

Action Plan Update for Manufacturing and Assembly Facilities

Prepared for

CSA Climate Change, GHG Registries GHG Challenge Registry

170 Laurier Ave West, Suite 600, Ottawa, Ontario K1P 5V5
Tel.: (613) 565-5151 Fax: (613) 565-5743 <http://www.ghgregistries.ca>
E-mail: reports@ghgregistries.ca

Prepared by

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

October 31, 2005



Table of Contents

Executive Summary	1
Organization Profile	2
1. Senior Management Support	3
1.1 Endorsement	3
1.2 Commitment to Regular Reporting	4
1.3 Internal Practices on Climate Change	4
1.4 Management Systems	7
2. Base Year Quantification	8
2.1 Quantification Target Setting	8
2.2 Quantification Methodology	8
2.3 GHG Emissions Inventory by Gas Type	9
2.4 Quantification Method by Gas Type	10
2.5 Indirect Energy Emissions	10
3. Results Achieved	11
3.1 Reported Results	11
3.2 All Reported Results Since Base Year	11
3.3 Tonnage Emissions Inventory	12
3.4 Emissions Inventory Since Base Year	12
3.5 Comparison with Previous Targets	14
3.6 Results Below Base Year Levels of CO ₂ e	15
3.7 Verifiable Results	15
3.8 External Verification	16
3.9 Emission Reduction Offsets	16
4. Business-as-Usual Projection	16
4.1 Basis for Business-As-Usual Projection	16
4.2 Business-As-Usual Projection - CO ₂ e	17
4.3 Major Sources of GHG emissions	18
4.4 Indirect Energy Emissions	20
4.5 Energy Emissions Specified by GHG type	21
5. Target Setting	21
5.1 Commitment to Target Setting	21
5.2 Target and Target Setting Process	21
5.3 Projected Targets to 2007	21
5.4 Target Review and Update Process	22
6. Past Actions	22
6.1 Estimated Impacts	22
6.2 Impacts of Key Projects	24
6.3 Sum of Key Projects Impacts in tonnes CO ₂ equivalent	24
6.4 Impacts of Key Projects in CO ₂ equivalent	24
6.5 Non-Production Load Reductions	24
7. Potential Future Actions to Achieve Targets	26
7.1 Potential Reduction Projects	26
7.2 Sum of Impacts of Potential Projects	27
7.3 Individual Impacts of Potential Projects	27
7.4 Sum of Impacts of Potential Projects in tonnes CO ₂ equivalent	27
7.5 Individual Impacts of Potential Projects in tonnes CO ₂ equivalent	27

7.6	Categorization of Projects	27
8.	Education, Training and Awareness	27
8.1	Climate Change Issue Explained to Employees.....	27
8.2	Corporate Response to Climate Change.....	28
8.3	Opportunities for Individual Action.....	29
8.4	Incentives for Emission Reductions by Employees Outside of Work.....	32
8.5	Supplier Incentives for Emission Reductions.	32
8.6	Customer Incentives for Emission Reductions	32
8.7	Influence of external contacts	32
8.8	Undertake public education	33
9.	Appendix	35

List of Figures

Figure 3.1: CO2 Generation Including CO2 Generated from Electricity Consumed	11
Figure 3.2: Vehicle Assembly Production	13
Figure 3.3: CO2 Generation at Assembly Plants Normalized to Production	14
Figure 3.4: Energy Consumption at GMCL Facilities compared to previous targets.....	15
Figure 4.1: Business-As-Usual Projection – Energy Consumption	17
Figure 4.2: Business-As-Usual Projection – CO2 Emissions	18
Figure 4.3: Facility Energy Input by Fuel Source	19
Figure 4.4: Facilities CO2 Generation by Fuel Source	20
Figure 6.1: Energy Efficiency Projects – Energy Reductions.....	23
Figure 6.2: Energy Efficiency Projects - CO ₂ Reductions.....	23
Figure 6.3: Sample Electricity Load Profile	25
Figure 6.4: Oshawa Autoplex Annual Non-Production Load Reduction (KWh)	25
Figure 6.5: Oshawa Autoplex Annual Non-Production Load Reduction (kg CO ₂ Avoided)	26
Figure 8.1: Communication to Employees on Energy Conservation	30
Figure 8.2: Communication to Employees on Saving Energy at Home	31

List of Tables

Table 2.1: Conversion Factors for Fuels Used - All Reporting Years.....	8
Table 2.2: Emission Factors Provided by GHG CR to Convert MWh to tonne CO ₂	10
Table 2.3: Impact of Varying the OPG Emission Factor	11
Table 3.1: CO ₂ Generation for GMCL Manufacturing Facilities (kilotonnes).....	12
Table 3.2: Energy and CO ₂ Intensity per Vehicle Produced	14
Table 4.1: Facilities Energy Input by Fuel Source (MWh)	19
Table 4.2: Facilities CO ₂ Generation Fuel Source (tonnes)	20
Table 6.1: Energy Efficiency Projects for 2004	22
Table 7.1: Proposed Energy Efficiency Projects for 2005 and Beyond.....	27

Executive Summary

General Motors has made the goal of reducing 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 report is GMCL's first submission to the Canadian Greenhouse Gas Challenge Registry (GHG CR), and would be its tenth update to the former Voluntary Challenge and Registry Inc. (VCR). The report 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 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.

For the period 1990 to 2004:

- Total energy consumption has been reduced 46% from 4928 MWh to 2657 MWh.
- Energy intensity normalized to vehicle production has been reduced by 47% for car assembly and by 28% for truck assembly.
- CO₂ emissions associated with GMCL energy consumption have decreased 42% over the period 1990 through 2004 and 54% if CO₂ from purchased electricity is not factored into the total.
- Energy efficiency initiatives have saved over 256 million kWh and avoided 151 kilotonnes of CO₂ 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 GHG CR for GMCL to remain a "Gold Champion Level Reporter".

Organization Profile

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 approximately 20,000 employees operating vehicle assembly and component fabrication plants, as well as parts distribution, sales and service centres. Today, GMCL has the capacity to manufacture more than one million units annually, exporting approximately 85% of this production primarily to the United States. Total vehicle assembly production for the 2004 calendar year was 923,451 cars and light duty trucks.

Manufacturing Operations

Oshawa, Ontario

Car Assembly Plants 1 & 2 – Chevrolet Impala sedans, Monte Carlo coupes, Buick Allure and Lacrosse 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 and crew cab versions 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 – suspension components, exterior sheet metal stampings

St. Catharines, Ontario

Glendale Ave (Engine) Plant – V-8 engines, HFV6 engines, V8 Aluminum Blocks, V6 Camshafts and is currently installing a new line to manufacture transmission gears.

Ontario Street (Components) Plant – Front wheel transmission final drives, differential gear assemblies, output shafts, miscellaneous transmission components, component assemblies and forgings.

Windsor, Ontario

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

London, Ontario

London Electro-Motive Division – Diesel locomotives

GMCL also manufactured vehicles in Ste.Thérèse, Quebec. However, those operations ceased in 2002. GMCL has a joint venture with Suzuki called CAMI Automotive Inc., located in Ingersoll, Ontario. However for the purpose of this report CAMI was not included as it is only a joint venture. GMCL sold its London Electro-Motive Division facility that manufactures diesel locomotives in 2005, and its energy usage and GHG emissions are included for 2004.

In addition to the manufacturing and assembly operations which have been included in this report, GMCL also operates five Parts Distribution Centres (PDCs) located across the country (a sixth one was closed in mid 2002) and an administrative building, the Canadian Headquarters (CHO), 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 GHG CR and previous VCR report submissions.

1. Senior Management Support

1.1 *Endorsement*

This report represents General Motors of Canada Limited (GMCL) first submission to the new Canadian Greenhouse Gas Challenge Registry (GHG CR), and tenth update to the former Voluntary Challenge Registry Inc. (VCR). We believe baseline tracking from 1990 and securing annual improvements are important elements of environmental leadership in today's Kyoto climate.

Further to GMCL original letter of intent and the submission of our Action Plan dated November 1995, GMCL strongly supports the objectives of the GHG CR's objectives and voluntary approach to reducing GHG emissions. In addition to GMCL's original letter of intent and Action Plan, GMCL has submitted an annual update in 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003 and 2004.

GMCL has significantly reduced emissions of CO₂ through the commitment, creativity and innovation of its employees. From 1990 through 2004, GMCL's overall emissions of CO₂ 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, and also in part on the consolidation and rationalization of facilities across North America. Despite some plant closures, Canadian vehicle production has actually increased by 30% relative to 1990. This focus on conservation has led to the implementation of many large and small energy conservation projects as well as the review and incorporation of energy efficiency technologies in our processes. GMCL encourages all employees to find ways to implement the GM Environmental Principles in their daily responsibilities.

