A LONG TERM CO_2

REDUCTION PLAN FOR

METROPOLITAN

DADE COUNTY

NOVEMBER 1993

THE URBAN CO_2 REDUCTION PROJECT STEERING COMMITTEE

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EXECUTIVE SUMMARY

There is a consensus that CO_2 concentrations are increasing and that such increased concentration of "greenhouse" gases poses a potential threat to climatic stability. It is estimated that temperatures may rise several degrees higher and at a faster rate than has been experienced within the last million years.[1] Scientific members of the United Nations Intergovernmental Panel on Climate Change (IPCC) concluded that burning fossil fuels and deforestation, both human activities, are substantially increasing the atmospheric concentration of greenhouse gases. Dade County would be particularly vulnerable to the potential impacts of global warming because it is a low-lying coastal community.

The purpose of this global warming project is to reduce CO_2 emissions by 20% below 1988 levels by 2005 through strong energy conservation measures and other energy alternatives. This report does not investigate the probability or magnitude of global warming. Rather, this report identifies the potential global warming scenarios as identified by the U.S. Environmental Protection Agency. The primary goal of this report is to present a long term CO_2 reduction strategy. The plan includes measures that, after implemented, will have significant environmental and energy conservation benefits in addition to reducing global warming risks.

Metro Dade County is one of twelve international urban jurisdictions participating in the program sponsored by the International Council for Local Environmental Initiatives (ICLEI). ICLEI is an international coalition of local governments established by more than 200 municipal officials from 42 countries at the World Congress for a Sustainable Future in September, 1990. ICLEI's mission is to build capacity among international municipalities to address and solve environmental problems. The premise is that urban areas will be central to solving international environmental problems.

[1] U.S. Environmental Protection Agency, Potential Effects of Global Climate Change on the United States, Washington, D.C., December 1989 (EPA-230-89-050), 9.

The 20% CO_2 reduction target is consistent with that of many states and nations from around the world. President Clinton has made a commitment to develop a plan to reduce CO_2 emissions to 1990 levels by the year 2000. The project's 20% target goal can be achieved by implementing and promoting a set of CO_2 reduction measures in transportation, electrical production/use, solid waste and land use. A steering committee made up of representatives from government agencies, environmental groups, universities and business groups has developed this strategic action plan.

In addition to a number of actions that can be directly implemented by Metro-Dade, this report recommends a number of measures that fall under the jurisdiction of either the state or federal government or involve changing the attitudes and behaviors of individuals. An important strategy to effectively reduce CO_2 emissions is to facilitate interest and action from all levels of government to address global warming and set policy to reduce CO_2 emissions. Metro-Dade can actively support state and federal policies which will support the goals of this plan.

Dade County's CO_2 emissions in 1988 totaled over 23 million tons from combustion of primary fuels. The largest sources of emissions came from the transportation (45%) and electricity (45%) sectors. The industrial (5%), commercial (4%) and residential (1%) sectors emitted emissions from the combustion of primary fuel used in energy consuming activities such as generators, lawn mowers, and industrial processes. The transportation and electrical production/use sectors present the County with the greatest opportunities for achieving reductions.

The CO_2 measurements in this plan are approximations. The county departments involved with this project are not set up to gather and analyze data in terms of CO_2 reduction potential. The estimated levels of reduced emissions serve as a guideline for long-term policy planning. The recommended alternatives in this plan are much more critical to a successful CO_2 reduction strategy than state of the art measurements.

The following is a list of the recommended measures in the report. For further description of the recommendations please refer to Chapter Five.

TRANSPORTATION

A. MASS TRANSIT AND ROAD IMPROVEMENTS

1. Complete expansion of the Metromover rail system to Brickell Avenue and Omni Center.
2. Extend transit
3. Construct all road improvements listed in the Long-Range Transportation Plan that are consistent with the other transportation and land use measures in this plan.

B. TRAFFIC DEMAND MANAGEMENT

1. Increase traffic demand management programs.

C. PROMOTE INCREASED USE OF BICYCLES

1. Adopt policy incorporating bicycle facilities into the County's plan for new road construction or reconstruction projects.
2. Adopt a shower facility ordinance for professional office buildings and require that all nonresidential and non-retail developments provide bicycle racks at a minimum rate of five bike parking spaces for every 100 automobile parking spaces as stated in the Draft Bicycle Facility Plan.
3. Expand Bikes-on-Train program to include counter-flow and first hour service.
4. Implement Bikes-on-Tri-Rail.
5. Investigate utility easements, transit and railroad rights-of-way to use for bicycle/pedestrian facilities.

D. INCREASE FUEL EFFICIENCY

1. Utilize more fuel efficient cars in the Metro-Dade fleet.
2. Develop a public education & awareness campaign to limit idling of automobiles/trucks.
3. Develop a team of local public/private representatives to identify and promote the most practical and cost-effective alternative fueled vehicles.
4. Promote an increase in national gas mileage standards to 45 mpg.

LAND USE

A. REDUCE VEHICLE MILES TRAVELED BY 5% THROUGH MIXED LAND USE

1. Review and amend regulations to encourage the implementation of transit and pedestrian oriented development (TOD) principles in new development.
2. Encourage infill development by requiring utilization of TOD principles within activity centers and along major transit corridors.
3. Continue to promote the evolution of a sub-centered urban form, comprised of major, intermediate and local activity centers; activity corridors; enterprise/employment centers and a transit network. In appropriate locations in intervening areas, promote applicable TOD principles and the balanced provision of convenience retail, personal services and various types of residences.
4. Encourage provision of civic buildings within urban neighborhoods through site planning and in capital improvements programming.

ELECTRICAL PRODUCTION/USE

A. INCREASE EFFICIENCIES OF METRO-DADE FACILITIES/OPERATIONS

1. Initiate the "Green Lights" programs and integrate with other County building retrofits for a 20% increase in energy efficiency.
2. If feasible, purchase the combined cycle cogeneration plant and wheel the current excess capacity of 82,000,000 kwh/yr. to County owned facilities and promote use of cogeneration for other appropriate commercial applications.

B. DECREASE RESIDENTIAL SECTOR ENERGY

1. Reduce annual electricity consumption by 5,359 kwh in 35,000 rebuilt homes in South Dade through promotion of energy efficient measures.
2. Develop and market a Miami Herald energy guide targeting the homeowner and encouraging special pricing in building supply stores.
3. Develop outreach program for contractors/builders on Florida's Energy Code.
4. Develop strategy with DCA to improve enforcement of the Florida Energy Code.

C. EXPAND THE USE OF ALTERNATIVE FUELS

1. Investigate cost effective energy efficient HVAC systems for Metro-Dade facilities.
2. Reinstate the renewable energy source exemption.
3. Shift to photovoltaic street lighting.

D. EXPAND COMMUNITY TREE PLANTINGS AND WHITE SURFACES

1. Integrate "Cool Communities" with community-wide tree planting program. (Direct)
2. Revise Dade County's landscape code to require strategic tree planting, street trees and parking lot trees. (Direct)

E. PROMOTE AND EXPAND PARTICIPATION IN ENERGY CONSERVATION

1. Increase public participation in FPL's Demand Side Management programs.
2. Adequately staff the recently established utility division within Metro-Dade's Department of Development and Facilities Management in order to investigate various rate structures that encourage and reward utilities for energy conservation.
3. Promote the Energy Conservation & Assistance Program.

SOLID WASTE

A. RECYCLE BETWEEN 30 AND 50% OF DADE COUNTY'S WASTE STREAM

1. Continue to implement and promote the following recycling programs:
   - ❖ single-family residential
   - ❖ multi-family residential
   - ❖ commercial
   - ❖ yard trash
   - ❖ disposal facilities
   - ❖ Metro-Dade government facilities

B. RECOVER AND UTILIZE LANDFILL METHANE

1. Recover and flare or use the methane gas to generate electricity for the South District WasteWater Treatment Facility.

C. REDUCE SOLID WASTE GENERATED BY UP TO 5%

1. Implement community-wide reduction programs.
2. Institute waste reduction purchasing practices in Metro-Dade.

TABLE 1

SUMMARY OF POTENTIAL CO_2 REDUCTION MEASURES

	CO_2 EMISSION REDUCTIONS U.S. TONS*
TRANSPORTATION	
1. Mass transit & road improvements	818,000
2. Traffic demand management	62,000
3. Promote increased use of bicycles	151,000
4. Increase fuel efficiency	7,896,000 or 8,200,000
LAND USE	
1. Reduce vehicle miles traveled by 5%	172,000
ELECTRICAL PRODUCTION/USE	
1. Increase efficiencies of Metro-Dade facilities/operations	145,000
2. Decrease residential sector energy use	159,000
3. Expand the use of alternative fuels	51,000
4. Expand the use of landscaping and white surfaces	137,000
5. Promote and expand participation in energy conservation	610
SOLID WASTE	
1. Recycle between 30 and 50% of Dade County's Waste Stream	1,188,000 to 1,979,000
2. Recover and utilize landfill methane gas	177,000
3. Reduce generated solid waste by up to 5%	388,000

*CO_2 emission reductions are approximations

PREFACE

On April 2, 1991, the Board of County Commissioners authorized Metropolitan Dade County's participation in the Urban CO_2 Reduction Project. The County is one of twelve international urban jurisdictions participating in the program sponsored by the International Council for Local Environmental Initiatives (ICLEI). ICLEI is an international environmental organization of local urban jurisdictions established in 1990 by more than 200 municipal officials from over forty countries at the World Congress for a Sustainable Future. The Congress was held at the United Nations and cosponsored by the United Nations Environmental Project, the Center for Innovative Diplomacy and the International Union of Local Authorities.

