Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands

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- Advising policymakers and program managers
- Working collaboratively with businesses, public interest groups, and other organizations
- Organizing conferences and workshops
- Publishing books, conference proceedings, and reports
- Educating consumers and businesses

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EXECUTIVE SUMMARY

Florida is among the fastest growing states in the country, and the state's electricity demand is growing even faster than the state's population. To sustain this rapid economic and population growth, Florida needs to take action to meet the resulting increases in energy needs. A particular challenge is peak demand (those times when extreme heat or extreme cold crank up air conditioners and heaters), which is growing slightly faster in recent years than regular day-to-day electricity demand, and is the most expensive type of electricity.

Florida's unique energy vulnerabilities have also become apparent during the past several years. Florida is one of the most natural-gas-dependent states in the country, with more than a third of its electricity generated by natural gas. In December 2005, the natural gas "crisis" drove utility prices from less than $3 per thousand cubic foot to over $14, a price that hurt Floridians' pocketbooks. The pain intensified when Hurricane Katrina disrupted natural gas supplies and jeopardized electricity generation. While the price of natural gas has fallen over the past year, it still costs over two and a half times more than it did when many of the state's new natural gas power plants were planned. It is not the bargain we once thought. To meet the growing electricity needs, Florida's utilities project the need for both more natural-gas- and coal-powered plants.

Opportunities for Energy Efficiency and Renewable Energy

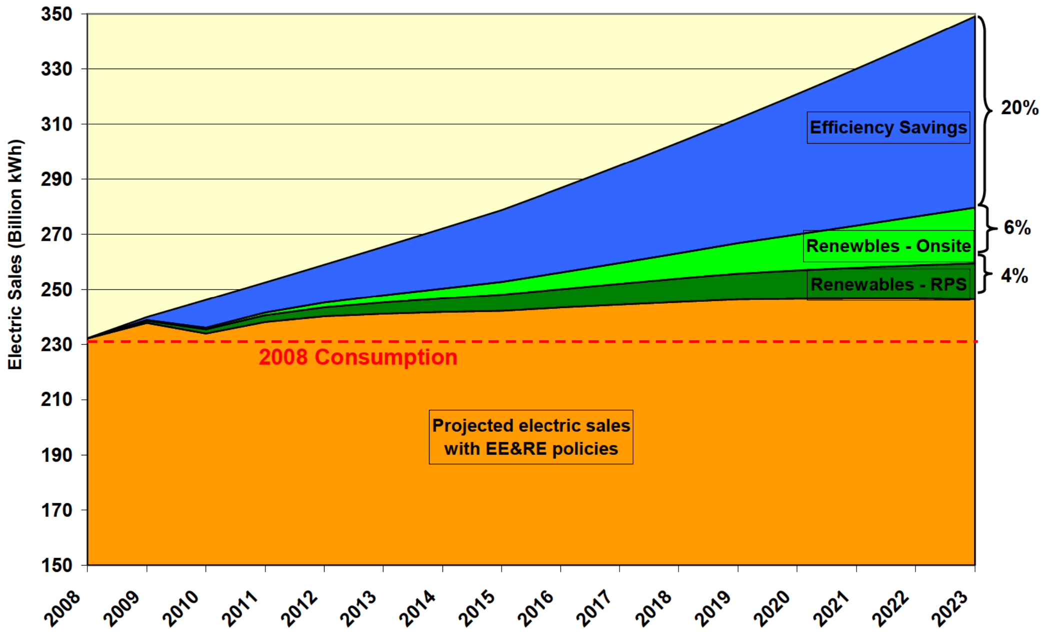
Fortunately, another suite of energy resource options is available—slowing energy demand growth with energy efficiency resources and demand response, and diversifying the supply resources with renewables. This report explores the magnitude of the efficiency and renewable resources that are available to the state, and suggests some specific policies that could be implemented to reduce future energy demands. If all the policies we recommend were implemented, the state could reduce its projected future use of electricity from conventional sources (i.e., natural gas, coal, oil, and nuclear fuels) by about 29% in the next 15 years (see Figure ES-1). Energy efficiency accounts for about two-thirds of the 2023 total 102,513 million kWh electricity reductions, with the renewable energy provisions accounting for the balance.

To make these energy efficiency and renewable energy resources a reality, we recommend eleven specific policies that the state should consider adopting:

1. Utility-Sector Energy Efficiency Policies and Programs (EERS)
2. Appliance and Equipment Standards
3. Building Energy Codes
4. Advanced Building Program
5. Improved Combined Heat and Power (CHP) Policies
6. Industrial Competitiveness Initiative
7. State and Municipal Buildings Program
8. Short-Term Public Education and Rate Incentives
9. Expanded Research, Development, and Demonstration Efforts
10. Renewable Portfolio Standard (RPS)
11. Onsite Renewables Program

Figure ES-1. Share of Future Electricity Consumption that Can Be Met with Energy Efficiency and Renewable Energy Resources

2023 Savings = 102,513 Million kWh



We believe these policies would establish a foundation upon which the state could build a sustainable energy future, while improving the state's economic health. The most significant energy efficiency recommendation is for a Utility-Sector Energy Efficiency Program, specifically an Energy Efficiency Resource Standard (a utility savings target similar to the RPS concept), which accounts for 30% of the total savings in 2023 (see Table ES-1). As would be anticipated because of the importance of buildings-related electric loads, buildings policies (including an improved building energy code and advanced buildings policies) would contribute another 19% toward the total electricity savings in 2023.

