

General Motors of Canada Ltd.

An Action Plan for Reducing Greenhouse Gas Emissions

October 29, 1999

Attention: Mr. Robert Flemington, P. Eng.
President
Canada's Climate Change
Voluntary Challenge and Registry Inc.



An Action Plan for Reducing GHG Emissions

1. Executive Summary

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 consumption patterns of all Canadians will be necessary. GMCL believes that steps toward meeting these objectives will be achieved most efficiently and with the lowest cost to the Canadian economy and society first by voluntary approaches and then secondly by broad-based market driven measures which encourage a gradual shift in behavioural patterns and economic activities to less greenhouse gas emitting pursuits. 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. This submission is GMCL's fourth 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. Significant progress has been achieved to date.

Since 1990:

- Total energy consumption has been reduced by 32%
- Projected Energy consumption per vehicle produced has been reduced by 29% for car assembly and by 23% for truck assembly operations for the period projected to 1999.
- Generation of CO₂ (including off-site generation) has been reduced by 39%
- Energy efficiency initiatives have saved 340.37 million KWh and avoided 675,300 tonnes 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. As part of our report, we have included our projections for 1999 greenhouse gas emission reductions. Given GMCL's demonstrated commitment to reducing greenhouse gas emissions from our facilities, it is our hope that this report will provide sufficient information to the VCR to identify GMCL as a "Gold" participant in the registry. 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.

2. 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 26,000 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. Vehicle assembly production for the 1998 calendar year was 751,000 units.

Manufacturing Operations

Oshawa, Ontario

Car Assembly Plants – Chevrolet Lumina and Impala sedans, Monte Carlo coupes, Buick Century and Regal sedans.

Truck Assembly Plant – GMC and Chevrolet extended cab version of the full-size, three-door, two-wheel and four-wheel drive light duty pickup trucks.

South Fabrication Plants – Batteries, suspension components, exterior sheet metal stampings.

Ste. Therese, Quebec

Car Assembly Plant – Chevrolet Camaro coupes and convertibles; Pontiac Firebird, coupes and convertibles.

St. Catharines, Ontario

Engine Plant – 5.7L V-8 engines and various engine components.

Components Plant – Transmission final drive and differential assemblies, rear axles, front suspensions, brake and drum assemblies and components.

Windsor, Ontario

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

London, Ontario

Diesel Division – Diesel locomotives and light armoured vehicles (LAVs) .

3. Senior Management Support

3.1 Signed Statement of Endorsement

President and General Manager

October 26, 1999

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:

It is with great pleasure that General Motors of Canada Limited (GMCL) submits its fourth update to the Voluntary Challenge and Registry Inc. (VCR). At GMCL, we take our commitment to the environment seriously and our attention to reducing energy usage and our emissions of greenhouse gases (GHGs) at our facilities is no exception.

Further to GMCL's original letter of intent and the submission of our Action Plan dated November 1995, I would like to reiterate GMCL's strong support of the VCR 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 and 1998. Our consistent 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 CO₂. From 1990 through 1998, GMCL's overall emissions of CO₂ from manufacturing facilities have been reduced by 39%. This achievement is based on the corporation's ongoing focus on the need to conserve energy in order to reduce environmental impact and reduce costs. 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.

This report offers a projection for 1999 energy consumption. We have already achieved a 32.1% reduction in energy since 1990. Our plan is to continue to reduce energy by at least 1% per year. The highly competitive and global nature of the automobile industry prevents us from publishing details of the specific methods we plan to use to achieve these continuing reductions. Facility emissions are correlated with production levels. We are continuing to pursue new and additional production opportunities for a number of our facilities. If possible 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 offsetting energy savings then total energy consumption and GHG emissions will increase. Factors affecting our production plans include consumer demand for automobiles, consumer preference (i.e. between makes, models, size and optional equipment content), and competition between facilities for product allocation. GMCL is striving for continuous improvement in the environmental performance of our facilities.

GM's Commitment to the Environment

“The goal of improved environmental quality around the world is one we share with many. The public – and our employees, dealers and suppliers – expect us to be accountable to the environment. It's part of being in business. It's the responsible thing to do.

The linkage of environmental responsibility to our business is clear. Quite simply, environmental success is critical to our business success. GM's environmental initiatives are driven by the GM Environmental Principles that serve as our philosophy with regard to the environment. They build on past successes – and opportunities – and look to the future.

Our focus remains to demonstrate our commitment to the environment and sustainable development through all of our actions worldwide.”

At GMCL we believe that part of our responsibilities as an industry leader in Canada is to be an environmental leader. We are involved in numerous environmental programs that address all aspects of our business. In addition to reporting to the VCR, GMCL has been an active participant in the national consultation launched by the Federal Government to help identify the means by which Canada can meet its Kyoto targets. To name one of the many additional environmental initiatives on the pollution prevention side, GMCL is involved in the Canadian Vehicle Manufacturers' Association (CVMA) Pollution Prevention Project. This project partners two levels of government, the CVMA and Canada's major automotive industry competitors (GMCL, Ford of Canada and DaimlerChrysler Canada) in the interest of reducing the automotive manufacturing industry's impact on the environment. This successful project is a voluntary approach that goes beyond regulation with a goal to reduce or eliminate the use, generation or

release of toxic substances and has worked to encourage Canadian auto parts suppliers to adopt a similar focus.

As noted above, GMCL continues its commitment to the VCR with the submission of our 1999 update. As we “Go for the Gold,” we hope that other companies will also seek to reduce their emissions of GHG. 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 other companies will take up the challenge offered by the VCR.

(SIGNED)

V. Maureen Kempston Darkes
President and General Manager
General Motors of Canada Limited

3.2 Internal Practices and Management Systems Dealing With Climate Change

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, weather conditions, etc. GMCL facilities throughout Canada primarily utilize the following forms of energy: natural gas, coal, fuel oil and electricity. This report communicates GMCL’s aggregate level of energy consumption and GHG emissions from manufacturing facilities over the period 1990-1998.

CO₂ is the only greenhouse gas generated in significant quantities by our stationary sources. CH₄ and N₂O emissions are not significant. This report covers energy consumption and GHG emissions from GMCL manufacturing facilities located throughout Ontario and Québec, excluding GMCL’s joint venture, CAMI Automotive, in Ingersoll, Ontario.

(Note: Electrical energy savings projects shown in this report have referenced the CAMI operations, since the GMCL Energy Management process accounts for all activities of this nature.)

Energy consumption and subsequent GHG generation is monitored carefully. 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 redefined its global EMS model for its facilities around the International Organization of Standardization (ISO) standard 14001, and 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. Although ISO-based, GM’s EMS includes several additional requirements that place increased emphasis on

supporting environmental performance, cost reduction activities, and the frequency of various activities (such as system auditing, etc.).

This enhanced corporate EMS will enable GM to more effectively implement the GM Environmental Principles. All GMCL manufacturing sites are expected to have their environmental management programs third-party certified in conformity with the ISO-based GM EMS specifications by December 2001.

Monitoring GMCL's energy usage is not a new activity. GMCL has set energy reduction targets for our operations since 1974. Each Canadian facility has an energy co-ordinator assigned to review the facility's energy usage and conservation planning. These Canadian co-ordinators meet to review progress and share best practices at an annual Energy Efficiency Conference. The conference lasts for two days and the minutes from the conference are compiled and kept on file for reference by employees with energy management responsibility.

Energy Awareness weeks are held annually in Canada, with the next one scheduled for November 1999 during which displays promoting energy conservation are placed in strategic locations. We work with utility suppliers to provide literature and technical support to assist our employees in understanding how they can reduce energy use both in their workplace as well as at home. GMCL is a participating member of 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 illustrate successful energy reduction projects. (Appendix for Photo)

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 suggestion are made to assist them in reducing such waste.

4. Base Year Quantification

4.1 Methodology

Since GMCL facilities do not directly measure CO₂ emissions, standard emission conversion factors of CO₂ for each utilized form of energy are used. For electricity, CO₂ generation is calculated based on emission factors for electricity production by the public utilities in Ontario and Quebec. The factors used are published by the respective utilities in these provinces.