We have continued to reduce energy consumption with a goal of a 25% reduction by 2005, compared to 1995 as a base year. This builds on our previous target of a 20% reduction by 2002, which the information in this progress report illustrates we successfully achieved.

GMCL continues to pursue new production opportunities for a number of our facilities. We will endeavour to undertake these new opportunities without increasing total CO₂ emissions. However, if production volumes increase more rapidly than our ability to achieve off-setting energy savings then total energy consumption and GHG emissions may increase. In addition more stringent environmental requirements related to abatement releases and discharges may

actually increase our energy consumption. GMCL is striving for continuous improvement in our facilities' environmental performance.

GMCL continues its commitment to the GHG CR with the submission of our 2004 update. In 2004, we are very proud to be recognized by VCR with our 6th 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 will continue with GHG CR.

Please refer to the cover letter for the President's Statement of Endorsement.

1.2 Commitment to Regular Reporting

Since 1994, GMCL has continued our commitment to annual reporting of greenhouse gas emissions through the former Voluntary Challenge Registry Inc., and the new Canadian GHG Challenge Registry. For past six years GMCL has been recognized as a "Gold Champion Level Reporter".

1.3 Internal Practices on Climate Change

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 lessen greenhouse gas emitting pursuits. This can be done most efficiently, and with the lowest cost to the Canadian economy and society, by first 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 neither voluntary approaches nor economic instruments have successfully yielded 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 GHG CR, formerly VCR, as a key element in Canada's response to the international climate change challenge. GMCL has also been an active participant in VCR's 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 require 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 (see Appendix) and the GMCL Environmental Policy.

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. Since 2001 all of GMCL's Ontario manufacturing sites have had their environmental management programs third-party certified in conformance with the ISO 14001 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.

1.4 *Management Systems*

As stated earlier, the management of energy is a part of our EMS and elements of this system have been the framework for our GM Canada energy management operations.

One of the key elements in our ISO 14001 EMS is Monitoring & Measurement. Since the 1980's Energy Monitoring, Tracking and Reporting systems at GMCL facilities have evolved from manual meter readings to a fully automated Web-based integrated system.

As a vital tool in our energy conservation efforts, the current Web based Utility Monitoring System (UMS) at GMCL was substantially completed in 2002/2003 and providing quality data throughout 2004. The system provides real-time energy consumption information from all of our Canadian plants to the Energy Team Members in each facility. Furthermore, 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.

The system provides consolidated consumption, updated every 15 minutes, for various commodities including: natural gas, electricity, steam, compressed air, and water. Reports are regularly used to monitor and track energy conservation initiatives and non-production turn down efforts.

The integration of this UMS has increased our ability to continuously reduce our energy demands. Between 2003 and 2004 energy consumption at GMCL decreased by approximately 2% and resulted in an approximately 2% reduction in our GHG emissions. Transition to this web-based real-time UMS has also been instrumental in reducing our energy expenditures and this system has had a tremendously short pay back period of approximately two months. Monitoring energy this closely permits us to pilot new energy saving initiatives that historically would have been difficult to pursue due to the unquantifiable impacts to production. Now energy conservation activities can be monitored in real time and any potential impact to production identified nearly instantaneously. This prevents actual disruptions to production and gives added confidence to management to tackle new initiatives.

The migration to this web-based UMS began slowly at our Oshawa Autoplex facility and gradually expanded to all our Ontario manufacturing facilities including our St. Catharines facilities and our Windsor facility.

Many elements of our EMS have documented procedures/processes, such as the determination of objectives and targets, documentation of programmes, monitoring, and reporting progress to senior management.

As a company GM and GMCL have processes for decision making that involve annual reviews of progress towards goals for corporate and applicable regulatory reporting requirements. The Senior GMCL Management reviews progress towards environmental and energy targets on a regular basis, which allows for informed decision making.

2. Base Year Quantification

2.1 Quantification Target Setting

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. This report covers energy consumption and GHG emissions from GMCL manufacturing facilities located throughout Ontario (and a facility in Quebec which has since been closed), excluding GMCL's joint venture, CAMI Automotive, in Ingersoll, Ontario.

We have retained the base year of 1990 for the purposes of this report. The direct GHG emissions were calculated to be approximately 749 kilotonnes CO₂ and 1060 kilotonnes CO₂ including indirect GHG emissions. The direct GHG emissions were calculated based on quantified fuel usage data and appropriate emission factors. The indirect GHG emissions were calculated from electricity usage in Ontario and Quebec and the GHG CR Guide emission factors.

Significant progress has been achieved to date as can be seen in the Section 3.2, Figure 3.1 and Table 3.1.

2.2 Quantification Methodology

Fuel Use and Conversion Factors

Since GMCL facilities do not directly measure CO₂ emissions, emission factors of CO₂ for each form of energy are used. The emission factors given in Table 2.1 are applicable to 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 2.1: 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 ₂)
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

A detailed method was provided in GMCL's VCR update report dated October 2000 giving an example template of how energy consumption is reported within GM Canada manufacturing facilities. The method 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 those operations on an ongoing basis. Energy consumption data for these facilities have been removed for all years and the adjusted baseline has been reflected in previous GMCL Update Reports. In 1999, Delphi Operations in Oshawa were sold and the operations continue to operate under different management. In 2005, London operations were sold, and continue to operate under different management. The energy consumption of the London operations have been included as they remained part of GMCL in 2004. After 2005, as in previous years, the Report will reflect the sale of these operations and the energy consumption data for these facilities will be 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 GHG reductions achieved.

2.3 GHG Emissions Inventory by Gas Type

CO₂ is the only greenhouse gas generated in significant quantities by our direct and indirect emissions, which are shown in Figure 3.1. For our company, CH₄ and N₂O emissions have been found to be negligible. A review of their contribution concluded that the combined addition of both CH₄ and N₂O emissions is less than 1% of CO₂ emissions. For the purpose of this report, CO₂ emissions are interchangeable with CO₂e emissions.

For example:

Natural Gas

A comparison of the kilogram carbon dioxide equivalents emitted/cubic meter for methane and nitrous oxide to the kilogram carbon dioxide emitted /cubic meter for natural gas combustion illustrates that their contribution is negligible when compared to carbon dioxide emitted/cubic meter. The emission factors used were provided in Table 3 of the Canadian GHG Challenge Registry Guide to Entity & Facility-Based Reporting, Aug. 2005 (GHG CR Guide).

Sample calculation:

$$\text{Emission factor for CH}_4 (0.000037\text{kgCH}_4/\text{m}^3) \times \text{GWP (21)} = 0.00077\text{kgCO}_2\text{e}/\text{m}^3$$

Fuel Source & GHG	Emission Factor (kg CO ₂ e/m ³)	% of CO ₂ Emission Factor
Nat Gas - CH ₄	0.000777	0.04%
Nat Gas - N ₂ O	0.01023	0.54%
Nat Gas - CO ₂	1.891	100%

Heavy Fuel Oil - #6

Similarly, the non-CO₂ direct emissions were negligible for heavy fuel oil #6. The emission factors used were provided in Table 3 of the GHG CR Guide.

Emission factor for N₂O (0.00012kg N₂O/L) x GWP (310) = 0.01984kgCO₂e/L

Fuel Source & GHG	Emission Factor (kgCO ₂ e/L)	% of CO ₂ Emission Factor
Heavy Oil #6 - CH ₄	0.00252	0.08%
Heavy Oil #6 - N ₂ O	0.01984	0.64%
Heavy Oil #6 - CO ₂	3.09	100%

2.4 Quantification Method by Gas Type

The method of base year quantification for CO₂ is described in Section 2.2.

2.5 Indirect Energy Emissions

For indirect emissions from electricity, CO₂ generation is calculated based on emission factors for electricity production by 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 CO₂. In the spirit of continuous improvement we recalculated all the indirect emissions from our Ste. Therese facility using the conversion factors supplied in Table 4 of the GHG CR Guide. The emission rate goes up and down depending on the mix of green power, fossil fuel and nuclear energy used. The emission factors used for our calculation of indirect emissions from electricity produced in Ontario and Quebec are given in Table 2.2.

