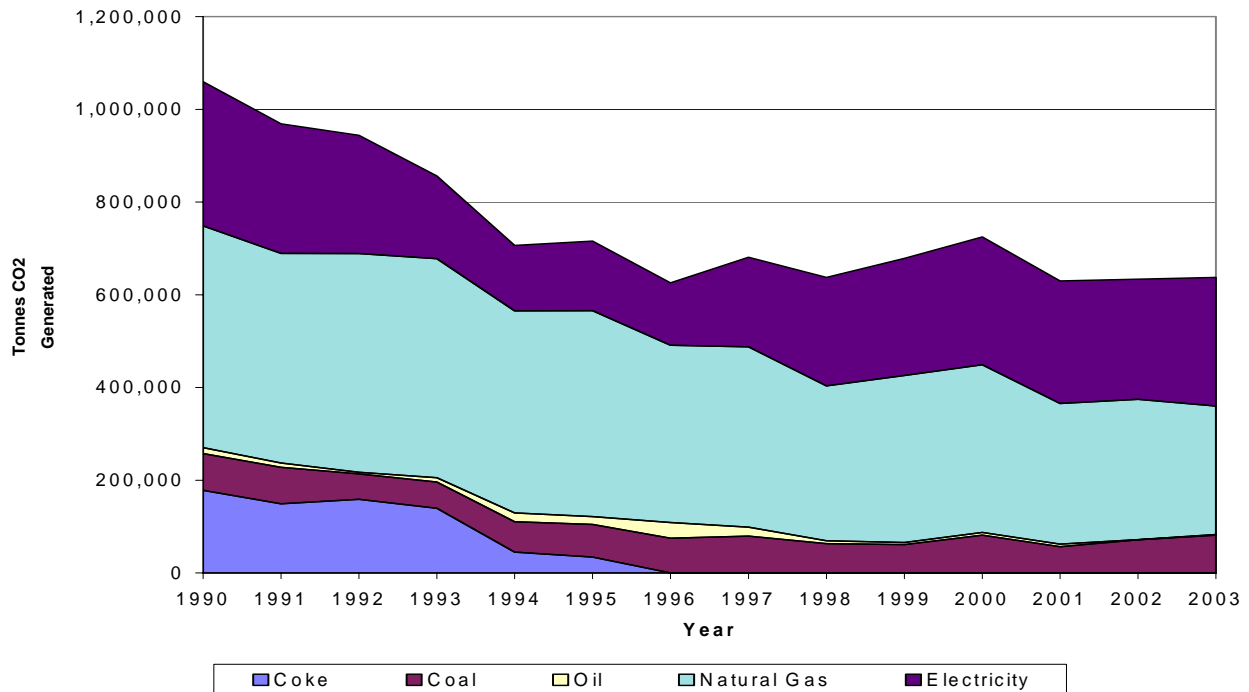
**Table 3: Facilities Energy Input by Fuel Source (MWh)**

	1990	2003
Natural Gas	2,686,933	1,556,626
Electricity	1,484,233	896,524
Coal	241,174	246,910
Oil	46,402	5,690
Coke	469,445	0
<b>Total</b>	<b>4,928,187</b>	<b>2,705,750</b>

## GHG Contribution by Energy Source

The total CO<sub>2</sub> generated by facilities by fuel source is broken down in Figure 5. Table 4 shows the absolute values of these CO<sub>2</sub> numbers. GMCL has achieved a 42% reduction in CO<sub>2</sub> generated over this period. The CO<sub>2</sub> generation over the period takes into account changes in the mix in source generation of electrical power of supplied electricity from Ontario and Quebec. Please note that 1990 data has been updated as a result of changes associated with the energy input table.

**Figure 5: Facilities CO<sub>2</sub> Generation by Fuel Source**



**Table 4: Facilities CO<sub>2</sub> Generation Fuel Source (tonnes)**

	1990	2003
Natural Gas	478,242	277,061
Electricity	311,003	257,399
Coal	79,507	81,398
Oil	12,855	1,576
Coke	178,010	0
<b>Total</b>	<b>1,059,616</b>	<b>617,434</b>

## Key Activities / Projects to Obtain Target Reduction

This report contains a selection of GMCL's energy savings projects for 2003 in Table 5. The energy savings are from GMCL manufacturing facilities located throughout Ontario. The chart shows energy saved for each project and the total yearly savings. Site utility managers and energy coordinators continue to identify numerous other energy savings projects through opportunities in heat recovery, HVAC, and process improvements.

**Table 5: Energy Efficiency Projects for 2003**

Plant/Project	Energy Saved	Unit/Type	CO <sub>2</sub> Saved (tonnes)	Annual Savings \$
Oshawa Truck Assembly Centre Automated lighting shutoff in robotic booths	3,550	MMBTU Electricity	613	\$ 77,100
Oshawa Truck Assembly Centre Close steam supply valve to snowcoil on oven level	15,424	MMBTU Steam	2,662	\$ 134,120
Oshawa Truck Assembly Centre Primer exhaust fans re-sheaved	3,932	MMBTU Electricity	679	\$ 63,360
Oshawa Truck Assembly Centre Automated weekend shutdown of sludge pumps	2,446	MMBTU Electricity	422	\$ 58,200
Oshawa Car Assembly Centre Installed controls on exhaust fans to DVT to regulate run time	5,015	MMBTU Natural Gas	866	\$42,004
Oshawa Car Assembly Plants Remove redundant unit heaters.	33,000	MMBTU Natural Gas	5,695	\$ 247,282
Oshawa Car Assembly Plants Steam Trap Audit and Repair program	29,008	MMBTU Natural Gas	5,007	\$ 244,000
St. Catharines Components Plant Consolidate heat treat furnaces	27,300	MMBTU Natural Gas	4,712	\$ 224,000
St. Catharines Components Plant Elimination of coarse bubble aeration hose with a fine bubble diffuser disc	6,824	MMBTU Electricity	1,178	\$ 140,000
St. Catharines Components Plant Tune up heat treat furnace	2,925	MMBTU Natural Gas	505	\$ 24,000
St. Catharines Components Plant Eliminate old compressed air lines	1,325	MMBTU Electricity	229	\$ 35,516

