1993 Project Abstract
FOR THE PERIOD ENDING JUNE 30, 1995
This project was supported by Oil Overcharge money (M.L. 93, Ch. 172, Sec. 14, Subd. 4a)

TITLE:	Reducing Energy and CO_2
PROGRAM MANAGER:	Sheldon Strom
ORGANIZATION:	Center for Energy and Environment
LEGAL CITATION:	M.L. 93 Ch. 172, Sec. 14, Subd. 4(a)
APPROPRIATION AMOUNT:	$230,000

STATEMENT OF OBJECTIVES

To develop a database of current and projected Minnesota energy use and associated air emissions, develop cost-effective energy efficiency strategies targeted at energy uses which are most significant and amenable to reduction, and produce an Action Plan for Minnesota which provides a clear direction for improving energy and economic efficiency.

RESULTS

Minnesota's greenhouse gas emissions are projected to increase by over 39 percent from 1990 to 2010. Recommended strategies cover the industrial, commercial, residential, agricultural, energy producers/distributors/service providers, forestry and transportation sectors. Aggressive implementation of strategies presented in this plan could produce over 36 million metric tons (MMT) in potential CO_2 equivalent savings. This is a 25 percent reduction from estimated 2010 emissions of 144 (MMT), and almost 4 percent above 1990 baseline emissions of 104 (MMT).

The industrial/commercial strategies exhibit the greatest potential to reduce emissions, contributing 36 percent to total Action Plan reductions. Second at 30 percent is the energy producers/distributors/service providers sector. Commercial/residential contributes 16 percent, while agriculture and forestry make up 2 percent of reductions. All of these sectors contribute to reductions at a share close to their contribution of overall emissions with the exception of transportation. While transportation is responsible for about 32 percent of Minnesota's CO2 emissions, it contributes only 16 percent to total reductions despite the aggressive strategies this plan recommends. More focused efforts must be made in the transportation sector.

An attempt has been made in this report, using available examples and studies, to quantify a range of some of the potential economic benefits to Minnesota to implementing these strategies. Based on available studies, the savings from implementation of strategies related to electric energy efficiency and renewable energy alone would create between 8,200 and 15,500 additional permanent jobs in Minnesota by 2010. Implementation efforts are already underway for some of these strategies. The success of the Action Plan is dependent upon the cooperation of the many different sectors and interests that make up Minnesota's private and public institutions as well as its citizens.

PROJECT RESULTS USE AND DISSEMINATION

This Action Plan was written with the goal and expectation of implementation and action. Opportunities for the implementation of strategies were identified and implementation was begun where possible. Presentations will be made to the Legislative Commission on Minnesota Resources, who recommended funding for this project. In addition, the *Inventory* and *Action Plan* will be distributed to other key players such as relevant state and local agencies, regional development commissions, private industry, environmental groups and other interested parties. Presentations may also be made to some key state agencies and groups in the various sectors.

Date of Report: July 1, 1995

LCMR Final Report

I. Project Title: Reducing Energy and CO_2

Program Manager: Sheldon Strom
Agency Affiliation: CEE
Address: Center for Energy and Environment
100 North 6th Street, Suite 412A
Minneapolis, MN 55403-1520
Phone: (612) 348-4669

A. Legal Citation: M.L. 93 Ch. 172, Sect. 14, Subd. 4(a)

Total Biennial LCMR Budget: $230,000
Balance: $0

Appropriation Language as drafted 7/27/92: This appropriation is from the oil overcharge money to the commissioner of administration for a contract with the center for energy and environment to develop a comprehensive action plan that will focus on energy efficiency, alternative energy, and fuel switching through an assessment of opportunities for the reduction of CO_2 and other greenhouse gases.

B. LMIC Compatible Data Language: Not applicable.

C. Status of Match Requirement: Not applicable.

II. Narrative: The goal of this project is to develop and implement cost-effective strategies which reduce energy use in the transportation, commercial-industrial-institutional (CII), and residential sectors, thereby reducing emissions of carbon dioxide (CO_2) and other air emissions, dependence on oil imports, and the cost of energy. Strategies will focus on energy end-use efficiency and the efficiency of energy conversion processes since these are the most effective measures in reducing not only energy use and local air emission, but CO_2 emissions as well. This process will combine strong economic and technical analysis with bold policy proposals resulting in net economic and environmental savings for Minnesota.

An Energy/CO_2 Emissions database will be developed for the state of Minnesota. The data base will include all major energy end uses and fuel types and the air emissions due to each end use and fuel type. The data base will include current data as well as projections based on current trends, and will be capable of analyzing alternative energy scenarios to determine potential economic and environmental impacts. A wide range of strategies will be developed to reduce energy use and emissions in each energy-using sector, and analyzed using the Energy/CO_2 Emissions data base. The analysis will be used to help guide the prioritization of the strategies. Priority will be given to strategies that most cost-effectively reduce energy consumption and emissions. These strategies will reduce CO_2, but must also result in a net benefit both locally and nearer term. In other words, the strategies must make sense in and of themselves, regardless of whether the dangers of global warming materialize or not.

