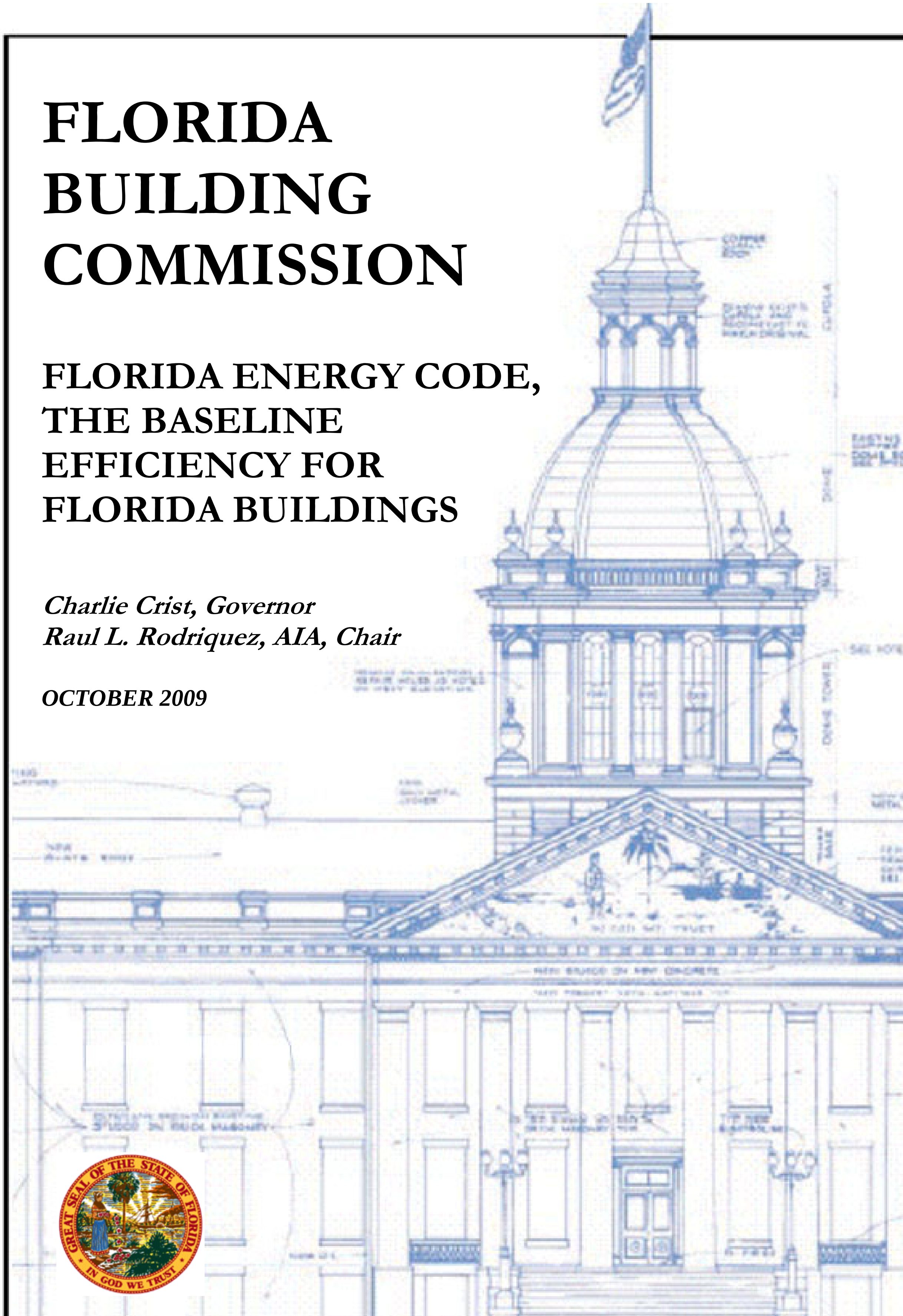
FLORIDA BUILDING COMMISSION

FLORIDA ENERGY CODE, THE BASELINE EFFICIENCY FOR FLORIDA BUILDINGS

Charlie Crist, Governor
Raul L. Rodriquez, AIA, Chair

OCTOBER 2009



INTRODUCTION

Florida's building energy efficiency standards and regulated utility companies' energy efficiency programs have been linked since the early 1980s. The Florida Energy Efficiency Code for Building Construction (Florida Energy Code) established a mandatory minimum building-energy performance for new buildings. The Florida Energy Efficiency and Conservation Act (FEECA) authorized utility programs to provide energy efficiency education and support that is essential to both the construction industry's compliance with the code and to increase awareness of building efficiency opportunities beyond the minimum requirements of the code. Together, these two tools for implementing energy conservation policy provide a combination of regulatory-push and market-pull dynamics that result in improved building sector energy efficiency.

