Chapter 3
Energy Supply and Demand (ESD)

Overview of Sectoral Greenhouse Gas Emissions

The Energy Supply and Demand (ESD) sector includes all greenhouse gas (GHG) emissions that are associated with energy usage in the residential, commercial, and industrial (RCI) sectors, as well as emissions from the electricity supply sector. These combined sectors are responsible for the majority of Florida's GHG emissions — 53 percent of the total in 2005. The state's future trends in GHG emissions therefore will depend heavily on future activities and climate policies in the ESD arena. ESD emissions can be separated into two categories – direct emissions that occur as fuels are used on-site at residential, commercial, and industrial buildings and facilities, and indirect emissions that occur at sites where electricity is produced.

Direct emissions of GHGs from the RCI sectors result principally from the on-site combustion of natural gas, oil, and coal, plus non-energy sources of GHG emissions. Some examples include CO_2 generated during cement production; the use of sulfur hexafluoride (SF_6) in the utility industry; the leakage of hydrofluorocarbons (HFCs) from refrigeration and related equipment; and the release of methane (CH_4) and nitrous oxide (N_2O) during oil and gas production and distribution. In Florida, direct emissions from RCI sectors in 2005 account for 11 percent of total GHG emissions– 6 percent from on-site combustion and 5 percent from non-energy sources.

Considering only the direct emissions that occur within buildings and industries, however, ignores the GHG emissions associated with electricity use in these facilities. Virtually all electricity sold in Florida is consumed as the result of activities in the RCI sectors. Emissions associated with producing the electricity consumed in Florida were responsible for about 42 percent of Florida's total GHG emissions in 2005. Since Florida imports almost 10 percent of its electricity from other states, the GHG emissions associated with the imported electricity are included in the accounting of Florida's total emissions.

Figure 3-1 shows GHG emissions from the ESD sectors by fuel type from 1990 through 2025, and illustrates the large fraction of emissions associated with electricity use. As described in Chapter 2, Inventory & Projections, estimates of future GHG emissions are based on projections from the Florida Reliability Coordination Council, the U.S. Energy Information Administration, and other sources. The resulting forecasts indicate that GHG emissions from the ESD sectors will increase by 24 percent from 2005 to 2025, with large increases expected from industrial process activities.