Windsor Transmission Compressed air leak repair	16,439	MMBTU Electricity	2,837	\$ 481,759
Windsor Transmission Elimination of two parts washers	989	MMBTU Electricity	171	\$ 20,700
Windsor Transmission Exhaust fan shutdown on long weekends	839	MMBTU Electricity	145	\$ 17,500
Subtotals	<u>Electricity:</u> 97,248 MMBTU			\$ 894,135
	<u>Natural Gas:</u> 36,344 MMBTU			\$ 781,286
				\$ 134,120
	<u>Steam:</u> 15,424 MMBTU			
<b>Grand Total</b>	<b>149,016 MMBTU</b>		<b>25,719 Tonnes</b>	<b>\$1,809,541</b>

GMCL has energy conservation specialist in our facilities on a full time basis to assist in identifying opportunities for further energy reductions. The energy conservation specialists conduct surveys, monitor, analyze and report out on energy consumption for each facility.

This report contains a selection of proposed GMCL energy efficiency projects for 2004 and beyond in Table 6.

**Table 6: Proposed Energy Efficiency Projects for 2004 and Beyond**

Plant/Project	Potential Energy Savings	Unit/Type	Potential CO <sub>2</sub> avoided (tonnes)
Oshawa Truck Assembly Centre Lighting elimination	5,898	MMBTU Electricity	1,018
Oshawa Truck Assembly Centre Penthouse non production time shutdown automation	23,500	MMBTU Natural Gas	4,056
Oshawa Truck Assembly Centre Penthouse non production period shutdown automation	3,670	MMBTU Electricity	633

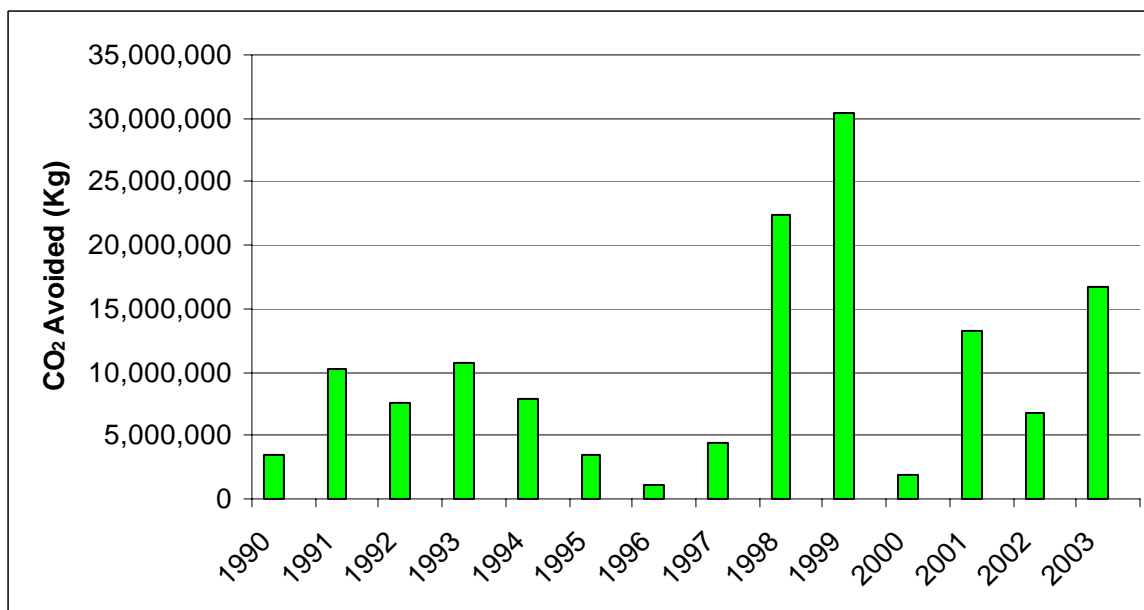
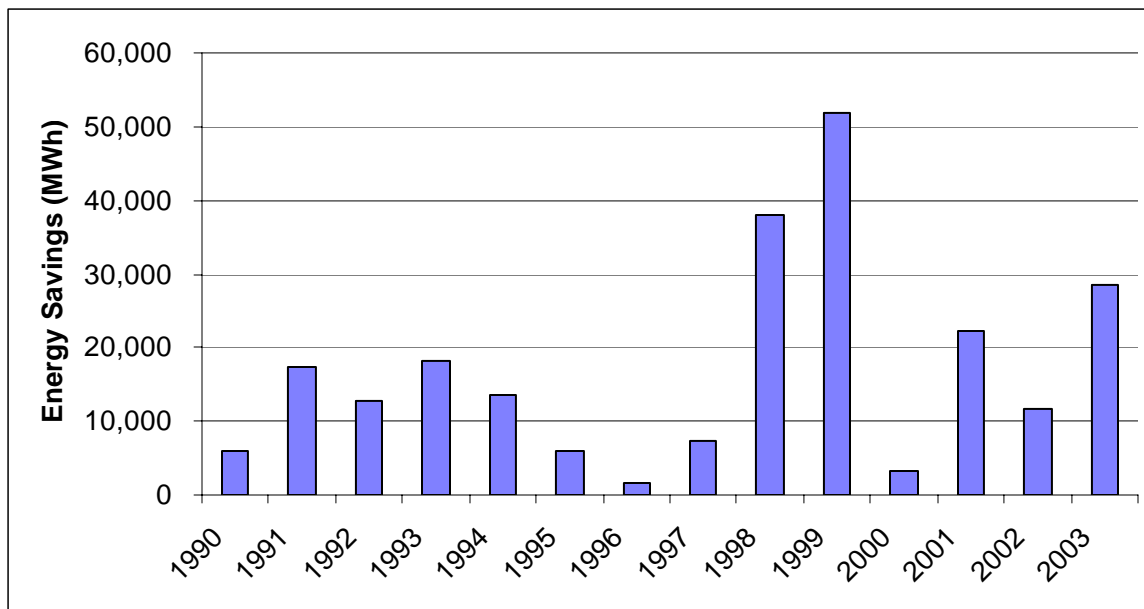
Oshawa Car Assembly Plants Lighting reduction in body plant (target 500 fixtures)	3,736	MMBTU Electricity	645
Oshawa Car Assembly Plants Targeting a 5% energy reduction during downtime using handsets and text messaging to convey energy information	6,879	MMBTU Electricity	1,187
Oshawa Car Assembly Plants Reduce steam pressure at the Powerhouse from 165 psi to 140 psi.	3,388	MMBTU Electricity	585
St. Catharine's Engine Plant Lighting retrofit project to convert 8 ft fluorescent lights from T12 to T8	1,918	MMBTU Electricity	331
Grand Total	48,989 MMBTU		8,455