The purpose of this worldwide project is to reduce CO_2 emissions attributable to residents of the project cities by 20% below 1988 levels through strong energy conservation measures and other energy alternatives. Since nearly half of the world's population is expected to reside in cities by 2000, and many activities that control energy consumption are local in nature, it is believed that some of the major opportunities for CO_2 emission reductions can be successfully addressed through local government actions.

Dade County is the only subtropical urban area in the project. Other participating cities include Portland, Oregon; San Jose, California; Minneapolis/St. Paul, Minnesota; Denver, Colorado; Toronto, Canada; Hannover, Germany; Sarrbrucken, Germany; Ankara, Turkey; Copenhagen, Denmark; Helsinki, Finland; and Bologna, Italy.

The plan has been developed under the guidance of a steering committee chaired by former Commissioner Harvey Ruvin and including representatives from the local electric and gas utilities, state universities, business groups and environmental organizations. Metro-Dade staff support has been provided by Solid Waste, Transit Agency, Metropolitan Planning Organization, Department of Development and Facilities Management, Planning, Building and Zoning and Information Technology Department (ITD). The project is administered by the Department of Environmental Resources Management. Project funding was provided by the Urban Consortium Energy Task Force.

I. INTRODUCTION

Global Warming

Global warming is an increase in average global temperatures caused by a build-up of carbon dioxide (CO_2) and other "greenhouse" gases such as methane, and to a lesser extent, chloroflurocarbons (CFC's) and nitrous oxide (N_20) that trap heat in the earth's atmosphere. Carbon dioxide (CO_2) is a colorless and odorless gas formed during respiration, combustion and organic decomposition. CO_2 is the single most important greenhouse gas contributing to about half of the potential warming. Burning fossil fuels and deforestation have caused a 25 percent increase in CO_2 atmospheric concentrations since the Industrial Revolution.[2]

Based on projected energy use, economic growth and the length of time CO_2 emissions remain in the atmosphere, the National Academy of Sciences (NAS) estimates that there is a seventy-five percent probability that atmospheric CO_2 concentrations will double by 2100.[3] The Intergovernmental Panel on Climate Change, a United Nations group, estimates that a doubling of atmospheric CO_2 could lead to a 4.5 degree warming.[4] Dr. James Hansen from the NASA Goddard Institute has examined ice cores from the last ice age and concluded that a doubling of CO_2 would produce a 5.4 degree warming.[5]

Throughout the planet's history there have been atmospheric heating and cooling cycles. There are two factors that differentiate the current trend from past warming cycles. First, the current warming is projected to be warmer than past cycles and secondly, it is expected to occur at a much faster rate than the planet has experienced in the last million years.[6]

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[2] Stephen H. Schneider, "The Changing Climate", Scientific American, September 1989, 70
[3] U.S. Environmental Protection Agency, Greenhouse Effect Sea Level Rise and Coastal Wetlands, Washington, July 1988 (EPA-230-05-86-013), 5.
[4] William K. Stevens, "Estimates of Warming Gain More Precision and Warn of Disaster," New York Times, December 16, 1992, B5.
[5] Ibid.
[6] U.S. Environmental Protection Agency, The Potential Effects of Global Climate Change on the United States, Washington, D.C., December 1989 (EPA-230-05-89-050), 9.

Global Warming and Dade County

Global warming represents a potential threat to Dade County's economy and way of living. Dade County would be particularly vulnerable to the impacts of global warming because it is a low lying coastal community. A worst-case scenario for Dade County includes but is not limited to: flooding, saltwater intrusion, shift in population, infrastructure damage, destruction of natural ecosystems, agricultural impacts, water shortage and a decline in tourism.

Warmer temperatures due to global climate change could increase Dade's electricity demand and generating capacity. An estimated 38% of a residential home's electricity is used for air conditioners. If temperatures rise, air conditioning demand will increase summer loads which may either be met through conservation or some type of generating capacity.

Salt water intrusion from sea level rise could contaminate the Biscayne Aquifer, the region's primary freshwater drinking supply, prompting the need for costly and energy intensive desalination plants. The Biscayne Aquifer is the sole source of fresh drinking water for millions of people. The South Florida Water Management District currently spends millions of dollars in infrastructure to protect the aquifer from salt water intrusion.

A sea level rise could also inundate the southern portion of the Everglades National Park with salt water which would change the natural character, disrupt water flow, kill important fisheries and seal the fate of endangered species like the Florida Panther. The patch coral reefs in Biscayne National Park, part of North American's only living reef, could experience a mass die-off from warmer temperatures and rising sea levels. Extensive coral bleaching occurred in the Caribbean following the summer of 1987 when temperatures were higher than usual.

Dade's commercial and sport fisheries could decline from a loss of mangroves which serve as important habitat for crab, shrimp and juvenile fish. Warmer temperatures may lead to an increase in algal blooms and reduce dissolved oxygen levels and exceed the thermal tolerance of marine finfish.

Sea level rise would significantly reduce or eliminate Dade's beaches. Without our beaches, the Everglades and fishing, Dade's tourism would be severely impacted and billions of dollars worth of ocean front buildings would be threatened. According to the U.S. Environmental Protection Agency, global warming could cause sea level to rise one to six feet by 2100. A model on sea level rise was created by ITD's Geographic Information System (GIS) and the United Nations Environment Program Global Resource Information Database. The model predicts locations and impacts of varying sea level rises in Miami. For example, a one-foot rise in sea level could displace 62,000 people and cost $3.7 billion (1989 dollars) in lost property and infrastructure. A three-foot rise in sea level could result in the displacement of 108,000 people and cost $5.8 billion in damages and could submerge Miami Beach and Key Biscayne.

In another study, The Urban Institute examined the probable impacts of sea level rise associated with a doubling of CO_2 atmospheric concentrations of Dade County's urban infrastructure. Rough estimates on the capital investment needed for raising canals/levees, canal control structures, raising streets, drainage, airport and electrical generation came to more than $600 million (1987 dollars). This estimate did not include beach renourishment, sea wall construction, elevating yards and houses, pumped sewer connections, elevating lots at reconstruction, raising bridges, sewer pipe corrosion and desalinization plants.

Violent hurricanes similar to Hurricane Andrew (1992), a category four hurricane, could become more common. Hurricane Andrew caused over $20 billion in property damage in Dade County, even though it struck the least intensely developed part of the County. Hurricane frequency and intensity are linked with sea surface temperatures warmer than 26.8 C.[7]

Despite the scientific opinions of the National Academy of Sciences, the World Meteorological Organization, the United Nations Environment Programme, the International Council of Scientific Unions and the Intergovernmental Panel on Climate Change, there are emerging divergent views on the extent and magnitude of global warming from a number of climatologists and meteorologists. These scientists question the predicted potential impacts from climate

[7] Wayne M. Wenland, "Tropical Storm Frequencies Related to Sea Surface Temperatures," Center for Climate Research, University of Wisconsin-Madison, May 1977, 477.

change. Some of the reasons they cite are flawed computer modeling and climatic feedback from clouds, vegetation and other factors. However, the important consideration here is that global warming could have severe impacts on low-lying subtropical coastal communities such as Dade County. This is not to say that these impacts will occur immediately or simultaneously, but rather to underscore the importance of acting responsibly to decrease the probability of their occurrence in the future.

Description of Metropolitan Dade County

Metro-Dade County, almost 2,000 square miles, is located along the southeastern coast of Florida and has an ethnically diverse population of 1.9 million people. It is larger than the states of Rhode Island and Delaware. Dade's humid subtropical climate is defined by an annual rainfall of 57.6 inches and temperatures averaging 75.5 degrees. Dade County is known for its flat topography and low elevation.

Metropolitan Dade County has a two-tier government system. The County includes a large unincorporated area and 27 separate municipalities. The Metro-Dade Board of County Commissioners consists of thirteen commissioners elected by districts. The County government provides services such as police and fire protection, zoning, garbage and trash collection, recycling, waste-to-energy production, neighborhood parks and building code enforcement to the unincorporated areas which encompasses approximately 60% of the County. Metro-Dade is also responsible for providing certain services to the incorporated municipalities including transportation, environmental management, and solid waste disposal. Metro-Dade has a Commission-Manager form of government. A full time executive hired by the Board is responsible for managing day-to-day operations.