These strategies will be summarized in a detailed action plan for the state. A "blue ribbon" Project Advisory Committee, consisting of key state and local leaders with interest and expertise in energy and environmental matters, will oversee the project from the beginning with a particular emphasis on promoting implementation of strategies recommended in the action plan. Public comment will be solicited in public forums to get the broadest possible view of the action

plan. The action plan will provide detailed information on the energy savings, environmental impacts, costs and benefits of the plan's components. The action plan will specifically identify responsibilities and funding sources necessary for implementation of major measures.

III. Statement of Objectives:

A. Develop a database of current and projected Minnesota energy use and associated air emissions.
B. Develop cost effective energy-efficiency strategies targeted at energy uses which are most significant and amenable to reduction.
C. Finalize an energy-efficiency action plan and promote implementation of the action plan.

IV. Objectives:

A. Title of Objective: Develop database of current and projected Minnesota energy use and associated air emissions.

A.1. Narrative: A database of energy use by fuel type and end-use sector will be developed for Minnesota. This information will be analyzed using the Total Emissions Model for Integrated Systems (TEMIS), a sophisticated computer model which calculates the emission of all greenhouse gases produced by energy conversion activities.

TEMIS was developed by the ÖKO-Institut, a German National Laboratory, for the Enquête Commission on Climate Change, and was funded by the German Federal Parliament. The main purpose of the project was to provide a tool for integrating environmental aspects into energy policy decision-making processes. Within the TEMIS project, energy and emission-related data for fuel cycles of various energy systems have been collected and compiled. The corresponding data base includes energy and fuel data, emissions factors (SO_2, NO_x, particulates, CO_2, CO, CH_4, and non-methane volatile organic compounds), solid wastes, land use, and relevant qualitative aspects. An English version of TEMIS was prepared by the ÖKO-Institut in Spring 1990 to be used for international-scale systems analysis. Although the English version includes some U.S. specific data, further adjustment will need to be made to make the data more U.S. and region-specific.

This project will use the model to generate energy use and emissions projections based on current trends and alternative projections based on achievable energy efficiency improvements. The TEMIS model also calculates the differences in the air emissions released by the energy options, and converts these differences to an economic indicator in order to monetize environmental effects. This feature allows for the consideration of both the economic and ecological effects of an energy scenario.

The model will not be used as a tool to free decision-makers from their responsibility to value environmental aspects by means of a computer model, but will enhance the background information about environmental aspects, thereby providing support for the decision process.

A Policy Advisory Committee (PAC), made up of key state and local leaders will be created. This committee will oversee the development of the comprehensive action plan and facilitate its implementation. Members of this committee will include representatives of local and state government, regulated and nonregulated utilities, consumers, regulatory agencies, private industry and environmental organizations.

A.2. Procedures: The Policy Advisory Committee will be established in late spring 1994. Data will be gathered from a variety existing sources including the Minnesota Department of Public Service Energy Division, Northern States Power, Minnegasco and other utilities, fuel suppliers, Minnesota Department of Transportation, Minnesota Environmental Protection Agency, and local governments. This process will be completed by summer, 1994. Necessary adjustments to TEMIS will continue through the data-gathering process to make the system more region-specific. The results of this process will be a region-specific Energy/CO_2 Emissions data base by fall, 1994. From this data base, trends will be developed based upon established demographic and economic projections and combined with trends on energy intensity of key demographic and economic indicators. During development, the Policy Advisory Committee will review assumptions underlying all trends. In fall 1994, a draft report on Minnesota's current and projected energy use and associated air emissions will be published and disseminated for review. Based on comments on the draft, a final report will be developed and disseminated in late fall 1994.

A.3. Budget:

a. Amount budgeted: $75,000
b. Balance: $0

A.4. Timeline:

	1993		1994				1995	
	3	4	1	2	3	4	1	2
Objective A			*	*	*			
-establish PAC				*				
-gather data		*	*	*				
-adjust TEMIS			*	*				
-develop trends			*					
-draft released					*			
-draft reviewed					*			
-final report released						*		

A.5. Status: CEE began this process by developing the *Energy/CO2 Emissions Database*. This database, which can be used to estimate emissions for any given year, calculates the emission of greenhouse gases produced by energy conversion and other emission producing activities in terms of fuel, sector and end use specifically for Minnesota. CEE originally intended to use the TEMIS computer program to calculate emissions and analyze future scenarios. However, its use was dependent on the review of its internal database of U.S. fuel characteristics and energy use processes, a complex and labor-intensive process for which the anticipated assistance of U.S. Department of Energy (DOE) staff was critical. The DOE decided not to allocate resources to this task. Fortunately, the use of the CEE-developed model instead of TEMIS allowed the results of this project to be more compatible with efforts at the national level as well as with other states. CEE has developed both 1988 and 1990 emissions estimates using this model. Projections to 2010 were developed using CEE-calculated historical and primary projections, as well as DPS-run Energy2020 model results.

