



FLORIDA SOLAR ENERGY CENTER®

Creating Energy Independence

Developing Natural Gas Cost Escalation Rates for the Associated Gas Distributors of Florida

FSEC-CR-1833-09

Final Report

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Submitted to

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Abstract

The Florida Solar Energy Center (FSEC) created a spreadsheet tool used to calculate the fuel escalation rates for electricity and natural gas for the previous 5-year and 10-year periods. These escalation rates are calculated at the local, State, and national level for both residential and commercial customers. The previous 5-year and 10-year general inflation rates as determined by the U.S. Department of Labor's Bureau of Labor Statistics consumer price index are also included. These calculations are made in accordance with rules established by the Florida Building Commission pursuant to rule 9B-13.0071 – Cost Effectiveness of Amendments to Energy Code.

Introduction

The Florida Department of Community Affairs (DCA) through the Florida Building Commission has adopted rules for determining the cost effectiveness of products or programs used in the construction or operation of Florida buildings. One such rule is the method for measuring the cost-effectiveness assessment of a specific product or program. This rule states that any proposed amendments to the Florida Energy Efficiency Code for Building Construction shall demonstrate cost effectiveness by applying tests as outlined in an associated document entitled “The Cost Effectiveness Test for Amendments to the Florida Energy Efficiency Code for Building Construction”.

A previous study¹, performed to assess the energy savings for various residential energy conservation measures, outlines the methodology used for economic assessments. This methodology was subsequently described in the aforementioned DCA document and adopted by reference on June 9, 2009 by the Florida Building Commission². The DCA rule and governing Florida statute along with the cost effectiveness test document are presented in Appendix A and B for completeness.

This report describes the accepted methodology used for determining several key economic impact factors used for economic analysis. The methodology described here was used to develop a [spreadsheet tool](#) used for calculating the inflation rates of these economic impact factors.

Economic Impact Factors

In general, the life-cycle cost of a particular consumer product is based on the initial cost of the product, the operating and maintenance costs over the life of the product, and any salvage value recovered at the end of the product's expected life. The life expectancy of the product may be measured in months, years, or even decades. In order to predict the total life-cycle cost of a specific product, economic impact factors must be used to predict the future costs of operating and maintaining said product. Several key economic impact factors used in typical economic analysis include the

¹ “Energy Efficiency Cost-Effectiveness Tests for Residential Code Update Process,” P. Fairey, R. Vieira, FSEC-CR-1794-09, February 27, 2009.

² [9B-13.0071](#): Cost Effectiveness of Amendments to Energy Code

general inflation rate and consumer price index, fuel escalation rates, and the monetary discount factor. These economic impact factors are described here.

Consumer Price Index

The U.S. Department of Labor's Bureau of Labor Statistics compiles monthly and annual statistics for changes in the prices of various goods and services³. These statistics are formally referred to as the Consumer Price Index (CPI). These statistics are compiled for many groups of goods and services as well as for multiple groups and service categories. Categories include foods, energy or fuels, household goods, and homes to name a few. One of these statistical measures is the cost of goods and services for all urban customers, known as CPI-U. The CPI-U is commonly used to represent the general inflation rate.

Discount Rate

The periodic compound interest rate at which a future cash flow is discounted back to the present value (PV) of money. The discount rate is also considered to be the interest rate charged to banks for borrowing short-term funds and would normally be considered to be 1.5% - 2% greater than the general inflation rate.

General Inflation Rate

The periodic rate increase in general consumer prices. The general inflation rate may be calculated using a base period where the reference cost is fixed in time or calculated using chained measurements where the reference cost changes over time. In this report, the general inflation rate will be considered analogous to the consumer price index for all urban consumers.

Fuel Escalation Rate

The periodic rate increase of energy. In this study, electricity and natural gas are the specific energy source. The energy cost is calculated as the revenue based cost of energy and may be calculated at the local, state, or federal level. The fuel escalation rate may also be adjusted for the general inflation rate in calculations which already include this economic impact factor.

Methodology for Determining Inflation Rates

Inflation rates describe the compounded annual increase or decrease in the price of a commodity or service over a period of time. The inflation rate can represent a change in price over the previous month or year, or the cumulative change in price over a number of months or years. The basis for the rate may be a fixed time (e.g., 1984), or represent a running time period (e.g., previous 5 years). With the various methods available for calculating the rate of inflation for specific products, a common methodology must be used to provide uniformity in the analysis technique. The Florida Building Commission's adoption of the cost effectiveness test methodology prescribes a method to be used for determining inflation rates. Specifically, the inflation rate shall be the greater of the most recent 5-year and 10-year annual compound inflation rate.