Table 2.2: Emission Factors Provided by GHG CR to Convert MWh to tonne CO₂

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
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	0.304	0.297	0.297
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	0.022

The variation in emission factors provided by the GHG CR 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 from 1990-2003. Table 2.3 shows the impact of varying the emission factor per the emission factors provided by VCR in 2004. As Figure 3.4 illustrates, the approach of varying the emission factors presents 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 2.3: Impact of Varying the OPG Emission Factor

	1990 Emissions (kilo-tonnes)	1990 Emissions (kilo-tonnes)	% Change from 1990- 2003
Constant Emission Factors	1,137	617	46%
Variable Emission Factors	1,060	617	42%

3. Results Achieved

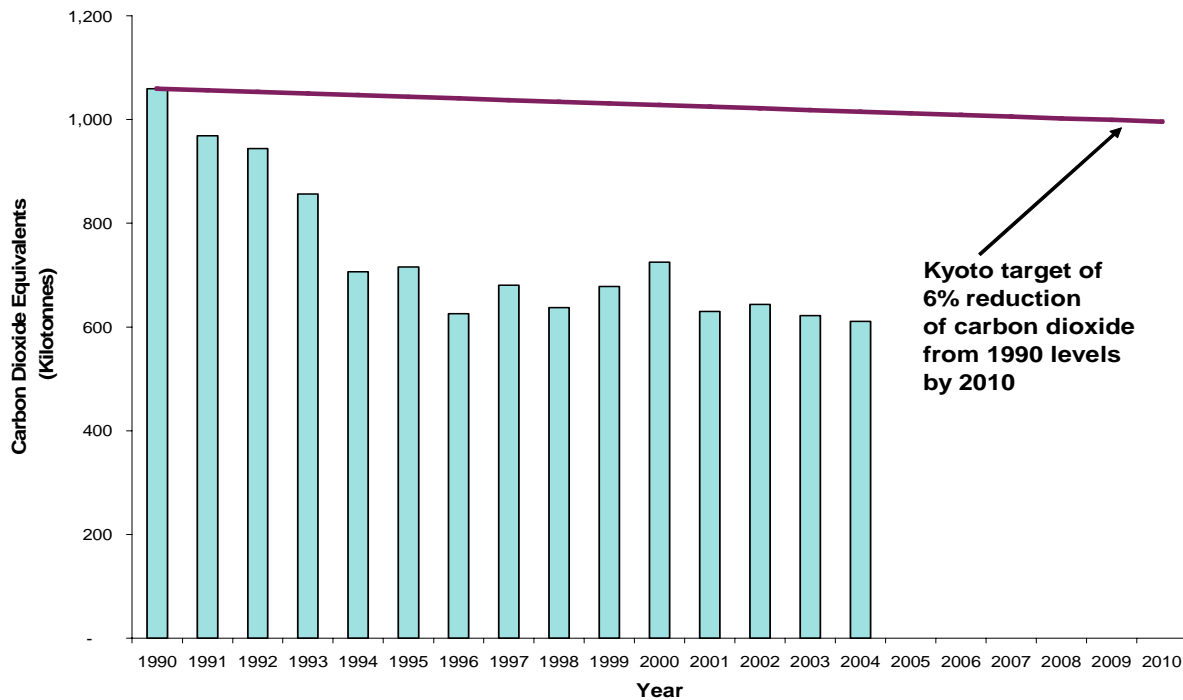
3.1 Reported Results

GMCL is committed to reporting GHG emissions for the most recent reporting year, 2004. All of the 2004 data has been added in the updated tables and figures throughout this report and include all years since our base year 1990.

3.2 All Reported Results Since Base Year

The significant reduction in GHG emissions can be seen in the provision of data for all years since the baseline year of 1990 in Figure 3.1.

Figure 3.1: CO₂ Generation Including CO₂ Generated from Electricity Consumed



3.3 Tonnage Emissions Inventory

Figure 3.1 above illustrates the results of total 2004 CO₂ equivalents, including direct and indirect emissions. Table 3.1 demonstrates the continued reduction of both direct and indirect GHG emissions.

Table 3.1: CO₂ Generation for GMCL Manufacturing Facilities (kilotonnes)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
On-site Generation	749	689	689	678	565	566	491	488	403	426	449	365	374	360	347
Including Electricity	1060	969	944	856	706	716	626	681	637	678	725	630	644	622	611

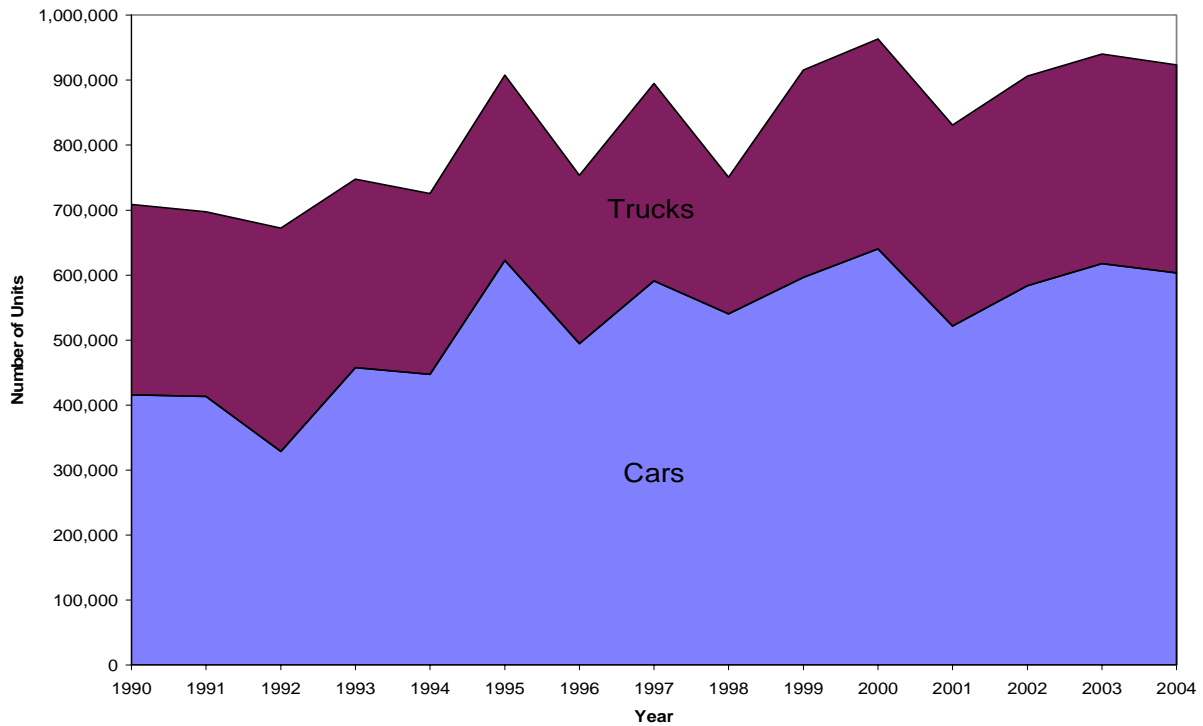
3.4 Emissions Inventory Since Base Year

Figure 3.1 CO₂ Generation Including CO₂ Generated from Electricity Consumed clearly demonstrates our GHG emission reductions since 1990. This is even more significant given our increases in Vehicle Assembly Production.

Vehicle Assembly Production

Vehicle assembly data given in Figure 3.2 reflects the production in Car and Truck Assembly Centres in Oshawa, Ontario and Ste.Thérèse, Quebec since 1990. Annual vehicle production has increased 30% over the 1990 through 2004 period. Production levels are a function of many factors including market conditions, work stoppages, downtime for reinvestment, and model changeover.

Figure 3.2: Vehicle Assembly Production



Energy Consumption and CO₂ Generation Normalized to Vehicles Produced

In 2004, automotive assembly operations accounted for 71% 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 CO₂ generation performance. The energy consumption per vehicle dropped by 47% for car assembly operations and by 28% for truck assembly, for the period 1990 through 2004. The CO₂ production per vehicle dropped by 39% for car assembly operations and by 19% for truck assembly, for the period 1990 through 2004. Detailed information is given in Table 3.2.

Figure 3.3 shows the kilograms of CO₂ 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 CO₂ intensity per vehicle.