A Technical Advisory Committee (TAC) made up of technical experts from Northern States Power, Minnegasco, Minnesota Department of Transportation, Minnesota Pollution Control Agency, Minnesota Department of Public Service, Izaak Walton League of America, Metropolitan Council, 3M, Department of Agriculture, Minnesota Power, and the Department of Natural Resources. This committee was an addition to the original workplan. The TAC participated in the review of technical assumptions and analysis produced by CEE in the development of its *Energy/CO_2 Emissions Database* and *Inventory*. In addition, the TAC helped develop strategy ideas to accomplish the goals of the project. In order to address specialized areas in more depth, CEE created informal

subgroups within each major area. This served as a way to bring other experts into the process. Small groups covered transportation, buildings, building codes, agriculture and forestry, and energy service provider issues.

Baseline emissions measure energy consumption in the state using sales (including fuel sales to electric utilities for generation occurring in the state). For most energy sources, this is a reasonable proxy for end-user consumption within the borders. However, it was decided that the electric generation sector is somewhat unique in that state sales do not reflect the energy consumption the inventory should measure. Therefore, an additional set of calculations was made for this sector, and a section has been added to the inventory. These calculations have never been done for Minnesota's electric utilities, and were of great interest to the utility and state agency participants on the TAC.

Thus, greenhouse gas emissions for Minnesota were measured in two different ways in the inventory: In-State and 'Global' emissions. The In-State emissions total includes only emissions generated and occurring within the state of Minnesota caused by Minnesotan's use of energy. It does not include the emissions from electricity used by Minnesotans, but generated outside of the state. This total can be directly compared with other state inventories being completed through grants from the Environmental Protection Agency. However, in order to form a clear picture of the emissions actually caused by our use of energy in Minnesota, the 'Global' total is used. The 'Global' total yields higher overall emissions than the In-State total and a higher rate of growth in emissions between 1990 and 2010.

In-State emissions of 95.91 million metric tons CO_2 equivalent in 1990 are expected to increase to 126.54 million metric tons CO_2 equivalent in 2010, an increase of 32 percent. 'Global' emissions, however, increase from 103.94 to 144.13 million metric tons CO_2 equivalent, or 39 percent. The 'Global' total includes emissions from electricity produced outside of the state, but purchased and used in Minnesota. This is the total used in the *Action Plan for Minnesota*, since any actions taken to reduce electricity use will have reduction effects both inside and outside the state.

The inventory and its accompanying projections yield numerous useful insights into future energy consumption and greenhouse gas emissions, and have helped to point the way toward the most promising areas for mitigation efforts. Of the different greenhouse gases for the In-State total, carbon dioxide overwhelms total greenhouse gas emissions by contributing 68 percent to the total, while methane contributes nine percent, nitrous oxide one percent, and chlorofluorocarbons 22 percent. While methane emissions from the sources examined in this report are expected to decline slightly, and nitrous oxide emissions from fertilizer use are expected to remain stable between 1990 and 2010, carbon dioxide emissions are expected to increase by about 37 percent.

CO_2 is a major focus for strategy development due to its large contribution to greenhouse gas emissions. Ninety-nine percent of CO_2 emissions are related to the combustion of fossil fuels, which further focuses the strategies on those related to energy use and production. Coal, gasoline, and natural gas are the largest contributors to emissions among the different fossil fuels. Electricity generation in the state contributes 40 percent of the CO_2 emissions due to the combustion of fossil fuels in its production. The largest CO_2 increases will come from the combustion of coal (largely for electricity generation) and from the especially difficult transportation sector.

The inventory also indicates which energy using sectors are the highest emitters, and thus which should be strategy focuses. The transportation sector is the largest emitter at 31 percent, with the industrial sector second at 24 percent. Emissions for the industrial sector are expected to grow by about 45 percent during the forecast period, although this sector

remains second in emissions to the transportation sector. Transportation emissions are expected to grow by 40 percent. Expected growth for commercial sector emissions is 27 percent compared to 21 percent for the residential sector. The inventory also identifies the major energy end use emitters, which gives further detailed focus to the strategies.

Methane emissions warrant some focus in strategy development, since they contributed nine percent to total CO_2 equivalent greenhouse gas emissions in 1990. Landfills are the major contributor in this area at 44 percent, with domestic animals contributing 37 percent, upstream emissions at 10 percent and animal manure at 9 percent. Nitrous oxide emissions are due to increases in the natural nitrogen levels in the soil when fertilizers containing various forms of nitrogen are used.

The projections suggest that fuel use increases are the key issue, since other greenhouse gas sources are expected to grow very little (or even decline as in the case of methane). However, even a goal of stabilization at 1990 levels in the year 2010 is ambitious, since a decrease of 29 percent of 2010 emissions would be required.