This methodology is detailed in a template (shown below) of how energy consumption is reported within GM Canada manufacturing facilities.

METHODOLOGY

Step 1) Monthly Data Collection

Create a **MONTHLY** database for all forms of fuel purchased and consumed within all GM Canada Manufacturing Facilities, indicating units of consumption. The source of this data is the utility invoices and / or site utility meter readings obtained on a monthly.

e.g.) 1999

FUELS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Oil (U.S. gal)												
Coal (tons)												
Coke (tons)												
Electricity (kWh)												
Natural Gas (mcf)												

Step 2) Annual Data Collection

Create a **YEARLY** database for the forms of fuel in Step 1, starting with the baseline year 1990. Any base year may be applied by the user.

e.g.)

FUELS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oil (U.S. gal)	255,123											
Coal (tons)	31,588											
Coke (tons)	68,038											
Electricity (kWh)	537,012,717											
Natural Gas (mcf)	4,125,480											

Step 3) Energy Consumption Tracking

Convert all fuel forms in Step 2 to Million BTU's (MMBTU), utilizing the conversion factors tabled below.

Fuel	BTU's	Equivalent kWh	Source / Remarks
Natural Gas	1,013 / CF	6.30/CF	TransCanada Test data 1998
Oil	142831 (US Gal)	41.9/US Gal	GM Test Data - CPE 1995
Coal	13,286 / LB	4.04/LB	GM Test Data - CPE 1996 and 1999
Coke	13,340 / LB	3.91/LB	ES&E is Environmental Science and Engineering (Henry & Henke, 1988)
Electricity	3,414 / kWh	1.00/kWh	ES&E is Environmental Science and Engineering (Henry & Henke, 1988)
Steam	1,176 / LB	6.34/LB	
Compressed Air	16,676 / MCF	4.38/MCF	

e.g.)

TOTAL ANNUAL MMBTU'S (Total Energy Consumption)

FUELS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oil	37,003											
Coal	878,724											
Coke	1,601,814											
Electricity	1,633,261											
Natural Gas	4,289,461											
Total MMBTU's	8,562,423											

Step 4) On-site Generated CO2 Emission

Convert all fuel forms in (MMBTU's) tabulated in Step 3 to CO2 Emission (tons), utilizing the conversion factors Table 2.

Fuel Source (MMBTU's)	CO2 Emission (tp)	CO2 Emission (tp)	Source / Remarks
One Million BTU's of Natural Gas	195	42.37	TransCanada Test data 1998
One Million BTU's of Coal	293	96.42	GM Test Data - CPE 1996 and 1999
One Million BTU's of Oil	178	95.38	GM Test Data - CPE 1995
One Million BTU's of Electricity	126	67.12	ES&E is Environmental Science and Engineering (Henry & Henke, 1988)
One Million BTU's of Coke	246	111.36	ES&E is Environmental Science and Engineering (Henry & Henke, 1988)

e.g.)

Total Annual On-site Generated CO2 Emission

FUELS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oil	3,317											
Coal	92,732											
Coke	156,222											
Electricity	115,189											
Natural Gas	242,044											
Total CO2 Emission (Imp Tons)	649,505											

4.2 Quantification

Energy Consumption Mix

Total energy consumption for GMCL for the 1990-1998 period is presented in section 8 below on Chart #8. GMCL has achieved a 32% reduction in energy consumption over this period.

Note: In 1997, manufacturing operations in Oshawa and Windsor were sold to other companies which continue to operate them on an ongoing basis. Energy consumption data for these facilities have been removed for all years.

See Section 8 for the charts as a reference.

5. Projection

5.1 Methodology

Energy Consumption and GHG Projections.

This report offers a projection for 1999 energy consumption. We have already achieved a 32.1% reduction in CO₂ emissions since 1990. Our plan is to continue to reduce CO₂ emissions by at least 1% per year. The highly competitive and global nature of the automobile industry prevents us from publishing details of the specific methods we plan to use to achieve these continuing reductions. Facility emissions are correlated with production levels. We are continuing to pursue new and additional production opportunities for a number of our facilities. If possible 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 offsetting energy savings then total energy consumption and GHG emissions will increase. Factors affecting our production plans include consumer demand for automobiles, consumer preference (i.e. between makes, models, size and optional equipment content), and competition between facilities for product allocation. GMCL is striving for continuous improvement in the environmental performance of our facilities.

See Section 8 for the charts as a reference.

5.2 Quantification

In 1997, GM established aggressive goals for facility resource conservation and pollution prevention. One management objective is to work towards a 20% reduction in energy usage (baseline year 1995), by the year 2002. Energy efficiency is a key element of GM's energy strategy, which includes five distinct areas: rates, conversion, control, conservation and operations. The methodology shown in section 4.1 identifies the major sources, direct and indirect emissions, emission factors and fuel types. See also Section 8 for the charts as a reference.

6 Target Setting

6.1 Targets

GMCL goal is to reduce energy consumption by 20% by 2002 based on a 1995 baseline. 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. The results of these projects are tabulated in the charts, with the 20% reduction already achieved by the GM Canada operations. Of course, we will continue to strive for further reductions.

See Section 8 for the charts as a reference.

6.2 Process for Target Review and Update

Energy Conservation at General Motors

General Motors Corporation (GM) formal environmental policies are embodied in the GM Environmental Principles. These principles establish the framework for GM's resource conservation activities. Within this framework, several significant initiatives are underway to address materials reduction, reuse, recycling, and energy and water conservation.

Reviews at GMCL track the energy consumption of the sources utilized on a monthly basis as outlined in the Methodology section 4.1. 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 our progress towards our environmental and energy targets on a regular basis. The submittal of the annual VCR report is an example of this review process.

See Section 8 for the charts as a reference.

7. Measures to Achieve Targets

7.1 List of Key Activities / Projects

General Motors of Canada Limited has reduced greenhouse gas emissions by more than 39% since 1990 through a number of energy-reducing initiatives including re-lamping several factories to high-efficiency lighting and converting coal and oil-burning facilities to natural gas. Furthermore GMCL has reduced energy consumption by more than 24% since 1995, attaining and exceeding the corporate goal of 20% nearly three years ahead of schedule.

The Fuel Conversion activity is aimed at maximizing the use of environmentally safe and sustainable energy sources through the conversion of coal and oil fired boilers to natural gas. Prior to switching fuels, an evaluation is conducted to determine the feasibility of eliminating steam loads altogether. GMCL converted two of its coal fired burners, at the Oshawa, Ontario manufacturing complex, to natural gas. The first conversion in Oshawa took place in 1985, the second in 1990.

Controls Initiatives – the installation of a strategic energy management system – is another key element of GM’s energy strategy. In 1997, GMCL installed energy management systems in the Windsor, Ontario, Transmission Plant, and the Oshawa, Ontario, Car Assembly Plant Paint Facility.

Installation of energy-efficient lighting is another key energy initiative. GM of Canada completed a major lighting retrofit project in the Oshawa Car Assembly Plant in November, 1998. By utilizing more efficient, high quality and state of the art lighting products, the project will both improve the quality of plant lighting, and save energy. The new high bay metal halide lighting (General Lighting) in the Car Body Plant, provides better lighting levels with 46% less energy, provides a more even distribution of lighting across work surfaces, and provides a better color rendition index score (85% of the natural day light, compared to 65% for the old fluorescent lighting). The new Line Lighting, T8 fluorescent lighting, provides the same light output with a better color rendition index score (85%), and consumes 38% less energy, with over 26.5 million KWh saved.

The energy saved on a yearly basis, continues to be an ongoing saving for future years and has an effect on cumulative CO₂ emission reductions well into the reduction program.

Site utility managers and energy coordinators continue to identify numerous other energy savings projects through opportunities in heat recovery, HVAC, and process improvements.

GMCL has also participated since July of 1998 in a joint program with Ontario Hydro to underwrite the cost of an energy conservation specialist who conducts surveys of our facilities on a full time basis to assist in identifying opportunities for further energy reductions.