Figure 3-1 Projected ESD GHG emissions by fuel type in Florida, 2005 to 2025

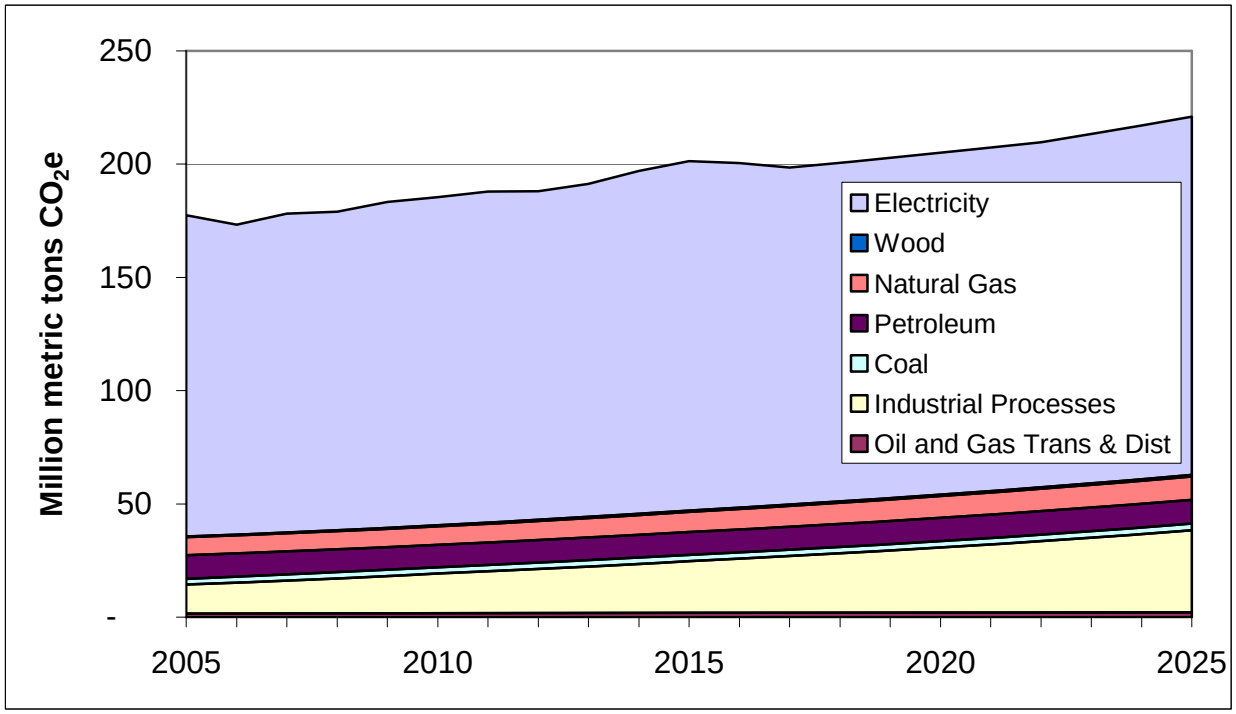
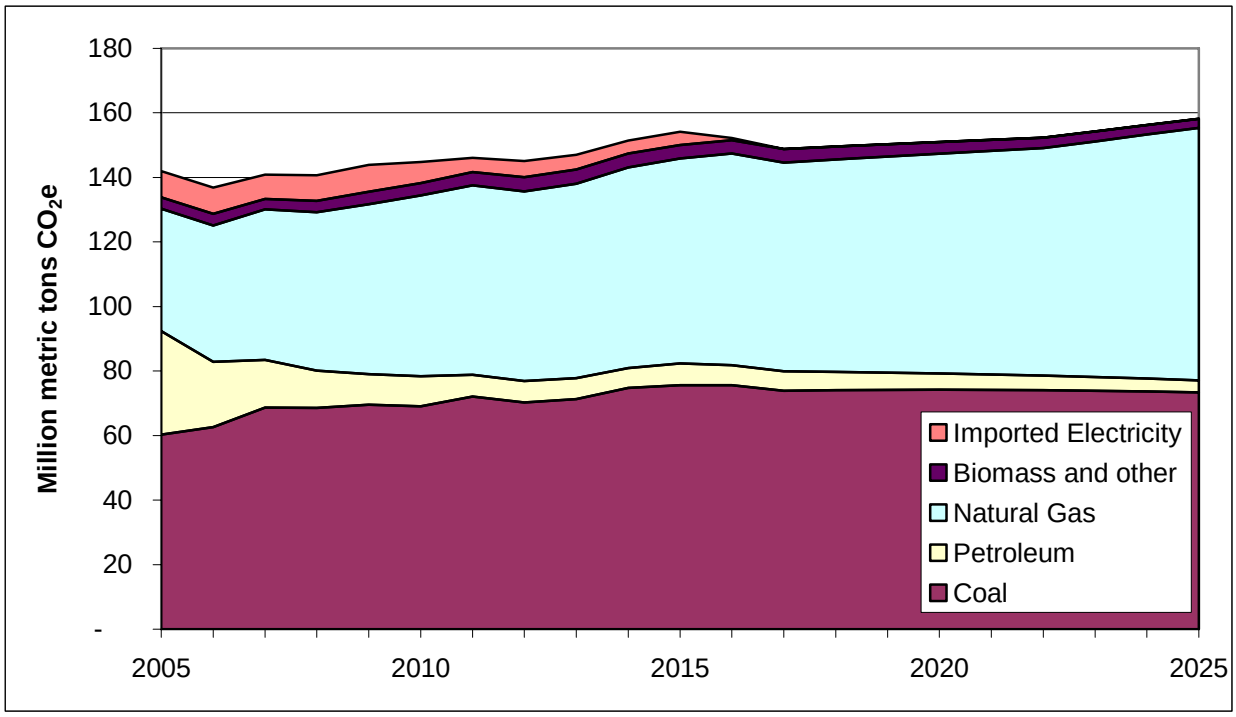