These results are detailed in the *Inventory and Projections of Minnesota Greenhouse Gas Emissions: 1990-2010.* This document, as well as a summary version, has been reviewed and will be disseminated to a broad list of interested parties at the beginning of July.

A.6. Benefits: The data analysis report will provide the state with accurate information on energy uses and fuel conversion efficiencies, and will identify the activities which contribute most significantly to energy use and emissions at present and which will contribute most to future growth in energy use. This will facilitate the development of strategies which will have the greatest long-term impact on state energy use. The use of TEMIS will allow convenient development of alternative projections of energy use and emissions based on different assumptions. This information will guide state energy policy development by providing policy makers with a clear understanding of the environmental and economic implications of different types of energy uses.

B. Title of Objective: Identify new cost effective energy-efficiency strategies and evaluate and revise existing strategies targeted at energy uses which are most significant and amenable to reduction.

B.1. Narrative: A wide range of strategies will be developed to cost-effectively improve energy-efficiency in the transportation, residential, and CII sectors. Upon evaluation, existing strategies will be further developed or revised. Where the need is identified, new strategies will be developed. Strategies will be prioritized in a detailed implementation action plan. Strategies which are most practical and cost-effective with significant immediate effects will be given first priority in the action plan; more complex strategies with significant effects only on a longer term basis will be given second priority. Cost effectiveness will be determined based on the costs and benefits from the perspective of society as a whole. By focusing first on the most cost effective strategies, the project will achieve tangible results quickly, enhancing project credibility and thus building support and consensus for implementation of more complex strategies.

Strategies developed will include:

- direct actions by state or local government such as improving the efficiency of their own buildings by doing energy efficient retrofits in all government-owned or leased buildings, and improving the efficiency of other operations such as the government fleet;

- new designs existing for electric utility demand-side management (DSM) programs such as an innovative financing program for public institutions and nonprofit organizations;

- working with municipal utilities to increase production efficiency by expanding cogeneration (simultaneous production of heat/steam and electricity), and to develop renewable energy strategies;

- suggestions for regulatory changes such as providing regulatory incentives for utilities to invest in energy conservation through decoupling (the untying of profits from energy sales), and through efficient energy production requirements;

- suggestions for legislative changes such as improved codes or standards for energy consuming devices not covered by federal regulations;

- voluntary efficiency programs promoted through business organizations, local government or other organizations, such as the EPA's "Green Lights" Program which involves the retrofitting of existing lighting systems with energy efficient lighting. This has been proven to save money and energy with relatively short payback periods.

Many energy plans concentrate on making policy recommendations and offer strategies that are vague or too general to implement effectively. In addition to well-defined new strategies, this project will build on plans like the *1992 Energy Policy and Conservation Report: Transition Into the 21st Century* done by the Department of Public Service by developing strategies that are very specific and practical as well as much more ambitious. For example, municipal utilities and rural electric cooperatives are doing very little in energy conservation and have limited resources to develop their own strategies. This project will work with a select group of these utilities to develop conservation strategies that make sense for utilities of their size. From this experience, a manual will be developed which could then be used by rural electric associations (REA's) and municipal utilities to design and implement energy efficiency programs that meet their local needs.

B.2. Procedures: On the basis of projected Minnesota energy use and associated air emissions per sector, specific strategies will be developed under the direction of the Policy Advisory Committee in cooperation with other interested parties. Where possible, the project will be coordinated with other ongoing projects and programs, such as the Urban CO_2 Reduction Project of the International Council on Local Environmental Initiatives (ICLEI), the Renewable Energy Study of the Union of Concerned Scientists(UCS), the American Council for an Energy Efficient Economy (ACEEE), and federal programs such as the Environmental Protection Agency's "Green Lights" Program.

Using TEMIS, these strategies will be analyzed to determine their potential economic and environmental impacts. These impacts will be weighed, and implementation factors taken into account, by the Policy Advisory Committee who will prioritize them. The strategies will then be disseminated in the form of a draft implementation plan for review by September 1994. To promote participation in this process, a number of public forums will be held at which comments will be solicited from all interested parties and the public at large beginning in late 1994. The public forums will include business groups, local governments, environmental groups, and others. Suggestions on legislative initiatives will be submitted to the legislature by January, 1995.

B.3. Budget:

a. Amount budgeted: $90,000
b. Balance: $0

B.4. Timeline:

	1993		1994				1995	
	3	4	1	2	3	4	1	2
Objective B			*	*	*	*	*	
-develop strategies				*	*			
-analyze strategies				*	*	*		
-prioritize strategies				*	*	*		
-review draft plan					*	*		
-public forums						*	*	
-legislative initiatives							*	

B.5. Status: Following the analysis of technical issues, the Policy Advisory Committee (PAC) was formed to focus in on funding, implementation and other policy-related issues associated with the mitigation strategies. The Committee included policy representatives from the Izaak Walton League; Department of Public Service; Minnegasco; NSP; City of Circle Pines; City of Jamesville; Minnesota Department of Transportation; 3M and the Minnesota Department of Agriculture. More concentrated subcommittee meetings were also held in this process which involved additional outside experts. These groups included industry, buildings, utilities, transportation and agriculture.