The following charts outline in detail the energy efficiency projects that have been undertaken since 1990 at many of GMCL's facilities, including the Joint Venture operation at CAMI, Ingersol, Ontario. The charts show energy saved for each project and the total yearly savings, costs, incentives and payback for the period. The charts show energy savings in two formats. The KW savings are associated with a DEMAND load elimination. ie: a piece of equipment taken out of service. The KWh savings are associated with an efficiency improvement and the introduction of operational controls. ie: computer controlled equipment operations.

Individual Project Cost data may be obtained by contacting the Director, Environmental Activities Staff, GMCL, Oshawa, ONT.

1991 ENERGY EFFICIENT PROJECTS

PROJECT	KW SAVED	1991 Projects Metrics
1. Trash Compactors: North and South Plants	31	Total Annual \$ Saved \$ 851,942 Project Cost \$ 1,109,120
2. Chassis Plant: Lighting Retrofit	581	Hydro Incentives \$ 558,815
3. Windsor Trim: Lighting Retrofit	1180	Payback in years 0.79
4. CHQ: Exit Signs Retrofit	4	
5. North Fab: Lighting Retrofit	180	
TOTAL	1976	

1992 ENERGY EFFICIENT PROJECTS

PROJECT	KW SAVED	1992 Project Metrics
1. Oshawa Truck Plant: Paint: Fan Reduction	1200	Total Annual \$ Saved \$ 2,047,581
2. Oshawa South Power House: Compressor Upgrade	142	Project Cost \$ 639,173 Hydro Incentives \$ 26,542
3. Oshawa Rad Plant: Metal Halide (Lighting Retrofit)	8.03	Payback in years 0.31
4. Oshawa Car Paint Shop: Lighting Refractor	32.4	
Process Improvement (Natural Gas & Hydro Reduction)	--	
Process Improvement (Steam Reduction)	--	
5. Oshawa Chassis Plant: H.E.M.	30	
6. Oshawa North Fab Plant: HPS (Lighting Retrofit)	55.4	
7. St. Catharines (Components) Summer Steam Reduction	--	
Compressed Air Reduction	--	
City Water Reduction	--	
8. Woodstock Warehouse (Lighting Control System)	--	
9. CAMI Compressor Efficiency Improvement	--	
Load Shifting to (off-peak)	--	
Snow Melting	--	
TOTAL	1467.83	

1993 ENERGY EFFICIENT PROJECTS

PROJECT	KW/KWh SAVED	1993 Project Metrics
1. Oshawa Body Plant: Air supply control system upgrade(remote set-point control).	3,639,276 Kwh 71 sys.Kw	Total Annual \$ Saved \$ 2,877,913 Project Cost \$ 2,950,498 Hydro Incentives \$ 1,099,964
2.Woodstock P.D.C. Lighting retrofit project.	1,205	Payback in years 0.74
3.Oshawa N.F.P. Diversion of non-contact cooling water from sewer.	-	
4.Windsor Transmission Energy management system.	20,000,000.Kwh 761 sys. Kw	
5.CAMI Process improvement Phosphate oven temperature reduction - natural gas	-	
6.Oshawa S.P. (CPE) Car plant Canopy lighting.	33	
7.Oshawa C.A.P. -Paint Non-production load	-	
TOTAL	23,639,276 KWh 2070 KW	

1994 ENERGY EFFICIENT PROJECTS

PROJECT	KW/KWh SAVED	1994 Project Metrics
BATTERY PLANT		
1. Orange & Brown Baghouses	139	Total Annual \$ Saved \$ 2,436,452
2. Charge Tables Control Automation	200	
3. Lead Melting Pots Retrofit	439	Project Cost \$ 1,362,253
		Hydro Incentives \$ 118,000
TRUCK PLANT		
1. Steam Condensate Monitoring	-	Payback in years 0.53
2. Seasonal Shutdown of steam lines	-	
3. Shutdown of modular spray booth supply air on weekends	2,877,550 KWh	
4. Third Shift Operation	-	
5. Rail Car Entrances Silhouettes	-	
WINDSOR TRANSMISSION		
Air Compressors Upgrade	77	
OSHAWA C,A,P. PAINT SHOP		
Lighting optimization (3M reflectors)	127	
OSHAWA SOUTH PLANT		
Slab Heating Control System	558	
OSHAWA SOUTH PLANT		
Non-Production load Improvement	22,800,000KWh	
CAMI		
Natural Gas split Service	-	
TOTAL	25,677,550 KWh 1540 KW	

1995 ENERGY EFFICIENT PROJECTS

PROJECT	KW/KWh SAVED	1995 Project Metrics
WINDSOR TRIM		
Compressed Air Replaced 300 hp compressor with H.E. 75 hp compressor	671,400 KWh 168 KW	Total Annual \$ Saved \$ 1,192,850 Project Cost \$ 68,680
TRUCK PLANT		
1. Heating Replaced 10 spraybooth air supply gas burners with H.E. burners		Hydro Incentives \$ 0 Payback in years 0.06
2. Process Improvement Replaced infrared heaters with N.G. heaters in the final bake ovens (2)	1,206,058 KWh 178.2 KW	
TRILINK PLANT		
Process Improvement Replaced N.G. heat exchanger with steam coil in stage 1 cleaning bath		
OSHAWA SOUTH PLANT (CPE)		
1. Compressed Air Repaired 415 compressed air leaks	3,970,382 KWh	
Non-Production load Improvement	23,632,640 KWh	
TOTAL	29,480,480 KWh 346.2 KW	

1996/1997 ENERGY EFFICIENT PROJECTS

PROJECT	KW/KWh SAVED	1996/97 Project Metrics
WINDSOR TRANS. Peak Demand Management Rotating series of shutting down H&V utilizing EMS (Peak Shaving).	298.4 KW 1157494 KWH	Total Annual \$ Saved \$ 426,013 Project Cost \$ 287,350 Hydro Incentives \$ 0 Payback in years 0.67
ST. CATHARINES - COMP. WWT Holding Tank Aeration Using 3 local 15 psi blowers instead of 100 psi plant air.	2247000 KWh	
STE. THERESE Finess line Lighting T12 to T8 (FL.)	16.1 KW 92,736 KWh	
Steam Load Reduction (Summer) Turn off steam to certain fan houses for a 84 days (Natural Gas savings).		
Compressed Air Refurbish and use 3000 CFM compressor'versus 6000 CFM compressor during non-production	3,926,000 KWh	
Reduce Air Ambient Temprature 2 - 3 degrees F (from 71 to 68). (Natural Gas savings).		
TOTAL	7,423,230 KWh 314.5 KW	

1998 ENERGY EFFICIENT PROJECTS

PROJECT	FUEL SAVINGS	ANNUAL KWh SAVINGS	1998 Project Metrics
ST. CATHARINES - COMP.			
HEAT TREAT WATER ABATEMENT Reduce water flow to heat treat furnaces by 57%	WATER		Total Annual \$ Saved \$ 3,104,390 Project Cost \$ 4,081,907
OSHAWA - CAR PLANT			Hydro Incentives \$ 0
LIGHTING RETROFIT PROJECT Replace general fl. lighting wiht MH.lighting Retrofit all 8 ft, T12 HO fl. with T8 HO	ELEC.	26,545,752	Payback in years 1.31
PAIT REPAIR HEAT LAMS UPGRADE Replce existing incandscnent heat lamps with infrared lamps - less curing time	ELEC.	268,646	
STE. THERESE			
HEATING AND VENTILATION Reduce ventilation to clean room during clean up period in Paint Shop	ELEC.\GAS	2,756,432	
PROCESS IMPROVEMENT Shut-off one100 hp circulating pump for cooling tower during winter non - production.	ELEC.	122,978	
LIGHTING Shut-off lighting during non-production	ELEC.	732,320	
HEATING AND VENTILATION Shut-off Paint Shop building ventilation during non-production.	ELEC.\STEAM	1,838,682	
PROCESS IMPROVEMENT Reduce water flow on phosphate pumps mechanical seals by using needle valves.	WATER		
BOILERS AND STEAM SYSTEMS Burn the unused portion of the NG firm conrract instead of buncker c oil.	OIL\GAS		
UTILITY RATES Negotiate 3 year contract instead of 2			
BOILERS AND STEAM SYSTEMS Shut-off steam across the plant during the summer shutdown.			
COMPRESSED AIR Reduce CA header pressure from 105 to 90 psi during non-production hours.	ELEC.	174,400	
ENERGY MANAGEMENT Reduce ambient air temp. by 3 degrees F.	GAS		
LIGHTING Replace 56 bays of fl. lighting to metal halide.	ELEC.	980,000	
OSHAWA AUTOPLEX			
COMPRESSED AIR Compressed Air leaks repairs	ELEC.	4,659,500	
TOTAL		38,078,710	

7.2 Estimated Impact of Activities / Projects

The individual projects in the charts presented above, include data that illustrates the impact of each activity or project for each year outlined above. The energy savings are outlined with the resulting emission reductions shown in section 8 within the applicable charts.