Building codes establish minimum standards of performance to protect the life safety of building occupants; to provide property protection for building owners, financers and insurers; and to provide for the welfare of building occupants and society in general. Building codes are, by nature, conservative and follow well-established principles and proven technologies and, typically, do not push the limits of existing knowledge and technology. The Florida Energy Code has, at times, been an exception.

When it was first imposed as a statewide mandate, a five-year target was administratively set for building energy efficiency improvement. In 2008, the Florida Legislature established a schedule for increasing efficiency requirements by 50 percent by 2019. Achieving that goal will require renewed efforts to develop and integrate energy-efficient technologies and construction methods and to develop the education and incentive programs to help the construction industry adapt.

The success of the Code in reaching the increased efficiency requirement increases depends, in part, on the continued momentum of the "green building" movement. Codes directed primarily to societal benefits – such as energy efficiency codes – are always secondary to life-safety codes and generally secondary to property protection codes. They become a more significant consideration when the cost of energy rises dramatically, as it did during the late 1970s to early 1980s, for example. Rising energy costs are once again a factor impacting state policy. Builder education, consumer awareness, and local government commitment are all essential components to reaching the new efficiency goals. Utility companies have been key communicators in reaching these groups in previous eras and can be again.

Building energy efficiency is currently a policy priority; however, building codes must balance multiple design goal priorities for building performance. When the proper balance is not established problems can result. Building energy efficiency measures can conflict with other building performance factors. Past experiences in Florida have revealed several such problems. Some examples are:

- Foam board sheathing applied to the exterior of wood frame walls provide significant energy efficiency improvements but this method proved too weak under hurricane conditions and has been replaced by structural panel sheathing.

- Insulating foam/synthetic stucco wall systems (also energy efficient) caused extensive rain water leaks which led to rotting walls and termite damage.
- Airtight construction combined, with efficient air conditioners that could not provide enough moisture removal, resulted in indoor mold and mildew problems.

Clearly building energy efficiency measures are not all appropriate to the different climate regions throughout the country. Measures need to be evaluated for more than cost effectiveness and conservation benefit. Utility companies have been proactive in conducting such evaluations and should continue to be in the future.

Building Codes are directed primarily to new construction. New buildings, and most additions to existing buildings, must fully comply with codes. However, unless an existing building is undergoing a significant alteration or renovation there is no authority to require upgrading components to current standards. The greatest impact codes have on existing building energy performance comes by requiring upgrades of equipment to current minimum efficiency levels when it is replaced. It is in this area of building sector energy efficiency that utility company programs have historically directed much of their resources. Studies show that intervention in emergency repairs or existing building upgrade projects have a significant level of consumer participation. “Beyond Code” programs that support installation of building components with efficiencies that are better than the minimums required by the Code can be very effective.

Buildings are major energy users in every state and building code energy efficiency standards are one tool to address that use. However, as Florida’s energy code has become more stringent over the preceding thirty years, energy use due to building components and features that can be directly effected by the code has diminished from 72 percent to 45 percent of the overall home energy use. Consequently, increasing building code standards for energy efficiency will impact, at most, only 45 percent of current home energy use. Other energy conservation policy tools are required to address the dominant energy uses.

Appliance efficiency standards are an alternate tool and Florida established an appliance efficiency law in the late 1980s. However, state specific standards for major energy using appliances are problematic and the industries that manufacture these products have submitted themselves to federal regulation to preempt potentially variable state standards. As with energy codes, the advancement of federal appliance standards has languished during the period of relatively stable prices and inexpensive energy. However, they are now undergoing significant development with a renewed focus on energy security and climate protection. All major building, energy-using equipment in national use is now covered by federal law. Other products – those that are minor users individually but have a significant impact in the aggregate (such as electronic equipment) – remain unregulated. Consumer education is currently the key to curtailing the growth in this consumption area.