### **Electricity Consumption Efficiency Projects & CO<sub>2</sub> Savings**

Over the years GMCL has made great gains in energy consumption through the implementation of energy efficiency projects similar to those detailed in Table 5. Figure 6 illustrates the electricity energy savings implemented each year along with the corresponding CO<sub>2</sub> emissions avoided for the energy savings achieved.

There are obviously fluctuations from year to year on the amount of electricity savings achieved from the energy efficiency projects. These fluctuations can be attributed to many issues such as a downturn in economy resulting in less capital investments, capturing the low hanging fruit at each facility, or even making gains in other areas such as natural gas, oil, or coal reductions. Overall, GMCL's electrical energy reduction projects and energy efficiency initiatives have significantly reduced CO<sub>2</sub> emissions.

**Figure 6: Electricity Energy Efficiency Projects - Energy & CO<sub>2</sub> Reductions**



**Non-Production Load Reductions & STAR Energy Program**

It is very difficult for the automotive industry to make adjustments to production periods in order to better balance electricity usage to non-peak hours. In fact, several of our facilities operate 24 hours a day, five or six days a week to meet the customer demand. As a result, GMCL has focused efforts on making the best of the non-production time

that is experienced throughout the year. Several of the energy efficiency projects that have been implemented to date are targeted at installation of automatic shutoff equipment, computer automation, and other energy reduction initiatives during non-production periods.

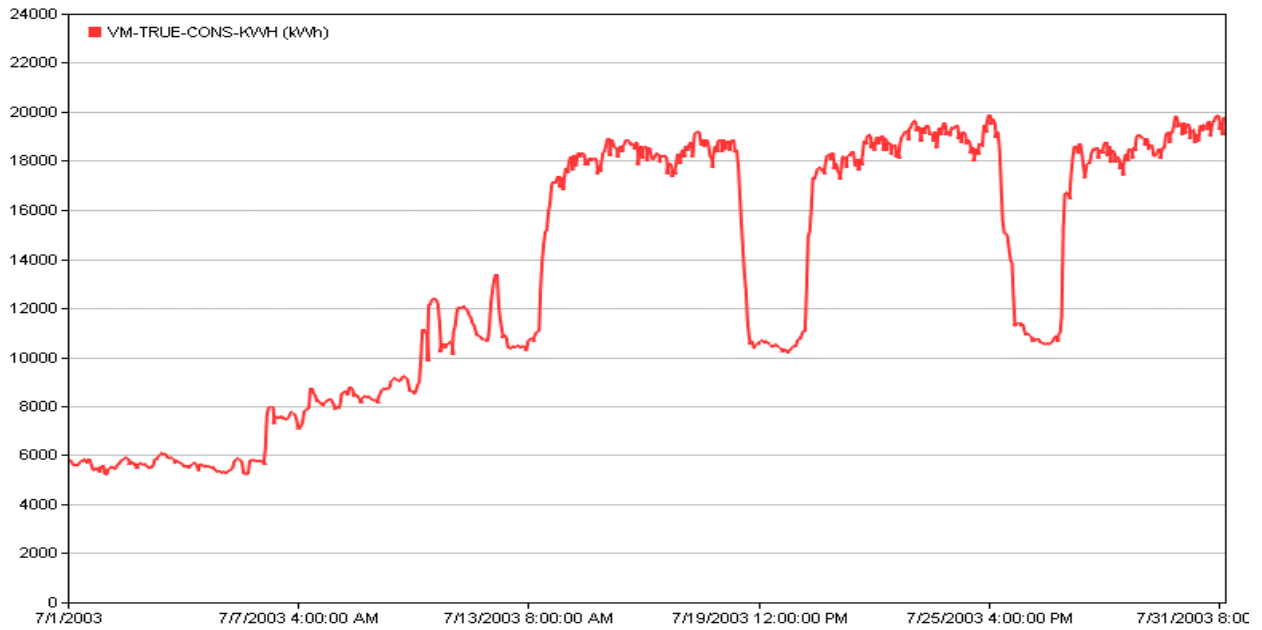
In recent years, GM Corporation has looked to model the U.S. Environmental Protection Agency's and U.S. Department of Energy's annual ENERGY STAR Award program, which recognizes leading companies and organizations for their outstanding contributions to environmental protection and energy efficiency. One of the key measures GM uses is performance during shutdown periods. GM North American locations are awarded one "star" for achieving more than a 70-percent reduction in electricity usage, more than a 75-percent reduction in compressed air usage or a 100-percent reduction in steam usage.