Figure 3-2 shows projected GHG emissions from electricity use in Florida. This information repeats the GHG emissions associated with electricity use in Figure 3-1, but provides additional information on the GHG emissions associated with different fuels used to produce electricity. (Nuclear and renewable power does not appear in Figure 3-2 because consumption of these resources does not directly result in GHG emissions.) As indicated, GHG emissions from electricity use increases by 11 percent from 2005 to 2025, even as electricity sales increase by 39 percent over the same time period. Florida's electricity sector is projected to be less GHG-intensive due to a combination of more nuclear power and more efficient natural gas generation, and less coal and petroleum generation. See Chapter 2 for more information on reference case projections from the electricity sector.

Figure 3-2 Projected Electric Sector GHG emissions by fuel type in Florida, 2005 to 2025



Key Challenges and Opportunities

As shown in the above charts, Florida's GHG emissions from ESD could increase by 24 percent between now and 2025. Florida's increasing population and economic growth, combined with increases in energy consumption per person, are key drivers for this projected growth in emissions. While countering the growth in emissions from the ESD sectors is no small challenge, Florida has a number of opportunities to reduce emissions. The choice and implementation of climate policies and supporting initiatives will be key to helping citizens and businesses take full advantage of these reduction opportunities.

The opportunities to reduce GHG emissions from ESD in Florida include improving energy efficiency in new and existing buildings and industrial facilities, using renewable resources and other low-GHG energy sources (such as solar water heating, photovoltaics, biomass, and nuclear power) to replace fossil fuels for producing electricity and heat, and increasing distributed (consumer-sited) electricity generation based on combined heat and power.

Recent actions by Florida's Governor, the Florida Legislature, and all aspects of state government demonstrate a strong commitment to exploring opportunities that will reduce energy consumption and increase renewable energy supply. In 2008, the Legislature passed new energy efficiency standards in the statewide building codes. The requirements are to be

incrementally scaled up to provide a 50 percent improvement in energy efficiency by 2019, relative to the 2007 codes. In addition, Florida's Energy Efficiency and Conservation Act (FEECA) was enacted in 1980, placing an emphasis on reducing the growth rates of weather-sensitive peak demand, reducing and controlling the growth rates of electricity consumption, and reducing the consumption of scarce resources such as petroleum fuels. The Florida Public Service Commission (PSC) adopted rules requiring those electric utilities that are subject to FEECA to implement cost-effective energy efficiency programs and additional incentives for increased efficiency gains, as contained in the 2008 legislation.

Florida has taken a multifaceted approach to reducing barriers to renewable generation and bringing those technologies to market. For example, the PSC has approved standard offer contracts to reduce regulatory lag and negotiations between qualifying renewable facilities and utilities. In 2008, the PSC approved tariffs to implement one of the nation's most aggressive net-metering laws, intended to promote the development and interconnection of customer-owned renewable generation, such as solar photovoltaic power. The PSC is currently developing a rule for a Renewable Portfolio Standard (RPS), which could encourage utility-scale renewables. This rule will be presented to the Legislature in its 2009 Session.