Figure 3.3: CO₂ Generation at Assembly Plants Normalized to Production

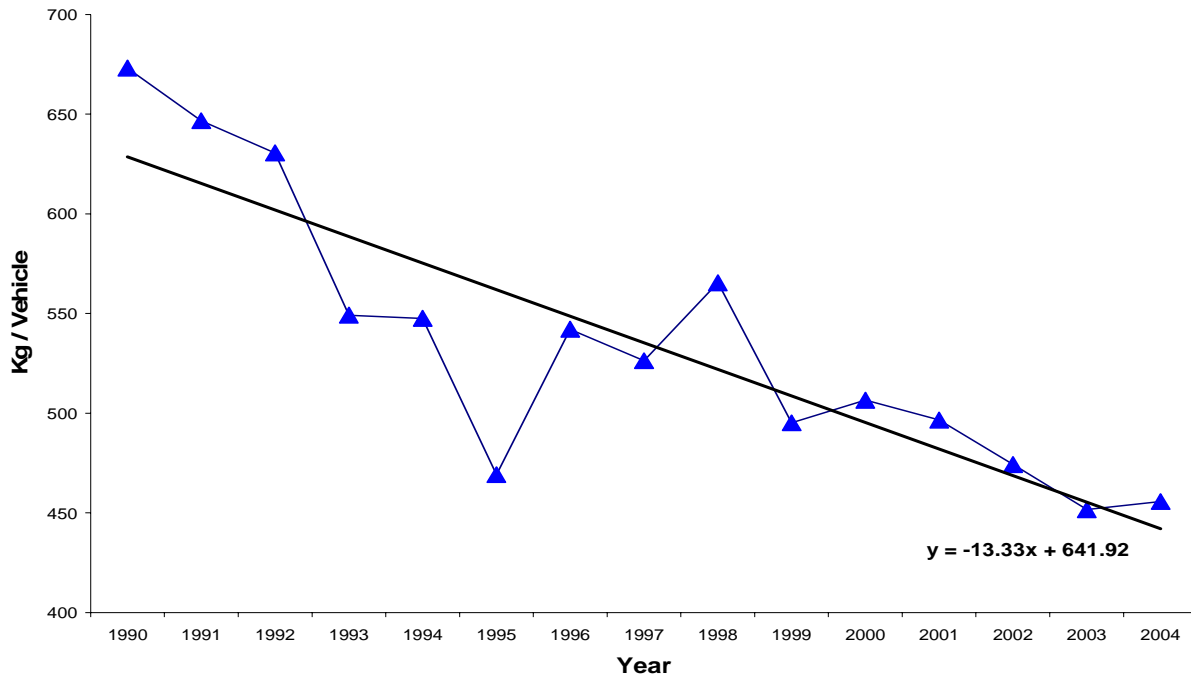


Table 3.2: Energy and CO₂ Intensity per Vehicle Produced

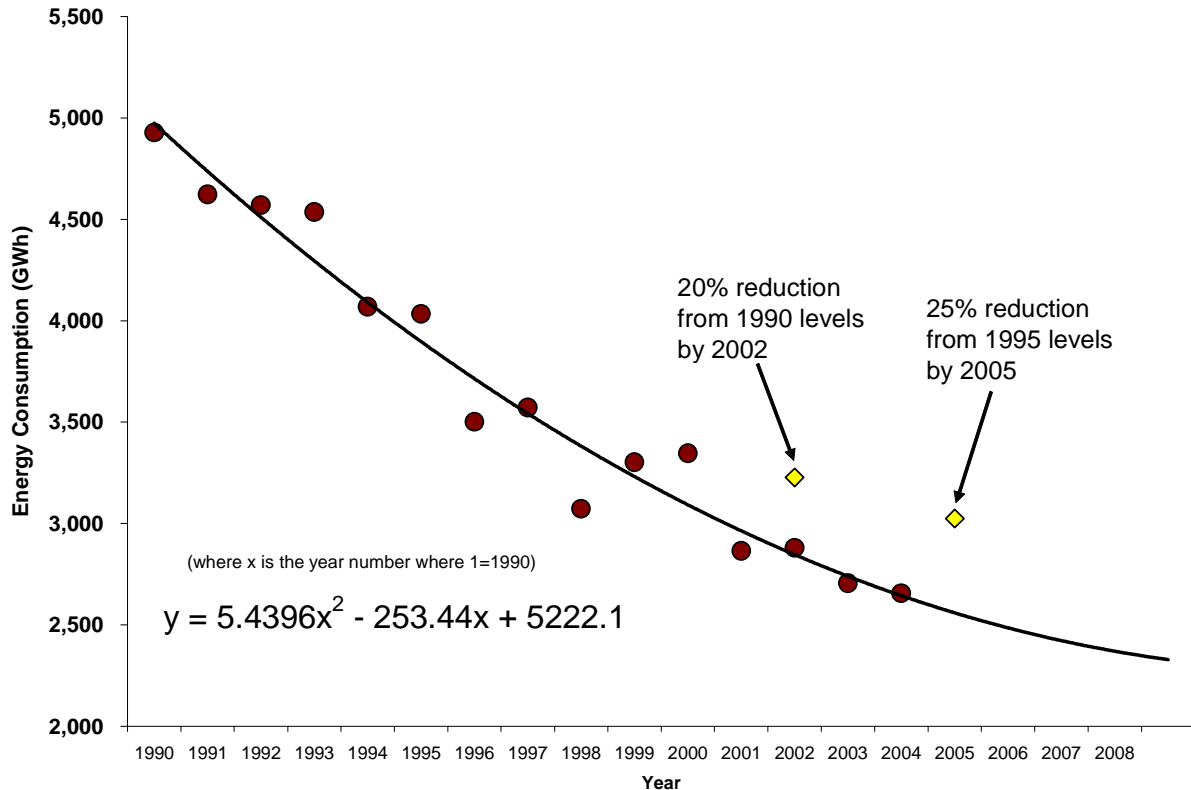
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Vehicles (thousands)	709	697	672	748	725	908	753	895	751	915	963	830	906	940	923
Energy Consumption (GWh)	2,427	2,312	2,240	2,344	2,306	2,425	2,254	2,471	2,109	2,284	2,354	1,975	2,011	1,888	1,880
Normalized Energy Consumption (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	2.04
CO ₂ Emissions (kilotonnes)	477	451	424	411	397	426	408	471	425	453	488	412	430	424	421
Normalized CO ₂ Emissions (kg/vehicle)	673	647	631	549	548	469	542	526	565	495	506	497	474	452	456

3.5 Comparison with Previous Targets

As reported in the 2002 VCR report, 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 3.4 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 2,560 GWh is also shown in Figure 3.4. This projection yields a 37% 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 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. Using this method of projection, and considering anticipated changes in technology and building footprints, GMCL will need to stretch to continue making energy consumption reductions to meet the 2005 target of 3,025 GWh.

Figure 3.4: Energy Consumption at GMCL Facilities compared to previous targets



3.6 Results Below Base Year Levels of CO₂e

Section 3.5 describes the improvement of total energy consumption with a 34% reduction below the 1995 base year quantification levels of energy consumed for the 2005 target and a 46% reduction of total energy consumption from 1990 base year. Sections 3.3 and 3.4 describe the reductions in CO₂ emissions, equalling 42% since 1990. The reduction in CO₂ can also be seen in Figure 3.1: CO₂ Generation Including CO₂ Generated from Electricity Consumed.

3.7 Verifiable Results

The calculations for this report were done internally and are verifiable against energy invoicing from suppliers. The calculations of greenhouse gas emissions were 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.

3.8 External Verification

GMCL has been 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. Furthermore, our energy efficiency projects are verified by a third party and both data and emission calculations are reviewed internally for verification.

GMCL is currently in the process of evaluating a system that will involve the third party verification of collected data.