CEE has developed a clear plan of action for improving Minnesota's energy and economic efficiency. Unlike most energy plans, the Action Plan focuses on the economic benefits of the recommended actions and views the environmental benefits as a direct outcome of greater efficiency. Recommended in the Action Plan is a comprehensive set of 61 strategies utilizing market incentives, regulatory changes, and education to improve energy efficiency and reduce greenhouse gas emissions in each energy using sector of Minnesota. Implementation measures and potential funding sources are identified for each strategy, and information on the potential savings in greenhouse gas emissions are provided. Reduction strategies address emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Nineteen measures in this comprehensive plan are highlighted as priority action strategies for which rapid and aggressive implementation is recommended to policy makers.

Energy is crucial to Minnesota's economy. When used inefficiently, the full potential of our economy cannot be realized. The strategies in this Action Plan focus on increasing the productivity of many different sectors and areas of Minnesota's economy by cost-effectively increasing the efficiency with which we produce and use energy. Although the strategies are designed to be aggressive and make significant reductions in emissions, they do not come at the expense of economic growth. The strategies are intended to achieve significant reductions using actions that provide leverage against the potentially devastating effects of climate change, and at the same time are beneficial even if these effects do not fully materialize. Existing barriers and needs to increase energy efficiency were addressed in the development of the strategies. Coordination of the goals of this project with ongoing major decision-making processes in Minnesota present an opportunity to make significant reductions cost-effectively.

Minnesota's greenhouse gas emissions are projected to increase by over 39 percent between 1990 and 2010. To address this growth, recommended strategies cover the industrial, commercial, residential, agricultural, energy producers/distributors/service providers, forestry and transportation sectors. Through aggressive implementation of the strategies presented in this Action Plan, it is estimated that over 36 million metric tons in potential CO_2 equivalent savings can be achieved. This is a 25 percent reduction from the

...mated 2010 emissions of 144 million metric tons, and almost 4 p... ...at above the estimated 1990 emissions of 104 million metric tons.

The industrial/commercial strategies exhibit the greatest potential to reduce emissions, contributing 36 percent to the total Action Plan reductions. Second at 30 percent is the energy producers/distributors/service providers sector. Commercial/residential contributes 16 percent, while agriculture and forestry make up 2 percent of reductions. All of these sectors contribute to reductions at a share close to their contribution to overall emissions. The exception is the transportation sector. While transportation is responsible for about 32 percent of Minnesota's CO_2 emissions, it contributes only 16 percent to the Action Plan reduction total.

More focused efforts to develop strategies must be made in the transportation sector. Despite the aggressive strategies this plan recommends, reductions from this sector fall short (by 16 percent) of its contribution to Minnesota's emissions. If automobile travel (approximately 85 percent of vehicle miles traveled) could be stabilized at expected 2000 levels, an additional 3.5 million metric tons could be saved over current Action Plan reduction estimates, which would stabilize Minnesota's emissions at 1990 levels. This level of reductions would be difficult for Minnesota to achieve on its own, and would require action at the national (or at least regional) level. Increases in fuel efficiency would also make reductions easier to achieve in this sector. Again, national action is necessary to achieve these types of reductions.

An attempt has been made in this report, using available examples and studies, to quantify a range of some of the potential economic benefits to Minnesota to implementing these strategies. Based on studies conducted by Economic Research Associates (1993) and the Union of Concerned Scientists (1993), the savings from implementation of strategies related to electric energy efficiency and renewable energy alone would create between 8,200 and 15,500 additional permanent jobs in Minnesota by 2010. The creation of these jobs can go a long way toward not only strengthening Minnesota's economy, but local and regional development as well.

B.6. Benefits: This objective will result in a wide variety of practical, cost-effective strategies for reducing emissions. Strategies will be developed so that in most cases they will pay for themselves through reduced energy expenditures, thus providing significant economic benefits as well as reducing CO_2 emissions and other state environmental problems, such as acid rain and urban air quality problems which are affected by the combustion of fossil fuels.

C. Title of Objective: Finalize and promote implementation of an energy efficiency action plan for Minnesota.

C.1. Narrative: Based on broad public review, the action plan will be revised and finalized. The action plan will clearly describe and recommend a comprehensive array of energy efficiency strategies for each end-use sector. The plan will estimate the costs, benefits, and environmental impacts of each recommended strategy. The cost-benefit analysis will take place in two tiers. The first tier will estimate total costs and benefits using existing sources. Available information will be taken from previous analyses by utilities, agencies including those in other states, and other published reports. In the case of key strategies where data seems uncertain, a sensitivity analysis will be completed. This tier will serve as a screening and prioritization process. The second tier of this analysis will include, in the implementation plan, a method for a more detailed cost-benefit analysis. The final plan will have a clearly defined goal for the reduction of CO_2 emissions by the year 2005. This goal will be ambitious but will be based upon a realistic assessment of the savings estimate from cost effective strategies. Costs and energy

savings for each strategy will be estimated, funding sources will be identified and the plans resulting reductions of emissions of CO_2 and other greenhouse gases will be calculated.