Energy Supply & Demand

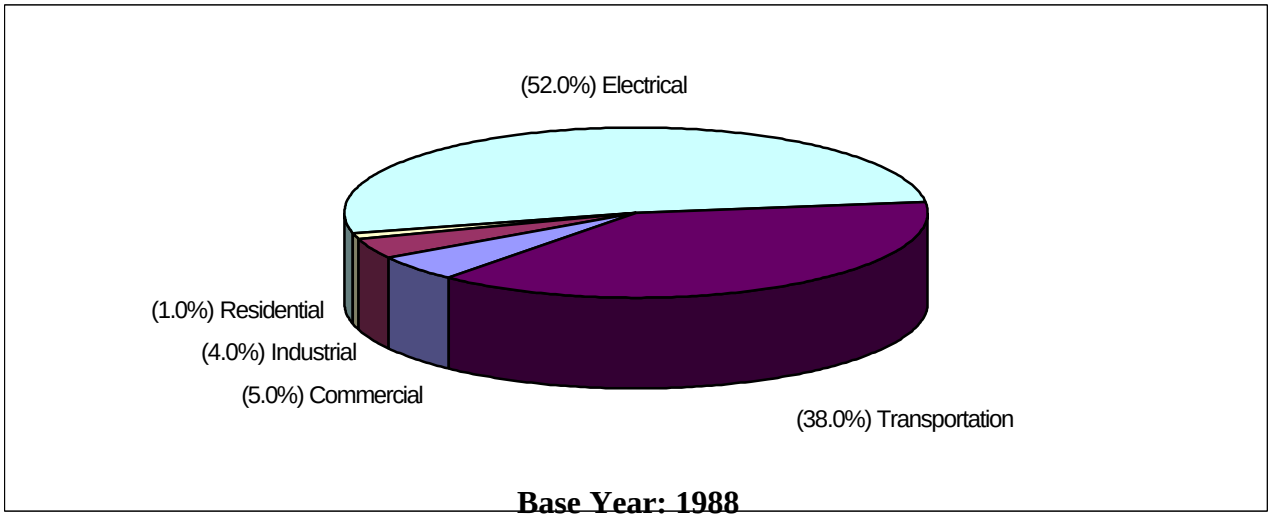
Dade County's primary fuel supply consists of imported gasoline, diesel fuel, fuel oil, liquid petroleum gas, natural gas, jet fuel, turbo fuel, propane, coal and uranium 235. The vast majority of these imports are brought into the County through Port Everglades in Ft. Lauderdale. Other modes of supply transport include shipment by rail, truck and pipeline and transmission line from the north.

Natural gas is transported to Florida and Dade County by Florida Gas Transmission Company which operates a system of interstate pipelines. These pipelines extend from the gas producers in Texas, Louisiana, Mississippi and Alabama to supply natural gas to local distribution companies (LDCs), electric utilities, and major industrial users in Florida. City Gas Company of Florida and Peoples Gas System are the LDCs serving Dade County. To meet the increased demand for natural gas Florida Gas Transmission is presently increasing their capacity from 0.9 billion cubic feet per day to 1.4 billion cubic feet per day by the end of 1994 and to 1.8 billion cubic feet per day by 1996/1997. Coastal Corporation is proposing to build a second pipeline which will initially supply 0.12 billion cubic feet per day in 1995 and increase demand in this state by LDCs, industrial users, commercial users, and electric utilities.

The project's 1988 breakdown of primary energy consumption by sectors showed electrical generating facilities consumed 52% of Dade's primary fuel and transportation used 38% of Dade's imported primary fuel. The residential (1%), industrial (4%) and commercial (5%) sectors used primary fuel for combustion in energy consuming activities such as generators, lawnmowers, and industrial processes.

FIGURE 1

Sectoral Percentages of Primary Energy Consumption for Dade County



Base Year: 1988

Metro-Dade's Energy Management

During the Arab oil embargo of the 1970s, Dade experienced a gasoline shortage and as a result established an Energy Management Office in order to create a fuel conservation plan. Shortly after an energy emergency plan was established, the Board of County Commissioners in 1977 adopted a Comprehensive Energy Management Plan which set minimum energy conservation standards for Metro-Dade's facilities and operations. The Energy Management Office was dispersed in 1991 after certain energy conservation policies were incorporated within Metro-Dade departments. Oversight of federal and state energy policies affecting Dade County is no longer carried out by Metro-Dade on a systematic basis.

Metro-Dade Department of Building and Zoning is responsible for enforcing the Energy Efficiency Code for Building Construction which is a statewide code for energy efficiency in thermal design and building operations. The energy code is a uniform set of minimum standards and cannot be made more stringent by local governments. However, Metro-Dade can require higher standards above and beyond what the state mandates in its own facilities and operations.

II. PROJECT DEVELOPMENT AND DATA COLLECTION

A broad based steering committee consisting of government agencies, universities, utilities, environmental organizations and educators was established to guide the development of this plan. The committee is also responsible for promoting the implementation of it through public outreach and education.

The first task in this two-year project was to establish a baseline CO_2 emissions inventory for the year 1988, the year being used by all other participants in the ICLEI project. The inventory includes CO_2 emissions from electrical production, gasoline and other fossil fuel consumption related to transportation and industry, and solid waste emissions.

Electrical production figures were obtained from Florida Power and Light (FPL). FPL supplied both network wide and Dade County specific data, including consumption percentages by sector. In addition, energy generation figures from Dade's Resources Recovery Facility and Central

Support Facility were included. Metro-Dade electric transit rail data was obtained from both FPL and the Metro-Dade Transit Agency.

Non-electrical generating facilities fuel usage was obtained from the Florida Energy Office's annual report on fuel consumption. In some cases, such as automotive fuel usage (transportation), data at the County level was specific. For non-automotive fuel usage (industrial and commercial sectors) only statewide data was available, in which case the data was prorated by County population and per-capita income. Natural gas consumption figures were supplied by People Gas and City Gas Company of Florida.

The consumption figures were converted to energy use by sector in units of megawatts. The energy usages for Dade, based on fuel and electrical usage per sector were entered in the Total Emissions Model for Integrated Systems (TEMIS) computer model.

TEMIS is a computer program which resulted from a joint project of the OKO-Institute, a non-governmental research institute, and the University of Kassel Environmental Systems Analysis Group. It has been designed to provide decision-makers with an analytical tool for developing energy policies. The computer model calculates direct CO_2 emissions associated with the combustion of various fuel types plus upstream emissions from the transportation, processing, and extraction of primary fuel. This total fuel cycle feature is designed to provide a complete accounting of greenhouse gas emission regardless of where they occur. This distinguishes the plan from typical air quality planning efforts which focus only on local impacts. Using this approach, nationwide and global impacts can be addressed in an environmental analysis.

TEMIS model files were modified to reflect local fuel types, fuel generators/consumers, end-use and sector types. After the modifications were made, the energy use data was loaded into the model and the associated CO_2 emissions were tabulated. Results of the TEMIS base year run were quite compatible with previous TEMIS studies. The TEMIS figures for downstream CO_2 emissions were within 3% of manual calculations.

Once the baseline was established using manual calculations, the project steering committee considered energy alternatives and conservation measures in transportation, electrical generation/use, solid waste and land use. The initial product of these sessions was a preliminary list of alternatives which are discussed in Section V of this plan. Each alternative is identified as being a direct or indirect measure. Direct measures are items which the County has direct control of with respect to its own operations and facilities or through regulation. Indirect measures include state/national mandates and public education programs. Even though the public education measures cannot be easily quantified in terms of CO_2 reduction, they are important to the overall achievement of reversing global warming.

Project Constraints

A constraint to the development of a more precise long term CO_2 reduction plan is the lack of detailed and concise information on Dade County's urban energy system. Although an accurate 1988 energy profile was completed for the project's baseline which outlined fuel quantity, fuel type and sectors, a further disaggregation of end use by building type was not achieved. In other words, information broken down by building type (restaurant, e.g…), measurement of structure (square footage), fuel type (natural gas), energy consuming activity (lighting) and technology (compact fluorescents) is not provided in this report. The plan's final recommendations would not necessarily be significantly different if more precise data on energy use were available. Additional detailed information could provide definitive justification for specific reduction measures.

Under the current Florida regulatory system, utilities earn additional revenues from every kilowatt hour of energy sold. Thus, demand side management programs are geared towards shifting load away from peak hours rather than lowering total energy consumption. Additionally, the current pricing system does not reflect environmental externalities (air and water pollution) and, therefore, may discourage the use of a variety of energy efficient measures in terms of cost effectiveness.

There are a variety of CO_2 reduction measures that Metro-Dade can initiate. For example, the County government can regulate its own operations and facilities by purchasing efficient

cars/trucks and replacing outdated lighting and machinery with more efficient technology. Metro-Dade can also discourage automobile use through improved urban design and mass transit. The County's Solid Waste Department can increase recycling rates by implementing a variety of community and business recycling programs. There are a number of other opportunities that are vital to a CO_2 reduction plan which fall under the jurisdiction of either the state or federal government or involve changing the attitudes of people. Some of these options include auto efficiency standards (CAFE), energy pricing, residential/commercial building standards, utility regulation reform and individual behavioral changes towards conservation and driving. Even though Metro-Dade has no direct control over these options, there is an important opportunity to encourage state and federal actions which support the goal of avoiding global warming.