3.9 Emission Reduction Offsets

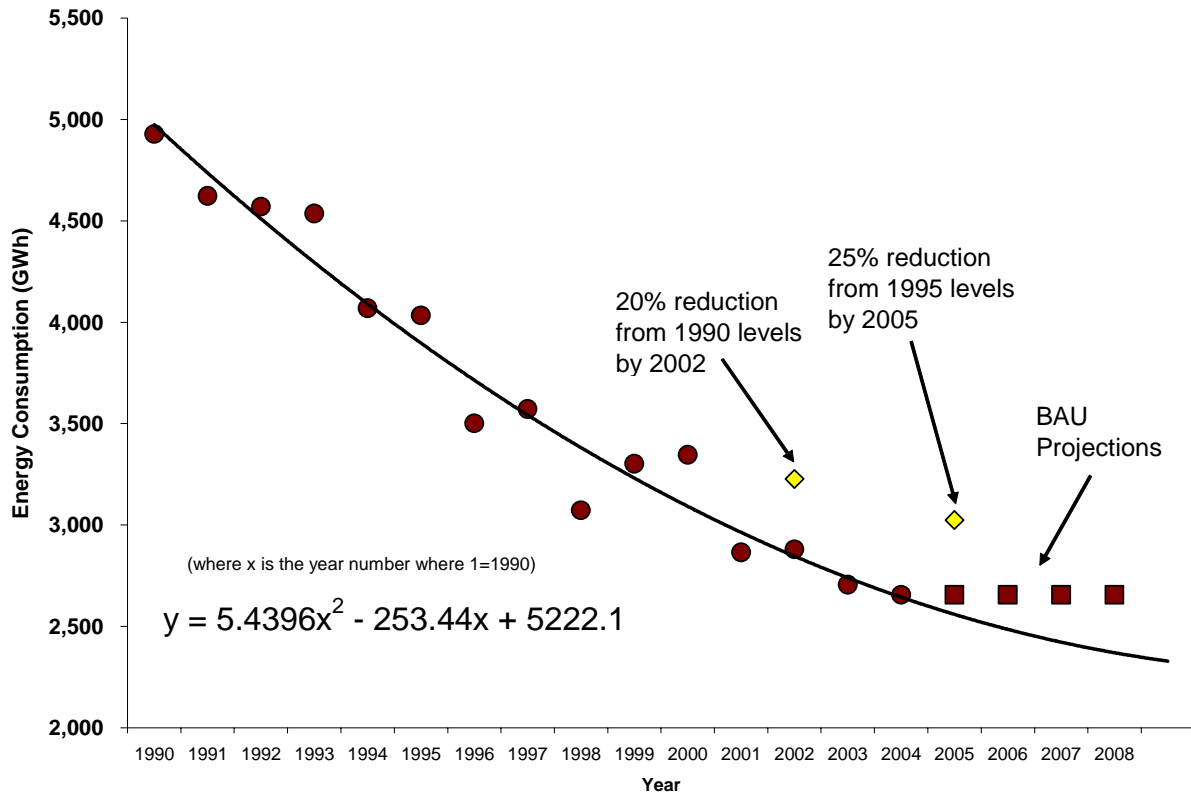
In addition to significant direct reductions in GHG emissions from our manufacturing facilities, GMCL has undertaken an offset initiative. Close to 50,000 trees and shrubs have been planted at several GMCL locations including the McLaughlin Bay Wildlife Reserve in Oshawa, Ontario and the Glendale Engine 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

4. Business-as-Usual Projection

4.1 Basis for Business-As-Usual Projection

Based on past performance that includes emission reduction efficiencies, GMCL has estimated projected energy consumption assuming the same fuel source mix, emission factors and continued energy efficiency programs, including indirect energy consumption (electricity) in Figure 3.4. If there were no ongoing energy efficiency program, an increase in energy consumption would be anticipated due to the construction and start-up of a new paint shop, new paint shop building and new abatement technology for the Oshawa Car Plant in 2006. The Business-As-Usual (BAU) Projection, if no emission reduction activities were to take place, assumes a zero change to the energy consumption, because there are numerous factors that influence our energy consumption beyond the energy efficiency program including production levels and weather conditions. This is illustrated in Figure 4.1.

Figure 4.1: Business-As-Usual Projection – Energy Consumption

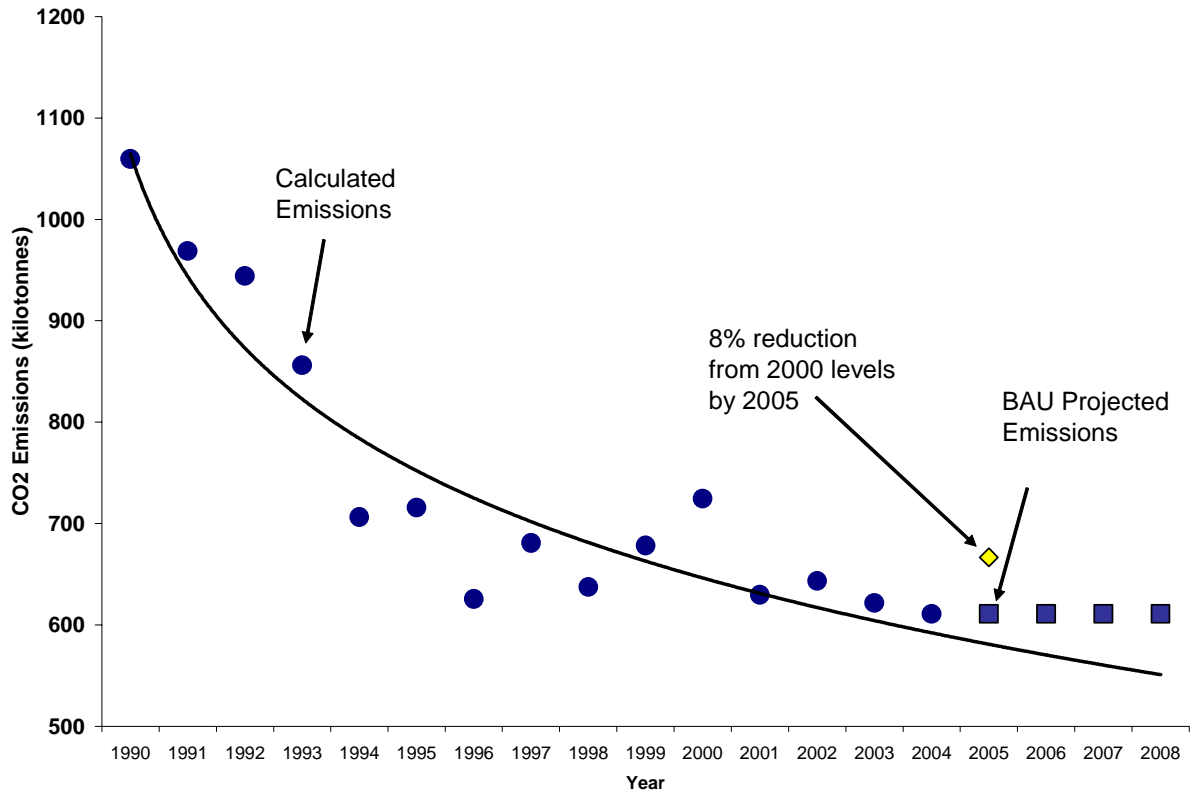


4.2 Business-As-Usual Projection - CO₂e

Based on past performance that includes emission reduction efficiencies, GMCL has estimated projected emissions, including indirect energy emissions in Figure 4.2. However, we anticipate an increase in GHG emissions due to construction and start-up of a new paint shop, new paint shop building and new abatement technology for the Oshawa Car Plant in 2006. The Business-As-Usual Projection, if no emission reduction activities were to take place, assumes the same fuel source mix, emission factors and a zero change to the CO₂ emissions, because there are numerous factors that influence our GHG emissions including production levels and weather conditions.

Meeting GMCL's energy and CO₂ emission targets are key enablers to the corporation achieving its 8% reduction in global CO₂ emissions. At the end of 2004 GMCL achieved a 16% reduction in CO₂ emissions.

Figure 4.2: Business-As-Usual Projection – CO2 Emissions



4.3 Major Sources of GHG emissions

Facilities Energy Input by Fuel and Source

The major sources of GHG emissions are the various energy inputs or fuel sources. The total energy input into facilities is broken down, by source, in Figure 4.3. Table 4.1 shows the values of these fuel source numbers. GMCL has achieved a 46% 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 4.3: Facility Energy Input by Fuel Source