³ United States Department of Labor – [Bureau of Labor Statistics](#).

The annual compound inflation rate is defined here as: $r_{inf} = \left(\frac{c_0}{c_n} \right)^{1/n} - 1$

where:

r_{inf} = rate of inflation

c_0 = cost of goods or service at the end of the previous year (year 0)

c_n = cost of goods or services at the end of previous year n

The future value of goods and services can then be calculated using the annual compound inflation rate. Rearranging the terms in the previous equation, the future value at year n of a product or service with a current cost of c_0 is:

$$FutureValue = c_0 (1 + r_{inf})^n$$

The rate of inflation is typically presented as a percentage where an inflation rate (r_{inf}) equal to the numerical value 0.035 would be presented as 3.5%.

Calculating Inflation Rates

An economic analysis begins by first determining the goal and assumptions of the analysis. These assumptions and goals would then dictate the source of the data used to determine inflation rates. For example, a national program to predict the average cost of purchasing and operating an automobile would use the average national cost of the vehicle and a fuel inflation rate based on the national average fuel costs. Similarly, if a local dealership were to conduct the same program, this local dealership may choose to use the local dealership's vehicle cost along with the local fuel inflation rates calculated from fuel prices collected in the general area. Both the vehicle cost and fuel inflation rate described in these examples would be calculated on a revenue per unit basis. If multiple sources of data are collected (e.g., all local area dealerships and gas stations), the number of customers is also required to calculate a customer-weighted average unit cost.

For this project, the Association of Gas Distributors of Florida wishes to determine the state-wide fuel inflation rates for use in their economic assessment of various appliance programs. In addition, the costs associated with the largest utility companies throughout Florida were to be analyzed. Information was gathered in a spreadsheet based tool to allow the calculation of inflation rates for 2009 and beyond.

The 3 key economic impact factors described here are:

- General Inflation Rate (CPI-U)
- Fuel Inflation Rate
- Discount Rate

General Inflation Rate calculation

The general inflation rate used for this project will be considered to be analogous to the national consumer price index as calculated by the U. S. Department of Labor’s Bureau of Labor Statistics. The [Bureau of Labor Statistics](#) publishes historical prices for all urban consumers in 1983 dollars. Using the historical values for the previous 10 years, the 5-year and 10-year inflation rates can be calculated.

$$5\text{-year}; r_{inf} = \left(\frac{215.3}{184.0} \right)^{1/5} - 1 = 0.03192$$

$$10\text{-year}; r_{inf} = \left(\frac{215.3}{163.0} \right)^{1/10} - 1 = 0.02822$$

General Inflation Rate – CPI-U				
10-year	5-year	1998	2003	2008
2.82%	3.19%	163.0	184.0	215.3

The larger of the 5-year and 10-year inflation rate is used as the general inflation rate for economic calculations. For economic calculations performed in 2009, a value of 3.19% would be used.

Fuel Inflation Rate calculation

The energy prices used in this analysis reflect the costs of natural gas and electricity throughout the State of Florida. The energy prices for the four largest electric and natural gas utilities are also presented. In addition, the energy prices for the four utility companies will be averaged, based on the number of customers, and will be compared to the state-wide and national average energy cost. The energy costs are also a function of the rate schedule used by the utility and can vary widely for residential and commercial customers. In this project, the costs for both residential and commercial customers are examined.

The Florida Public Service Commission (FPSC) provides a summary of residential energy costs for both electricity and natural gas (Quick Search for [Comparative Rate Statistics](#) and scroll down). These statistical summaries were used to gather information for the past 10 years. For each utility company, the cost per unit energy along with the number of customers served by each utility were cataloged to allow averaging of utility data and comparison of this data with state and national averages. Using the previously described methodology, the 5-year and 10-year inflation rates were calculated.

The FPSC’s comparative rate statistics provides the information required to determine the average energy cost for the four largest utility companies in the State of Florida. The four electric utilities and associated statistics for the residential sector, as presented by the FPSC, are summarized in Figure 1 below. The number of customers, total revenue, and average revenue per kWh sold are presented. These statistics are available for the previous 10 years.

Similarly, the four natural gas utilities and associated statistics for the residential sector, also presented by the FPSC, are summarized in Figure 2 below. The number of customers, total revenue, and average revenue per therm sold are presented.