Our calculations show that these energy efficiency and renewable energy policies can also reduce peak demand for electricity by over 20,000 MW in 2023, or 32% of projected peak demand. In addition, we also recommend that the state consider implementing a robust demand response effort, which could reduce peak demand by an additional 4,353 MW in 2013 and 9,637 MW in 2023, or 9% and 15% of projected peak demand, respectively (see Figure ES-2). While the utilities in the state have had various curtailable tariffs for many years, there is much more that could be done to reduce peak electrical loads. Demand response programs combined with energy efficiency and renewable energy policies could slow the rapid growth in peak demand projected by the state's utilities.

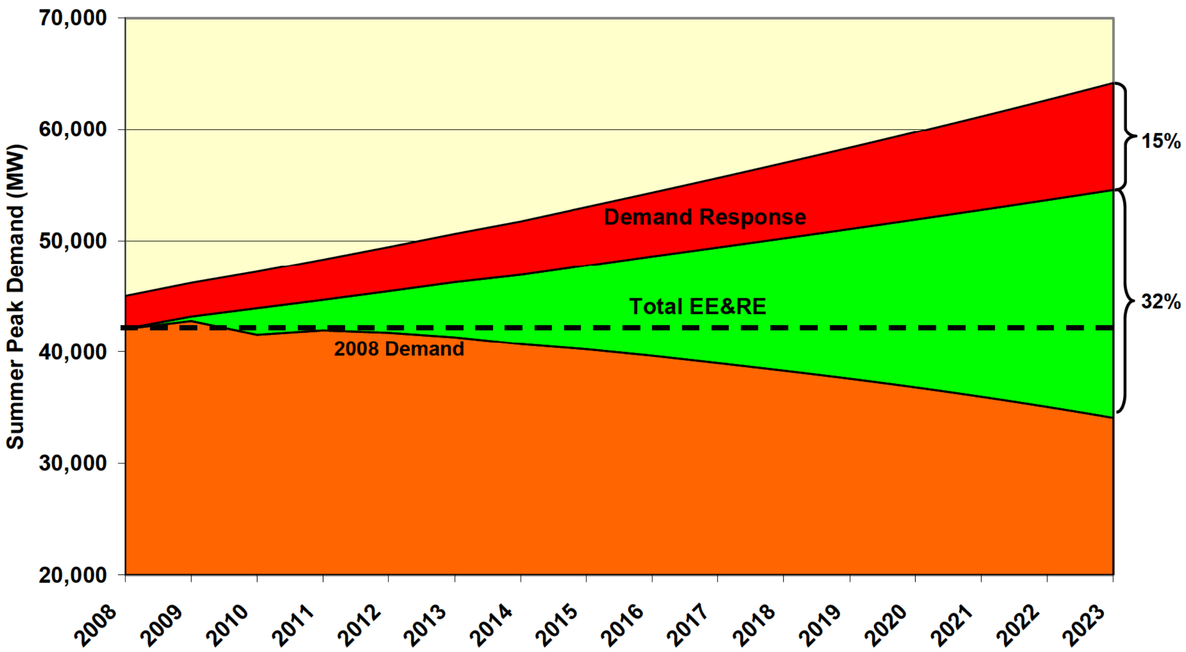
Our study asserts that energy efficiency, coupled with renewable energy, can slow future electricity demand. It would also diversify the state's energy resources, making Florida less vulnerable to global markets and volatile energy prices. The study shows that implementing energy efficiency policies alone (such as efficient windows, compact fluorescent light bulbs, and ENERGY STAR new homes and appliances) can almost offset the future growth in electric demand.

Table ES-1. Summary Results from Analysis of Recommended Policies

Annual Savings in 2013 and 2023

		2013		2023	
	Energy Efficiency (EE) Policies	**Electricity Savings (million kWh)**	**Demand Savings (MW)**	**Electricity Savings (million kWh)**	**Demand Savings (MW)**
1	Utility savings target	7,183	1,375	30,962	5,828
2	More stringent building codes	1,760	336	12,286	2,302
3	Public buildings program	1,536	293	4,608	847
4	Improved CHP policies	1,097	172	3,291	517
5	Short-term public ed. & rate incentives	4,582	873	3,549	653
6	Appliance & equipment standards	776	233	3,680	990
7	Advanced buildings program	458	336	7,503	2,302
8	Industrial competitiveness initiative	232	44	676	124
9	Expanded RD&D efforts	23	6	2,800	756
	Subtotal	*17,647*	*3,668*	*69,354*	*14,319*
	Renewable Energy (RE) Policies				
10	Onsite renewables policy package	2,542	486	20,183	3,775
11	Renewable portfolio standard	4,090	779	12,976	2,386
	Subtotal	*6,631*	*1,265*	*33,159*	*6,161*
	Total	**24,278**	**4,933**	**102,513**	**20,480**

Figure ES-2. Impact on Summer Peak Demand of Expanded Demand Response, Energy Efficiency, and Renewable Energy