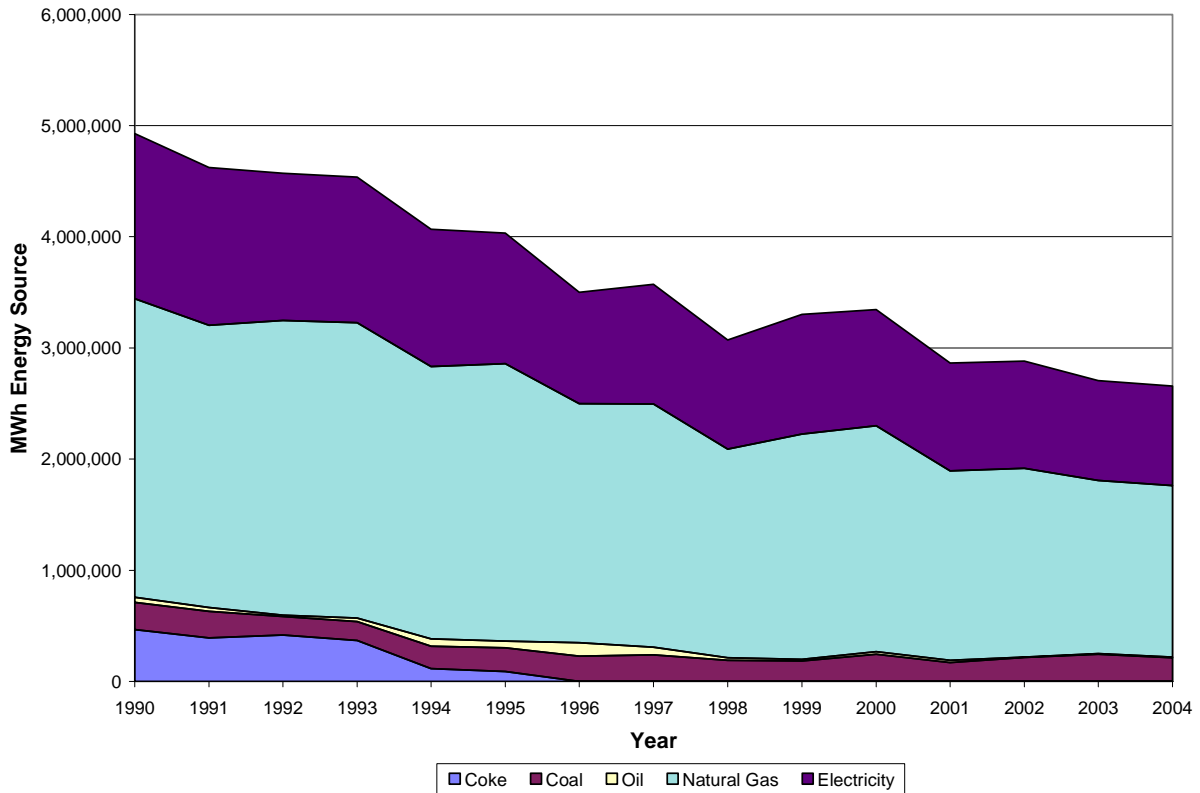


Table 4.1: Facilities Energy Input by Fuel Source (MWh)

	1990	2004
Natural Gas	2,686,933	1,543,210
Electricity	1,484,233	892,749
Coal	241,174	215,351
Oil	46,402	5,350
Coke	469,445	0
Total	4,928,187	2,656,661

GHG Contribution by Energy Source

The total CO₂ generated by facilities is broken down, by fuel source in Figure 4.4. Table 4.2 shows the absolute values of these CO₂ numbers. GMCL has achieved a 42% reduction in total direct and indirect CO₂ generated over this period, and a 54% reduction if indirect CO₂ generated is not included. The CO₂ 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 4.4: Facilities CO₂ Generation by Fuel Source

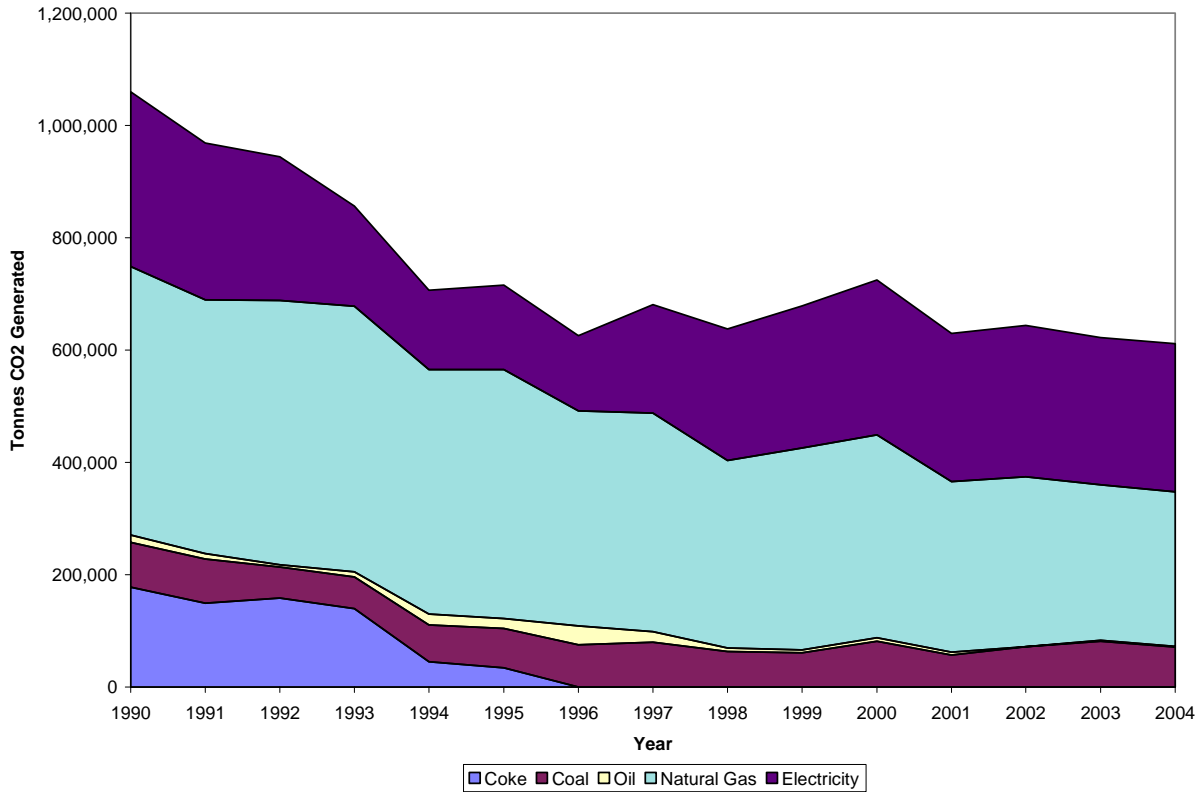


Table 4.2: Facilities CO₂ Generation Fuel Source (tonnes)

	1990	2004
Natural Gas	478,242	274,673
Electricity	311,003	263,703
Coal	79,507	70,994
Oil	12,855	1,482
Coke	178,010	0
Total	1,059,616	610,852

4.4 Indirect Energy Emissions

Please note that indirect energy emissions were included in Section 4.2 Business-As-Usual CO₂ Emission Projections.

4.5 *Energy Emissions Specified by GHG type*

Please note that the Business-As-Usual direct emissions were given for CO₂ in Section 4.2. It was determined that non-CO₂ emissions are negligible. Please see Section 2.3 for the documented explanation.

5. Target Setting

5.1 *Commitment to Target Setting*

GM has been committed to voluntary target setting, and continues to be, as described in Section 5.2.

5.2 *Target and Target Setting Process*

GMCL has set energy reduction targets for our operations since 1974. In 1997, GM established aggressive goals for facility resource conservation and pollution prevention with a management objective to work toward a 20% reduction in energy usage with a baseline year of 1990, by the year 2002, which was achieved. This GM Corporate goal has been adjusted to a 25% reduction in energy usage, with a baseline year of 1995, by the year 2005. GMCL has already reduced energy consumption by 34% since 1995 despite adding an entire third shift to one of the Oshawa Car Assembly Plants, and is projected to achieve 37% reduction for 2005, as shown in Figure 4.1. However, meeting the projected 37% reduction will take considerable effort, as construction and installation of the new paint shop for Oshawa Car Assembly Plant is underway. The new paint shop includes a new building and new abatement technologies both of which require additional energy consumption to operate. Using this projection and considering the changes in technology and building footprints, GMCL will need to stretch to continue to make energy consumption reductions to meet the 2005 target of 3025 GWh.

In 2003, a new goal was initiated by General Motors to reduce CO₂ emissions globally by 8% by 2005 in comparison to the baseline year of 2000. GM achieved a 12.5% reduction by 2004.

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.

5.3 *Projected Targets to 2007*

GMCL has set a target of 1% reduction per year in energy consumption, from a baseline year of 2005, through 2007. Recognizing that the installation and start-up of the new Oshawa Car Paint Shop, with new equipment related to the abatement of releases, may actually increase our energy consumption, we will continue to monitor our progress and review this target on a regular basis.

5.4 Target Review and Update Process

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

6. Past Actions

6.1 Estimated Impacts

This report contains a selection of GMCL's energy savings projects for 2004 in Table 6.1. The energy savings are from GMCL manufacturing facilities located throughout Ontario. The chart shows energy saved for each project and the total yearly savings, in MWh and in tonnes of CO₂ Avoided. Site utility managers and energy coordinators continue to identify numerous other energy savings projects through opportunities in heat recovery, HVAC, and process improvements.