**Investor-Owned Electric Utilities
Growth and Use Statistics
December 31, 2008**

UTILITY	RESIDENTIAL				ANNUAL REVENUES				
	Average Annual Consumption		Number of Customers		Residential			Total Retail Operating	
	kWh	Percent Increase	As of 12/31/2008	Percent Increase	Total Revenue	Percent Increase	Avg. Revenue per kWh Sold (cents)	Revenue	Percent Increase
Florida Power & Light Co.	13,333	-3.70%	3,992,262	0.30%	\$6,216,864,898	-1.10%	11.68	\$11,295,886,437	0.30%
Progress Energy Florida, Inc.	13,339	-3.34%	1,448,933	-2.00%	\$2,273,649,802	-3.79%	11.76	\$4,002,713,138	-3.28%
Tampa Electric Co.	14,545	-3.80%	586,611	-0.40%	\$981,713,435	-3.60%	11.49	\$2,021,557,803	-4.60%
Gulf Power Co.	14,274	-3.26%	373,595	0.15%	\$562,922,559	2.67%	10.52	\$1,080,601,719	5.10%

Figure 1. Investor-Owned Electric Utility Growth and Use Statistics for Residential Consumers

**Investor-Owned Natural Gas Utilities
Growth and Use Statistics
December 31, 2008**

UTILITY	RESIDENTIAL				ANNUAL REVENUES				
	Avg. Consumption		Number of Customers		Residential			Retail Operating	
	Total Therms	Percent Increase	As of 12/31/2008	Percent Increase	Total Revenues	Percent Increase	Revenue per Therm	Total Revenue	Percent Increase
Chesapeake Utilities Corporation	247.00	4.70%	13,401	-2.00%	\$3,725,321	-1.23%	\$1.127	\$11,842,928	2.11%
Florida City Gas	174.00	1.00%	96,771	-84.00%	\$40,401,683	13.00%	\$2.400	\$93,534,826	8.08%
Florida Public Utilities Company	252.16	-95.00%	47,078	68.00%	\$23,675,370	10.00%	\$1.996	\$72,588,611	11.93%
Indiantown Gas Company	NR	NR	NR	NR	NR	NR	NR	NR	NR
Peoples Gas System	243.80	6.10%	304,111	-4.0%	\$150,457,999	7.40%	\$2.03	\$680,919,753	14.82%
Sebring Gas System	122.50	-2.70%	414	-97%	\$67,857	-4.26%	\$1.45	\$530,597	-52.28%
St. Joe Natural Gas Company	252.00	0.00%	3,097	8.20%	\$1,413,274	40.03%	\$2.02	\$2,510,865	0.00%

Note: All revenues include gas costs. All data unaudited, preliminary, and subject to change.

NR=Not reported

Figure 2. Investor-Owned Natural Gas Utility Growth and Use Statistics for Residential Consumers

Also available from the FPSC are the annual reports from the utility companies. These annual reports were used to determine the commercial energy costs for the four largest electric and natural gas utility companies. Information gathered from the Federal Energy Regulatory Commission's FERC Financial Report FERC Form No. 1: Annual Report of the Major Electric Utilities, Licensees and Others and Supplemental Form 3-Q: Quarterly Financial Report (select [Electric Companies](#) and click Electric radio button and then View – Page 304) was used to determine the commercial electric fuel cost.

Information gathered from the FPSC's Annual Report of Natural Gas Utilities (select [Gas Companies](#) and click Gas radio button and then View – Page 26) was used to determine commercial natural gas fuel cost.

The [Energy Information Administration \(EIA\)](#) is the official energy statistics agency of the U.S. government and publishes historical fuel cost data for residential and commercial consumers. This information is available for both electricity and natural gas and was used to determine the Florida State and U.S. national average fuel costs for both electric and natural gas.

Information from each of these sources was assembled into a spreadsheet tool and used for calculating economic impact factors. The spreadsheet tool used to calculate the energy cost inflation rate statistics is shown in Figure 3 for both residential and commercial consumers. Information is shown for years 1998 through 2008. Additional columns included in the tool, out through the year 2018, are not shown in these figures, but are available in the tool for calculating energy cost data for future years.

The 5-year and 10-year inflation rates are calculated for:

- The general inflation rate (consumer price index – CPI-U)
- Each of Florida's four largest electric and natural gas utility companies
- The customer-weighted average of the four largest electric and natural gas utility companies
- The state-wide average cost of electricity and natural gas
- The national average cost of electricity and natural gas

The spreadsheet tool automatically calculates the larger of the 5-year and 10-year inflation rates and highlights these values in green as shown in the figure. The 4-Utility Average shown in the figure is a customer-weighted average of the energy costs for the four largest electric and natural gas utility companies. The sum of the energy cost for each utility company multiplied by the number of customers in each service territory is divided by the total number of customers in all service territories. The fuel costs associated with each utility company and the 4-Utility Average are also compared to the Florida State and U.S. national averages.