C.2. Procedures: Project staff and Project Advisory Committee members will present the plan in public forums and in speaking engagements with business groups, local governments, environmental groups and other interested parties. Presentation of the plan will make extensive use of the media and public relations events involving state agencies, local governments, environmental groups and others. Based on feedback obtained through these forums, revisions will be made to the draft implementation plan. A CO_2 reduction goal will be set by April 1995, after extensive evaluation of the expected reductions of each measure has been completed. By involving the key players who are able to take action in the development of the plan, implementation will be made smoother. As the plan develops, Project Advisory Committee members will assist staff in securing formal commitments from key organizations and individuals to publicly endorse recommendations and make the changes and improvements necessary to facilitate implementation. Barriers to the recommended strategies will be identified and solutions developed in order to make their implementation more feasible. Most implementation will require action by state and local governments or utilities. As a result of its close working relationship with these entities and proven record of effective implementation, CEUE will act as a catalyst for implementation. While the project will produce a final implementation plan by June 1995, implementation of some of these strategies will begin as early as late-1994. Early implementation of strategies such as those for investor-owned utilities and local governments will enhance the overall project credibility.

C.3. Budget:

a. Amount budgeted: $65,000
b. Balance: $0

C.4. Timeline:

	1993		1994				1995	
	3	4	1	2	3	4	1	2
Objective C					*	*	*	*
-initial implementation					*	*	*	*
-public forums/media							*	*
-revise plan							*	*
-set CO_2 goal								*
-commitments						*	*	*
-final plan and implementation								*

C.5. Status: The results discussed above are detailed in *Energy Efficiency, Economic Development and Reduced Emissions: An Action Plan for Minnesota.* As discussed above, the strategies were reviewed not only by both advisory committees, but by many other outside experts and interested parties as well. This process succeeded in generating valuable feedback, as well as peaking interest in the actions. This document, as well as a summary version, will be disseminated to a broad list of interested parties in mid-July. The goal, based on this ambitious but realistic assessment of savings from the recommended strategies, is to reduce greenhouse gas emissions by 25 percent of projected 2010 emissions.

Full implementation of the Action Plan is critical to Minnesota's efforts to reduce growth in greenhouse gas emissions. No strategy should be implemented without considering its linkage to the others, and its role in addressing overall emissions. Implementation efforts are already underway for some of these strategies. For example, the strategy linking regional economic development to energy issues (S.F. 1670) passed in the 1995

legislative session. CEE also submitted a proposal with the cities of Minneapolis and St. Paul to the DOE for a Rebuild America grant to improve the energy efficiency of institutional and commercial buildings. In addition, CEE was instrumental in getting CO_2 valued as an environmental externality resulting from electricity production in interim proceedings before the Public Utilities Commission, and final values will be set this Fall as a result of a formal contested case proceeding. Other implementation efforts are also underway.

Some other strategies will require anywhere from a little push, to a great deal of persistence and advocacy to be successfully implemented. It is the hope of this project that key players will adopt and champion a strategy or set of strategies, and that the State will support them in their efforts. The success of the Action Plan is dependent upon the cooperation of the many different sectors and interests that make up Minnesota's private and public institutions as well as its citizens.

It is essential that the state establish an organized implementation and monitoring system to promote and evaluate the success of this effort. An annual or biennial inventory of greenhouse gas emissions should be undertaken through this effort, as well as coordination and tracking of implementation efforts. This effort should be housed in a specific agency, but should encourage participation from all interested parties.

This Action Plan was written to be a very dynamic document, with the goal and expectation of implementation and action. It is intended for use as a comprehensive guide to the most important and promising reduction strategies for Minnesota. As the project progressed, opportunities for the implementation of strategies were identified and implementation was begun where possible. This process is ongoing and its continuation is essential if the Action Plan is to be successful.

Presentations will be made to the Legislative Commission on Minnesota Resources. In addition, the Inventory and Action Plan will be distributed to the intended users of these documents such as Minnesota Legislature; State Agencies; Regional Development Commissions; Local Governments; Private Industry; Regulated Industry; Environmental Groups; Educational Institutions; Foundations; Individual Citizens; Other States or Other Interested Parties. Presentations may also be made to some key state agencies and groups in the various sectors.

C.6. Benefits: This objective will produce a clear plan for improving Minnesota's energy efficiency. This will result in short and long term reductions in energy use in all sectors. Improved energy efficiency will reduce air emissions and help Minnesota's economy.