GMCL facilities have begun this initiative as a means to motivate people to reduce energy consumption during non-production periods such as shutdowns and weekends, reducing greenhouse gas emissions and utilities operation expenses. During the 2004 summer shutdown period there was substantial work being completed in the plants to facilitate new model year product and changeovers. Despite this high activity rate four GMCL facilities received at least one star (up from only three facilities last year), and two facilities received a perfect three-star rating, up from just one facility during the 2003 summer shutdown.

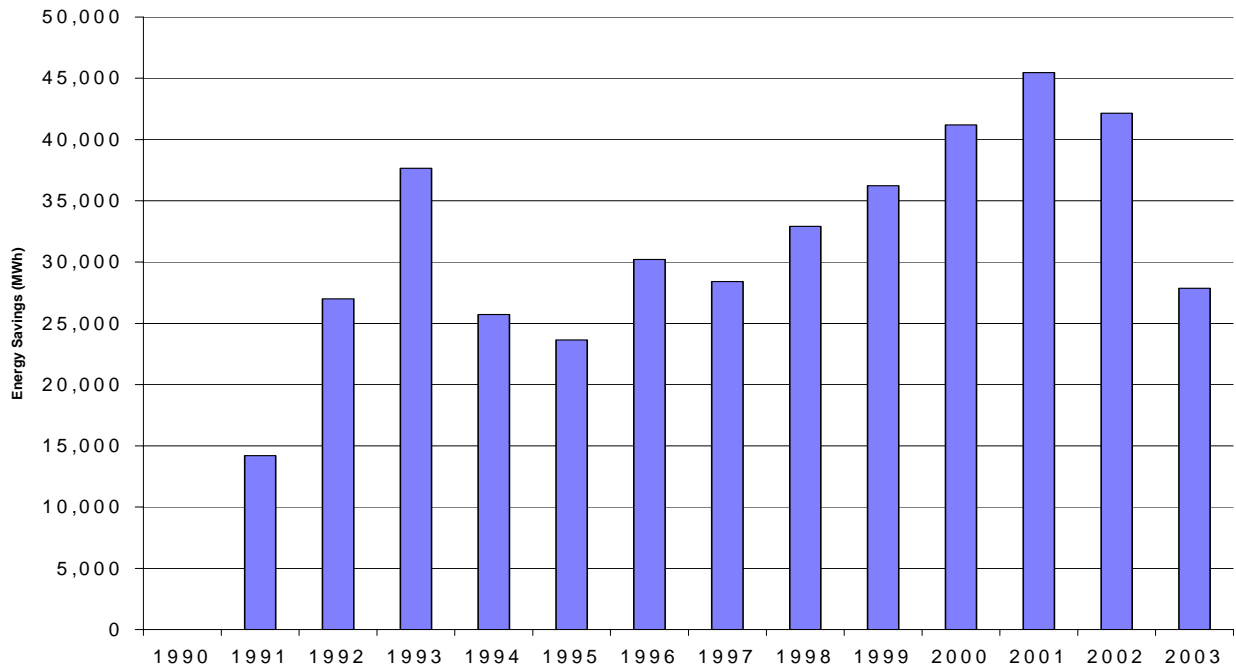
Figure 7 is a representative sample from one of our manufacturing facilities that works 24 hrs a day and the results that our continued efforts to reduce load during non-production have made. The load profile in Figure 7 is for the month of July 2003 and clearly illustrates the dramatic decreases experienced on weekends and during the Summer Shutdown (first 2 weeks of July). Unfortunately it is not possible to reduce the load to zero as weekends and shutdowns are often the only times available to get regular maintenance and major project work completed.

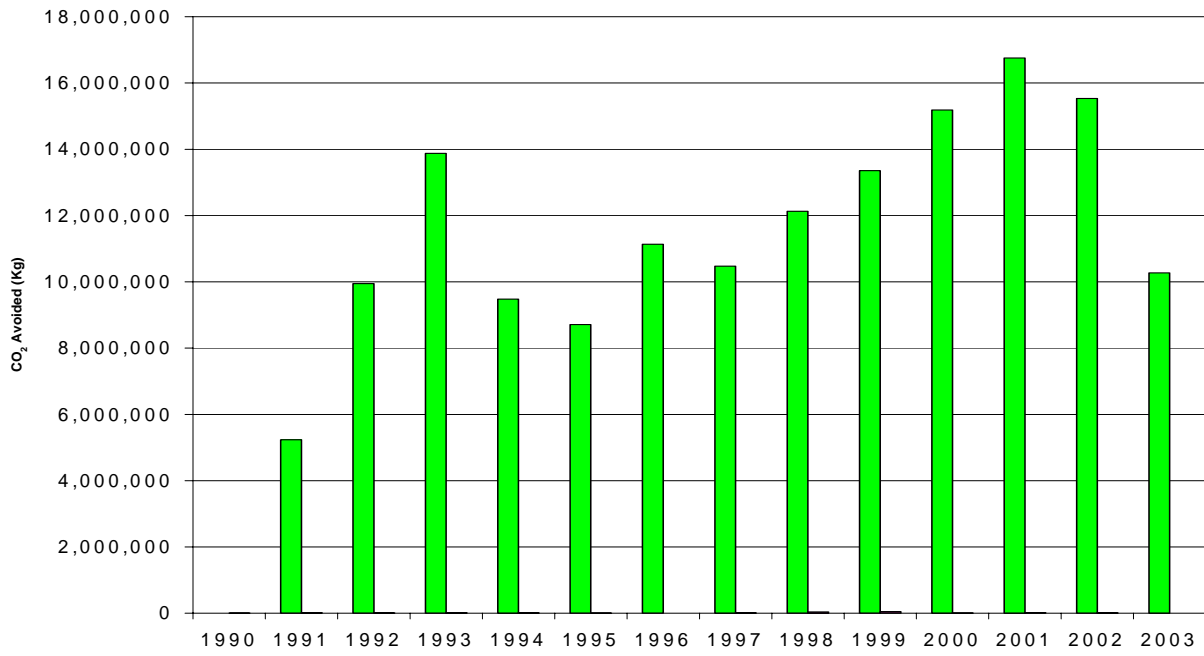
Figure 8 illustrates the annual electricity savings and associated CO<sub>2</sub> emissions avoided by the Oshawa Autoplex through a focused effort on non-production load energy reductions. Figure 8 focuses on the Oshawa Autoplex savings as they have a monitoring system in place that collects this information for shutdown periods. The energy reductions and associated CO<sub>2</sub> avoidance was less substantial in 2003 relative to the last few years in large part because the amount of non production downtime at the autoplex has decreased. In late 2002 the Oshawa Car Assembly Plant added a third shift to their plant 1 production which tipped the balance of production at the entire Oshawa Autoplex to a more even three shift operation. In the spirit of continuous improvement GMCL is investigating the possibility of putting systems in place to collect similar data from the other manufacturing and assembly facilities.