III. BASELINE EMISSIONS AND POLICY IMPLICATIONS

Dade County CO_2 emissions in 1988 totaled over 23 millions tons, or about 12.5 tons per capita from combustion of primary fuels. The largest sources of emissions came from the transportation (45%) and electricity (45%) sectors. The transportation sector does not include fuel inputs from aircraft, ships and barges. The industrial (5%), commercial (4%) and residential (1%) sector emissions are from the combustion of primary fuel used in energy consuming activities such as generators, lawnmowers, and industrial processes.

Not surprisingly, the two primary contributors to CO_2 emissions in Dade County are transportation and electrical production/use. These two categories present the County with the greatest opportunities for achieving emission reductions.

The County has a minimal modal split between the use of automobiles, public transit and bicycles. This 97% to 3% modal split in favor of cars (of which 86% are single occupancy vehicles) means that the County must substantially improve and expand its mass transit system and decrease reliance on automobiles if the targeted CO_2 emission reductions are to be achieved. An increase in average gas mileage standards would have the largest impact on CO_2 emissions reduction. Urban design with traditional neighborhood principles that reduces the need for the automobile will also be important.

The second category with a high potential for achieving CO_2 emission reductions is in electrical end use. The recent hurricane has provided an opportunity to rebuild thousands of homes energy efficiently. Additionally, Metro-Dade's participation in two federal programs, "Green Lights" and "Cool Communities" will help further reduce Dade's electricity consumption.

Table 2[8]

Dade County CO_2 Emissions – 1988 (U.S. Million Tons)

Sector	Liquid Petrol	Natural Gas	Coal	Wood/ Waste	Solar	Hydro	Nuclear	Imports	Total
Residential	0.059	0.137							0.196
Commercial	0.375	0.647							1.022
Industrial	0.534	0.089	0.673						1.297
Transportation	10.448	0.001							10.449
Electrical Usage	3.742	1.893	2.033	0.543				2.248	10.459
Total Emissions	15.16	2.767	2.706	0.543	0	0	0	2.248	23.422

Table 3

Dade County CO_2 Emissions – 2005 (U.S. Million Tons)

Sector	Liquid Petrol	Natural Gas	Coal	Wood/ Waste	Solar	Hydro	Nuclear	Imports	Total
Residential	0.076	0.177							0.253
Commercial	0.484	0.835							1.319
Industrial	0.689	0.115	0.869						1.673
Transportation	13.483	0.001							13.484
Electrical Usage	4.829	2.443	2.624	0.701				2.901	13.497
Total Emissions	19.56	3.571	3.49	0.701	0	0	0	2.9	30.226

[8] Figures do not include fuel inputs from aircraft, ships, barges and other potential sources.

FIGURE 2

Sectoral Percentages of CO_2 Emissions for Dade County

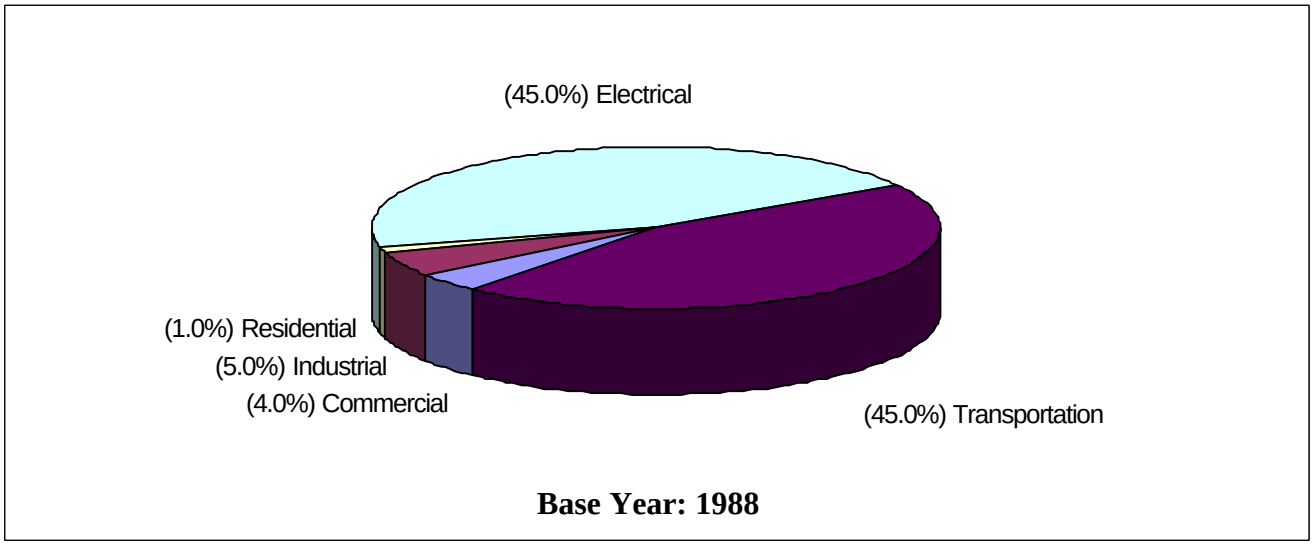


Table 4

Dade County Energy Profile 1988 – (In Megawatt Hours, MWH)

Sector	Liquid Petrol	Natural Gas	Coal	Wood/ Waste	Solar	Hydro	Nuclear	Imports	Total
Residential	205,016	724,225							929,241
Commercial	1,263,990	3,416,662							4,680,652
Industrial	1,785,421	471,149	1,868,205						4,124,774
Transportation	35,448,947	3,611							35,452,558
Electrical Usage	11,378,688	9,721,611	5,338,205	1,813,756			17,748,642	2,996,906	48,997,808
Total Emissions	50,082,062	14,337,258	7,206,410	1,813,756	0	0	17,748,642	2,996,906	94,185,034

IV. GOALS AND ALTERNATIVE MEASURES

Metropolitan Dade County has made a commitment to develop a long-term strategy to significantly reduce CO_2 emissions.

In order to achieve a 20% reduction below 1988 levels by the year 2005 as outlined in the project goal, overall emissions associated with activity in Dade County must be reduced by a total of

50% (11.6 million tons annually) which includes the effect of a 30% projected increase in population (and therefore CO_2 emissions) from 1988 to 2005. Beginning in 1993, CO_2 emissions will have to be reduced by approximately 970,000 tons per year to reach the 50% target by 2005. Dade County's 20% total reduction goal is consistent with what other cities in the U.S. have committed to.

If the 1988 per capita CO_2 emissions value of 12 tons could be reduced by 20% (to 10 tons) by the year 2005, there would be a corresponding 20% decrease in projected CO_2 emissions (from 30,000,000 to 24,000,000 tons). Please note that while this reduction in the per capita figure would result in a 20% reduction of CO_2 emissions on a per capita basis, there would be an actual 3% increase over 1988 CO_2 emissions due to post-Andrew population growth. To achieve a true 20% reduction in total CO_2 emissions by the year 2005, taking into account post-Andrew population growth, the per capita CO_2 emissions would have to be reduced by 38% to a value of 7.7 U.S. tons of CO_2 emissions per person.

To accomplish the 20% total reduction goal (50%), the project steering committee has identified reduction measures in transportation, electrical production/use, solid waste and land use. Additional project goals include identifying energy initiatives that reduce energy consumption in the County, generate dollar savings, increase Dade's competitiveness through energy-efficiency, create jobs, protect the environment and improve the quality of life.

Energy efficient businesses can benefit by reducing their production costs which allows them to undersell their competitors. For example, both Germany and Japan use 50% less energy than U.S. Manufacturers do to produce the same value of goods.[9] This gives Japan and Germany the competitive edge in many areas of the international market place. The American Council for an Energy Efficient Economy (ACEE) conducted an analysis of energy efficient improvements in vehicles, appliances, commercial buildings and manufacturing. Using an input-output economic model, the High Efficiency scenario leads to more jobs, higher personal income, and a slightly

[9] Howard Geller, John DeCicco, and Skip Laitner, Energy Efficiency and Job Creation: The Employment and Income Benefits from Investing in Energy Conserving Technologies, American Council for an Energy-Efficient Economy, Washington, DC, October 1992, 3.

higher gross domestic product (GDP).[10] According to the ACEE, "about 293,000 new jobs could be created by 1995, 471,000 new jobs by 2000, and nearly 1.1 million jobs by 2010 on a net basis. The addition of 1.1 million jobs in 2010 represents approximately a 0.7 percent increase in the projected employment level that year. Likewise, the rise in personal income during the twenty-year period in the high efficiency case reaches 0.5 percent by 2010, while the increase in GDP is less than 0.1 percent."[11]

Energy efficient measures and conservation will also reduce our reliance on polluting fossil fuels and provide additional benefits to the environment. By reducing our reliance on fossil fuel, we prevent the emissions of other air pollutants. For example, if everyone in the U.S. used energy-efficient lighting, we could prevent the emission of 1.7 million tons of sulfur dioxide, 900,000 tons of nitrogen oxides in addition to the 232 million tons of CO_2.[12]

Planting trees increases property values, improves air quality, protects watersheds, enhances aesthetics, provides wildlife habitat, reduces electric bills, and improves the overall well being of a community. Studies have shown that trees have a positive effect on the physical and mental condition of a person.[13] Improving urban design which incorporates a broad mix of uses and traditional neighborhood principles can lead to less congested streets and, thereby, reduce emissions. But good urban design can also lead to real communities that are neighborly, friendly and livable.