Overview of Policy Recommendations and Estimated Impacts

The Governor's Action Team on Energy and Climate Change (Action Team) recommends a set of 19 policies for the ESD sector, offering the potential for significant GHG emission reductions. A summary of the ESD recommendations developed is shown in Table 3-1. Policies were grouped into "Tier 1" and "Tier 2" in order to focus the resources for analyzing these opportunities. Criteria for the tiers were based on the following:

- Tier 1 – recommendations which were expected to lead to significant GHG reductions by 2025 and were relatively straightforward to analyze (information readily available, similar policies had been implemented elsewhere)
- Tier 2 – policies that did not meet the criteria for Tier 1

The Action Team noted the importance of all of the ESD policies, including both Tier 1 and Tier 2, but chose to focus quantitative analysis and subsequent recommendations (as described below) on the Tier 1 recommendations. (More information on Tier 2 options can be found in Appendix A.) Table 3-1 also includes estimated GHG reductions of recent policy actions that have been implemented by Florida. Many of Florida's recent policy actions are included in the reference case forecast. Changes to the building code, however, were quite recent, and since the impacts of those changes are not reflected in the forecast, they have been estimated for the Action Team, with the results of the analysis presented below.

Table 3-1 Summary List of Policy Recommendations

Policy No.	Policy Recommendation	GHG Reductions ($MMtCO_2e$)			Net Present Value (See Note 2) 2009–2025 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Status of Recommendation
		2017	2025	Total 2009–2025			
Tier 1							
ESD-5	Promoting Renewable Electricity through Renewable Portfolio Standard (RPS), incentives and barrier removal (20% by 2020)	17	34.5	319	-$9,274	-$29	Approved
ESD-6	Nuclear Power	0.0	7.3	49.4	$1,782	$36	Pending
ESD-7	Integrated Resource Planning (IRP)	Not to be quantified					Approved
ESD-8	Combined Heat and Power (CHP) Systems	1.8	2.2	26.5	$126	$5	Approved
ESD-9	Power Plant Efficiency Improvements	8.4	8.9	111.4	–$1,541	–$14	Approved
ESD-11	Landfill Gas-To-Energy (LFGTE)	3.7	8.7	64.7	$79	$1	Approved
ESD-12	Demand-Side Management (DSM)/Energy Efficiency Programs, Funds, or Goals for Electricity	13.0	21.8	201.4	–$8,566	–$43	Approved
ESD-13a	Energy Efficiency in Existing Residential Buildings	3.4	5.4	50.4	-$1,432	-$28	Approved
ESD-14	Improved Building Codes for Energy Efficiency	0.0	4.9	9.9	-$265	-$27	Approved
ESD-15	Training and Education for Building Operators and Community Association Managers	*Not to be quantified*					Approved
ESD-17	Consumer Education Programs	*Not to be quantified*					Approved
ESD-23	Decoupling	*Not to be quantified*					Approved
Recent Actions							
	Building Codes for Energy Efficiency (HB 697 and Executive Order 127)	8.0	15.4	136.5	-$4,082	-$30	Not applicable
Sector Totals		**47.4**	**93.6**	**832.8**	**-$19,090**	**-$23**	
Sector Totals After Adjusting for Overlaps (see Note 3)		**44.4**	**106.4**	**841.3**	**-$16,143**	**-$19**	
Reductions from Recent Actions		**8.0**	**15.4**	**136.5**	**-$4,082**	**-$30**	
Sector Totals, including recent actions and adjustment for overlaps		**52.4**	**121.8**	**977.8**	**-$20,226**	**-$21**	