8 Results Achieved

8.1 Current Reporting Year

Vehicle Assembly Production

In 1998, assembly operations accounted for just under 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 performance. Chart #1 presents annual vehicle production, which has increased 21% over the 1990 through 1998 period. A work stoppage in 1998 accounts for the reduced energy consumption shown in the charts for that period. The 1999 projected volume represents a more normal operating scenario and mirrors the 1997 operation.

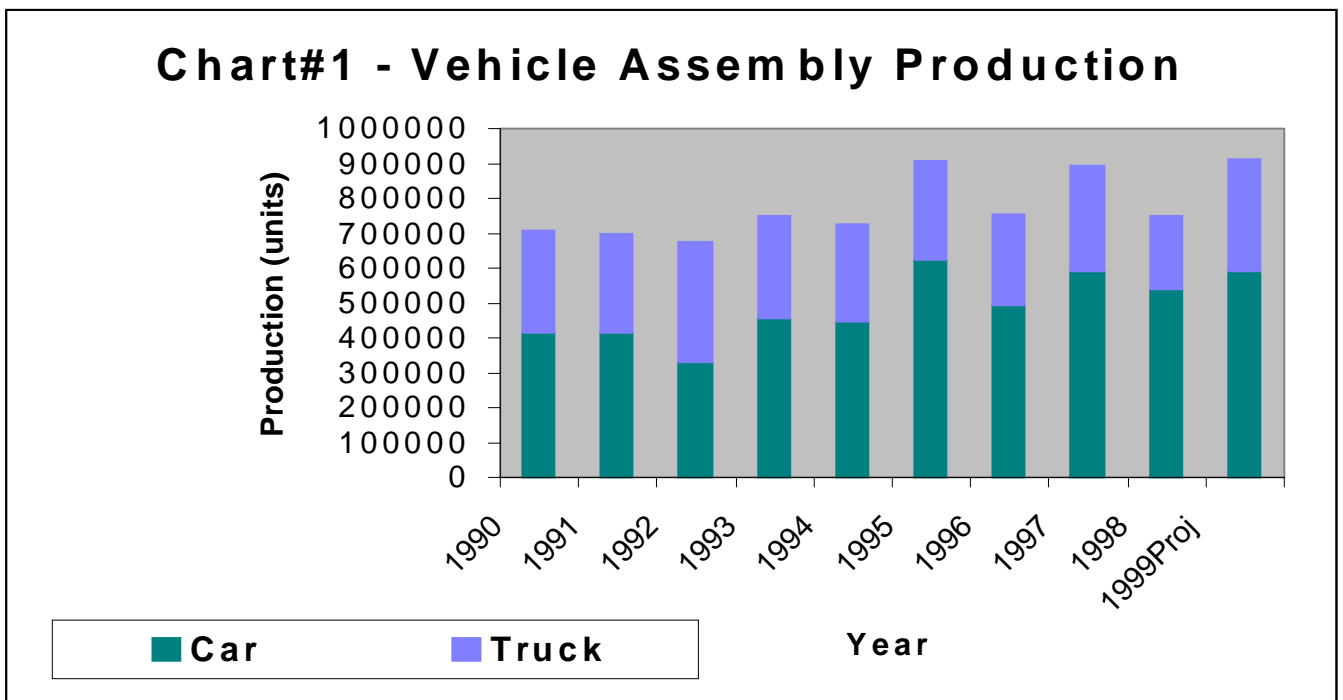


Chart #1 - Vehicle assembly data reflect the production in Car and Truck Assembly centers in Oshawa, Ontario and Ste. Therese, Quebec. Variation of production is shown over the periods due to market conditions, work stoppages, downtime for investments, model changeover, and other factors.

Energy Consumption Per Vehicle Produced

Energy consumption per vehicle produced data for our assembly operations is presented below in Chart 2. The projected energy consumption per vehicle produced will drop by 29% for car assembly operations, and by 23% for truck assembly, for the period 1990 through 1999 Projected. Variation on a yearly basis is attributed to the fluctuation of production, work stoppages, weather, downtime for investments, model change and other related factors.

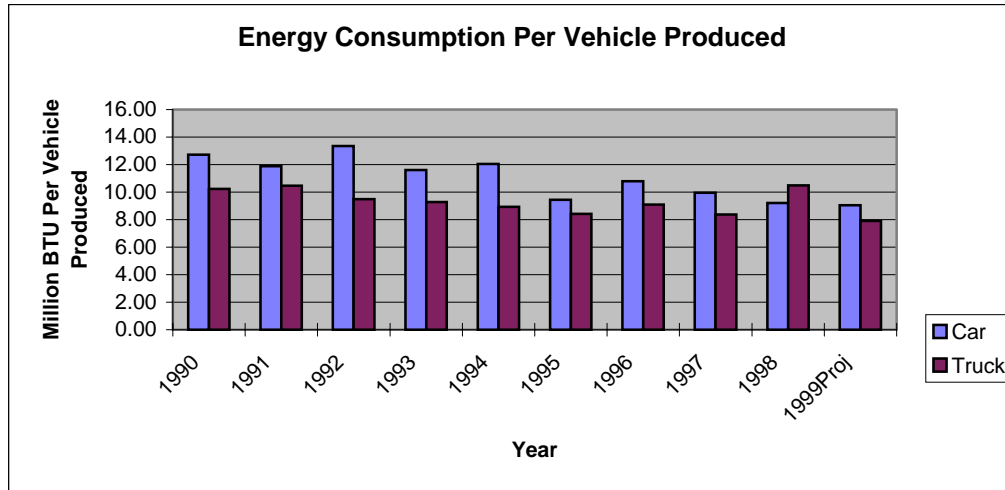


Chart 2

Chart #2 – Energy consumption per vehicle produced is shown in this chart and reflects the BTU energy consumed to produce each composite passenger and light duty truck in the period from 1990 to 1998. A projection is also shown for the 1999 year based on forecasted vehicle production. The total energy consumed is made up of coke, coal, natural gas, oil and hydro electric power. The data reflects the use of emission factors for each energy source and in the province consumed.