[10] Ibid.
[11] Ibid.
[12] U.S. Environmental Protection Agency, A Bright Investment in the Environment, Washington, DC: (EPA/400/1-92/003)
[13] Gary Moll and Stanley Young, Growing Greener Cities, (Venice, California: Living Planet Press, 1992): 14.

Table 3

Dade County CO_2 Emissions-2005 (U.S. Million Tons)

Sector	Liquid Petrol	Natural Gas	Coal	Wood/ Waste	Solar	Hydro	Nuclear	Imports	Total
Residential	0.076	0.177							0.253
Commercial	0.484	0.835							1.319
Industrial	0.689	0.115	0.869						1.673
Transportation	13.483	0.001							13.484
Electrical Usage	4.829	2.443	2.624	0.701				2.901	13.497
Total Emissions	19.56	3.571	3.49	0.701	0	0	0	2.901	30.226

Table 5*

SUMMARY OF CO_2 POTENTIAL REDUCTION MEASURES

	CO_2 EMISSION REDUCTIONS U.S. Tons
TRANSPORTATION	
1. Mass transit & road improvements	818,000
2. Traffic demand management	62,000
3. Increase bicycle pedestrian modal split	151,000
4. Increase fuel efficiency	7,896,000 or 8,200,000
LAND USE	
1. Reduce vehicle miles traveled by 5%	172,000
ELECTRICAL PRODUCTION/USE	
1. Increase efficiencies of Metro-Dade facilities/operations	145,000
2. Decrease residential sector energy use	159,000
3. Expand the use of alternative fuels	51,000
4. Expand the use of landscaping and white surfaces	137,000
5. Promote and expand participation in energy conservation	610
SOLID WASTE	
1. Recycle between 30 and 50% of Dade County's Waste Stream	1,188,000 to 1,979,000
2. Recover and utilize landfill methane gas	177,000
3. Reduce generated solid waste by up to 5%	388,000

* CO_2 emission reductions are approximations

V. DESCRIPTION OF MEASURES

A. TRANSPORTATION

Introduction & Background

During the 1950's, America's obsession with the automobile flourished, particularly in Dade County. Dade's flat topography, development opportunities, subsidized roads, cheap fuel, and urban sprawl supported the use of the automobile and discouraged public transit. Today less than 3% of Dade's population ride public transit.

Transportation was responsible for 45 percent of Dade County's CO_2 emissions in 1988. There were over 1.7 million vehicles traveling Dade roads in 1988 emitting 10 million tons of CO_2. Vehicle miles traveled (VMT) in 1988 were 10 billion and are projected to increase by 38% in 2005 without transportation improvements. Dade County has approximately 7,255 miles of highway and roadway. There are four levels of service on arterial highways: uncongested, congested, very congested and extremely congested. Arterial highways that are "extremely congested" are projected to increase despite the mass transit & road improvements outlined in this plan.

Dade County, prior to its commitment to this project, had undertaken a number of transportation projects related to energy conservation. The major program is a commitment to a multi-modal public transit system including buses, heavy rail, and an interconnected automated rail system located downtown. Dade has made an enormous capital investment for mass transit infrastructure in order to provide an alternative to the automobile. The County has also provided bikeways, car pool and vanpool programs, and public education to encourage the use of alternative modes of transportation.

Measures 1, 2 & 3 are included in Metro-Dade's Transportation Plan and Improvement Priorities Long-Range Plan. Mass transit extensions excluding the South Dadeland-Cutler Ridge corridor are expected to cost approximately $11.4 billion and road improvements will run an estimated $4.1 billion. Because of the availability of existing rights-of-way and hurricane relief monies, it may now be more feasible to extend transit from Dadeland South to Cutler Ridge.

MASS TRANSIT & ROAD IMPROVEMENT

The following three measures could result in reducing 816,000 tons of CO_2.

1. **Complete the expansion of the Metromover rail system to Brickell Avenue and Omni Center.** (Direct)

Metromover is an electrically powered, fully automated, 1.9 mile people mover system. It connects with Metrorail at the Government Center Station, and with Metrobus at various locations throughout downtown Miami. Metromover cars operate on an elevated double loop that runs through the central business district. The nine Metromover stations offer convenient access to a variety of government, business, cultural, and entertainment centers in the downtown area. Metromover currently averages almost 12,000 passengers a day. Completion of the Omni and Brickell expansion legs of Metromover is anticipated by 1994. The extensions will add fifteen vehicles and 2.5 miles to the existing system.

2. **Extend transit.** (Direct)

Metrorail is a 21.5 mile elevated rapid transit system that averages almost 48,000 passengers per day. The total annual ridership for FY '90 was approximately 13,600,000. Heaviest ridership occurs during the morning and evening rush hours. The Metrorail transit service should be extended along eight new corridors which cover a total of 61.7 miles. These corridors run east-west from Florida International University to Miami Beach, linking Miami International Airport and the Port of Miami. Other additions include:

North-King Plaza to NW 215 Street
West-Downtown to NW 87th Avenue
South-Dadeland South to Cutler Ridge
Kendall-Dadeland North to SW 137th Avenue

Ridership is projected to increase by 280% if all of the above mentioned transit corridors are built.

3. **Construct all road improvements listed in the Long Range Transportation Plan that are consistent with the other transportation and land use measures in this plan.** (Direct)

The Long-Range Transportation Plan recommends approximately 212 road and highway improvements considered necessary to lessen congestion which would reduce vehicle miles traveled.

TRAFFIC DEMAND MANAGEMENT

The following measure could reduce CO_2 emissions by 62,000 tons based on projected reductions in vehicle miles traveled.

1. **Increase traffic demand management programs.** (Indirect)

Establish car pool program, promote ridesharing, park-and-ride, auto restriction zones, employer transit subsidies, telecommuting, shuttle systems, high occupancy vehicle lanes, compressed work week, parking management, and traffic management organizations.

The Metropolitan Planning Organization (MPO) is undertaking a study to investigate traffic demand management (TDM) measures for Dade County. TDM is a systematic approach to reducing single occupant vehicles and number of cars on roads especially during peak hours. The study cites TDM strategies that would relieve traffic congestion, enhance air quality and promote energy conservation. Implementation of these programs could potentially reduce 72,800,000 VMT's annually.

PROMOTE INCREASED USE OF BICYCLES

The following measures could reduce CO_2 emissions by 151,000 tons.

1. **Adopt policy incorporating bicycle facilities into the County's plan for new road construction or reconstruction projects.** (Direct)

This policy would allow roadways to be designed for all vehicles, and make use of the existing roadway network more appealing to those who may choose bicycling for transportation purposes. A current poll conducted by Harris & Associates reveals that a 20% increase of bicycle usage can be expected by adding bicycle facilities to a roadway.

2. **Adopt a shower facility ordinance for professional office buildings and require that all nonresidential and non-retail developments provide bicycle racks at a minimum rate of five bike parking spaces for every 100 automobile parking spaces as stated in the Draft Bicycle Facility Plan.** (Direct)

Polls indicate that commuting to work by bicycle would increase by at least 17% if showers at these sites were made available. In Dade County, this figure may become higher due to the humidity of our climate. Bicycle racks must be made available in order to encourage commuting.

3. **Expand Bikes-on-Trains program to include counter-flow and first hour service (6:00-7:00am).** (Direct)

Counter flow service runs in the opposite direction of morning rush hour traffic. Extending the hours of the Metrorail Bikes-on-Trains program would allow for commuters to transfer from rail to bicycle in order to get to work, school or other sites on a regular basis. This accommodation would often furnish individuals with less delay than they may experience by rail to bus transfer, and offer the convenience to travel to destinations which buses do not serve.

4. **Implement Bikes on Tri-Rail.** (Indirect)

Currently, Tri-Rail does not offer Bikes-on Tri-Rail. Initiating such a program for commuters would serve the same goal as previously mentioned for Metrorail. Additionally, individuals, families or groups may also become interested in weekend cycling trips, thus reducing automobile excursions.

5. **Investigate utility easements, transit and railroad rights-of-way to use for bicycle/pedestrian facilities.** (Indirect)

Metro-Dade should investigate the use of utility easements and transit or railroad rights-of-way as locations for bicycle ways linking major urban activity centers. These corridors, because of their linear alignment and few conflicts with intersections, could serve as the backbone of a suitable countywide bikeway system. This may prove most effective in Planned Urban Developments (PUD) and Traditional Neighborhood Developments (TND).

INCREASE FUEL EFFICIENCY

Measure 1 could reduce 4,899 tons of CO_2. The Corporate Average Fuel Efficiency (CAFE) measures, if implemented without any improvements in road, mass transit or land use could reduce CO_2 emissions by 7.8 million tons. However, if national auto efficiency rates increase along with all of the road, mass transit and land use improvements in this plan, the total reduction for transportation and land use measures could reach 8 million tons.

1. **Utilize more fuel efficient cars in the Metro-Dade fleet.** (Direct)

Analysis of Metro-Dade's fleet has shown the lowest efficiency rate is in the police fleet. In 1988, Metro-Dade's police fleet, for example, was comprised of 588 eight-cylinder vehicles that averaged 10.12 miles per gallon. Metro-Dade could switch to the six-cylinder Ford Taurus type vehicle which as a higher fuel efficiency.