Economic and Jobs Impacts

Increased investments in energy efficiency rather than construction of new conventional power generation would result in significant reduction in consumer energy expenditures over the next 15 years, while promoting robust job growth in the state (see Table ES-2). The energy efficiency policies would reduce consumer energy costs by over $28 billion relative to constructing new power plants, and would result in the creation of more than 14,000 new jobs—many trade jobs related to the implementation of the energy efficiency measures. The direct and indirect total jobs mean that the efficiency strategy would be equivalent to nearly 100 new manufacturing plants relocating to Florida, but without the demand for infrastructure and other energy needs. And, in light of recent volatility in energy prices, the efficiency strategy would have an added benefit of balancing the fuel supply and therefore stabilizing energy prices.

The state's environment would benefit as well, with reductions in conventional power plant operations reducing sulfur dioxide (SO_2) by more than 16 thousand tons and nitrogen oxides (NO_X) by almost 11 thousand tons. With concern growing about global warming, these efficiency measures would reduce carbon dioxide (CO_2) by over 37 million metric tons in 2023, making a down payment of reducing the state's carbon signature.

Table ES-2. Economic Impact on the State of Florida of Expanded Energy Efficiency

Financial Impacts (Millions of $2004)	**2008**	**2013**	**2018**	**2023**
Annual Consumer Outlays	1	1,585	2,172	2,584
Annual Electricity Savings	3	1,174	2,679	4,674
Electricity Supply Cost Adjustment	(1)	(894)	(1,867)	(2,975)
Net Consumer Savings	3	484	2,375	5,065
Net Cumulative Energy Savings	2	840	8,652	28,250
Macroeconomic Impacts	**2008**	**2013**	**2018**	**2023**
Jobs (Actual)	(33)	366	7,557	14,264
Wages (Million $2004)	(2)	(168)	(62)	64
GSP (Million $2004)	(4)	(1,134)	(1,857)	(2,745)
Estimate of Avoided Emissions *	**2008**	**2013**	**2018**	**2023**
SO_2 (thousand short tons)	0.0	5.9	10.8	16.3
NO_x (thousand short tons)	0.0	3.7	6.7	10.9
CO_2 (million metric tons)	0.0	11.1	21.8	37.1

* Note: Emissions are based on average emission rates.

Conclusions

Based on this analysis, we are confident that energy efficiency and renewable energy can change Florida's energy future for the better. Energy efficiency resource policies can offset the majority of projected load growth in the state over the next 15 years. Expanded development of renewable energy resources in the state would further reduce future needs for conventional generation. Combined, these policies can meet nearly 30% of projected needs for electricity in 2023, deferring the need for many new electric power generation projects in the state.

The economic savings from the recommended energy efficiency policies alone in this report can cut Florida consumers' electricity bills by about $840 million by 2013 and $28 billion by 2023. While these savings will require substantial investments, they cost less than the projected cost of electricity from conventional sources. In addition, the investments would save consumers money while creating new jobs for the state.

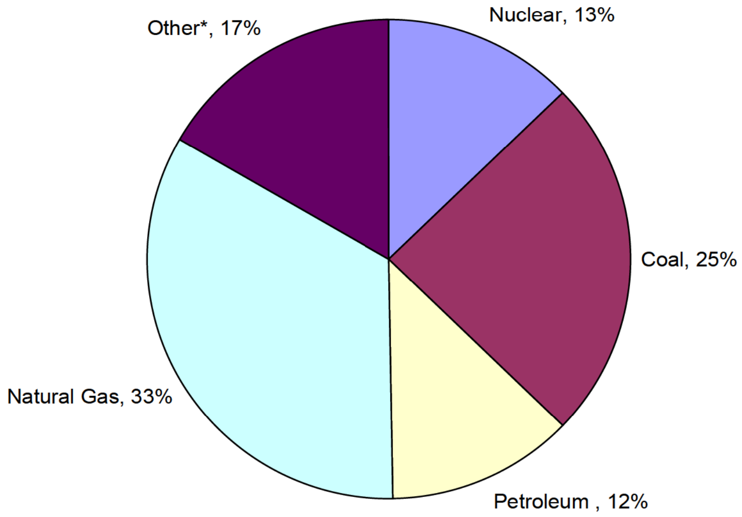
Reducing demand for electricity with efficiency and renewables will also reduce emissions from the combustion of fossil fuels at utility power plants, offering the state a more sustainable environmental future at an affordable cost and allowing the state to start on a path to reducing its global warming emissions.

Florida faces important decisions regarding its energy future. The current course calls for investments in new coal, gas, and potentially nuclear generation to make sure that the state has enough electricity to sustain its economic prosperity. Energy efficiency and renewable energy resources would offset some of that growth in demand, offering a lower cost, cleaner, and more stable energy path, without sacrificing Florida's quality of life or its economic growth.

INTRODUCTION

The past decade has seen fundamental shifts in national energy markets. Low prices and surplus capacity for both natural gas and electricity in the 1990s have been replaced by high natural gas prices and rising electric prices, resulting from tight natural gas markets and constraints in other generating fuels markets (Elliott 2006). Florida has been particularly hard hit by this shift because of its dependence on natural gas for electric power generation. The state generates 32.5% of its electricity (see Figure 1) from natural gas (FPSC 2006a), in contrast to a national average of 13.7% (EIA 2006a). By 2015, natural gas-fired electricity is expected to comprise 43.7% of Florida's generation mix (FPSC 2006a).