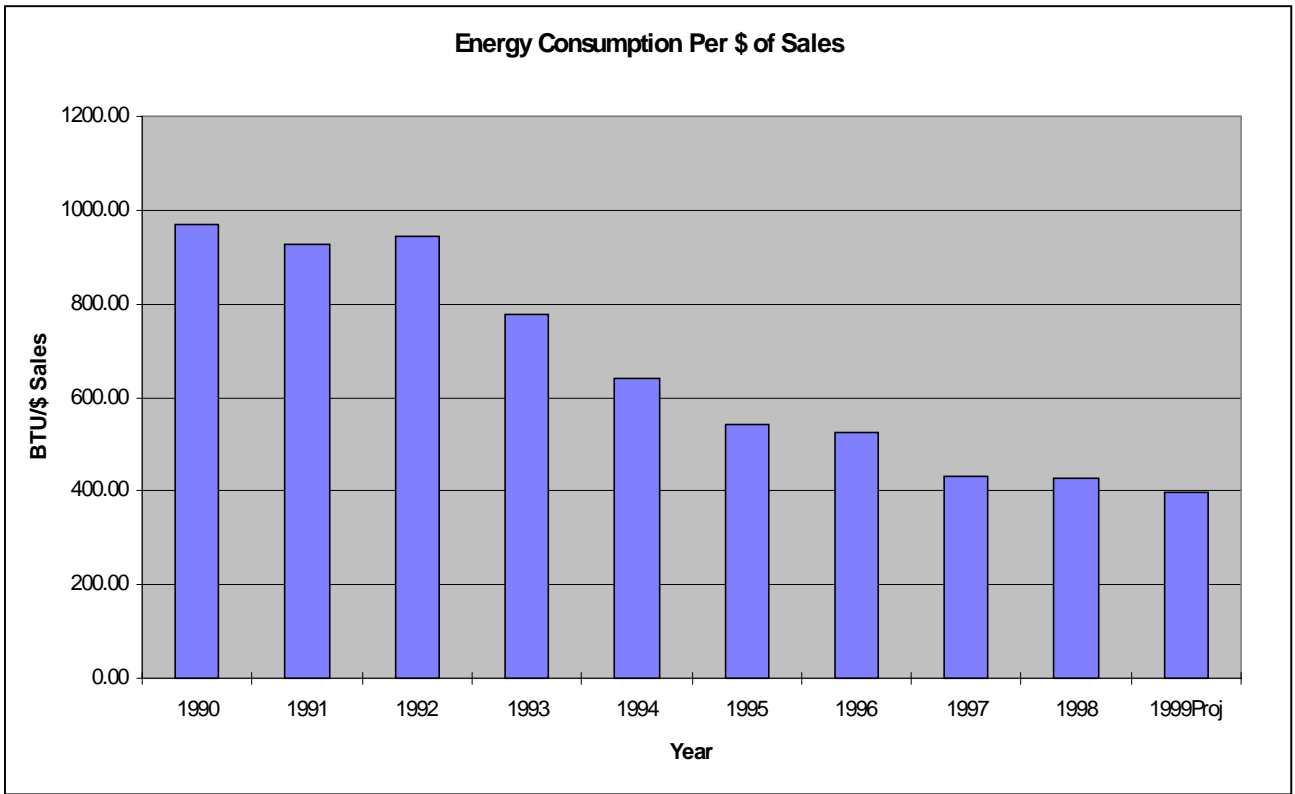


Chart #3 – This chart shows the energy consumption on a BTU per Dollar Value of sales by GMCL in Canada.

Stationary CO₂ Generation

CO₂ emissions associated with GMCL energy consumption have decreased 39% over the period 1990 through 1998. CO₂ emission data is presented below on Chart 4.

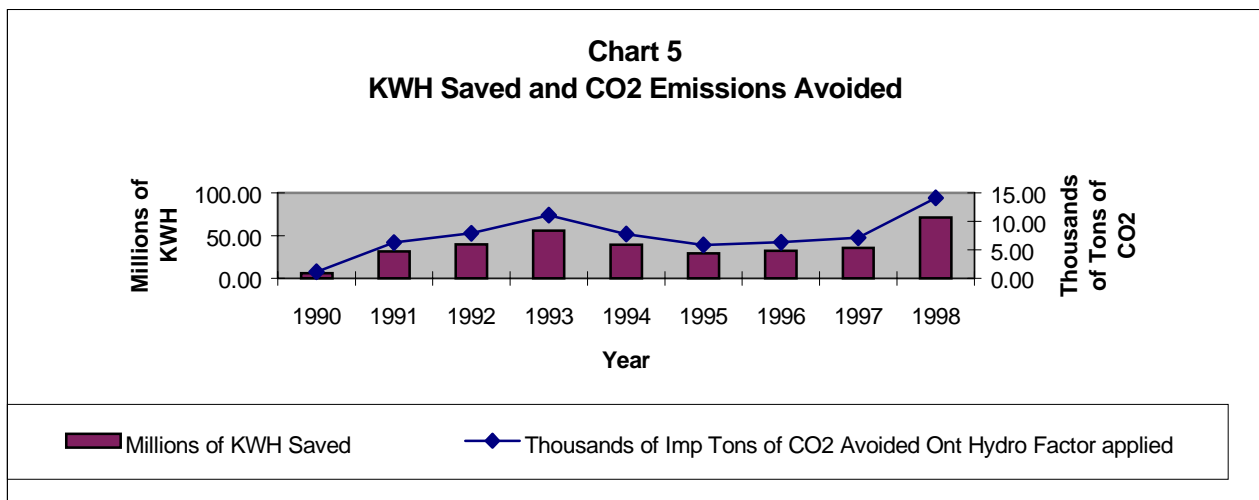
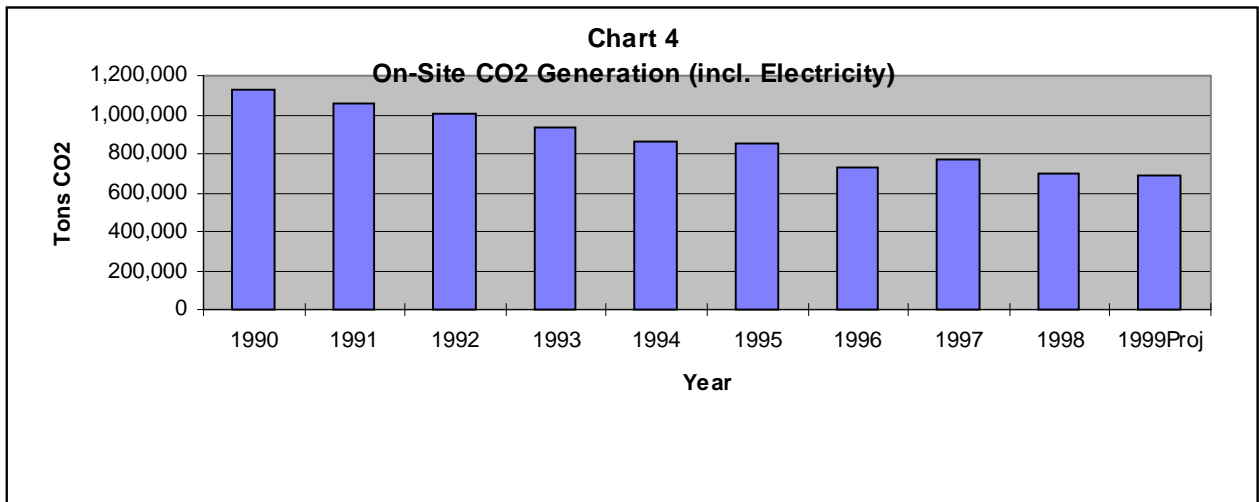


Chart #5 – This chart reflects the savings achieved in the reduction of electrical power consumption due to projects accomplished and energy efficiency initiatives during the period. Savings of electrical energy and corresponding CO₂ emission avoided are shown.

Chart 6
KWH Saved and CO2 Emissions Avoided (Cumulative)

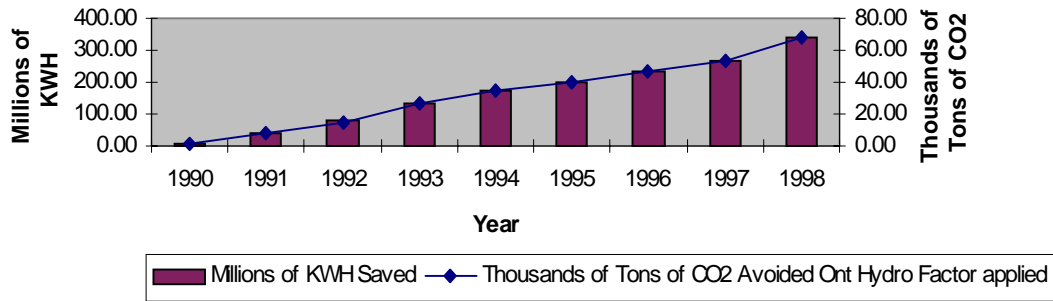


Chart #6 – This chart shows the accumulated electrical energy saved with the corresponding CO₂ emissions avoided for the period. GMCL’s electrical energy reduction projects and energy efficiency initiatives over the years have significantly offset and reduced the CO₂ emissions that would have otherwise increased due to power generating options utilized by the local utilities.