Policy No.	Policy Recommendation	Energy Security Fuel Savings (Saved 2009 - 2025)		
		Coal (million short tons)	Natural gas (billion cubic feet)	Petroleum (million gallons)
Tier 1				
ESD-5	Promoting Renewable Electricity through Renewable Portfolio Standard (RPS), incentives and barrier removal (20% by 2020)	37	4,092	654
ESD-6	Nuclear Power	4	733	61
ESD-7	Integrated Resource Planning (IRP)	*Not quantified*		
ESD-8	Combined Heat and Power (CHP) Systems	5	198	431
ESD-9	Power Plant Efficiency Improvements	14	1,383	241
ESD-11	Landfill Gas-To-Energy (LFGTE)	0	27	4
ESD-12	Demand-Side Management (DSM)/Energy Efficiency Programs, Funds, or Goals for Electricity	19	2,266	326
ESD-13a	Energy Efficiency in Existing Residential Buildings	6	650	100
ESD-14	Improved Building Codes for Energy Efficiency	0	171	4
ESD-15	Training and Education for Building Operators and Community Association Managers	*Not quantified*		
ESD-17	Consumer Education Programs	*Not quantified*		
ESD-23	Decoupling	*Not quantified*		
Recent Actions				
	Building Codes for Energy Efficiency (HB 697 and Executive Order 127)	16	1,750	279
Sector Totals		**85**	**9,520**	**1,822**
Sector Totals After Adjusting for Overlaps (see Note 3)		**172**	**6,394**	**68**
Reductions from Recent Actions		**16**	**1,750**	**279**
Sector Totals, including recent actions and adjustment for overlaps		**188**	**8,144**	**347**

Policy No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value (See Note 2) 2009–2025 (Million $)	Cost-Effective-ness ($/tCO_2e$)	Status of Option
		2017	2025	Total 2009–2025			
Tier 2							
ESD-1	Technology Research and Development (R&D) with Commercial Opportunities	**The Action Team noted the importance of all options but the focus for analysis and subsequent recommendations was on Tier 1 policies.**					
ESD-4	Electricity Transmission and Distribution Improvements						
ESD-13b	Incentives for New Residential Buildings and Master Planned Communities Achieving High Energy Performance Standards						
ESD-16	More Stringent Appliance/Equipment Efficiency Standards						
ESD-18	Incentives to Promote Implementation of Customer-Sited Renewable Energy Systems						
ESD-21	Rate Structures and Technologies to Promote Reduced Greenhouse Gas (GHG) Emissions						
ESD-22	Demand-Side Management (DSM)/Energy Efficiency Programs, Funds, or Goals for Natural Gas						

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; HB = House Bill.

Note: The numbering used to denote the above pending priority policies is for reference purposes only; it does not reflect prioritization among these important policies.

Note 2: Negative numbers in the "Net Present Value" column denote recommendations for which the discounted value of the monetary **benefits** of the recommendation are greater than the discounted total **costs** of the policy.

Note 3: The emissions reduction and cost estimates shown for each individual recommendation presume that each policy is implemented alone. Many recommendations interact extensively, as they target the reduction of energy use or emissions from the same sources. Therefore, if multiple recommendations are implemented, the results will not simply be the sum of each individual recommendation result. After individual recommendation assessments were complete, a "combined policies" assessment was conducted to estimate total emission reductions, and to capture the overlaps among policies that are reported here.

These Tier 1 recommendations include efforts to increase the use of renewable and waste-based resources for generating electricity (ESD-5, ESD-11), increase the use of nuclear power (ESD-6), improve the energy and GHG emissions performance of buildings, power plants and other activities (ESD-9, ESD-12, ESD-13a, ESD-14), and increase the penetration of combined heat and power systems (ESD-8). All of these recommendations have been quantitatively analyzed, and the estimates prepared suggest that the recommendations can provide substantial reductions in GHG emissions. Other Tier 1 recommendations include support for electric power planning

requirements (Integrated Resource Planning, ESD-7) that directly considers attributes such as GHG emissions, Training and Education for Building Operators and Community Association Managers (ESD-15), Consumer Education Programs (ESD-17), and a regulatory policy recommendation (Decoupling, ESD-23) designed to reduce disincentives for utilities to invest in energy efficiency. These recommendations are crucial policies that support the ESD recommendations that have been quantitatively analyzed, but have not been analyzed individually.