**Figure 7: Sample Electricity Load Profile**



**Figure 8: Autoplex Annual Non-Production Load Reduction**





## Target Setting and Projections

### Targets

In 1997, GM established aggressive goals for facility resource conservation and pollution prevention with a management objective to work towards a 20% reduction in energy usage with a baseline year of 1990, by the year 2002. This GM Corporate goal has been adjusted to a 25% reduction in energy usage with a baseline year of 1995, by the year 2005.

In 2003 a new goal was initiated by General Motors to reduce CO<sub>2</sub> emissions globally by 8% by 2005 in comparison to the baseline year of 2000.

Energy efficiency is a key element of GM's energy strategy, which includes five distinct areas: rates, conversion, control, conservation and operations. Activities are being targeted to reduce energy usage at each plant, focusing particularly on paint processes. Significant progress is also being made in the design of energy efficient manufacturing and facility systems.

### Process for Target Review and Update

Reviews at GMCL track the energy consumption of the sources utilized on a monthly basis. Annual reviews of progress towards and beyond the goals are carried out regularly for corporate and applicable regulatory reporting requirements. The GMCL Board of Directors reviews the progress towards environmental and energy targets on a regular basis. The submittal of the annual VCR report is one tool used in this review process.

### Verification

The calculations for this report were done internally and are verifiable against energy invoicing from suppliers. The calculations of greenhouse gas emissions are carried out using publicly available emission factors and are also verifiable. In addition, the on-site external utility specialist is a third party who has regular access to the energy data to make recommendations for potential conservation initiatives.

GMCL is a member of the VCR Champions in Action program. In June 2003 the GMCL 2002 Action Plan Update underwent a Peer Review by the Champions in Action members. Continuous improvement recommendations made during the Peer Review have been incorporated into this Action Plan Update.

### Offsets

In addition to significant direct reductions in GHG emissions from our manufacturing facilities, GMCL has undertaken an offset initiative. Close to 50,000 trees and shrubs have been planted at several GMCL locations including the McLaughlin Bay Wildlife Reserve in Oshawa, Ontario and the Glendale Engine facility in St. Catharines, Ontario. GMCL will continue to track the number of trees planted and report out on offset values

when we reach a “critical” number such that there is substantial impact to the bottom line of greenhouse gas emissions.

### Energy Consumption and GHG Projections.

This report offers a projection for 2005 energy consumption using a polymeric trend line for the period 1990 to 2007. The CO<sub>2</sub> projections for 2005 and 2007 assume the same fuel source mix and emission factors as in 2003. These projections are shown in Table 7.

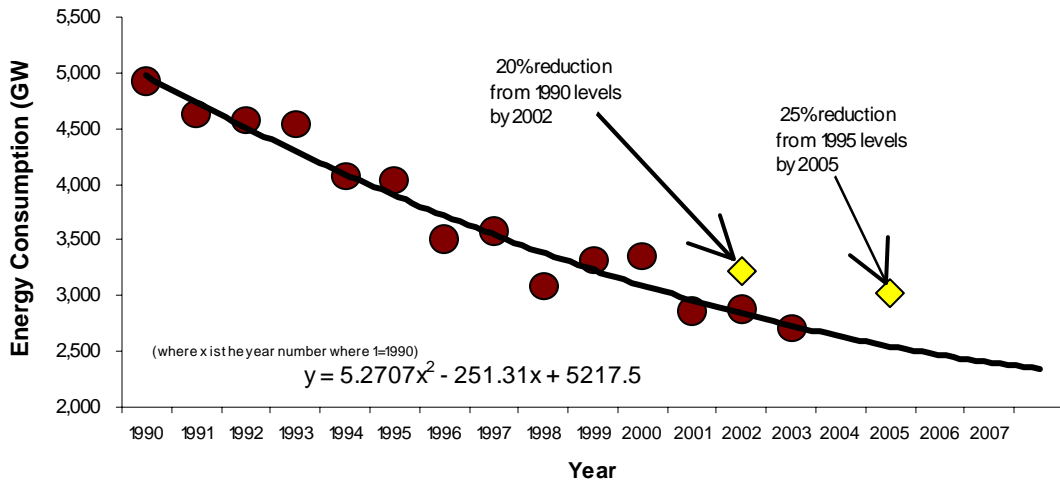
**Table 7: Energy Consumption and GHG Emission Projection**