2. **Develop a public education & awareness campaign to limit idling of automobiles/trucks.** (Indirect)

Vehicle engine idling is an energy intensive and wasteful activity. Therefore, Metro-Dade should develop a public awareness campaign on the environmental implications of excessive idling.

3. **Develop a team of local public/private representatives to identify and promote the most practical and cost effective alternative fueled vehicles.** (Direct)

Switching from petroleum to an alternative fuel would not only improve air quality and reduce CO_2 emissions but would also increase the nation's security. There are a number of alternative fuel options available that include: methanol, compressed national gas (CNG), ethanol, electric vehicles and hydrogen-powered vehicles which can all reduce CO_2 emissions. Some measures like methanol and CNG are commercially available today, while others like electric and hydrogen powered vehicles need further development. Currently, Metro-Dade is investigating and comparing the performance of four control groups of buses. Each group is fueled by either methanol, CNG, particulate trap or duel fuel diesel. Project completion is expected in Spring of 1996.

4. Promote an increase in national gas mileage standards to 45 mpg. (Indirect)

Metro-Dade should strongly advocate an increase in the Corporate Average Fuel Economy (CAFE) from the current 27.5 miles per gallon (mpg) to 45 mpg by 2005. An increase in the national fuel efficiency standards for cars and trucks presents the County with the single largest opportunity to reduce emissions. A national poll taken in May 1991, indicated that 65% of Americans favored higher fuel efficiency standards.[14]

B. LAND USE

Background and History

Early urbanization was shaped by the pedestrian nature of the "urban" activities taking place at the time. Today urbanization is primarily a reflection of our departure from the pedestrian nature of "urban" activities to the automotive nature of "suburban" activities. The sub-urbanization process, highly influenced through the last five decades by the single-occupant motor vehicle, has adversely affected the form of our metropolitan areas and our environment. With the advent of growth management planning practices, more communities are departing from past planning practices in order to encourage compact growth. The compact growth alternative consists of directing new development and housing to centers and corridors strategically located along mass transit lines. These activity centers and corridors are characterized by their higher densities and mixed-used activities. The Dade County government has taken the first step towards compact growth management by delineating an urban development boundary and by adopting compact development related policies (Land Use Elements 3.A, 3.B and 3.C) in its Comprehensive Development Master Plan.

[14] Source: Environment Opinion Study, Inc.; Poll conducted by Market Strategies, Inc. and Frederick/Schneiders, Inc.

REDUCE VEHICLE MILES TRAVELED BY 5% THROUGH MIXED LAND USE[15]

This measure could potentially reduce 179,000 tons of CO_2.

1. **Review and amend regulations to encourage the implementation of transit and pedestrian oriented development (TOD) principles in new development.** (Direct)

Dade County should review and amend Dade County's zoning, subdivision, and other development regulations to implement transit oriented development (TOD) principles such as the following:

- Maximize the use of existing urbanized areas accessible to transit through sensitive infill and redevelopment.
- Plan and design the urban area to reduce the need for future expansion of the urban development boundary by increasing the intensity of uses in close proximity to transit.
- Reinforce transit through land use planning.
- Reduce the number of auto trips and regional vehicle miles traveled by creating opportunities to walk, bike, and use transit.
- Protect the natural environment and community character by reducing the need for roadway expansions.
- Provide a diversity of housing types to serve diverse households.
- Foster a more vital, interactive and secure community.

2. **Encourage infill development by requiring utilization of TOD development principles within activity centers and along major transit corridors.** (Indirect)

The TOD strategy directs much of the County's projected growth to higher density urban areas within walking/biking distance of existing or proposed designated transit stops and lines.

[15] The 5% reduction in VMT's is based on the 38% increase in traffic flow from 1988 to 2005. The 5% is a conservative estimation. Recent studies have indicated a 50% daily trip reduction in areas emphasizing mixed uses and traditional neighborhood principles.

Infill should be encouraged by establishing minimum, as well as maximum authorized densities for infill areas designated in the Comprehensive Plan, and by authorizing liberalized level of service standards for roadways in infill locations within walking/biking distance of transit stops and lines.

To promote mixed-use development activity centers, the Dade County Planning Department should sponsor a design competition in order to generate a variety of alternative plans.

3. **Continue to promote the evolution of a sub-centered urban form, comprised of major, intermediate and local activity centers; activity corridors; enterprise/employment centers and a transit network. In appropriate locations in intervening areas, promote applicable TOD principles and the balanced provision of convenience retail, personal services and various types of residences.** (Indirect)

Dade County should continue to promote the evolution of a sub-centered urban form by means of the above mentioned TOD principles, as well as through the following:

- protection of stable residential areas;
- protection of core industrial/enterprise areas which are critical to the economic vitality of the region;
- establishment of mixed-enterprise areas, and
- provision of an efficient mass transit system

Mixed-enterprise areas should contain a mix of economic activities such as office, retail, residential and compatible light industrial uses where community services can be provided and a pedestrian environment can be created.

4. **Encourage provision of civic buildings within urban neighborhoods through site planning and in capital improvements programming.** (Indirect)

In order to further the civic needs of our modern society, the County should encourage the provision of facilities to provide for social interaction, entertainment and cultural activities, and some public related services.

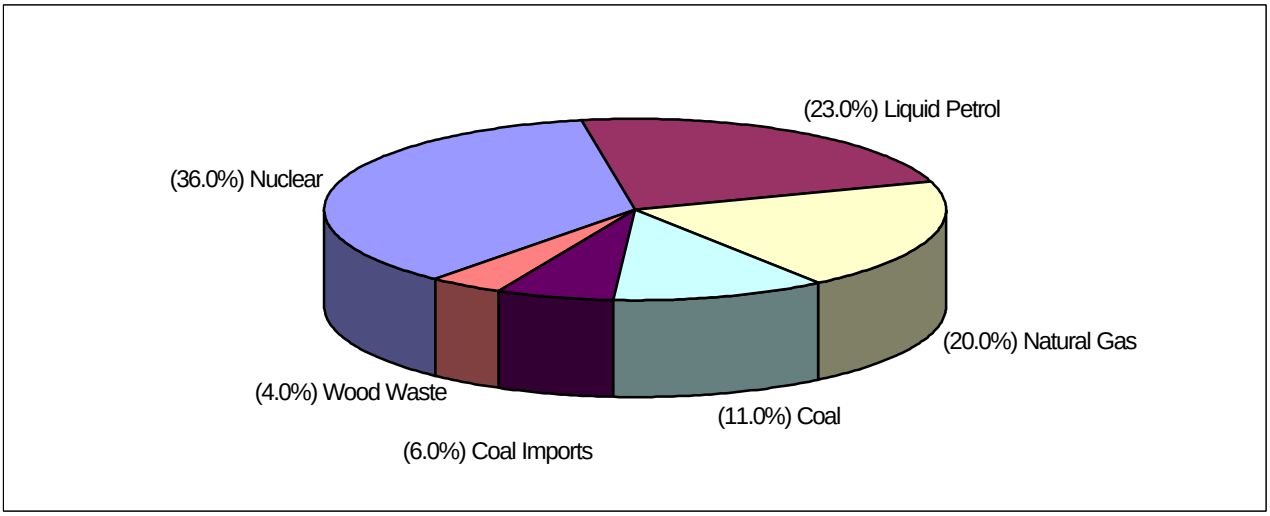
C. ELECTRICAL PRODUCTION/USE

Introduction & Background

In 1988, the electrical sector represented the largest consumer of primary fuel (52%) serving Dade County, contributing 44% of total CO_2 emissions. Florida, Power & Light (FPL), the states' largest private utility, services all of Dade County with the exception of the City of Homestead. FPL's service area consists of 3.4 million customers in 35 counties. Dade County represents approximately 25% of FPL's total customer count. Existing generating facilities are fueled by coal, oil, gas and nuclear energy. FPL's generation mix in Dade County is cleaner than FPL's system average and FPL's system fuel mix is one of the cleanest in the nation in terms of emissions to the air. In calculating emissions attributable to activities in Dade County, a pro rata share of FPL's total system emissions were assigned based upon consumption data. The fact that the emission occurs is of more importance than the specific emission point of greenhouse gases.

FIGURE 4

Electricity Generation Fuel Mix - 1988



In 1988, the residential sector consumed 50.2% of Dade County's electrical energy. The commercial sector used 42.5% of the share and both the industrial (6.9%) and transportation (Metrorail .04%) sectors consumed much less.

Metro Dade operates its own Resources Recovery Facility. Steam produced by burning the solid waste is used to generate electricity. Some of the electricity is used to power the facility and the excess 300,000 kwh of electric power is exported to Florida Power Corporation. Metro also operates a 32MW combined cycle power plant that supplies electricity, air conditioning and hot water to government facilities.

INCREASE EFFICIENCIES OF METRO-DADE FACILITIES/OPERATIONS

Measure 1 could reduce 145,000 tons of CO_2. The CO_2 reduction rate for measure 2 is unknown at this time.