Application of Economic Impact Factors

The economic impact factors described in this document may be used for a variety of economic analysis. The assumptions and goals for any given economic analysis will identify the specific impact factors to be used for the analysis. Let's identify the economic impact factors to be used for an energy conservation program in the State of Florida.

Program statement: Florida natural gas utility companies would like to implement an energy conservation program which will provide an incentive to specific Florida commercial customers to purchase a gas appliance over a comparable electric appliance.

- Assumptions: The program will be offered to customers residing in the territories of the four largest natural gas utility companies.
- Goal: Determine the economic impact factors used in this programs economic analysis.
- Appliance Costs: Although not related to the economic impact factors, the appliance costs are required to complete the economic analysis and would be an average of the purchase price, installation costs, operating and maintenance costs, replacement cost(s), and salvage value for the specific appliance as determined in the general service territories of the utility companies.

Given these assumptions and goals, the accepted methodology for defining a general inflation rate, an associated discount rate, and a commercial natural gas and electric fuel escalation rate is as follows.

1. The general inflation rate is assumed to be analogous to the consumer price index. In this case, the national average CPI-U rate is used. This method provides the simplest approach for determining the general inflation rate.
2. The discount rate is greater than the general inflation rate by 1.5%.
3. The natural gas and electric fuel escalation rates are derived from revenue based fuel costs. In this case, the commercial natural gas and electric fuel costs for Florida’s four largest utility companies are used to compute the customer-weighted average of these utilities.

From Table 3, using the larger of the 5-year and 10-year inflation rates for specific categories, these economic impact factors can be defined as:

- General Inflation Rate = 3.19% (CPI-U)
- Discount Rate = 4.69% (CPI-U + 1.5%)
- Commercial Natural Gas Escalation Rate = 8.77% (4-Utility average)
- Commercial Electricity Escalation Rate = 7.12% (4-Utility average)

Remember that the fuel escalation rates shown here would be reduced by the general inflation rate for calculations where the general inflation rate is already accounted for. These economic impact factors are then used to perform an economic analysis for the given appliance type. Alternatively, the analysis could also be based on the service territories of each individual natural gas company. In this case, the natural gas and electric fuel escalation rates would be based on the specific natural gas utility company and the associated electric utility company serving the same territory.

The analysis results would then accurately measure the ratio of the monetary benefits of purchasing and operating a natural gas appliance to the monetary cost for purchasing and operating a comparable electric appliance. This type of economic analysis is referred to as a benefit-to-cost ratio analysis and would typically be calculated for a period greater than or equal to the larger of the life expectancies of the natural gas or electric appliance. The details of this type of analysis are beyond the scope of this document.