	1990	1995	2000	2003	2005	2007
Energy Consumption (GWh)	4,849	3,927	3,346	2,706		
Projection (GWh)					2,546	2,402
Energy Consumption Target (GWh)					3,025	
CO <sub>2</sub> Emissions (kilotonnes)	1,060	716	725	617		
Projection (kilotonnes)					600	566

As reported last year GMCL realized our goal of reducing energy consumption by 20% based on a 1990 baseline by 2002. Our next goal to achieve is the 25% energy consumption reduction by 2005 from a 1995 baseline. Figure 9 shows that GMCL has already reduced energy consumption by 34% since 1995 despite adding an entire third shift to one of our Oshawa Car Assembly Plants. The energy use projection for 2005 of 2,546 GWh is shown in the figure above. This projection yields a 35% reduction compared to the 1995 base year which is well in excess of our current corporate target however meeting this projection will take considerable effort over the next 2 years as GMCL has begun construction on the first phase of a new paint shop for the Oshawa Car Assembly Plant. The new paint shop includes a new building and new abatement technologies both of which will require additional energy consumption to run. Using this method of projection and considering anticipated changes in technology and building footprints, GMCL will need to stretch to continue to make energy consumption reductions to meet the 2005 target of 3,025 GWh.

Meeting GMCL’s energy targets is a key enabler to the corporation achieving its 8% reduction in global CO<sub>2</sub> emissions. At the end of 2003 GMCL has achieved a 14.8% reduction in CO<sub>2</sub> emissions and based on predicted energy consumption GMCL will attain a 17% reduction in CO<sub>2</sub> emissions.

Figure 9: Energy Consumption at GMCL Facilities



## Methodology

### Fuel Use and Conversion Factors

Since GMCL facilities do not directly measure CO<sub>2</sub> emissions, emission factors of CO<sub>2</sub> for each form of energy are used. These are given in Table 8 for all reporting years. As respective sources are modifying their emission factors to more accurately account for their operations and GMCL conducts similar activities, previously reported levels may be modified up or down to reflect the new information.

**Table 8: Conversion Factors for Fuels Used - All Reporting Years**

Fuel	Fuel unit	Fuel unit to energy (fuel unit per MWh)	Energy to GHG (MWh per tonne CO <sub>2</sub> )
Oil	U.S. gal	41.9	0.277
Coke	tons	7.82	0.379
Coal	tons	8.08	0.330
Natural Gas	cf	0.30	0.178

For indirect emissions from electricity, CO<sub>2</sub> generation is calculated based on emission factors for electricity production by VCR for the public utilities in Ontario and Quebec. In previous submissions indirect emissions from electricity in Quebec were held constant at 0.014 MWh per tonne of CO<sub>2</sub>. In the spirit of continuous improvement we recalculated all the indirect emissions from our Ste. Therese facility using the conversion factors supplied by VCR. The emission rate goes up and down depending on the mix of green power, fossil fuel and nuclear energy used.

**Table 9: Emission Factors Provided by VCR to Convert MWh to tonne CO<sub>2</sub>**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
ON	0.223	0.208	0.203	0.150	0.127	0.143	0.150	0.202	0.264	0.261	0.295	0.302	0.293	0.292
PQ	0.034	0.015	0.044	0.020	0.021	0.016	0.015	0.007	0.031	0.018	0.011	0.015	0.009	0.022

The variation in emission factors provided by VCR results in variation in our calculated greenhouse gas emissions. For example, if instead of varying the emission factor each year, it is assumed that the current emission factor applies to all previous years GMCL has seen a 44% reduction in greenhouse gas emissions since 1990. Table 10 shows the impact of varying the emission factor. As Figure 9 illustrates, the approach of varying the emission factors present the most accurate annual releases, however it makes year over year comparisons difficult to assess because improvement in energy conservation may be overshadowed by the impact of changing emission factors associated with varying the mix of electricity sources.

**Table 10: Impact of Varying the OPG Emission Factor**

	1990 Emissions (kilo-tonnes)	1990 Emissions (kilo-tonnes)	% Change from 1990
Constant Emission Factors	1,137	617	46%
Variable Emission Factors	1,060	617	42%

A detailed methodology was provided in GMCL's update report dated October 2000 giving an example template of how energy consumption is reported within GM Canada manufacturing facilities. The methodology in that report identifies the major sources, direct and indirect emissions, emission factors and fuel types. That update report also gives references for the conversion factors used.

In 1997, manufacturing operations in Oshawa and Windsor were sold to other companies that continue to operate them on an ongoing basis. Energy consumption data for these facilities have been removed for all years and this adjusted baseline has been reflected in previous GMCL Update Reports. Additionally, in 1999, Delphi Operations in Oshawa were sold and the operations continue to operate under different management. As in previous years, the Update Progress Report reflects the sale of these operations as energy consumption data for these facilities have been removed for all years.

Since 1990 GMCL has realized efficiencies through the rationalization of production, while producing more vehicles today than in 1990, there are fewer plants in operation, which inherently lends to additional energy efficiencies. These plant closures remain in the GMCL baseline and contribute to the overall greenhouse gas reductions achieved.

## **Education, Training and Awareness**

### **Our Corporate Response to Climate Change**

As a corporation, GM's position indicates our recognition of the need to determine how to operate in ways that promote economic growth and comprehend the needs of the environment and society, without compromising those needs in the future.