V. Evaluation: The project will be evaluated by comparing energy use and emissions projections based on current practices and trends for the year 2005 with projections based on the energy efficiency action plan. Since, implementation will have just begun when this project is completed the evaluation will be based upon projections of energy use and emissions combined with a description of the likelihood of full scale implementation of individual actions.

VI. Context: Burning of fossil fuels is the primary source of CO_2 emissions and other greenhouse gases, which are likely to lead to global warming. Most industrialized countries are committing to strategies which reduce these emissions. Although the U.S. has lagged behind in these efforts, it did sign an international accord at the Rio de Janeiro Earth Summit in June 1992 committing itself to stabilizing CO_2 and other greenhouse gas emissions at 1990 levels by the year 2000. Federal initiatives to achieve this goal are likely to be targeted at states which are established leaders in environmental initiatives. States can take actions which reduce CO_2

emissions while providing both economic and environmental benefits to the state. Since energy efficiency is the most effective CO_2 reduction strategy, states can use the awareness and interest in global warming to provide a focus to statewide efforts to improve energy efficiency. This is truly a synergistic relationship since energy efficiency has great benefits in addition to its impact on CO_2 emissions. This project would build upon the work done by Minneapolis and St. Paul as part of the Urban CO_2 Reduction Project. This project is being done cooperatively with twelve communities around the world under the sponsorship of ICLEI.

ICLEI, an affiliate of the United Nations, is a new environmental agency of local governments established by more than 200 municipal officials from 42 countries at the World Congress for a Sustainable Future in September, 1990. The primary objective of ICLEI is to build the capacity of local governments to prevent environmental problems before they happen, to respond effectively to problems when they arise, and to enhance both the natural and built environments at the local level. ICLEI's Urban CO_2 Reduction Project was launched to explore how local governments can address their own emissions and develop strategies that can serve as models for effective policies worldwide. During the first two-year phase of the project, 12 communities representing 14 local units of government from six countries have joined forces to develop specific strategies to reduce energy use and greenhouse gas emissions. These strategies focus on more efficient energy end-uses and production. Planning for the Urban CO_2 Reduction Project is to be completed by June 1993.

This project will coordinate with phase two of ICLEI's CO_2 Reduction Project. The LCMR statewide project will begin in December of 1993 and will build upon all the work completed by all cities participating in the Urban CO_2 project. Phase two will focus on implementation and dissemination of strategies. While it will apply the local initiatives developed across the state, this project will differ from the Minneapolis-Saint Paul project by focusing on statewide initiatives. Model municipal/state collaboration will be established to take advantage of opportunities for making the land-use/transportation connection, financing energy efficiency retrofits, and strategically procuring energy efficient products and services. In addition, a program of applied research, curriculum development, training workshops, and consultative outreach on specific implementation issues that have been identified as a priority (i.e., financing) will be undertaken by ICLEI.

VII. Qualifications:

1. **Program Team**
   a. Center for Energy and Environment: Sheldon Strom, Program Manager. Mr. Strom has over twelve years experience in energy policy analysis and program design and implementation. He has overseen the design, development and implementation of utility conservation programs totalling approximately $35 million. Mr. Strom has extensive experience with community planning and public participation programs. He has been the principal staff resource to the Minneapolis/St. Paul CO_2 Reduction Project. Mr. Strom has a Masters of Architecture degree from the University of Wisconsin-Milwaukee and a Bachelor of Mechanical Engineering degree from the University of Minnesota. Mr. Strom will spend approximately twenty percent of his time on this project. Mr. Strom will be spending ten percent of his time on issues relating to Objective 1, twenty percent relating to Objective 2, and ten percent on Objective 3. He will be supported by a professional staff including energy engineers, statisticians, program evaluators, policy and financial analysts, a marketing director, and a graphics designer.
   b. Center for Energy and Environment: Martha Hewett, Senior Analyst. Ms. Hewett has managed a wide variety of technical projects for the Center, including assessments of energy service needs within major building sectors, extensive technology assessments,

field tests of energy conservation retrofits, and program evaluations. She has authored numerous research papers on energy and related topics. Ms. Hewett is a member of the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc (ASHRAE) and serves on the methodology advisory committee for the national evaluation of the DOE Weatherization Assistance Program. Ms. Hewett holds a Masters of Science in Hydrogeology from the University of Minnesota and a Bachelor of Arts degree in geology from Middlebury College in Vermont. Ms. Hewett will spend approximately fifty percent of her time over the 19 month period on this project. She will be spending thirty percent of her time on issues relating to Objective 1, forty percent relating to Objective 2, and thirty percent on Objective 3.