Table 6.1: Energy Efficiency Projects for 2004

Plant	Project	MWh Savings	Type	CO2 Avoided (tonnes)
Oshawa Truck Assembly Centre	DI Plant water overflow logic	148	Indirect (electricity)	87
	Compressed Air Blower conversions	811	Direct (Natural Gas)	478
	Lighting removals	2081	Indirect (electricity)	1226
	Penthouse Automations	6914	Direct (Gas)	4074
Oshawa Car Assembly Plant	Energy reduction during downtime using handsets and text messaging to convey energy information	2016	Indirect (electricity)	1188
	Reduce steam pressure at the Powerhouse	993	Indirect (electricity)	585
St. Catharines Glendale Ave. (Engine)	Lighting retrofit project to convert 8 ft fluorescent lights from T12 to HID	1700	Indirect (electricity)	1002
Windsor Transmission	Lighting projects	964	Indirect (electricity)	568
TOTAL		15626		9207

Electricity Consumption Efficiency Projects & CO₂ Savings

Over the years GMCL has made great gains in reducing energy consumption through the implementation of energy efficiency projects similar to those detailed in Table 6.1. Figures 6.1

and 6.2 illustrate the energy savings implemented each year along with the corresponding CO₂ 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 CO₂ emissions.

Figure 6.1: Energy Efficiency Projects – Energy Reductions

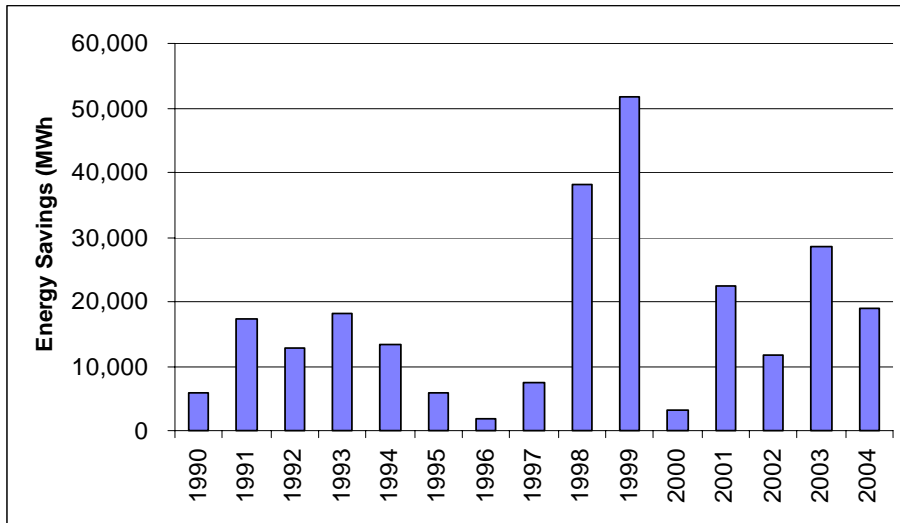
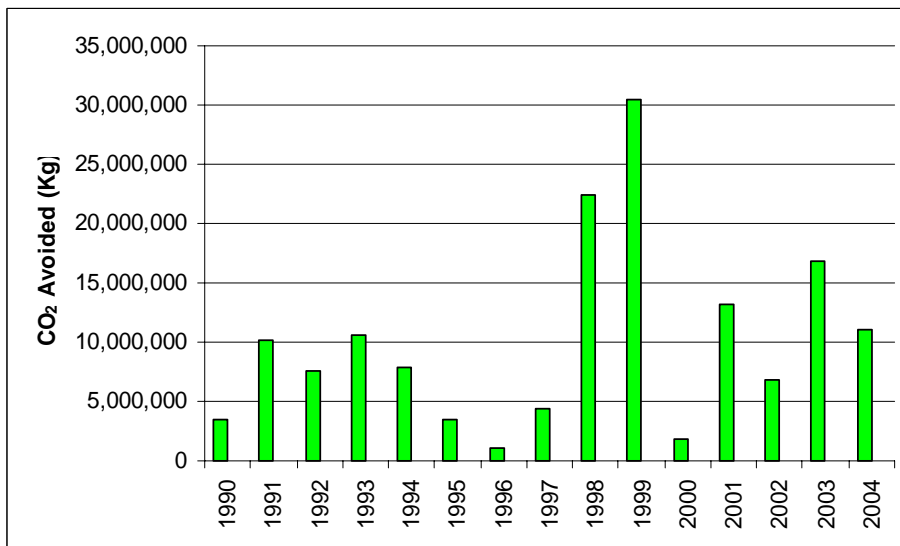


Figure 6.2: Energy Efficiency Projects - CO₂ Reductions



6.2 *Impacts of Key Projects*

Table 6.1 lists the individual impacts of key projects.

6.3 *Sum of Key Projects Impacts in tonnes CO₂ equivalent*

Table 6.1 provides the sum of key projects in tonnes CO₂.

6.4 *Impacts of Key Projects in CO₂ equivalent*

Table 6.1 lists the individual impacts of key projects in tonnes CO₂.

6.5 *Non-Production Load Reductions*

It is very difficult for the automotive industry to make adjustments to production periods in order to better balance electricity usage, for example, by shifting 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.

GMCL facilities have begun this initiative as a means to motivate personnel 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.

Figure 6.3 shows a representative sample (one of our manufacturing facilities that works 24 hrs a day) of the results that our continued efforts to reduce load during non-production have made. The load profile in Figure 6.3 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 6.4 illustrates the annual electricity savings and Figure 6.5 illustrates the associated CO₂ emissions avoided by the Oshawa Autoplex through a focused effort on non-production load energy reductions. Figure 6.4 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 CO₂ avoidance, were less substantial in 2003 relative to the last few years in large part because the amount of non-production downtime at the Oshawa 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 6.3: Sample Electricity Load Profile

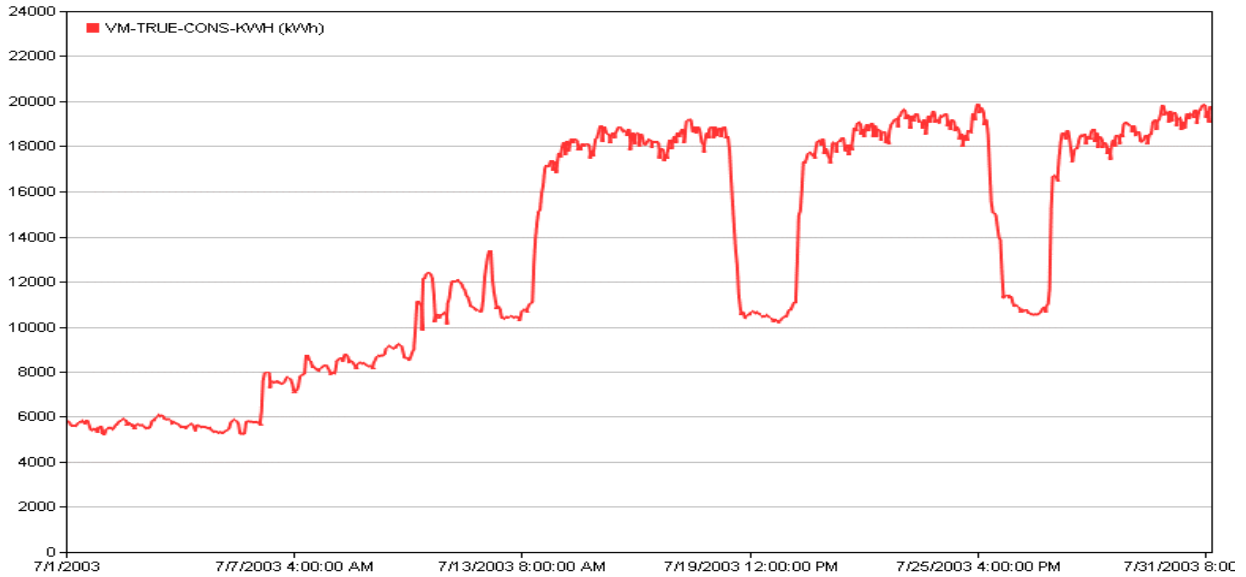


Figure 6.4: Oshawa Autoplex Annual Non-Production Load Reduction (KWh)