Figure 1. Florida 2005 Utility Energy Generation by Fuel Type (%)



* "Other" includes Non-Utility Generation (3.3%), Wholesale (7.1%), Hydro (0.1%), and Non-Specified (6.3%).

Tightening natural gas markets in the early years of this decade began to create problems for the state as rapidly growing demand for electricity exceeded deliverability of the natural gas supply system. The resulting market tightness has amplified natural gas price volatility (Elliott 2006). The hurricanes of 2005[5] were felt particularly strongly in Florida as disruptions in natural gas production and transmission imperiled temporarily electricity system reliability for the state. These problems have led to calls to diversify the state's fuel mix while adding new capacity to meet growing demand. The Florida Public Service Commission (FPSC) projects summer peak demand to grow at 2.39% per year and winter peak to grow at 2.36% annually over the next ten years (FPSC 2006a). This means that the state will need to find additional energy resources (Economy.com 2007).

According to FPSC, the utility industry's response to the challenge of meeting the growth has been to propose construction of about 10,500 MW of new natural gas and 5,200 MW of new coal capacity (FPSC 2006a). The FPSC has also called for greatly increased resource

[5] For more information, see Energy and Environmental Analysis, Inc. (2005) on the effect of the hurricanes.

commitments in fuel diversity, energy efficiency, demand response, and renewable generation (FPSC 2006a).

The state took some initial steps, as evidenced by the passage of the *2006 Florida Energy Act* (SB 888), that focused some attention on both renewable energy and energy efficiency as resource options, rather than relying on conventional power supply resources. The legislation established a solar rebate program, grant and tax credit opportunities, and a sales tax holiday for ENERGY STAR® appliance purchases. The Public Service Commission must review the state's need for new generation, and any proposed steam generator larger than 75 MW is subject to a Commission need determination; as part of that proceeding, the proposing utility must show that "all cost-effective conservation and demand-side management (DSM) opportunities have been exhausted in order to obtain a need determination order for new electric generating capacity" (FPSC 2006a).

Although total peak demand and energy saved by Florida's investor-owned utilities have increased over the past decade, total expenditures in DSM recovered by utilities fell steadily between 1995 and 2004. This occurred because Florida requires energy efficiency programs to meet a cost-effectiveness test, but declines in the capital and fuel costs of new generating units lowered the potential cost reduction benefits from deferring generating capacity. At the same time, changes in appliance standards and building codes to increase energy efficiency left less opportunity for utility-sponsored efficiency programs to make a substantive, cost-effective impact (FPSC 2006c). Recently, investor-owned utilities have filed significant new DSM plans, though the focus of the plans remains largely focused on demand reductions rather than energy savings as a result of the direction provided by the FPSC (IOU 2007).

Scope and Purpose of this Project

This report estimates the capacity for energy efficiency and renewable energy resources in Florida and suggests a suite of policy options that the state should consider to realize their achievable potential. As the report will show, energy efficiency resources are available at a fraction of the cost of new conventional generation, slowing the rate of energy demand growth while offering greater resource diversity and system reliability compared with construction of major new conventional generation. Expanded energy efficiency policies will also result in energy cost savings to consumers, creation of new jobs in the state as a result of the investments and substantial reduction in emissions from electric power generation. Expanded investment in renewable energy resources would reduce emission even more and place the state on the path for a sustainable energy future.

The remainder of this report is divided into five sections:

1. Overview of the reference case used for this analysis and how the results should be used;
2. An assessment of the economic potential for energy efficiency, combined heat and power, renewable energy, and demand response;
3. Suggestion of a portfolio of policy recommendations that could help realize the resource potential identified in the economic assessment, and projected impacts of these policies;

4. Suggestions on how these policies might be implemented in Florida; and
5. The assessment of the economic impacts of the suggested policies on the economy of the state, employment and consumer energy bills, and reduction in emissions.

Details on the analyses and assumptions are included in appendices along with the detailed results tables.

OVERVIEW OF ANALYSIS

Methodology

We approached this analytical effort by building upon other state resource potential analyses that ACEEE has undertaken over the past two decades. During these years, we have developed a general approach as follows:

1. We began the analysis by developing reference projections for electric consumption and demand, disaggregated by end-user category (e.g., residential, commercial, and industrial) based on available data, along with estimates of energy prices and utility avoided costs (as discussed in the next section).
2. We then assessed the potential for energy savings and demand reduction in each sector, based on available technology performance and cost.
3. We applied the savings projections to the reference case to estimate the impact that efficiency and renewable resources could have on the state's energy future.
4. We developed a set of policy proposals that have achieved results reliably in other states' energy markets, and we estimated the fraction of the potential savings that would be realized if these policies were implemented.

ACEEE's research has identified three general types of energy efficiency and renewable energy resource potential: technical, economic, and achievable.