1. **Initiate the "Green Lights" programs and integrate with other County building retrofits for a 20% increase in efficiency.** (Direct)

On April 21, 1992, the Board of County Commissioners approved Metro-Dade's participation in the Green Lights program which is sponsored by EPA. Metro-Dade has agreed to install cost effective and energy-efficient lighting in 90% of their facilities within five years. Retrofits may include occupancy sensors, T-8 lamps, T-12 lamps, reflectors, and electronic ballasts. Lighting for Metro-Dade Facilities currently represents 30% of its total energy use.

Because lighting retrofits are relatively inexpensive and have high savings with a short pay-back period they should be integrated with costlier retrofits that have a longer pay-back period in order to improve pay-back periods and financing options.

2. **If feasible, purchase the combined cycle cogeneration plant and wheel the current excess capacity of 82,000,000 kwh/yr. to County owned facilities and promote use of cogeneration for other appropriate commercial applications.** (Direct)

Cogeneration produces electricity and steam which is used for heating and cooling purposes. Cogeneration can increase the efficiency of power plants by 30% and more in terms of fuel consumption per unit of usable energy, thereby improving air quality and lowering CO_2 emissions. Despite these advantages, cogeneration is not widely used. There are a number of barriers which limit the marketing of this technology which include a lack of knowledge, capital, financing options, inexpensive fuel and the need for high thermal demand. Efficient application of cogeneration requires proper sizing of the unit.

Metro-Dade operates a combined cycle cogeneration plant owned by a limited partnership which leases the equipment to the Rolls Royce Thermo Electron Joint Venture. Energy is supplied to a complex of government buildings including a county courthouse, public library, museum, art center, public transport center and several administrative buildings with electricity, chilled water for air conditioning and hot water for humidity control. To fully utilize the electrical generating capacity of the plant, the owners would need to use FPL's transmission lines to move the power to other facilities. This "third party wheeling" is not permitted under existing state regulations which are designed to protect investments already made by utilities. Metro-Dade is currently conducting an audit on the cogeneration plant to assess the economic viability of purchasing it. If Metro-Dade was to purchase the plant it would eliminate the third party and then the County government could attempt to self service wheel to its other facilities. This can legally be done but only after proving to the PSC that the self-service wheeling would not be a detriment to other ratepayers. In addition, there is ongoing litigation concerning the condition under which the plant was built which could affect the future operation and ownership of the plant.

DECREASE RESIDENTIAL SECTOR ENERGY

Measure 1 could reduce 159,000 tons of CO_2. The rest of the measures under this objective are important educational components to the plan.

1. **Reduce annual electricity consumption by 5,350 kwh in 35,000 rebuilt homes in South Dade through promotion of energy efficient measures.**

Metro-Dade should aggressively promote the use of energy efficient measures in the reconstruction of South Dade County post Hurricane Andrew. The Florida Solar Energy Center investigated the potential for improved energy use in single family homes. They identified a package of cost-effective measures that if used in new construction would generate an annual reduction in electricity consumption by 5,350 kwh per house. These savings are based on engineering estimates and represent maximum probable savings.

The recommended measures are primarily targeted to reduce the cooling load since an estimated 38% of a home's demand for electrical energy is used for air conditioning in South Florida. Refrigeration and water heating each represent 14% of a home's total energy use. Based on these end uses for a typical single family home, FSEC developed four categories of measures

which include building envelope, heating/cooling systems, solar water heating and appliances. The measures include the following: reflective roof or attic radiant barrier; reflective east/west windows or reflective window film; white colored walls; sealed duct air distribution system; duct system within the conditioned space or reflective roof; air conditioner SEER 12.0 Btu/W; proper air conditioning sizing; low-flow showerheads; improved tank insulation; low-cost add on solar water heater; high efficient refrigerator; compact fluorescent lighting; halogen incandescent lighting; and down sized pool pump on timer with large piping and filter.

2. **Develop and market a Miami Herald energy guide targeting the homeowner and encouraging special pricing in building supply stores.** (Indirect)

Several weeks after Hurricane Andrew, members of the Urban Consortium Energy Task Force, FPL and South Florida community leaders met to brainstorm energy opportunities in the South Dade reconstruction effort. The overwhelming consensus from this meeting was that in order to rebuild right it is important to get information to the homeowner on how to rebuild his/her home using energy conservation measures. Following several planning meetings with The Miami Herald and others, the Herald published a "How To" energy efficiency guide covering appliances, landscaping, roofing and windows, and many other energy efficient options for customers as well as utility programs to assist customers. Metro-Dade should market the plan and encourage special pricing of energy efficient products at building supply stores.

3. **Develop outreach program for contractors/builders on Florida's Energy Code.** (Indirect)

Metro-Dade should work closely with the Florida Energy Office and "We Will Rebuild" to sponsor workshops for developers/contractors on energy efficient home building. Metro should develop packets of information on Florida's energy code and effective conservation measures for developers/contractors to pickup when they apply for permits with the County's Building and Zoning Department. Rebuilding South Dade County is expected to take approximately ten years.

4. **Develop strategy with DCA to improve enforcement of the Florida Energy Code.** (Indirect)

Due to lack of staff and training, Metro-Dade is not adequately enforcing the Florida Energy Code. The aftermath of Hurricane Andrew has only exacerbated the problem. Metro-Dade

should work with the Department of Community Affairs to train County government inspectors in energy code enforcement.

EXPAND THE USE OF ALTERNATIVE FUELS

Measure 2 could reduce 51,000 tons of CO_2 if a total of 24,000 solar water heaters are installed by the year 2005. CO_2 reduction rates for measures 1 & 3 are unknown at this time.

1. **Investigate cost effective energy efficient HVAC systems for Metro-Dade facilities.** (Direct)

Metro's Department of Development and Facilities Management should investigate both electric and natural gas chillers to determine the most suitable HVAC systems for Metro-Dade's facilities. The energy savings, up-front capital investment, payback period, environmental impacts and hot water demand need to be determined.

2. **Reinstate the renewable energy source exemption.** (Property tax exemption for installation of solar water heaters) (Indirect)

Even though Florida is known as the "Sunshine State", only ½ of 1% of the State's energy demand is met by solar energy. Metro-Dade should advocate re-instituting the statewide property tax exemption for installing solar water heaters. Solar water heaters can save a South Florida home an estimated annual 2500 kwh.

3. **Shift to photovoltaic street lighting.** (Direct)

Photovoltaics (PV) are solar cells that convert sunlight directly to electricity. Although the present use of PV lighting is too expensive for area-wide application, they can be used cost-effectively in some locations and are expected to be much more competitive in the next five years. An additional benefit from the use of PV's is security. In the event of a prolonged loss of electricity (e.g. hurricane), PV's can be used to light dark streets. As with each of these measures, an analysis of the life cycle cost is necessary to determine the feasibility of each application.

EXPAND COMMUNITY TREE PLANTINGS AND WHITE SURFACES

Measure 1 could reduce approximately 3,000 tons of CO_2 and measure 2 could result in a 133,500-ton reduction. Both the direct and indirect effects of tree plantings were calculated for CO_2 reduction. Trees reduce CO_2 concentrations by both direct absorption through photosynthesis and shading which reduces ambient air temperatures resulting in lower energy consumption. Trees strategically planted around structures can also reduce the need for air-conditioning.

1. **Integrate "Cool Communities" with community-wide tree planting program.** (Direct)

"Cool Communities" is a cooperative effort between American Forests, Department of Energy and Metropolitan Dade County. Dade is one of seven U.S. cities selected to participate in this program. The demonstration project entails selecting residential neighborhoods and commercial sites in which to plant trees and lighten surface colors. The project goal is to counter the "heat island effect" which causes cities and urban areas to be several degrees warmer than surrounding rural areas. This effect is linked to increased energy consumption and air quality degradation. The research goal is to document the area-wide effects of trees and light surface colors on buildings.

As part of "Cool Communities", American Forests has expressed a keen interest in helping Dade County replace its urban forest canopy lost in Hurricane Andrew. Preliminary estimates of tree canopy loss in South Dade are 45% to 65%. In order to encourage and support community tree plantings, it is recommended that Metro-Dade revise its policy on planting within public rights-of-way and indemnify the homeowner from liability which may arise from installing trees in the right-of-way. Additionally, providing public assistance by digging holes in community group plantings of ten or more trees in public rights-of-way will help encourage neighborhood plantings.

2. **Revise Dade County's landscape code to require strategic tree planting, street trees and parking lot trees.** (Direct)

Dade County's tree ordinance is being re-drafted to consider strategic tree planting, street trees and parking lot trees in order to reduce the heat island effect. Staff has recommended that builders be responsible for planting trees along all residential structures 35 feet or less with an

average spacing of 30 feet on center for a minimum of 50 percent of the total lineal footage of the building footprint. Staff has also recommended that it should be required to shade air conditioners mounted on the ground. Based on development trends, Metro-Dade's Planning Department has projected that 62,917 trees will be planted annually.

PROMOTE AND EXPAND PARTICIPATION IN ENERGY CONSERVATION

Measure 3 could reduce CO_2 emissions by 610 tons of CO_2. Reduction rates for measure 1 are unknown at this time.