Florida’s energy code has been mandatory statewide for 29 years. Over that time, the standard of performance for building energy use due to components covered by the code has increased by more than 65 percent. Currently, potential energy efficiency increases for building envelope improvements are close to their cost-effective or current technological limits for Florida's mild climate (relative to other regions). Consequently, the major efficiency standards increases targeted by the Florida Legislature (30 percent for 2013 code, 40 percent for 2016 code, 50 percent for 2019 code) will require significant and costly changes to current building construction practices if they are to be achieved. Reaching the efficiency targets will require use of improved water heating and space heating and cooling technologies as well as adapting building designs and construction methods to Florida's sunny and humid climate.

The 50 percent building efficiency increase goal set for the Florida Energy Code in 1980 was more easily accomplished because the starting point was at a much lower efficiency than is the case today. Incremental changes to building component efficiencies made more impact than they make at current efficiency levels. Nonetheless, change in the construction industry did not come without difficulty. Significant education and outreach efforts that went beyond government capabilities were employed to facilitate the transition and builders were provided a range of options to increase the efficiency of their building designs. Radical change was not required over a short period of time. The combination of multiple compliance options and industry education was a significant contributor to the rapid increase in regulation driven efficiency improvements to buildings during the 1980s and will be essential to the improvements scheduled for the next ten years.

THE FLORIDA ENERGY CODE

The Florida Energy Code incorporates both prescriptive- and performance-compliance methods, which require the same level or standard of energy performance. Prescriptive methods, such as the one used in the Florida code, are derived by applying the performance method to a standard reference building to determine building component efficiencies that are then prescribed for all buildings using that method to comply with the Code.

The prescriptive method is the more simple of the two; however, in Florida, contractors use the performance compliance method for more than 90 percent of buildings. The performance compliance option establishes an energy budget specific to the building being build by using a computer program that simulates hourly energy use. It allows tradeoffs, within bounds, between the efficiencies of different building components so long as the overall energy budget is met. For instance, a building can have a greater amount of glass than used to calculate the budget by installing a higher efficiency air conditioner. The prescriptive compliance method allows no trade offs between the minimum efficiency levels of each building component. Efficiency levels can be better, but the efficiency level prescribed by the method is the absolute minimum allowed for that component.

Florida's energy code established three climate regions within the state between 1979 and 2007: North, Central, and South. These climate regions were modified with a 2009 code amendment that implemented Governor Crist's Executive Order 2007-127. This Order was a directive to increase building efficiency requirements by 15 percent and, as a result, the climate regions were modified to be consistent with the two International Energy

Conservation Code climate regions. Additionally, the pass/fail criteria used for the performance (energy budget method) compliance method was modified.

From 1979 to 2007 the criteria for compliance was that the calculated energy use for the house as it was designed had to be equal to or less than the energy use calculated using "baseline" efficiency levels for each building component. Increases in the energy performance standard were made by increasing the "baseline" efficiencies for building components resulting in a lower energy budget. The baseline component efficiencies for each climate region are show in Table A. The 2009 amendment changed the criteria by leaving the "baseline" efficiency levels at the 2007 levels and requiring the calculated energy use for the designed building to be the target percent less than the 2007 budget. That is to say compliance criteria for the 2009 amended code is 85 percent of the 2007 budget (15 percent improvement compared to the 2007 code) and the 2019 code would require compliance to be 50 percent of the 2007 budget. Florida law references the increased efficiency requirements to the 2007 code.

Note: The following review of the Florida Energy Code, is an excerpt from the Florida Solar Energy Center report FSEC-CR-1806-09, *Effectiveness of Florida's Residential Energy Code 1979-2009*, developed for the Florida Building Commission.

THE ENERGY EFFICIENCY STANDARD OF PERFORMANCE FOR RESIDENTIAL BUILDINGS

The Florida Energy Code establishes a standard of performance for buildings by establishing an estimated annual energy use characteristic specific to each individual house. The energy use covered by the code includes water heating and space heating and cooling. Energy use is determined by applying baseline levels of energy efficiency for individual building components that contribute to space heating and cooling and to water heating. The changes in these baseline building component efficiencies reflects the overall increase in building energy efficiency over time.