The basic challenge is to meet the world's growing demands for energy necessary to sustain economic growth while also addressing long-term concerns about the environment. GM believes the development and global implementation of new, cost effective energy technologies in all sectors such as renewable hydrogen, is the most effective way to improve energy efficiency and reduce greenhouse gas emissions. This approach is best facilitated by relying on voluntary initiatives and market-oriented measures, not government mandates. In addition to developing new technologies and processes, GM continues to monitor greenhouse gas emissions from its facilities and products and is taking steps to achieve near-term reductions. GM publicly reports

greenhouse gas emissions within its Corporate Responsibility Report which is available to the public at [www.gmresponsibility.com](http://www.gmresponsibility.com). GM also continues to support scientific research to improve the understanding of the possible long-term effects of economic growth and other human activities on the climate system.

GMCL has undertaken concrete activities in Canada to assist in determining the appropriate response to climate change concerns. The Federal Government launched its National Implementation Strategy consultation in 1998. GMCL, in conjunction with the other auto companies in Canada, took an active role. GMCL representatives participated at the Credit for Early Action table, and sub-groups of both the Industry Table and the Transportation Table. Additionally, the auto industry pooled its resources in order to provide comprehensive input to the national process and other auto company representatives sat on the Public Education and Outreach Table, the Industry Table, and the Transportation Table. The activities of the other tables were reviewed at regular industry meetings. As the table process is now complete, GMCL will continue to work with the government and industry stakeholders on an ongoing basis to assist in determining the appropriate response to climate change concerns.

In addition to our involvement in the consultation process, GMCL has participated in many other ways. For example:

- In May 2003, GMCL hosted a Tech Tour in Ottawa that featured a line-up of vehicles and technologies that will play an important role in our comprehensive strategy. Federal and Provincial government officials, media, and other key decision makers were invited to participate in this event to learn more about what GM is doing to take the automobile out of the environmental debate. Tech Tour guests were able to drive a range of new hybrid (gasoline/electric) vehicles which GM starts introducing in Canada in early 2004. GM's approach is to bring hybrid powertrains to mainstream segments of the market with a wide variety of vehicle types over the next several years. Guests were also able to drive our unique "Hy-wire" hydrogen fuel cell vehicle. GM sees hydrogen fuel cells as the ultimate answer and continues to invest heavily in developing this exciting and revolutionary technology.
- In 2004 GMCL participated in the Globe Conference held in Vancouver, B.C. to profile barriers to the hydrogen economy and barriers to the introduction of fuel cell vehicles
- In 2004 GMCL undertook Mission Green, a cross Canada odyssey that helped profile GM automotive technology for reducing greenhouse gas emissions.
- In 2004 GMCL successfully completed the sale of 2 hybrid buses to BC Transit and continues to promote the GHG reduction potential of hybrid buses to transit fleets across the country.

### **Climate Change and Our Employees**

Our employees guide their day-to-day activities with the GM Environmental Principles in mind. GMCL also uses other tools to communicate with employees on environmental

issues and on climate change specifically. Each of GMCL's manufacturing facilities have newsletters that are distributed to local personnel. These publications often contain environmental awareness information. These publications have included information on reducing energy usage both at the workplace and at home. GMCL's Intranet website has a section dedicated to the environment with links to GM's World Wide Facilities Group (WFG) Energy and Utilities Services and this section includes a significant amount of material describing energy conservation initiatives that have been implemented at our facilities, and techniques that our employees can use to reduce the energy requirement and environmental impact associated with their work on site. Finally, all our employees have access to the internet and therefore our [www.GMCanada.com](http://www.GMCanada.com) site where we have posted information on the Environment including a summary of our energy use and links to the VCR web site should employees wish to read our annual updates in detail.

### **GM Canada Energy Awareness Communications**

GMCL communicates with employees on a variety of subjects via email messages. Environmental topics are frequently addressed, including the need to conserve energy in the workplace to reduce costs and reduce environmental impacts. Newsletters on energy awareness are circulated on a regular basis throughout the year. Practical tips are often cited for reducing energy usage. A sample is given in Figure 10.

In addition to employee communications to save energy at work, GMCL has also communicated an awareness program concerning energy efficiency at home; an example of this is given in Figure 11.

Figure 10: Communication to Employees on Energy Conservation

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# GM Canada Communications

## Energy Conservation Message

Helping the environment we live in is everybody's responsibility, whether at home or at the workplace. Eliminating energy waste to conserve our natural resources is a fundamental element of GM's environmental policy. All of GM manufacturing facilities now have developed their plant specific "Sufficiency Plan", to ensure that our energy conservation efforts are focused on keeping the non-production (Holidays, Weekends and between shifts) energy usage to a minimum.

### Please Consider the Following for Your Plants and Offices:

- Turn off all non-essential HVAC equipment.
- Turn off all non-essential lighting.
- Ensure that any computer controlled equipment (HVAC, Lighting....etc.) will not come on automatically as normally scheduled.
- Where applicable, contact your local TSC/EMS coordinator(s) with production/equipment requirements for your area.
- Turn-off fans, air conditioners, computers, monitors, printers, photocopiers, coffee makers.
- Ensure that all doors and windows are closed.
- Shut down production equipment (tools, personal pedestal fans, conveyors, pumps.....etc.).
- Disconnect any air tools and isolate air line branches to air powered equipment.

**Please ensure that all the equipment to be shut-off are considered with personnel and equipment safety in mind.**

**If you would like to use GM Canada Communications to send out a message or if you have any comments or questions please contact Employee Communications by using the "Reply" button on this screen or by calling us.**

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Figure 11: Communication to Employees on Saving Energy at Home



# GM Canada Communications

## Waste Reduction Week

### Energy Conservation

#### Did You Know.....

- It takes 20 well-tuned cars to produce the same amount of pollution as one badly tuned car. Cars should be serviced regularly to help reduce air pollution.
- About 20% of the energy used in residences goes for heating water.
- For each degree you lower your thermostat in the winter, you can save about 3 percent on your heating bill.