1. Increase public participation in FPL's Demand Side Management programs. (Indirect) "Demand Side Management" (DSM) is the program used by electric utilities to facilitate reduced consumer demand when it is more cost effective than providing more supply (usually by building a new power plant). Such programs operate under rate regulations which allow utilities to offer rebate incentives for conservation/efficiency measures which exceed state energy code requirements. Because the peak daily and seasonal demands drive the need for new power plants, DSM programs tend to emphasize those measures which reduce peak loads. Under current rate regulations, utilities can only participate in DSM programs which are shown to be cost effective when compared with the direct cost of a new power plant. By the end of 1993, FPL will have spent over $600 million on DSM and deferred building approximately 800 MW in additional power plants.

FPL's residential programs include: conservation service audits; ceiling insulation; conservation window treatment; conservation water heating; high-efficiency residential HVAC systems; home energy loss prevention; thermal energy storage, conservation research and development, photovoltaic pool pump research project; new home construction project and load control (The On Call Program). Commercial and industrial programs include: business energy evaluation, business energy planning; efficient lighting; energy efficient motors; air-cooled chillers; DX HVAC systems; retrofit program for water-cooled chillers; cogeneration and small power production; general service trial project, water heating pump research project, cold air distribution system research project, heat pipe research project, hot water storage project, central chiller system research project, business custom incentive program; dehumidification research project, thermal energy storage and load management.

One side effect of delaying the construction of new power plants is that older, less efficient power plants remain in service longer than they otherwise would. Even so, the important of conservation and efficiency on the demand side warrant aggressive promotion of the program. Metro-Dade can add to FPL's efforts through public education with particular focus on the building process.

2. **Adequately staff the recently established utility division within Metro-Dade's Department of Development and Facilities Management in order to investigate various rate structures that encourage and reward utilities for energy conservation.** (Indirect)

Utility rate structures are being reviewed in many states in an effort to encourage conservation, to incorporate the long term environmental costs of various production alternatives, to consider the value of efficient and sustainable energy sources, to maintain a reliable energy system, and to keep consumer costs and utility profits reasonable. The Florida Public Service Commission is currently evaluating conservation goals as a way of addressing some of these issues. Despite energy efficiency regulations and demand-side management programs, average per capita consumption has increased in recent years, though not as much as it would have in the absence of these programs. By carefully reviewing alternative pricing and conservation approaches, Metro-Dade can effectively participate in this policy discussion which has the potential to increase efficiencies and conservation, decrease emissions, and decrease costs.

3. **Promote the Energy Conservation & Assistance Program** (ECAP).(Indirect)

Metro-Dade should work with the Small Business Development Center Network to help promote ECAP and increase public participation by 10%. The goal of this project is to: reduce the per capita energy consumption in the State of Florida; reduce a company's electric bill; and encourage the development of energy saving devices and energy management programs. The ECAP program is funded by the Florida Energy Office and is administered through the Small Business Development Center network. Metro-Dade can help by acquainting small businesses which receive County permits or approval with ECAP services.

D. SOLID WASTE

Background and History

Dade County residents and visitors generate more than 3,000,000 tons of solid waste each year, a 50% increase in 10 years. In 1991-92 about 24% of Dade's total waste stream was recycled, a substantial increase from the 10% recycled in 1988-89, though still short of the 1994 State of Florida's 30% recycling goal.

Dade County is a national leader in waste management. The Metro-Dade Department of Solid Waste (DSWM) manages one of the nation's largest integrated waste disposal systems consisting of 3,000 tons per day waste-to-energy facility, a Class I sanitary landfill, a supporting Class III trash-only landfill and three regional transfer stations.

RECYCLE BETWEEN 30 AND 50% OF DADE COUNTY'S WASTE STREAM

Measure 1 could achieve an annual CO_2 reduction of between 1,188,000 and 1,979,000 tons of CO_2 by 2005.

1. **Continue to implement and promote the following recycling programs.** (Direct)
    - ❖ single-family residential
    - ❖ multi-family residential
    - ❖ commercial
    - ❖ yard trash
    - ❖ disposal facilities
    - ❖ Metro-Dade Government facilities

In order to achieve compliance with the State of Florida's 1994 30% recycling goal, the DSWM has implemented a variety of recycling efforts. These programs include a curbside recycling program serving over 265,000 households, a yard trash mulch recycling program, a recycling materials drop-off program, and ferrous and aluminum recovery at the Resources Recovery Plant. In addition to various programs operated directly by the DSWM, the County has implemented two recycling ordinances, the first requires commercial and multi-family establishments to provide recycling programs to their occupants and/or residents and the second mandates participation in the program. As a part of this effort, Metro-Dade County facilities and offices are implementing recycling programs. The DSWM continues to develop additional programs, such as clean organic waste composting and high-grade trash processing, in order to

increase the County's recycling potential. In this way, the County is planning to meet and exceed the State's 1994 recycling goal.

RECOVER AND UTILIZE LANDFILL METHANE

This measure is estimated to reduce 177,000 tons of CO_2 over the life of the landfill.

1. **Recover and flare or use the methane gas to generate electricity for the South District WasteWater Treatment Facility.** (Direct)

The South Dade Landfill is a 340-acre five-cell landfill. Cells 1 and 2 have been filled and closed, the third is currently being filled and the fourth is being developed. As a result of the materials decomposing, landfills emit gases, 50% of which is methane (CH4). Methane is a potent "greenhouse gas" because it has a high warming potential that is approximately 21 times that of CO_2.

The Metro-Dade DSWM is currently investigating several different options for recovering and utilizing the methane to generate power. One alternative is the delivery of medium-BTU gas to the South District Wastewater Treatment Facility. Since methane is a potent "greenhouse" gas, simply flaring the gas will result in a substantial reduction, however, the use of methane as an alternative fuel will result in an even greater savings.

REDUCE SOLID WASTE GENERATED BY UP TO 5%

The following measures could reduce 389,000 tons of CO_2.

Measures

1. **Implement community-wide reduction programs.** (Direct)

Given the significant level of growth in the waste stream over the last twenty years or so, achieving even a modest reduction would be a tremendous accomplishment. The waste reduction program includes the following components: educating consumers to avoid the purchase of excessive packaging and other disposal items; and promoting the home composting residential program in order to encourage a reduction in the amount of yard trash entering the waste stream.

2. **Institute waste reduction purchasing practices in Metro-Dade.** (Direct)

Metro-Dade County Government is currently implementing procurement policies and practices to achieve reduced purchasing of disposal or single-use products and reduced purchasing of excessive packaging.

VI. IMPLEMENTATION

The plan's CO_2 targets and alternatives are a framework for policy development and should be used as a guideline for long-term planning. Each alternative in the plan will be given a priority in terms of CO_2 reduction potential and cost-effectiveness. Specific implementation measures will be prepared for Commission action, as appropriate. Various public education/outreach programs will also be developed simultaneously. In order to successfully carry out this strategy, there should be a coordinated effort to monitor, evaluate and modify the plan. The implementation process includes the following objectives:

1. Create the capacity to monitor programs and results and made modifications to the plan if necessary.
2. Actively involve representations of all community sectors in this process.
3. Foster public awareness of global warming and public awareness issues to encourage individual choices supportive of the goal.
4. Actively encourage other communities to undertake similar plans in recognizing that global warming is a worldwide problem which cannot be solved by the actions of isolated communities.
5. Actively encourage state and federal agencies to support the plan and to exercise their authority and responsibility to address global warming.

VII. CONCLUSION

The project's developmental process has generated an increased awareness for the need to tackle global warming at the local level. This increased awareness should prove beneficial when public outreach programs are established to encourage individuals to drive less and conserve energy at home.

The National Academy of Sciences in a report entitled "Policy Implications of Greenhouse Warming" has stated that "despite the great uncertainties, greenhouse warming is a potential threat sufficient to justify action now."[16] The premise of the project is based on this NAS statement. The Board of County Commissioners has recognized the potential threat to the County from global warming. It is clear that this problem cannot be solved unilaterally. It must be a collective effort between international, national and local governments and citizenry.

This plan represents a set of measures that are considered important to significantly reducing CO_2 emissions. Many options in this plan have been identified in other existing plans and are justifiable for many reasons. For example, extending transit would help reduce congested roads, improve air quality, decrease reliance on fossil fuels, increase national security, decrease respiratory illnesses and improve the quality of life. Computing the dollar value of these benefits is difficult, but all of the benefits should be considered in the economic analysis. There are also other measures in the plan which could cost very little to implement or are ongoing. As individual implementation decisions are made, it will be important to evaluate carefully all of the costs and benefits.

A major purpose of this plan is to focus continuing attention on the potential global impacts of local actions. It is apparent that individual decisions and the decisions of local governments can and do result in global impacts. By using this plan as a guide to specific actions across several important policy areas, Metro-Dade can provide important leadership for its residents and other local governments. Working through the Urban Consortium and the International Council for Local Environmental Initiatives, Metro-Dade can encourage those actions in other areas, thereby reducing the risk of the potentially serious consequences of global warming.

[16] Opening statement of Senator Gore, before the U.S. Senate Committee on Commerce, Science, and Transportation, April 25, 1991.

APPENDICES

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