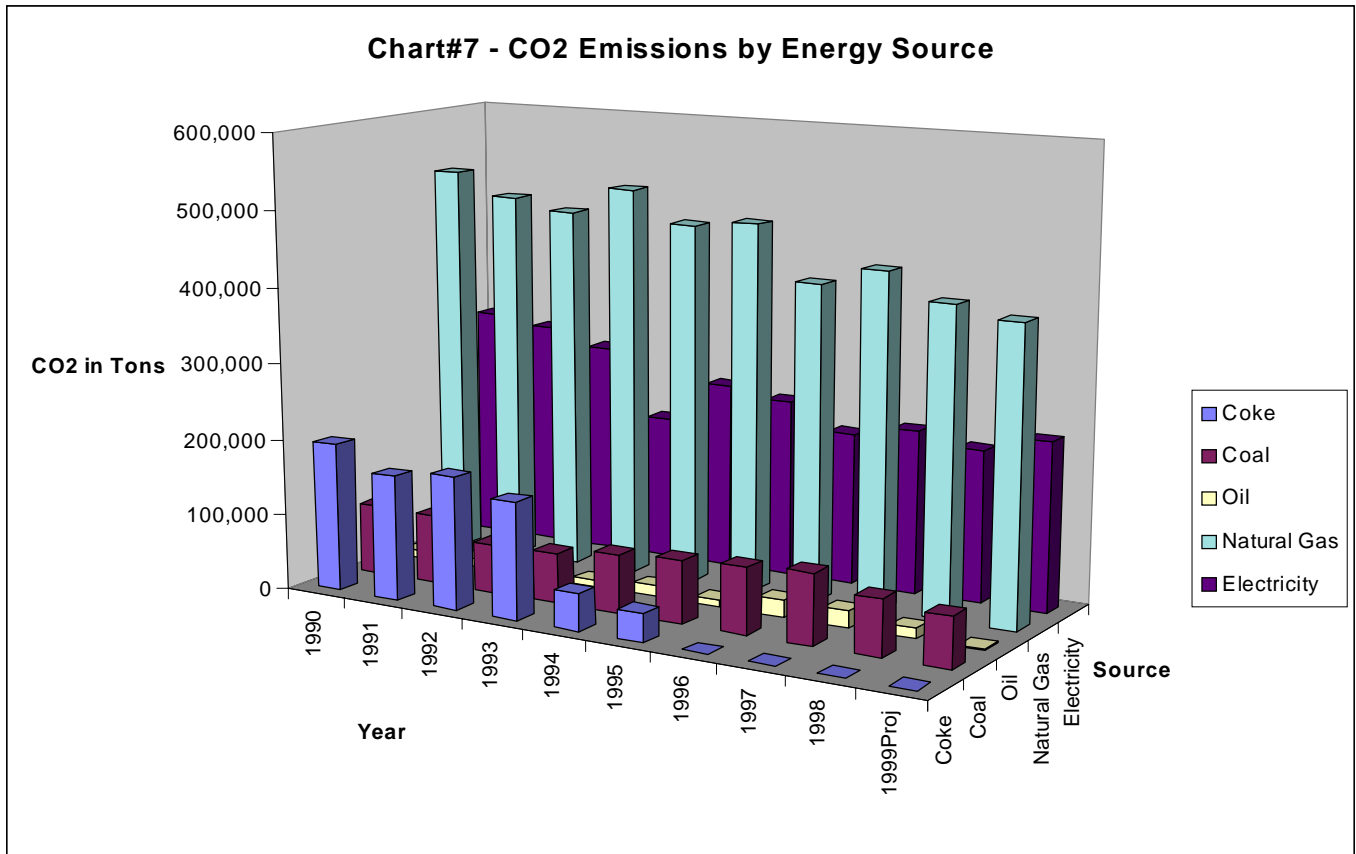


Chart #7 – This chart shows the energy mix with the corresponding CO₂ generation over the period. The CO₂ generation over the period does not take into account changes in emission factors due to mixes in source generation of electrical power. For example the movement to more fossil fuel generation in the 1997 to 1999 period had no effect on the emission factor developed by the local utilities and used in the calculations.

Chart #8 - Energy Consumption Mix in MBTU

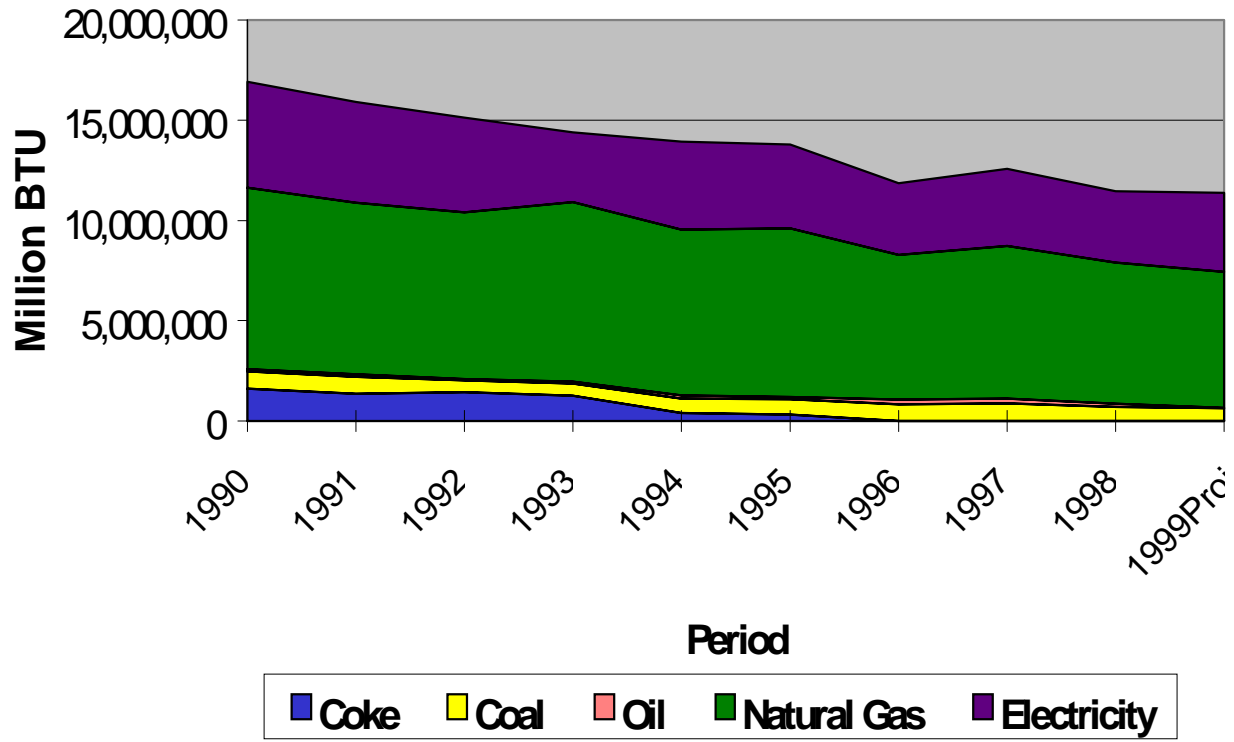
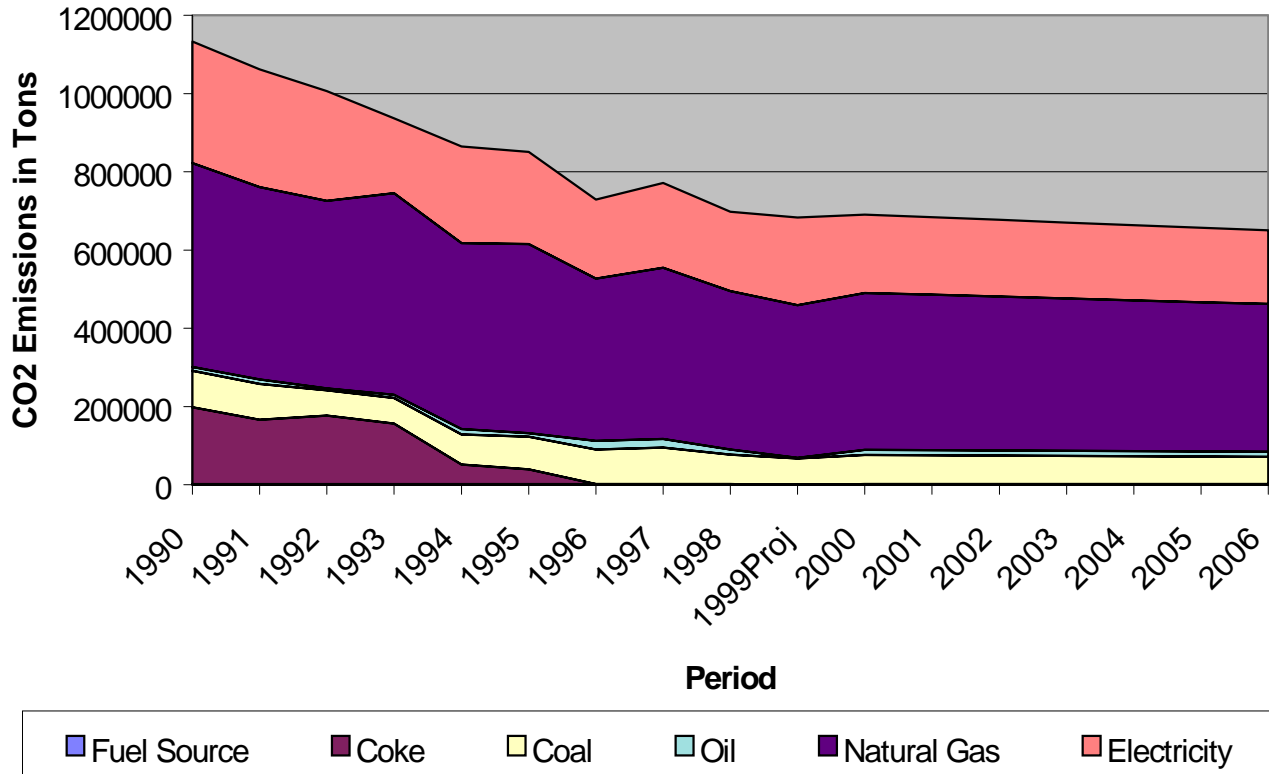