#### Energy Conservation Tips:

- Turn down the temperature on your hot water tank.
- In the winter, run your ceiling-fans counter-clockwise to force hot air downward. In the summer, run them clockwise to circulate cooled air.
- Cook with the microwave, toaster oven and electric skillet – all use much less energy than their traditional, full-size counterparts. For example, microwaves cook in one-quarter of the time and use 30-70% the electricity of an oven.
- Refrigerators and freezers work best when they are full. Use extra items to fill them even if they don't need to be kept cold.
- Defrosting frozen foods in the refrigerator helps the refrigerator stay cool.
- If you have a TV that uses a remote to turn it on, part of the TV is actually on all the time. To turn this type of TV off completely, plug it into a socket that is controlled by a light switch, and to use that light switch when you turn off the set.
- Energy-saver bulbs (compact-fluorescent) give as much light as conventional bulbs, but use less energy. Even though they have a higher initial cost, they are longer lasting and can cut the cost of lighting by 50%!

#### Resources:

*Waste Reduction Week in Canada, Volunteer and School Activity Handbook*, [www.wrwcanda.com](http://www.wrwcanda.com)  
*Region of Durham "2001 Blue Box Recycling Collection Schedules"*, [www.region.durham.on.ca](http://www.region.durham.on.ca)  
*Gov. Gary Locke, State of Washington Energy Home Page*, [www.governor.wa.gov/energy/energy.htm](http://www.governor.wa.gov/energy/energy.htm)

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**If you have any comments or questions please contact Employee Communications by using the "Reply" button on this screen or by calling us.**

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## **Climate Change and Our External Contacts**

### **The CERES Principles**

In February 1994, GM became the first mainstream “Fortune 50” company to endorse a set of environmental principles as developed by the Coalition of Environmental Responsible Economies (CERES). CERES is composed of national environmental groups and socially responsible investors. By endorsing the CERES Principles, GM publicly affirmed not only our commitment to the environment but also the accountability for corporate performance. CERES endorsed GM’s Environmental Principles as consistent with the goals of the CERES Principles.

We now annually issue a Corporate Environmental Report (including specific information relating to the activities of GMCL) that follows the CERES report protocol. Our investment in issuing an annual report facilitates internal evaluation of environmental performance, increases employee awareness of GM’s environmental issues, and promotes open discussion with the public on environmental performance.

GM’s quest for continuous improvement has encompassed more than three decades of environmental policy. Throughout GM, our employees continue to use their talents to better understand how our business and our products affect the environment. We’re working hard to identify the environmental challenges and develop solutions.

As a leader of the Canadian automotive manufacturing industry and as a responsible corporate citizen, GMCL is dedicated to protecting human health, natural resources and the global environment.

### **Suppliers and Dealers**

GMCL encourages our external business partners to undertake responsible environmental management.

GM recognizes that our suppliers are critical to our reputation for environmental performance and quality. Each supplier’s creativity and product and process knowledge are important in helping GM achieve its environmental goals. In Canada, GMCL organizes meetings with the Supplier Council and on an annual basis, the assembled group is informed about the issue of climate change and the need for GM’s supplier organization to reduce energy consumption and track GHG emissions. The supplier community has been informed about the Voluntary Challenge and Registry and encouraged to participate and establish baselines for their individual operations.

Our Supplier Development team assists our Suppliers in identifying waste of many types. This is accomplished by conducting a waste identification audit that includes a section that specifically targets energy waste. Such items include air leaks, inappropriate use of compressed air, lack of operational controls or use of inefficient energy sources. The results of these audits are reviewed with the Supplier and suggestions are made to assist them in reducing such waste.

GMCL's dealers and retailers are also a critical part of GM's overall reputation. Our dealers are encouraged to put in place environmental management programs. GMCL makes the dealers aware of provincial and federal environmental regulations with which they must comply via a waste management guide. To further reduce waste, GMCL has a parts refurbishment program with its dealers. GMCL also regularly undertakes presentations and other communications to dealers on issues of interest, including energy and environmental issues, to assist in educating and informing the dealer body.

### **Our Public Education on Climate Change**

GM undertakes a number of activities that endeavour to educate the public about climate change.

In May of 2001, GMCL was approached by a local principal of a high school situated near a scenic wetland area. The vision was to develop a School of Environmental Studies and an appropriate curriculum through partnerships with GM, Friends of the Second Marsh and Earthforce. The results of this collaboration were two innovative courses, "Watershed Monitoring and Management" (Gr. 11) and "Industry and the Environment: (Gr. 12). These courses received Ontario Ministry of Education approval in January of 2002 and will be the only ones of their kind offered in Ontario. GMCL collaborated with the school on the implementation of the grade 11 course which is now being taught. The second course, Industry and the Environment, will teach grade 12 students the balance between economic growth and environmental protection including topics such as energy conservation and climate change.

GMCL's corporate website contains valuable information about climate change and our effort to reduce environmental impacts to help inform the public. The website also offers advice to the public about how they can minimize their impact on the environment by maintaining their vehicles properly and conserving fuel.

All vehicle owner's manuals contain information for the public on the need to maintain their vehicles properly and ensure that all emission control technology is functioning as it was designed. Manuals also offer information to the public about the need to complement vehicle technology with appropriate fuels to ensure that emissions performance is optimal.

Additionally, GMCL actively participates in the production of the annual Fuel Consumption Guide in conjunction with the Federal Government. This reference ensures that consumers have the necessary information to help choose the most fuel-efficient vehicles that meet their personal and functional needs.