- The technical potential represents what can be saved from available or emerging efficiency and renewable technologies and practices without considering the cost of the measures.
- The economic potential represents the fraction of the technical potential that is cost-effective under a set of technology costs and avoided costs developed for the analysis period.
- The achievable potential represents the fraction of the economic potential that can plausibly be realized in the marketplace given market constraints (e.g., equipment turnover rates) and the impacts of programs and policies that could be implemented. For purposes of this study, we have elected not to develop an entirely new set of technical potential data, because numerous studies conducted by ACEEE and others have largely characterized the potential measures that are available in Florida. This allowed us to focus on the more important economic potential and achievable potential estimates (see Nadel, Shipley, and Elliott 2004 for a more detailed discussion of these issues and past research).

With respect to the achievable potential estimates, we have relied upon results from the best-practice programs and policies that have been implemented in other states in recent years; these are discussed in the section on policy recommendations. While the economic potential reported here represents the overall size of the resource, for policy-making decisions, the appropriate focus should be on achievable potential results.

Energy Demand Reference Case

In order to determine energy efficiency potentials for Florida, it was first necessary to establish disaggregated reference case energy consumption and demand forecasts. There are currently no publicly available long-term energy consumption forecasts that include both statewide and end-use sector (residential, commercial, and industrial) breakdowns. We used short-term electricity sales and summer peak demand forecasts (through 2015) from the Florida Reliability Coordinating Council (FRCC) and applied an average growth rate to project to the year 2023 (FRCC 2006) (see Tables 1 and 2). For electricity consumption data, we used FRCC's total and end-use sector data, which accounts for conservation in each sector. For peak demand forecast, we used FRCC's "Summer Net Firm Peak Demand," which accounts for demand reduction from conservation and load management. Sector-specific forecasts of peak summer demand, however, were not included in FRCC data.

We also used publicly available data from the U.S. Department of Energy's Energy Information Administration (EIA) and purchased data from economy.com for other economic information to produce sector-specific data for the electricity consumption reference case forecast.

Table 1. Florida Reference Case Electricity Consumption Forecast by End-Use Sector

	Million kWh			2008–2023
Sector	**2008**	**2013**	**2023**	**Average Growth Rate**
Electricity Consumption—All Sectors (million kWh)*	232,396	265,566	349,059	2.8%
Residential	120,011	137,401	179,259	2.7%
Commercial	83,456	96,572	131,960	3.1%
Industrial[+]	22,541	24,306	31,412	2.2%
Peak Summer Demand—All Sectors (MW)	45,029	50,611	64,184	2.4%

* Total electricity sales also include street and highway lighting and unspecified "other" sales, which are not specified here.
[+] Note that the FRCC estimates for industry are used for the policy estimates, but that a more detailed disaggregated forecast discussed below is used for the economic analysis.

Figure 2. Reference Forecast for Electricity Consumption by Sector

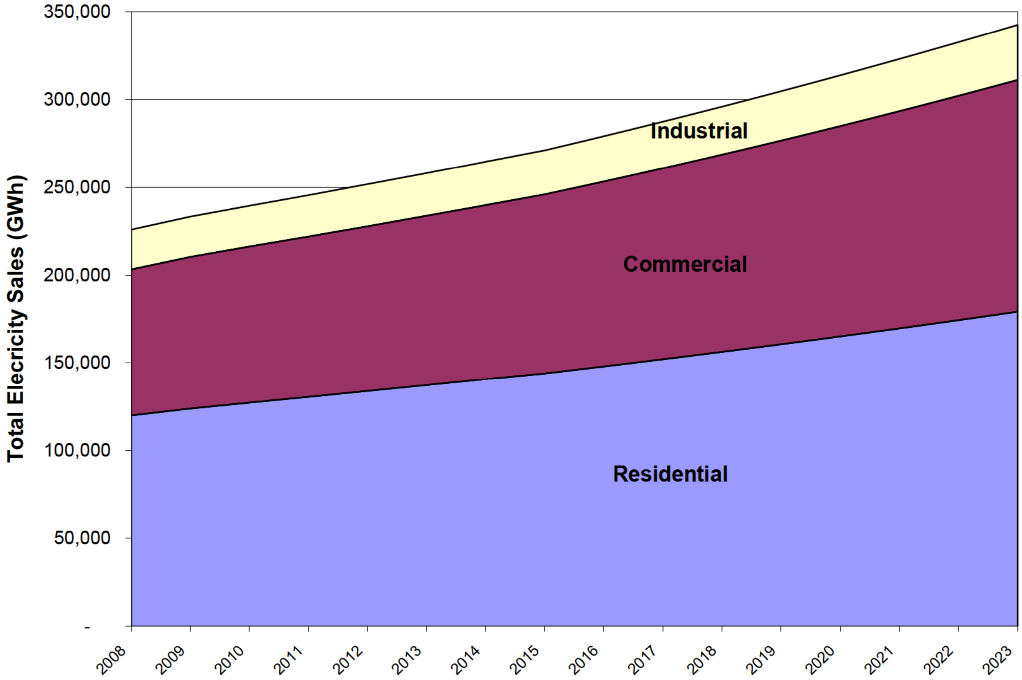
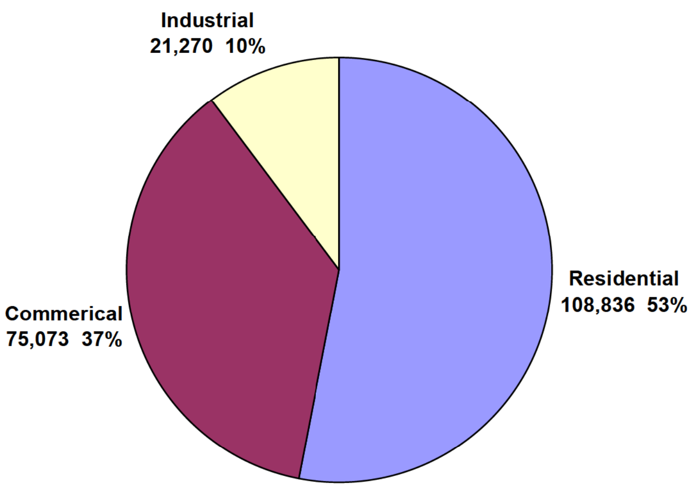