Sector	Fuel Type	Region	Analysis Year		Description	Year											
			2008														
			Inflation Rate			1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
10-YR	5-YR	CPI-U															
Residential	Natural Gas	All Items	Consumer Price Index	2.82%	3.19%	CPI-U	\$ 163.0	\$ 166.6	\$ 172.2	\$ 177.1	\$ 179.9	\$ 184.0	\$ 188.9	\$ 195.3	\$ 201.6	\$ 207.4	\$ 215.3
		Florida City Gas		2.20%	4.46%	Cost per Therm (\$)	\$ 1.930	\$ 1.700	\$ 1.440	\$ 1.920	\$ 1.770	\$ 1.930	\$ 2.210	\$ 2.290	\$ 2.390	\$ 2.130	\$ 2.400
		Florida Public Utilities		6.79%	5.32%	No. of Customers	94,819	95,045	96,335	96,285	96,318	98,860	97,946	97,244	98,350	97,595	96,771
		Peoples Gas		6.36%	4.23%	Cost per Therm (\$)	\$ 1.035	\$ 1.045	\$ 1.180	\$ 1.440	\$ 1.240	\$ 1.540	\$ 1.630	\$ 1.843	\$ 2.055	\$ 1.810	\$ 1.996
		St. Joe Natural Gas		10.78%	4.77%	No. of Customers	33,007	34,636	36,217	36,900	42,226	43,319	45,078	46,068	46,706	47,139	47,078
		4-Utility Average		4.83%	4.32%	Cost per Therm (\$)	\$ 1.096	\$ 1.134	\$ 1.240	\$ 1.470	\$ 1.270	\$ 1.650	\$ 1.750	\$ 1.960	\$ 2.000	\$ 2.000	\$ 2.030
		State of Florida		6.55%	5.66%	No. of Customers	218,408	224,542	235,895	244,683	253,588	271,153	285,204	293,468	303,858	305,439	304,111
		United States		7.21%	7.27%	Cost per Therm (\$)	\$ 0.725	\$ 1.149	\$ 0.930	\$ 1.860	\$ 1.600	\$ 1.600	\$ 1.850	\$ 1.451	\$ 1.395	\$ 1.410	\$ 2.020
		Florida Power & Light		4.03%	6.21%	No. of Customers	3,101	3,118	3,140	3,068	3,080	3,015	3,005	2,906	2,862	3,097	3,097
		Gulf Power		5.40%	6.80%	Cost per kWh (\$)	\$ 0.079	\$ 0.076	\$ 0.076	\$ 0.088	\$ 0.080	\$ 0.086	\$ 0.091	\$ 0.096	\$ 0.119	\$ 0.114	\$ 0.117
	Progress Energy (FPC prior to 2003)		3.40%	6.21%	No. of Customers	3,266,011	3,332,422	3,413,953	3,490,541	3,566,167	3,652,666	3,744,920	3,828,375	3,906,270	3,981,453	3,992,262	
	Tampa Electric Co.		3.70%	4.34%	Cost per kWh (\$)	\$ 0.062	\$ 0.062	\$ 0.065	\$ 0.064	\$ 0.070	\$ 0.076	\$ 0.078	\$ 0.086	\$ 0.090	\$ 0.100	\$ 0.105	
	4-Utility Average		3.92%	6.07%	No. of Customers	307,077	315,240	321,731	327,128	333,757	341,935	343,151	354,466	364,647	373,036	373,595	
	State of Florida		3.99%	6.42%	Cost per kWh (\$)	\$ 0.084	\$ 0.084	\$ 0.085	\$ 0.092	\$ 0.087	\$ 0.087	\$ 0.093	\$ 0.101	\$ 0.118	\$ 0.119	\$ 0.118	
	United States		3.24%	5.43%	Cost per kWh (\$)	\$ 0.080	\$ 0.080	\$ 0.083	\$ 0.087	\$ 0.094	\$ 0.093	\$ 0.099	\$ 0.098	\$ 0.110	\$ 0.115	\$ 0.115	
	Florida City Gas		8.17%	6.21%	Cost per Therm (\$)	\$ 0.683	\$ 0.630	\$ 0.639	\$ 1.122	\$ 0.923	\$ 1.108	\$ 1.261	\$ 1.331	\$ 1.490	\$ 1.666	\$ 1.498	
	Florida Public Utilities		9.84%	7.28%	No. of Customers	4,707	4,707	4,725	3,948	3,792	3,855	4,011	4,071	4,200	4,364	4,552	