Chart #8 – This chart shows the energy consumption mix in another format showing the total overall reduction of BTU over the period by all combined energy usage sources.

Chart #9 - Energy Consumption Mix in CO2 Emissions



New CO2 Emissions - Manufacturing (NOTE: This table is used to generate chart #9 to show a 1% reduction in CO2 from the year 1998)

By Energy Source - Tons	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999Proj	2000	2001	2002	2003	2004	2005	2006
Fuel Source																	
Coke	196222	164448	174952	154058	49371	37523	0	0	0	0	0	0	0	0	0	0	0
Coal	92732	91489	64601	65717	77228	82995	87852	92929	74503	66912	73765	73035	72312	71596	70887	70185	69490
Oil	10434	10987	4798	8062	13989	8777	22346	21811	13670	1407	13535	13401	13268	13137	13007	12878	12750
Natural Gas	520689	492048	478820	515200	474930	484178	414494	438156	405062	390587	401052	387081	393150	389257	385403	381587	377809
Electricity	310767	300813	280661	191581	247204	235447	201943	216803	202233	224364	200230	198248	196285	194342	192417	190512	188626
Total On-Site (w/o Ele)	820078	758952	723171	743037	615518	613474	524682	552896	493235	458907	490352	485518	480731	475892	471300	468655	462055
Total (with Electricity)	1130845	1059765	1003832	934617	862722	848921	726835	769699	695468	683271	688582	681765	675014	668331	661714	655162	648676

Chart #9 – Same Chart as #8, but showing the equivalent CO₂ emissions for each stacked energy source in tons of CO₂ over the period. Also shows a 1% per year reduction of CO₂ for each Energy source projected from the 1998 baseline to the year 2006.

	1995	1996	% Change	1997	%Change	1998	%Change	1999Proj	%Change
Vehicle Production	907,680	753,417	-17.00%	894,925	-1.41%	750,907	-17.27%	910,521	0.31%
Energy Consumption (MMBTU)	14,978,090	12,984,487	-13.31%	12,573,144	-16.06%	11,456,590	-23.51%	11,379,285	-24.03%
Energy Consumption Per Vehicle									
MMBTU/Car	9.44	10.79	14.32%	9.96	5.53%	9.20	-2.53%	9.04	-4.18%
MMBTU/Truck	8.41	9.10	8.20%	8.38	-0.41%	13.15	56.34%	7.92	-5.87%
Facilities CO2 Generation (Tons)	613,474	524,692	-14.47%	552,896	-9.87%	493,235	-19.60%	458,907	-25.20%
Avoided Through Electricity Savings - Cumulative (Tons) Ont Hydro Factor	39,993	46,338	15.87%	53,449	33.65%	67,535	68.87%		

Chart#10 - This chart reflects GMCL goal to reduce energy consumption by 20% by 2002 based on a 1995 baseline. 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. The results of these projects are tabulated in the charts outlined in section 7, with the 20% reduction already achieved by the GM Canada operations. Of course, we will continue to strive for further reductions.

8.2 Interim Years

See Section 8 for the charts as a reference.

8.3 Verification

The calculations for this report were done internally and have not been verified by a third-party. However, the calculations are verifiable against energy invoicing from external suppliers. Our external auditors, while not conducting an invoice by invoice audit, do include an assessment of energy cost per vehicle as part of their financial audit. In addition, an external Utility specialist has regular access to the energy data to make recommendations for potential conservation initiatives.

8.4 Offsets

In addition to significant direct reductions in GHG emissions from our manufacturing facilities, GMCL has undertaken an offset initiative. More than 35,000 trees and shrubs have been planted at the McLaughlin Bay Wildlife Reserve in Oshawa, Ontario since 1990. In addition, more than 9,000 trees have been planted in 1999 at the Glendale facility in St. Catharines, Ontario. Plans are in place for an additional 4,000 trees and shrubs to be planted on this site in the spring of 2000.

9. Education, Training and Awareness

9.1 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. GM's position is as follows:

Whether emissions from human activity will cause climate change and what the impact will be is still uncertain. GM believes there is enough cause for concern to take moderate cost actions to reduce global greenhouse gas emissions and the risk from potential change. Development of new, cost-effective technologies is the most effective long-term response to address the global climate issue.

GM agrees that the potential consequences of global climate change require responsible actions. The key to acting responsibly is technology development, and GM is committing substantial technical and financial resources to technology development. GM is also taking actions at its facilities and with our suppliers to reduce GHG emissions.

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, has taken and continues to take an active role. GMCL representatives sit on the Credit for Early Action table, and sub-groups of both the Industry Table and the Transportation Table. Additionally, the auto industry has pooled its resources in order to provide comprehensive input to the national process and other auto company representatives sit on the Public Education and Outreach Table, the Industry Table, and the Transportation Table. The activities of these other tables are reviewed at regular industry meetings.

In addition to our involvement in the consultation process, GMCL, in conjunction with other auto manufacturers in Canada, have undertaken outreach activities with government officials on climate change issues. In April, 1999, the auto industry held a Technology Forum in Windsor. Federal and Provincial government officials were invited to the Forum to discuss climate change issues related to the auto industry's products and manufacturing processes. A follow-up meeting was held in June in Ottawa, to allow for further discussion with government officials.

GMCL has also participated in the annual Canadian Energy Research Institute's conference, addressing the issues of climate change. In 1998, GMCL's Director of Engineering addressed the CERI conference on the subject of changing vehicle technologies and how these advancements may assist in addressing climate change.