Figure 3. 2005 Florida Electricity Consumption (Million kWh)



Source: FRCC 2006

Industrial Sector

Comprehensive, highly disaggregated electricity data for the industrial sector is not available in the state-level FRCC forecast. To estimate the electricity consumption, this study drew upon a number of resources, all using the same classification system[6] and sample methodology. Fortunately, a conjunction of the various economic censuses for each state allows us to use a common base year of 2002. The major data source available for Florida was *2002 Economic Census Subject Series for Mining and Manufacturing* (Census 2006).

Unfortunately, disaggregated state-level electricity consumption data was not reported for the sub-sectors (such as chemical, paper, primary metals industries, etc.). Because of the magnitude and diversity in this manufacturing sub-sector, it is important to disaggregate beyond the sub-sector or industry group level (e.g., the fraction of pharmaceutical products in the chemicals industry). As a result, we used national industry electricity intensities derived from industry group electricity consumption data reported in the *2002 Manufacturing Energy Consumption Survey* (MECS) (EIA 2005) and the value of shipments data reported in the *2002 Annual Survey of Manufacturing* (ASM) (Census 2005). These intensities were then applied to the value of shipments data for the manufacturing energy groups (three-digit NAICS) in Florida. These electricity consumption estimates were then used to characterize each sub-sector's share of the industrial sector electricity consumption.

Because state-level disaggregated economic growth projections are not publicly available, data was used from the *Annual Energy Outlook 2006* (AEO) (EIA 2006b). The growth rate of industrial electricity consumption from the 2006 AEO was applied to the base year (2002) disaggregated electricity consumption. These values were then calibrated to the 2005 industrial electric sales as stated in the 2005 *Electric Power Annual* (EIA 2006c).

ECONOMIC POTENTIAL: COST-EFFECTIVE ENERGY SAVINGS FROM EFFICIENCY AND RENEWABLE ENERGY

As noted above, the economic potential represents an assessment of the overall resource potential that exists from energy efficiency and renewable energy, given an assessment of full benefits and full costs. In this section, we evaluate energy resources that are cost-effective, i.e., the dollar savings from reduced energy consumption or demand outweighs implementation costs to the customer. In general, experience with actual programs suggests that only a portion of this is realistically achievable in the real world from programs and policies (see Nadel, Shipley, and Elliott 2004). In the next section, we explore the fraction of this economic resource potential that can be realistically achieved through a suite of suggested policies, limiting our analysis to full policy and investment costs, but only direct electricity bill impacts or savings. This analysis does not take into consideration any externalities, such as avoided emissions, avoided future carbon control risks, health implications, or other indirect benefits of this deployment of these resources. If these costs were included, energy efficiency and renewable energy resources would be even more cost competitive with conventional fossil-fueled generation.

[6] ACEEE's industrial analyses use the North American Industrial Classification System (NAICS) to disaggregate industrial sector economic activity and energy use.

Residential Efficiency

In 2005, Florida's residential sector consumed about 50% of the state's electricity use. There is a large potential for cost-effective electricity savings in the state from energy efficiency improvements in both existing and new homes. To estimate this potential for homes in Florida, detailed building energy use analysis was conducted for both new and existing residential buildings. The analyses were conducted using the EnergyGauge® software suite.[7] This software suite uses the DOE-2.1E building energy simulation engine, with simulation enhancements and a user-friendly front-end and report preparation functions written by the Florida Solar Energy Center (FSEC), to simulate energy use.

Baseline homes were created for both existing and new building prototypes and then efficiency improvement measures for these baselines were compared on a measure-by-measure basis to determine the energy and demand savings potential for each measure. For residential buildings, a table of costs was prepared using a combination of the R.S. Means database (RSMeans 2005) and the best judgment and experience of the authors. The detailed cost data used for this analysis are given in Appendix A.

For residential buildings, the existing baseline prototype was configured using a process that "calibrated" the home's characteristics against a large data set of monitored existing home energy end-use characteristics that were measured in central Florida homes (Parker 2002). For new homes, the baseline prototype was configured to reflect the minimum code compliance characteristics of the latest edition of the Florida Building Code, which became effective December 8, 2006. These new Florida building code requirements are closely aligned with the minimum requirements of the 2006 International Energy Conservation Code (IECC). The detailed characteristics of the new and existing baseline homes along with the individual efficiency improvements considered by the analysis are provided in Appendix A.