   c. Center for Energy and Environment: Ken Campbell, Senior Policy Analyst. Mr. Campbell analyzes and directs public policy initiatives and provides direction to Center projects which require his expertise in pubic policy, financial analysis, program evaluation, strategic planning, and public infrastructure. He provides consulting services to public sector clients in areas of financial analysis, organizational development, strategic planning, and program design. He develops proposals, designs and supervises delivery of solid waste management, water conservation, and transportation projects. Before joining the Center, Mr. Campbell performed extensive program design and evaluation of municipal programs including economic development, planning, public works, inspections and fire department services for the City of Minneapolis. Mr. Campbell holds a Bachelor of Arts degree from Carleton College and has completed his course work for a Master of Arts in Public Affairs from the Humphrey Institute of Public Affairs at the University of Minnesota. Mr. Campbell will spend approximately five percent of his time over the 19 month period on this project. He will be spending five percent of his time on issues relating to Objective 2 and five percent relating to Objective 3.
   d. Center for Energy and Environment: Timothy Dunsworth, Statistician. Mr. Dunsworth, a statistical analyst with CEUE for eight years, has performed analyses for a wide range of program evaluations, field retrofit tests, and market characterizations. He validated the data quality requirements for the Princeton Scorekeeping Method (PRISM), an internationally recognized tool for weather normalization of energy consumption data. Currently, he is a key staff person in the Minneapolis-Saint Paul CO_2 Reduction Project, and has extensive experience working with TEMIS. Mr. Dunsworth will spend approximately forty percent of his time over the 19 month period on this project. He will be spending forty percent of his time on issues relating to Objective 1, twenty percent relating to Objective 2, and ten percent on Objective 3.
   e. Center for Energy and Environment: Sheryl Carter, Policy Analyst. As a Policy Analyst, Ms. Carter has been a principal staff resource in the drafting of the Minneapolis-Saint Paul Urban CO_2 Reduction Plan. Before joining the Center, Ms. Carter was involved in the development of markets for recycled materials with the Minnesota Project, a nonprofit organization serving rural communities on environmental and economic development issues. Ms. Carter holds a Bachelor of Science degree in Marketing and finance from the University of Colorado at Boulder and will complete a Master of Arts in Public Affairs from the Humphrey Institute of Public Affairs at the University of Minnesota in June, 1993. Ms. Carter will spend approximately one hundred percent of her time over the 19 month period on this project. She will be spending thirty percent of her time on issues relating to Objective 1, forty percent relating to Objective 2, and thirty percent on Objective 3.

2. **Cooperators/Other Investigators**
   a. City of Minneapolis: James Orange, Environmental Projects Coordinator, Office of Environmental Management. He is responsible for completing environmental reviews required for all federally-assisted projects for the City.

b. Minnegasco. Minnegasco, Minnesota's largest natural gas supplier, would supply valuable expertise and data related to utility sector strategies. Minnegasco currently has a representative on the Executive Steering Committee for the Minneapolis-Saint Paul CO_2 Reduction Project.
c. Moorhead Public Service (MPS). MPS is a municipal utility in Moorhead, Minnesota. MPS has received a state grant to develop an integrated resource plan. CEUE will be working with them on the development of the plan and production of a manual that will be used by other municipal utilities and rural electric associations (REA's).

Potential Cooperators The following are listed as potential cooperators because there was not enough time to receive formal commitments.

a. International Council for Local Environmental Initiatives: Philip Jessup, Project Director, Urban CO_2 Reduction Project. Mr. Jessup also Co-Chairs the City of Toronto's Special Committee on the Environment, which has outlined for the City a strategy to address global warming and specific policy initiatives for reducing CO_2 emissions. He was also principal author of a report outlining steps towards a provincial global warming strategy.
b. Environmental Protection Agency (EPA). The EPA is beginning to operationalize the U.S. commitment made in Rio in June 1992, to stabilize CO_2 reductions at 1990 levels by 2000. This project would coordinate with the EPA's initiative to encourage state action plans. Working in such a coherent, strategic way could enhance the EPA's state investments. The EPA can also offer existing federal programs, such as the Environmental Protection Agency's "Green Lights" Program involving energy efficient lighting, that may be appropriate links to the project.
c. American Council on an Energy Efficient Economy (ACEEE). ACEEE has conducted numerous studies on the effectiveness of many energy end-use efficiency measures, and is a significant contributor to national energy policy. ACEEE is considering working with a small number of states on climate change-related issues. Because of the close working relationship already existing between CEUE and ACEEE, it is likely that they will select Minnesota as one of those states.
d. Union of Concerned Scientists (UCS). The Renewable Energy Study of the Union of Concerned Scientists has been collecting data in the Midwest on renewable resources and potential. The Program Manager is on the policy steering committee for the Renewables Project, and UCS has invited other projects to share their data and information. Their data and findings would be helpful in developing renewable energy strategies for Minnesota.
e. Northern States Power (NSP). NSP, Minnesota's largest electric/gas utility, would provide valuable expertise and data related to utility-sector strategies. NSP currently has a representative on the Executive Steering Committee for the Minneapolis-Saint Paul CO_2 Reduction Project.

VIII. Reporting Requirements:

Semiannual status reports will be submitted not later than Jan. 1, 1994, July 1, 1994, Jan. 1, 1995 and a final status report by June 30, 1995.