	Peoples Gas ¹		8.85%	6.76%	Cost per Therm (\$)	\$ 0.535	\$ 0.560	\$ 0.713	\$ 0.886	\$ 0.671	\$ 0.963	\$ 1.041	\$ 1.255	\$ 1.377	\$ 1.151	\$ 1.368	
	St. Joe Natural Gas		6.95%	7.75%	No. of Customers	3,412	3,493	3,594	3,707	4,107	4,182	4,214	4,193	4,278	4,316	4,366	
	4-Utility Average		8.77%	6.76%	Cost per Therm (\$)	\$ 0.624	\$ 0.613	\$ 0.747	\$ 0.983	\$ 0.751	\$ 1.051	\$ 1.148	\$ 1.424	\$ 1.412	\$ 1.425	\$ 1.458	
State of Florida		8.62%	7.08%	No. of Customers	17,530	18,163	16,795	15,255	13,392	11,284	11,316	10,774	10,257	10,028	9,805		
United States		8.14%	7.38%	Cost per Therm (\$)	\$ 0.725	\$ 0.599	\$ 0.745	\$ 1.135	\$ 0.947	\$ 0.978	\$ 1.091	\$ 1.118	\$ 1.006	\$ 0.997	\$ 1.420		
Florida Power & Light ²		4.73%	7.00%	No. of Customers	240	250	253	258	255	262	256	249	251	253	248		
Gulf Power ²		5.68%	7.90%	Cost per Therm (\$)	\$ 0.624	\$ 0.609	\$ 0.722	\$ 0.993	\$ 0.769	\$ 1.042	\$ 1.147	\$ 1.364	\$ 1.416	\$ 1.413	\$ 1.446		
Progress Energy ³		4.00%	7.89%	Cost per Therm (\$)	\$ 0.619	\$ 0.629	\$ 0.746	\$ 1.015	\$ 0.794	\$ 1.005	\$ 1.105	\$ 1.284	\$ 1.345	\$ 1.264	\$ 1.415		
Tampa Electric Co. ²		3.89%	5.46%	Cost per Therm (\$)	\$ 0.530	\$ 0.515	\$ 0.637	\$ 0.815	\$ 0.641	\$ 0.812	\$ 0.912	\$ 1.097	\$ 1.160	\$ 1.095	\$ 1.159		
4-Utility Average		4.58%	7.12%	Cost per kWh (\$)	\$ 0.065	\$ 0.063	\$ 0.062	\$ 0.074	\$ 0.067	\$ 0.073	\$ 0.078	\$ 0.082	\$ 0.105	\$ 0.100	\$ 0.103		
State of Florida		4.80%	7.42%	No. of Customers	396,752	404,944	415,295	426,577	435,322	444,654	458,057	469,976	478,869	493,131	500,751		
United States		3.33%	5.06%	Cost per kWh (\$)	\$ 0.052	\$ 0.051	\$ 0.054	\$ 0.053	\$ 0.058	\$ 0.061	\$ 0.064	\$ 0.071	\$ 0.076	\$ 0.085	\$ 0.090		
Florida Power & Light ²		4.73%	7.00%	Cost per kWh (\$)	\$ 0.061	\$ 0.060	\$ 0.058	\$ 0.065	\$ 0.061	\$ 0.062	\$ 0.070	\$ 0.077	\$ 0.093	\$ 0.092	\$ 0.090		
Gulf Power ²		5.68%	7.90%	No. of Customers	45,510	47,292	47,584	48,481	49,139	50,421	51,981	52,916	53,479	53,791	53,810		
Progress Energy ³		4.00%	7.89%	Cost per kWh (\$)	\$ 0.065	\$ 0.060	\$ 0.063	\$ 0.067	\$ 0.073	\$ 0.073	\$ 0.079	\$ 0.078	\$ 0.090	\$ 0.095	\$ 0.095		
Tampa Electric Co. ²		3.89%	5.46%	No. of Customers	58,542	60,828	62,680	64,168	65,613	67,244	68,787	70,364	71,690	72,385	72,192		
4-Utility Average		4.58%	7.12%	Cost per kWh (\$)	\$ 0.063	\$ 0.061	\$ 0.061	\$ 0.070	\$ 0.065	\$ 0.070	\$ 0.075	\$ 0.080	\$ 0.099	\$ 0.096	\$ 0.098		
State of Florida		4.80%	7.42%	Cost per kWh (\$)	\$ 0.064	\$ 0.062	\$ 0.063	\$ 0.071	\$ 0.066	\$ 0.071	\$ 0.076	\$ 0.082	\$ 0.099	\$ 0.098	\$ 0.102		
United States		3.33%	5.06%	Cost per kWh (\$)	\$ 0.074	\$ 0.073	\$ 0.074	\$ 0.079	\$ 0.079	\$ 0.080	\$ 0.082	\$ 0.087	\$ 0.095	\$ 0.097	\$ 0.103		