Using the simulated energy savings, the cost data, and a capital recovery discount rate of 4.5%, a levelized cost of conserved energy (CCE) was calculated for each efficiency measure (Meier, Wright, and Rosenfeld 1983). Using the CCE, sets of efficiency "packages" were then created by selecting non-competing single efficiency measures that produced CCEs of less than $0.11/kWh.[8] These packages were then simulated to determine the energy and demand savings and the levelized cost for each package. For new homes, an ENERGY STAR new home and a federal tax credit package were also created and analyzed by combining the most cost-effective efficiency measures from the measures list that qualified the homes for these programs. To estimate the statewide potential for energy savings in both existing and new homes, the savings from each package of efficiency measures were then applied to a percentage of homes to which the cost-effective measures would be applicable.

Existing homes can achieve significant energy savings through more efficient air conditioners, insulation improvements, and more efficient lighting and appliances. Efficiency measures in Package EH1 includes six replacement measures: SEER 15 air

[7] EnergyGauge is a registered trademark of the Florida Solar Energy Center. See http://energygauge.com/

[8] The cut-off of $0.11/kWh was selected as a reasonable value in light of the fact that the average retail residential cost of electricity in Florida is currently running at about $0.12/kWh.

conditioner and 9.0 HSPF heat pump; efficient air ducts (reducing air leakage from 10% to 3%); ceiling insulation improvement from R-18 to R-30; solar hot water system; 50% fluorescent lighting replacement; and programmable thermostats. At a levelized lifecycle cost of about $0.10 or less per kWh saved, homeowners can reduce electricity consumption by up to 28% by implementing these measures. We assume that 50% of homes can cost-effectively implement Package EH1 measures by 2023, for a total savings of 15,681 GWh statewide by 2023. Package EH2 achieves even greater savings: about 47% electricity savings per home at a cost of about $0.07 per kWh saved. In addition to the measures included in Package EH1, Package EH2 also includes the replacement of an old refrigerator with an ENERGY STAR unit, selection of ENERGY STAR ceiling fans, the replacement of a standard roof with a cool roof (high performance roofing materials), the replacement of regular windows with high-efficiency windows, and a change of wall color to white We assume that by 2023, 20% of homes can cost-effectively achieve Package 2 efficiency measures, resulting in statewide savings of 11,628 GWh.

New homes built in the 15-year period between 2008 and 2023 can achieve significant additional savings. A total of 30 new home measures and measure packages are analyzed by this study (see Figure 4 for cost and savings information for these measures). The acronyms and descriptions of the single measures and measure packages are given in Appendix Table A-1. New homes that achieve 50% savings of heating and cooling energy (or about 25% savings of total home energy use), which are currently eligible for a $2,000 federal tax credit, are achievable at a levelized cost of $0.03 per kWh saved when the tax credit is used. A second package reaches the Energy Star level of performance (15% savings) and results in a levelized cost of $0.06 per kWh saved. A third option for new homes is a more aggressive package of measures (Package NH1) that reaches 40% total energy savings at a cost of about $0.06–0.07 per home.

A high level of adoption of efficiency measures in new buildings is achievable through building energy codes. We assume that 50% of new homes in 2008 can meet the cost-effective ENERGY STAR specifications and that new Florida building codes mandating 15% savings above today's code go into effect in 2009, resulting in savings of 5,764 GWh by 2023. We assume that 50% of new homes built between 2008 and 2023 can achieve the Tax credit eligible homes level of savings, resulting in additional savings of about 3,894 GWh. We assume that 10% of new homes can achieve the Package NH1 savings cost-effectively, resulting in an additional 838 GWh of electricity savings by 2023. Using these assumptions, we estimate that there is an economic potential (i.e., potential for cost-effective energy efficiency measures) of 40,293 GWh statewide electricity savings by 2023, or 22% of the projected electricity consumption of 179,259 GWh in the same year. See Table 2 for the breakdown of potential savings.

Figure 4. Annual Energy Savings and Levelized Cost of Conserved Energy for Energy Savings Measures and Packages for New Homes in South Florida (Miami)