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:

- We are committed to actions to restore and preserve the environment
- We are committed to reducing waste and pollutants, conserving resources and recycling materials at every stage of the product life cycle
- We will continue to participate actively in educating the public regarding environmental conservation
- We will pursue vigorously the development and implementation of technologies for minimizing pollutant emissions
- We will continue to work with all governmental entities for the development of technically sound and financially responsible environmental regulations
- 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.

GM Environmental Management System/ISO 14000

GM has recognized the significant value of a structured environment 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.

The management of energy is a part of this EMS and elements of this process has been the framework for our GM Canada energy management operations since the early 1990's.

9.2 Climate Change and Our Employees

As previously mentioned our employees guide their day-to-day activities with the GM Environmental Principles. Also, as GMCL facilities move towards adopting ISO 14001 EMS systems by the end of 2001, this will enable employees to more efficiently implement the Environmental Principles.

GMCL also uses other tools to communicate with employees on environmental issues and on climate change specifically. GM Today is a magazine distributed to all employees and retirees in Canada twice annually. Once a year, an environmental awareness topic is included in the magazine. Additionally, GMCL communicates with employees via email messages. Email messages on a variety of subjects are sent to employees. Environmental topics are frequently addressed, including the need to conserve energy in the workplace to reduce costs and reduce environmental impacts. Practical tips are often cited for reducing energy usage. Each of GMCL's manufacturing facilities has newsletters that are distributed to local personnel. These publications also 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 is currently being updated to include over 40 pages of environmental and energy information. This section includes total of 10 pages 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 vehicle use. There are several pages specifically referencing the "VCR" and how to access its website to obtain more detailed information.

9.3 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.

The Global Sullivan Principles

In May 1999, the Global Sullivan Principles were announced to business leaders at the African-African American Summit in Ghana. These principles were developed by the Reverend Leon H. Sullivan with the help of a number of multinational corporations, including GM, Shell, and Procter & Gamble, and a business association in Latin America. The Global Sullivan Principles are designed for large and small companies, particularly those that do business in less developed economies, and provide a positive, universal framework with which companies can align their internal policies and principles. GM supports the Global Sullivan Principles because they are consistent with GM's internal policies and principles, including "Winning with Integrity - Our Values and Guidelines for Employee Conduct".

THE GLOBAL SULLIVAN PRINCIPLES

The Preamble

The objectives of the Global Sullivan Principles are to support economic, social and political justice by companies where they do business; to support human rights and to encourage equal opportunity at all levels of employment, including racial and gender diversity on decision making committees and boards; to train and advance disadvantaged workers for technical, supervisory and management opportunities; and to assist with greater tolerance and understanding among peoples; thereby, helping to improve the quality of life for communities, workers and children with dignity and equality.

I urge companies large and small in every part of the world to support and follow the Global Sullivan Principles of corporate social responsibility wherever they have operations.

The Reverend Leon H. Sullivan

THE PRINCIPLES

As a company which endorses the Global Sullivan Principles we will respect the

law, and as a responsible member of society we will apply these Principles with integrity consistent with the legitimate role of business. We will develop and implement company policies, procedures, training and internal reporting structures to ensure commitment to these principles throughout our organization. We believe the application of these Principles will achieve greater tolerance and better understanding among peoples, and advance the culture of peace.

Accordingly, we will:

- Express our support for universal human rights and, particularly, those of our employees, the communities within which we operate, and parties with whom we do business.
- Promote equal opportunity for our employees at all levels of the company with respect to issues such as color, race, gender, age, ethnicity or religious beliefs, and operate without unacceptable worker treatment such as the exploitation of children, physical punishment, female abuse, involuntary servitude, or other forms of abuse.
- Respect our employees' voluntary freedom of association.
- Compensate our employees to enable them to meet at least their basic needs and provide the opportunity to improve their skill and capability in order to raise their social and economic opportunities.
- Provide a safe and healthy workplace; protect human health and the environment; and promote sustainable development.
- Promote fair competition including respect for intellectual and other property rights, and not offer, pay or accept bribes.
- Work with governments and communities in which we do business to improve the quality of life in those communities - their educational, cultural, economic and social well-being - and seek to provide training and opportunities for workers from disadvantaged backgrounds.
- Promote the application of these principles by those with whom we do business.

We will be transparent in our implementation of these principles and provide information which demonstrates publicly our commitment to them.

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.

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.

9.4 Our Public Education on Climate Change

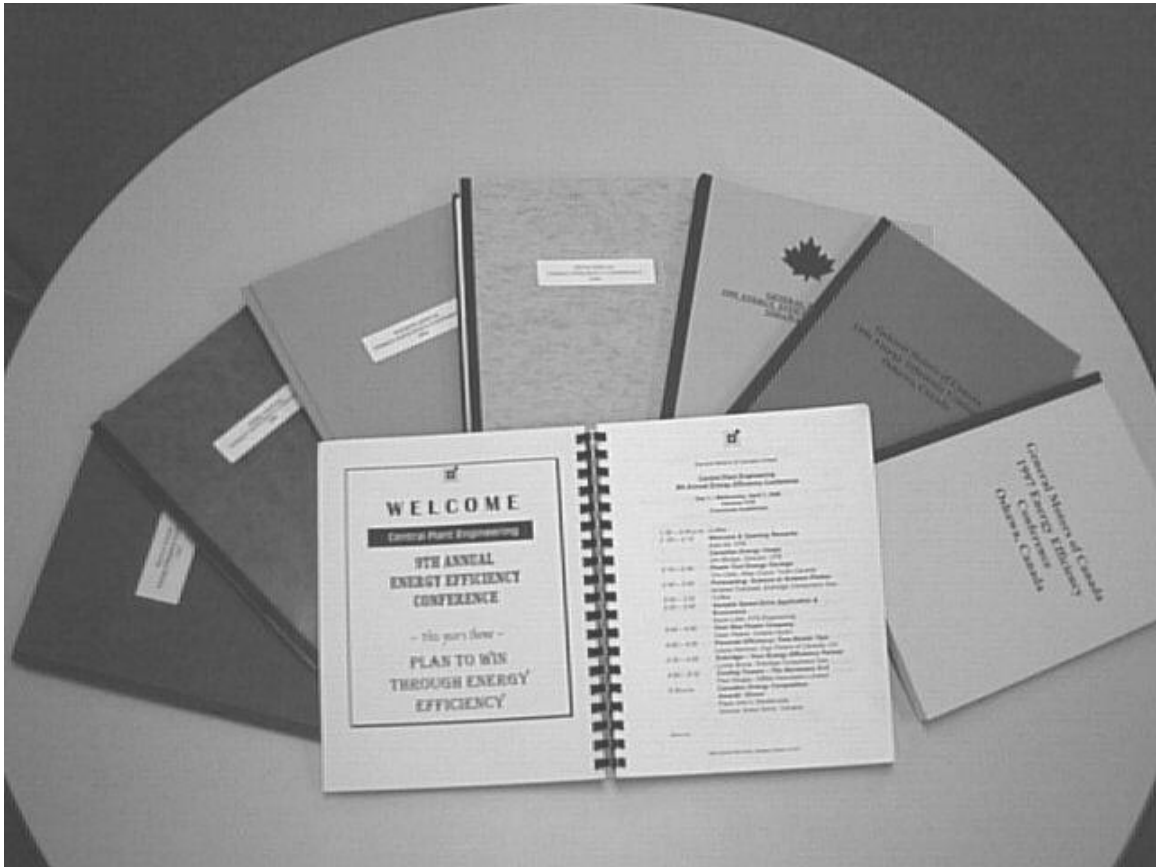
GM undertakes a number of activities that endeavour to educate the public about climate change.

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 participates in the production of the annual Fuel Economy Guide in conjunction with the Federal Government. This manual ensures that consumers have the necessary information in order to factor fuel economy into their vehicle choice decisions.

APPENDIX 1 - Photograph



Photograph of the reports from the Annual GMCL Energy Efficiency Conference.

APPENDIX 2 - Photograph



Photograph of a display to publicize "Energy Conservation Week" held annually at GMCL Oshawa Headquarters.