The ESD recommendations yield an annual GHG emissions reduction, from reference case projections, of 92 $MMtCO_2e$ in 2025, and cumulative reductions of 708 $MMtCO_2e$ from 2009 through 2025, at a net cost of approximately -$16 billion through the year 2025 on a Net Present Value (NPV) basis. This result accounts for overlaps between recommendations and for the cumulative changes that the electricity savings (through efficiency) and generation, provided by the recommendations, will have on the patterns of electricity demand and supply in Florida. The weighted-average cost of saved carbon for the combination of all ESD recommendations evaluated is -$23/$tCO_2e$ avoided. The negative costs indicate that, over time, the savings from the recommendations (from energy efficiency and/or avoided use of fossil fuels) will exceed the costs of implementation.

The Action Team also analyzed the estimated impact of Florida's recent changes to its building code, as described above, which is expected to result in substantial GHG emission reductions of about 15 $MMtCO_2e$ in 2025, and cumulative reductions of about 136 $MMtCO_2e$ through 2025. The net cost is approximately –$4 billion through the year 2025 on an NPV basis.

Energy Supply and Demand (ESD)
Policy Descriptions for Tier 1 Recommendations

Tier 1 recommendations are described briefly below. More information on each of these recommendations, plus the Tier 2 options, can be found in Appendix A to this report.

ESD-5. Promoting Renewable Electricity Generation through Renewable Portfolio Standard (RPS), Incentives and Barrier Removal

The fundamental policy objectives of encouraging renewable electricity generation are to reduce GHG emissions, provide fuel diversity, and stimulate Florida's economy. A Renewable Portfolio Standard (RPS) sets the minimum amount of electricity from renewable sources that must be generated and supplied to the electricity grid in a given year. This minimum requirement is applied to each utility, but provisions are often made for utilities to purchase renewable electricity or credits from other utilities.

The PSC is currently engaged in rulemaking for a RPS in Florida. This rule must be presented to the Legislature in its 2009 Session for its consideration and ultimate ratification. The Action Team recommends that the policy require 20 percent of retail electricity sales be met by renewable energy by 2020.

ESD-6. Nuclear Power

Nuclear power has historically presented a low-GHG source of electricity. No new commercial reactor has come on line in the United States since 1996 due to a combination of high capital costs, the absence of an operational system for permanent disposal of nuclear waste, and perceived risks to public safety. The administration of President George W. Bush has been supportive of nuclear expansion, emphasizing its importance in maintaining a diverse energy supply and its reputation for producing electricity with negligible pollutant emissions during operation. Congress has also offered significant financial subsidies for new nuclear plants in an effort to jump-start the industry, including limitations on liability for nuclear accidents.

As of 2006, nuclear power plants provided about 20 percent of electric power nationally and 14 percent of Florida's generation. The goal for this policy is the installation of two additional (relative to the reference case) reactors/units of 1,100 MW each, in 2020. The reference case forecast for the electricity sector assumes the installation of the facilities and capacities that are currently planned and permitted in Florida, including a total of four 1,100 MW reactor units at the Turkey Point and Levy sites. The Action Team also recommends vigorous efforts in Florida and across the nation to safely address issues associated with nuclear waste material.

ESD-7. Integrated Resource Planning (IRP)

Integrated Resource Planning (IRP), as it relates to electric utilities, is an economic planning process designed to identify the lowest practical cost at which a utility can deliver reliable energy services to its customers. It differs from traditional resource planning (the 10-Year Planning process currently used in Florida), in that it requires the use of analytical tools that assess and compare the costs and benefits of demand and supply-side energy resources. IRP should help to identify and standardize the critical assumptions across each of the varied planning forums that drive utility resource decisions while building in flexibility to account for future uncertainties. While originally targeted primarily toward cost-minimization, IRP processes increasingly have considered the environmental risks and the potential costs and benefits associated with future GHG regulations.

This recommendation calls on Florida to undertake an integrated resource planning regime that embraces the idea of "least cost-best fit" as its primary criterion. Depending on its design, the

IRP regime in Florida could be a means of implementing many of the other ESD recommendations.