Notes: ¹ - Firm Sales Service 481 General Service 1
² - Subtotal Commercial Rate Schedule
³ - Commercial and Industrial Service combined

Figure 3. Commercial Energy Prices for Natural Gas and Electricity

APPENDIX A - 9B-13.0071 Cost Effectiveness of Amendments to Energy Code

9B-13.0071 Cost Effectiveness of Amendments to Energy Code.

“The Cost Effectiveness Test for Amendments to the Florida Energy Efficiency Code for Building Construction”, a document approved by the Florida Building Commission on June 9, 2009, is hereby adopted by reference. A copy of the document can be obtained from www.floridabuilding.org. Proposed amendments to the Florida Energy Efficiency Code for Building Construction shall demonstrate cost effectiveness applying the test herein adopted.

Rulemaking Authority 553.9061(3) FS. Law Implemented 553.9061(3) FS. History—New 8-17-09.

APPENDIX B - Cost Effectiveness Test for Amendments to the Florida Energy Efficiency Code for Building Construction

The following are the criteria for the cost-effective test which shall be used to determine whether proposed increases in energy efficiency to residential and commercial buildings as defined in Section 13-101 of the Code result in a positive net financial impact:

(I) Energy Analysis Methodology:

The energy analysis necessary to determine energy savings for Energy Conservation Measures (ECMs) for residential and commercial buildings shall be conducted using the Energy Gauge published by the Florida Solar Energy Center. The analysis shall be conducted for both single EMCs and packages of ECMs. Each ECM shall be evaluated for cost effectiveness based on calculation of energy savings it provides when modeled with a package of ECMs that all together achieve the target percent efficiency improvement as established by law for the given Code edition.

(II) Economic Analysis Assumptions:

The following economic assumptions shall be used in conducting the cost-effective analysis for residential and commercial buildings:

- (1) The cost of an ECM shall be the full, installed incremental cost of improvements. The incremental cost shall be equal to the difference between the baseline measure cost and the improved measure cost unencumbered by any federal tax credits, utility incentives or state rebates, with an option to consider encumbering utility incentives.
- (2) Study life period. The economic analysis shall be conducted using cash flow analysis over a 30-year study period.
- (3) ECM service life. The economic evaluation shall be conducted using the appropriate service lives of the measures.
- (4) Mortgage Parameter values:
 - (a) Mortgage interest rate for residential buildings shall be the greater of the most recent 5-year average and 10-year average simple interest rate for fixed rate, 30-year mortgages computed from the Primary Mortgage Market Survey (PMMS) as reported by Freddie Mac. The residential mortgage down payment rate shall be 10%.
 - (b) Mortgage interest rate for commercial buildings shall be the greater of the most recent 5-year average and 10-year average simple interest rate for fixed rate, 30-year mortgages computed from the Primary Mortgage Market Survey (PMMS) as reported by Freddie Mac plus 2%. The commercial buildings mortgage down payment rate shall be 20%.
- (5) Annual rate parameter values.
 - (a) The General inflation rate shall be the greater of the most recent 5-year and 10-year Annual Compound Inflation Rate (ACIR) computed from the annual average Consumer Price Index (CPI) as reported by the U.S. Bureau of Labor Statistics. ACIR shall be calculated as follows:

$$ACIR = [(ending\ value) / (starting\ value)]^{1.0 / [(ending\ year) - (starting\ year)]} - 1.0.$$

(b) The Discount rate shall be general inflation rate plus 2%.

(c) The Fuel escalation rate shall be the greater of 5-year and 10-year ACIR computed from revenue-based prices as reported by Florida Public Service Commission minus the general inflation rate. ACIR shall be calculated as follows:

$$\text{ACIR} = [(\text{ending value}) / (\text{starting value})] ^ \{1.0 / [(\text{ending year}) - (\text{starting year})]\} - 1.0.$$

(d) The baseline electricity and natural gas prices used in the analysis shall be as follows:

- (1) For residential buildings, the statewide, revenue-based average residential price for the most recent available 12 months as provided by the Florida Public Service Commission shall be used; and
- (2) For commercial buildings, the statewide, revenue-based average commercial price for the most recent available 12 months as provided by the Florida Public Service Commission shall be used

(6) The present value cash flow streams of the benefits and costs for ECMs and packages of ECMs shall be calculated as follows:

(a) Benefits – the annual present value benefits cash flow stream shall be calculated as follows:

- (i) The present value of the energy cost savings for years 1 through 30 with energy savings determined in accordance with clause (I) multiplied by the baseline electricity and natural gas prices as specified by clause (II)(5)(d), escalated at the general inflation rate plus the fuel escalation rate, calculated as follows:

$$\text{PV Energy Cost Savings} = \{[(\text{Annual Energy Savings}) * (\text{Baseline Fuel Cost})] * [(\text{General Inflation Rate}) + (\text{Fuel Escalation Rate})] ^ \text{Year} \} / [(\text{Discount Rate}) ^ \text{Year}].$$

- (ii) The present value of any salvage value, applied in the 30th year of the study period, for ECMs that have been replaced during the study period and for which the service life of the replacement has not been reached by the end of the 30th year. Salvage value shall be calculated as follows:

$$\text{PV Salvage Value} = [(\text{ECM final replacement cost}) * (\text{remaining ECM life}) / (\text{full ECM service life})] / [(1 + \text{Discount Rate}) ^ 30].$$

(b) Costs – the annual present value cost cash flow stream be calculated as follows:

- (i) The down payment cost applied in year 0, calculated as the full cost of the improvements (ECMs) as specified in clause (II)(1) multiplied by the down payment rate as specified in clause (II)(4)(a) for residential buildings or as specified in clause (II)(4)(b), whichever is appropriate.
- (ii) The annual mortgage payment on the balance of the ECM costs after the down payment has been subtracted for years 1 through 30, as calculated at the mortgage rate specified by clause (II)(4)(a) for residential buildings or as specified by clause (II)(4)(b) for commercial buildings.
- (iii) For all ECMs with service lives less than 30 years, replacement costs shall be applied to the annual cost cash flow stream. Excepting the 30th year of the study period,

replacement costs shall be applied during each year for which ECM end of life has been reached. Replacement cost shall be the original ECM cost inflated at the general inflation rate, calculated as follows:

$$\text{Replacement Cost} = (\text{Original ECM Cost}) * (1 + \text{General Inflation Rate}) ^ (\text{Replacement Year}).$$

- (iv) Where incremental maintenance costs exist, they shall be incorporated into the annual cost cash flow stream during the year(s) the maintenance costs occur. All such maintenance costs shall be inflated at the General Inflation Rate over the study period and calculated as follows:

$$\text{Maintenance Cost} = (\text{Base Maintenance Cost}) * (1 + \text{General Inflation Rate}) ^ (\text{Maintenance Year})$$

- (v) For years 1 through 30, the above annual costs shall be summed and this summation shall be brought to its present value by discounting at the rate specified in clause (II)(5)(b), calculated as follows:

$$\text{Annual Present Value Cost} = [(\text{Mortgage Cost}) + (\text{Replacement Cost}) + (\text{Maintenance Cost})] / [(1 + \text{Discount Rate}) ^ \text{Year}].$$

- (7) The Present Value Benefit-to-Cost (PVBC) Ratio shall be calculated as the sum of the annual present value benefits for years 1 through 30 divided by the sum of the annual present value costs for years 0 through 30.

(III) Economic Indicators of Cost Effectiveness:

The following economic indicators shall be used to determine whether the cost-effective test results in a “positive net financial impact”:

- (1) Present Value Benefit-to-Cost Ratio (PVBC). A value of 1.0 or greater shall be used for present value cost-to-benefit ratio (PVCB);
- (2) Internal Rate of Return (IRR).

A value equal to 8% shall be used for IRR on investments for residential and a value equal to 7% shall be used for IRR on investments for commercial.

- (3) Levelized Cost of Conserved Energy (LCCE).
- (a) For residential applications, a value equal to the statewide residential revenue-based retail cost of electricity adjusted at the fuel escalation rate over one-half of the life of the measure (yields average over the measure life) shall be used for LCCE.
- (b) For commercial applications, a value equal to the statewide commercial revenue-based retail cost of electricity adjusted at the fuel escalation rate over one-half of the life of the measure (yields average over the measure life) shall be used for LCCE

(IV) Evaluation Methodology for Measures and Packages of Measures:

The ECM and packages of ECMs shall be evaluated as follows:

- (1) Multiple packages of ECMs shall be created that result in the target percentage efficiency increase for each Code cycle update (20, 30, 40 and 50%) based on comparison to the 2007 Code (without the 2009 supplement).
- (2) Each ECM shall be evaluated using cost effectiveness indicators (PVBC, IRR, LCCE), within their specific package of ECMs. PVBC shall be considered the primary measure with IRR and LCEE used as measures for illustration and communication of individual ECMs and packages of ECMs comparative economic viability.
- (3) Validation of the cost effectiveness of the Code changes shall mean that a number of ECM packages evaluated to comply with the statutory percent energy efficiency increase requirements have a greater benefit than cost as measured in present value dollars.

(V) Definitions:

Benefit-to-Cost Ratio: The sum of the present value of the benefits from an investment divided by the sum of the present value of the costs of the investment.

Consumer: A class of economic system participant that makes no distinction between the owner of the building and the utility rate payer.

Discount rate: The periodic compound interest rate at which future cash flow streams are discounted back to their present value (PV).

Energy Conservation Measure (ECM): An improvement to a building, a building system or a building component that is intended to reduce building energy consumption.

Fuel Escalation Rate: The periodic rate at which the price of fuel increases minus the General Inflation Rate.

General Inflation Rate: The periodic rate at which general consumer prices increase.

Internal Rate of Return (IRR): The discount rate at which the Net Present Value of an investment exactly equals zero. IRR is also sometimes referred to as return on investment or ROI.

Levelized Cost of Conserved Energy (LCCE): The Levelized Cost of an energy conservation investment divided by the annual energy savings produced by the investment.

Present Value (PV): The worth of a future cash flow in today's dollars as calculated using the Discount Rate.