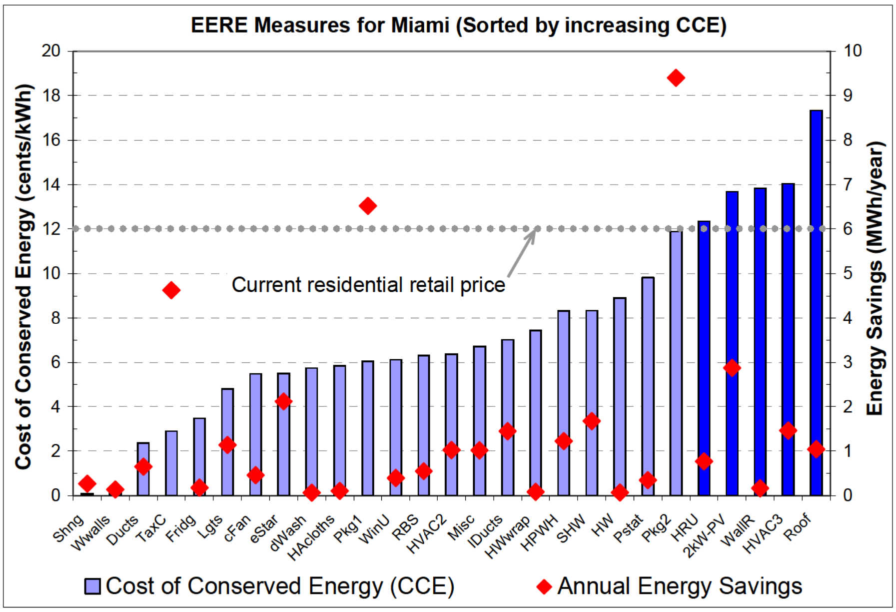


Table 2. Residential Energy Efficiency Measures

Existing Homes Efficiency Measures	kWh Saved per Home per Year (Statewide Average)	2023 Statewide Savings (GWh)	Economic Savings Potential (% of Total Residential Electricity Potential)	Cost per kWh Saved
Package EH1	*3504*	*15,681*	*39%*	*$ 0.10*
High-efficiency air conditioner (SEER-15; HSPF-9)	977			$ 0.09
Ducts: Normalized leakage 0.10 to 0.03	589			$ 0.08
Ceiling insulation: R-18 to R-30	560			$ 0.06
Solar hot water system	1780			$ 0.08
50% fluorescent lighting replacement	803			$ 0.06
Programmable thermostat with 2°F setup/setback	403			$ 0.08
Package EH2[a]	*6,497*	*11,628*	*29%*	*$ 0.07*
Cool roof	353			$ 0.00
ENERGY STAR refrigerator	157			$ 0.04
ENERGY STAR ceiling fans	560			$ 0.03
Miscellaneous load reduction (30%)	717			$ 0.09
Window replacement (U=0.39: SHGC=0.40 vinyl)	1257			$ 0.04
White walls (alpha = 0.40)	233			$ 0.00
New Construction				
ENERGY STAR Home (15% savings)	*2,021*	*8,252*	*20%*	*$ 0.06*
Tax Credit Eligible Home (25% savings)[b]	*1,857*	*3,894*	*10%*	*$ 0.03*
Package NH1 (40% savings)[c]	*1,998*	*838*	*2%*	*$ 0.07*
Total Savings (GWh)		**40,293**	**100%**	**$ 0.056**
% Savings (% of 2023 Projected Sales)		**22%**		

[a] Package EH2 efficiency measures also include all measures in Package EH1.
[b] Savings are incremental to ENERGY STAR Homes.
[c] Savings are incremental to both ENERGY STAR homes and Tax Credit Eligible Homes.

Commercial Efficiency

In 2005, Florida's commercial sector consumed about 40% of the state's electricity use. To estimate the potential for energy efficiency in commercial buildings in Florida, we defined baseline characteristics of the existing and new commercial buildings stock and then analyzed cost-effective packages of efficiency improvements in eight prototypical building types. We used the 1993 vintage Florida code requirements to define the baseline characteristics of the existing commercial building stock and the 2006 version of Florida's code to define the baseline characteristics of new commercial buildings. The 1993 vintage Florida code is equivalent to ASHRAE Standard 90.1-1989 and the 2006 version of the Florida code is equivalent to ASHRAE Standard 90.1-2004.

A total of eight commercial building types were simulated and analyzed by this study. These prototypes were developed by LBNL (Huang & Franconi 1999) based on the Commercial Buildings Energy Consumption Survey (EIA 1995). These prototypes represent building types, which cover 85% of the commercial building stock surveyed by CBECS. See Table 3 for a breakdown of potential savings by building type. The building types and sizes are:

- Large office (90,000 ft^2)
- Small office (6,600 ft^2)
- Large retail store (80,000 ft^2)
- Small retail store (6,400 ft^2)
- School (16,000 ft^2)
- Hospital (155,800 ft^2)
- Large hotel (250,000 ft^2)
- Restaurant (5,200 ft^2)

For the small existing building prototypes, the energy efficiency improvements included T-8 lighting retrofits and occupancy sensors, window film retrofit, cool roof retrofit, EER 12.5 air conditioning replacement, and variable speed drive blowers. For the large existing building prototypes, improvements included the same measures as for the small existing prototypes, except that chiller plant efficiency was improved to COP=4.7 rather that air conditioning replacement.

For the small new building prototypes, the energy efficiency improvements included improved wall and roof insulation (R-13 and R-30, respectively), a cool roof, daylighting and occupancy sensors, and high-efficiency cooling (EER-12.5) with variable speed drive blowers. For the large new building prototypes, the measures were the same except that the chiller plant efficiency was improved to COP=6.0.

According to our analysis, the economic efficiency potential for the commercial sector is roughly 30%, or 39,495 GWh, by 2023. The majority of the savings come from energy efficiency improvements in existing buildings (20,765 GWh), while significant additional savings can be achieved through advanced new buildings (18,730 GWh). See Table 3 for a breakdown of savings by building type and Appendix Tables A-11s and A-11b for more detailed efficiency measure savings information by region.