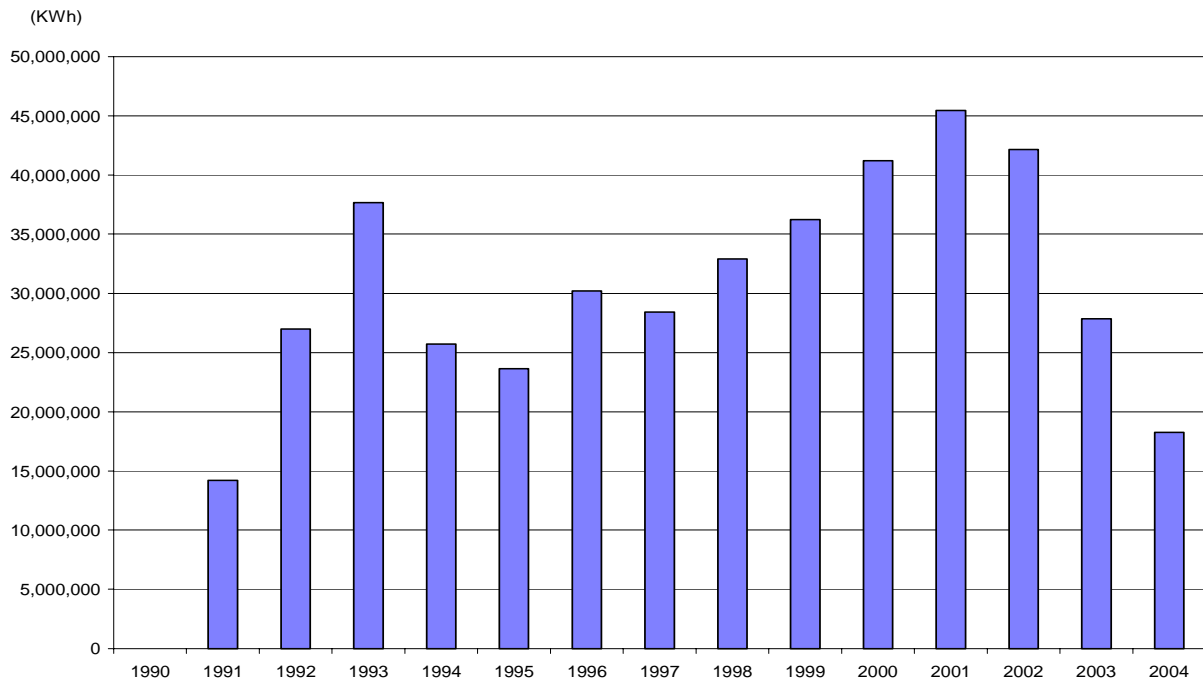
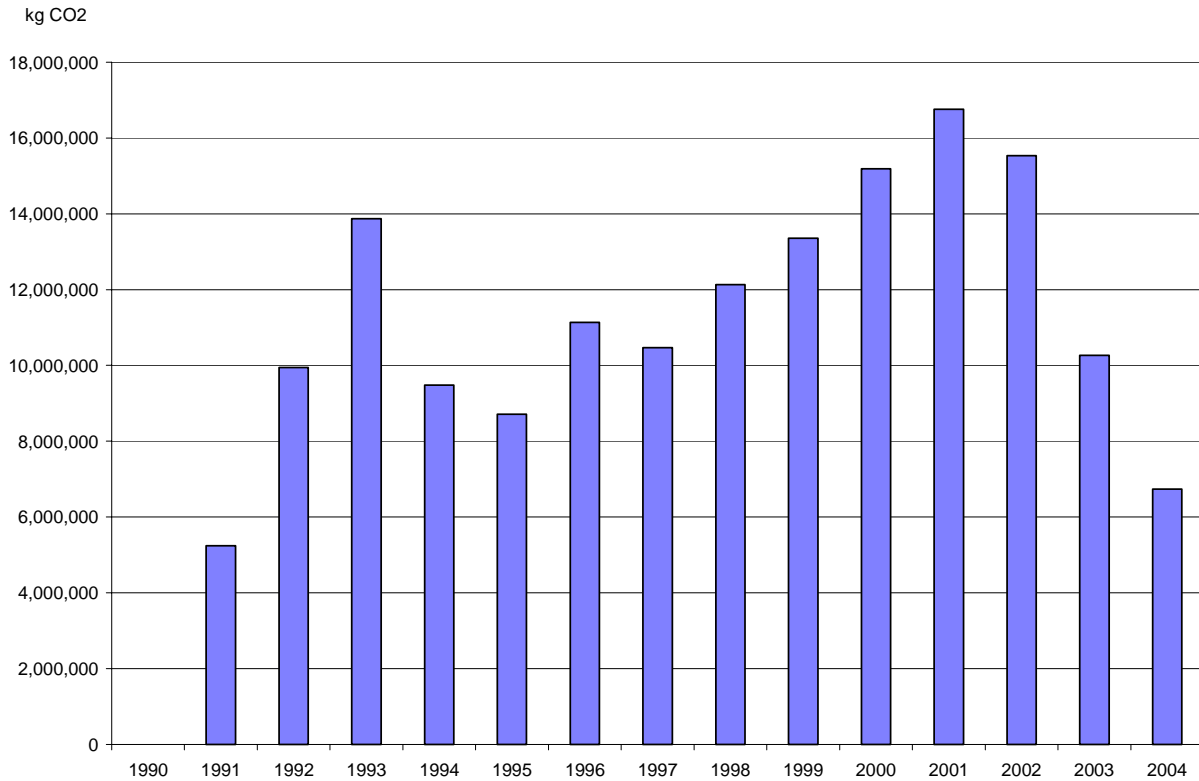


Figure 6.5: Oshawa Autoplex Annual Non-Production Load Reduction (kg CO2 Avoided)



7. Potential Future Actions to Achieve Targets

7.1 Potential Reduction Projects

GMCL has full-time energy conservation specialists in our facilities 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 2005 and beyond in Table 7.1.

Table 7.1: Proposed Energy Efficiency Projects for 2005 and Beyond

Plant	Project	MWh	Type	CO2 Avoided (tonnes)
Oshawa Truck Assembly Centre	HVAC EMS	12105	Direct	7133
		618	Indirect	364
	Paint Shop PM&C EMS screens	1536	Indirect	905
Oshawa Car Assembly Plant	Oshawa Car Body HVAC	19334	Direct	11392
	Oshawa Car Body Lighting	1570	Indirect	925
Windsor Transmission	HVAC	964	Direct	568
TOTAL		36126		21286

7.2 Sum of Impacts of Potential Projects

Table 7.1 provides an estimate of the sum of the impacts of key projects.

7.3 Individual Impacts of Potential Projects

Table 7.1 provides estimates the impacts of individual key projects.

7.4 Sum of Impacts of Potential Projects in tonnes CO₂ equivalent.

Table 7.1 provides an estimate of the sum of the impacts of key projects in tonnes CO₂ equivalent.

7.5 Individual Impacts of Potential Projects in tonnes CO₂ equivalent

Table 7.1 provides estimates the impacts of individual key projects in tonnes CO₂ equivalent.

7.6 Categorization of Projects

Table 7.1 provides the emission type categories as either Direct or Indirect.

8. Education, Training and Awareness

8.1 Climate Change Issue Explained to 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 has 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 Worldwide Facilities Group (WFG) Energy and Utilities Services. 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 site where we have posted information on the Environment including a summary of our energy use and links to the GHG CR web site, should employees wish to read our annual updates in detail.

8.2 *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. GM's position is as follows:

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 hydrogen fuel cells, 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 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, in this consultation. 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 which 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 2005 all new GM vehicles run on 10% ethanol and GM offers the most vehicles equipped to run on 85% ethanol in the industry (E-85).
- In 2005 the Oshawa Car Plant began production of a Chevrolet Impala that is capable of running on E-85, a cellulose based ethanol that produces the same or less net greenhouse gas emissions than the smallest hybrid on the road today.
- In 2005 GM introduced a new hybrid GMC Sierra pick-up truck.
- 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.
- 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.

8.3 *Opportunities for Individual Action*

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. As previously discussed, 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 8.1.

In addition to communications that encourage employees 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 8.2.

Figure 8.1: Communication to Employees on Energy Conservation



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.](#)

Figure 8.2: 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.wrwcanada.com
Region of Durham "2001 Blue Box Recycling Collection Schedules", www.region.durham.on.ca
Gov. Gary Locke, State of Washington Energy Home Page, www.governor.wa.gov/energy/energy.htm

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

8.4 *Incentives for Emission Reductions by Employees Outside of Work*

Section 8.3, Figure 8.2 is an example of the communications to employees regarding energy conservation at home.

8.5 *Supplier Incentives for Emission Reductions.*

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 organizations to reduce energy consumption and track GHG emissions. The supplier community has been informed about the VCR 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 implement 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.

8.6 *Customer Incentives for Emission Reductions*

GMCL, through all of the vehicle owner's manuals, directly shares 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.

8.7 *Influence of external contacts*

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 Responsibility Report (including specific environmental 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 are working hard to identify the environmental challenges and develop solutions.

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 with other companies.

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.

8.8 Undertake public education

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. Furthermore, the GM Corporate website provides

additional information on our initiatives and accomplishments, as well as our global CO₂ emissions at <http://www.gmresponsibility.com>

9. Appendix

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.