ESD-8. Combined Heat and Power (CHP) Systems

Combined heat and power (CHP) is generally considered to refer to the use of a heat engine or a power station to simultaneously generate electricity and useful heat. CHP systems reduce fossil fuel use and GHG emissions through the improved efficiency of the CHP systems, relative to separate heat and power technologies, and by avoiding transmission and distribution losses associated with moving power from central power stations located far away from where the electricity is used. For this policy, CHP is defined broadly to include large-scale projects for heat and waste heat recovery. Also, it is intended to include the potential capture of all sources of byproduct heat generation, including waste heat from exothermic reactions when sulfuric acid is produced (such as is generated in phosphate fertilizer manufacturing).

The Action Team recommends that this policy be implemented by providing financial incentives and addressing the numerous barriers to development of CHP systems, including: inadequate technical information; institutional barriers; high transaction costs due to small project size; lender unfamiliarity and perceived risk; "split incentives" between building owners and tenants; and utility-related policies, such as interconnection requirements, high standby rates, and exit fees.

ESD-9. Power Plant Efficiency Improvements

Efficiency improvements refer to increasing generation efficiency at power stations through incremental improvements at existing plants (for example, more efficient boilers and turbines, improved control systems, or the use of combined cycle technology) and/or repowering. Repowering existing plants refers to switching to lower- or zero-emitting fuels at existing plants or for new capacity additions. This includes use of biomass or natural gas in place of coal or oil, thus reducing emissions rates at existing plants.

The Action Team recommends consideration of a range of policies that would encourage efficiency improvements and repowering of existing plants by including incentives or regulations as described in other recommendations and offering additional financing opportunities for those efficiency improvements.

ESD-11. Landfill Gas-to-Energy

The capture of methane gas from landfills provides an opportunity to reduce direct emissions of methane from landfills and to produce electricity. Added policy benefits of landfill gas power plants include producing base-load-like electric generation, and offering the opportunity for combined heat and power to serve nearby thermal loads.

The Action Team recommends consideration of the expansion of landfill gas to energy in Florida either through a mandate or an incentive program.

ESD-12. Demand-Side Management (DSM)/Energy Efficiency Programs, Funds, or Goals for Electricity

Demand Side Management (DSM)/energy efficiency programs, and funds or goals for electricity entail actions that influence the quantity and/or patterns of use of energy consumed by end users. For this recommendation, DSM refers to programs implemented by utilities with the objective of reducing electricity consumption. Historically, Florida DSM programs have focused more on peak power demand savings than on electrical energy savings; thus, this recommendation represents a shift in the objectives, and therefore the application, of DSM by Florida utilities.

This recommendation focuses on increasing investment in electricity efficiency through programs run by utilities or others, energy efficiency funds, and energy efficiency goals. These programs may be designed to work in tandem with other strategies that encourage efficiency gains. The policy design includes two key and linked dimensions: achievable/desirable energy savings and policy/administrative mechanisms to achieve these savings.

The Action Team recommends consideration of a range of policy and administrative mechanisms that might be applied include: regulator-verified savings targets; public benefit charges; portfolio standards; "energy trusts"; IRP as noted above; performance-based incentives; decoupling of rates and revenues; and appropriate rate treatment for efficiency. Potential mechanisms include revisions of existing statutes to enable utility investments in energy efficiency at the levels indicated above, and consideration of eligible programs that are cost-effective, taking into account the valuation of carbon dioxide emissions.

ESD-13a. Energy Efficiency in Existing Residential Buildings

With more than 50 percent of electricity in Florida used in residences, focusing attention on energy efficiency improvements to existing home structures has the potential to provide substantial reductions in electricity usage and associated GHG emissions.

The Action Team recommends consideration of a range of measures, including: incentives that focus on existing residential buildings, including low- or zero-interest energy efficiency loans; rewards for alternative business models aimed at delivering energy efficiency services; usage of energy performance benchmarks for buildings and incentives for exceeding the benchmarks; and health and safety standards that complement energy efficiency features.

ESD-14. Improved Building Codes for Energy Efficiency

Buildings are significant consumers of energy and other resources. Building energy codes can be an effective way to ensure that the most energy-efficient practices are incorporated into new or renovated buildings. This policy sets a goal for reducing building energy consumption to be achieved by increasing standards for the minimum performance of new and substantially renovated commercial and residential buildings through the adoption and enforcement of building codes. Building codes would be made more stringent via incorporation of aspects of advanced or next-generation building designs and construction standards, such as sustainable design and green building standards.

House Bills 697 and 7135 signed into law in 2008 call for the energy efficiency requirements of the Florida Energy Efficiency Code to be incrementally scaled up to 50 percent higher than the 2007 code by 2019. The Action Team recommends that the scale-up of energy efficiency requirements from House Bill 697 and House Bill 7135 be made to continue beyond 2019.

ESD-15. Training and Education for Building Operators and Community Association Managers

Energy Management Training provides administrative and technical training for energy managers, school officials, building operators, and others responsible for energy-efficient facility operation. The Action Team recommends the following:

- Train commercial building energy managers, for example, by making use of the building operator training and certification program developed in the Pacific Northwest;
- Train industrial energy and facility managers in techniques for improving the efficiency of their steam, process heat, pumping, compressed air, motors, and other systems, perhaps in collaboration with ongoing U.S. Department of Energy programs in this area; and
- Create a credentialing program for certification of "green" energy managers that requires both training and examinations to qualify.

ESD-17. Consumer Education Programs

In many cases, the ultimate effectiveness of emissions reduction activities depends on providing information and education to consumers regarding the energy usage and resulting GHG emissions implications of their choices. Public education and outreach is vital to fostering a broad awareness of climate change issues and effects (including co-benefits, such as clean air and public health) among the state's citizens. Such awareness is necessary to engage citizens in actions to reduce GHG emissions in their personal and professional lives. Public education and outreach efforts should integrate and build on existing outreach efforts involving climate change and related issues in the state. Ultimately, public education and outreach will be the foundation for the long-term success of all of the mitigation actions proposed by the Action Team, as well as those that may evolve in the future from other entities. The Action Team recommends the following measures:

- Institute mandatory labeling programs for time-of-sale (TOS) energy use for all consumer products, devices, and systems (including all buildings) that can be evaluated by either testing or computer simulation, and educate consumers on the implications of these labels.
- Create a public inquiry "information center" to provide factual answers (vetted by experts in the field) to common energy-efficiency and GHG questions.
- Provide public education materials and energy information that can be used at local levels by minimally trained speakers.
- Create an awards program that recognizes businesses and individuals exhibiting exemplary behavior or performance with respect to local energy and climate public education programs or in local GHG or energy use reduction programs.
- Provide Public Service Announcement (PSA) programs.

ESD-23. Decoupling

Traditional regulatory frameworks tie a utility's recovery of fixed costs of providing service (for example, infrastructure costs) to the quantity of energy sold. As a result, there is a contrary "incentive" for utilities to increase sales in order to boost revenues and minimize investments in energy efficiency (which would lead to lower sales). This recommendation includes the implementation of cost recovery rules that "decouple" the level of utility sales from net revenues earned by investor-owned utilities. Decoupling should be geared exclusively to remove barriers to utility investment in programs to increase customer energy efficiency and reduce customer loads. Decoupling mechanisms should be carefully designed in order to avoid, as much as possible, adverse economic impacts on ratepayers and to ensure that the decoupling mechanism is fair to both consumers and shareholders.

HB 7135 directed the PSC to analyze utility revenue "decoupling" and to provide a report and recommendation to the Governor, President of the Senate, and Speaker of the House of Representatives by January 1, 2009. The PSC began its workshops on this topic in August 2008.