Baseline Building Component Efficiency Changes:

Table A. Characteristics of Florida Code "Baseline" Homes by Code Vintage

Code Component:	Code Year													
	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
House type	Wood frame; 3 bedroom; square; slab-on-grade													
Floor area	1736	1749	1767	1784	1851	1929	1976	2007	2053	2141	2225	2273	2308	2308
Slab edge	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	R=3.4	R=3.4	R=0	R=0	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=0
Central	R=3.4	R=3.4	R=0	R=0	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=3.5	R=0
South	R=3.4	R=3.4	R=0	R=0	R=0	R=0	R=0	R=0	R=0	R=0	R=0	R=0	R=0	R=0
Walls	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	R=0	R=0	R=11	R=11	R=19	R=19	R=19	R=19	R=19	R=11	R=11	R=11	R=11	R=13
Central	R=0	R=0	R=11	R=11	R=19	R=19	R=19	R=19	R=19	R=11	R=11	R=11	R=11	R=13
South	R=0	R=0	R=11	R=11	R=19	R=19	R=19	R=19	R=19	R=11	R=11	R=11	R=11	R=13
Ceilings	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	R=17.2	R=17.2	R=19	R=19	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30
Central	R=17.2	R=17.2	R=19	R=19	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30
South	R=17.2	R=17.2	R=19	R=19	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30	R=30
Roof/attic	Composition shingle on felt on plywood on trusses with vented attic													
Doors (north)	R=2	R=2	R=2	R=2	R=5	R=5	R=5	R=5	R=5	R=5	R=5	R=5	R=5	U=0.75
Windows:	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
% WFA	15%	15%	15%	15%	15%	15%	15%	15%	15%	18%	18%	18%	18%	18%
Area (sq.ft.)	260	262	265	268	278	289	296	301	308	385	400	409	415	415
U-factor:	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	1.30	1.30	1.30	0.87	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.75	0.75
Central	1.30	1.30	1.30	1.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.75	0.75
South	1.30	1.30	1.30	1.30	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.75	0.75
SHGC:	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	0.75	0.75	0.75	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.40	0.40	0.40	0.40
Central	0.75	0.75	0.75	0.75	0.66	0.66	0.66	0.66	0.66	0.66	0.40	0.40	0.40	0.40
South	0.75	0.75	0.75	0.75	0.66	0.66	0.66	0.66	0.66	0.66	0.40	0.40	0.40	0.40
Envelop leakage	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
ach50	12.4	11.8	10.8	9.9	9.0	7.9	7.3	7.1	6.8	6.1	5.7	5.6	5.6	5.6
Heating System	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
Type:														
North	Strip	Strip	Strip	Strip	HP	HP	HP	HP	HP	HP	HP	HP	HP	HP
Central	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	HP	HP	HP	HP
South	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	Strip	HP	HP	HP	HP
HSPF:	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
North	COP=1	COP=1	COP=1	COP=1	6.6	6.6	6.5	6.8	6.8	6.8	6.8	6.8	7.7	7.7
Central	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	6.8	6.8	7.7	7.7
South	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	COP=1	6.8	6.8	7.7	7.7
Cooling System	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
SEER														

Code Component:	Code Year													
	1979	**1980**	**1982**	**1984**	**1986**	**1989**	**1991**	**1991R**	**1993**	**1997**	**2001**	**2004**	**2004R**	**2007**
North	6.1	6.8	8.0	7.8	8.5	8.5	8.9	10.0	10.0	10.0	10.0	10.0	13.0	13.0
Central	6.1	6.8	8.0	7.8	9.0	9.0	8.9	10.0	10.0	10.0	10.0	10.0	13.0	13.0
South	6.1	6.8	8.0	7.8	9.0	9.0	8.9	10.0	10.0	10.0	10.0	10.0	13.0	13.0
HW System EF	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
EF	0.81	0.81	0.81	0.83	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.92	0.92	0.92
Tank (gal)	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Ducts	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
Leaks (Qn)	0.12	0.12	0.12	0.12	0.12	0.12	0.10	0.10	0.08	0.08	0.08	0.06	0.06	0.05
R-value	4.2	4.2	4.2	4.2	4.2	4.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Location	Attic	Attic	Interior	Interior	Attic	Attic	Attic	Attic	Attic	Attic	Attic	Attic	Attic	Attic
AHU	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage	Garage
Other (kWh/yr)	1979	1980	1982	1984	1986	1989	1991	1991R	1993	1997	2001	2004	2004R	2007
Miscellaneous	2159	2185	2219	2252	2382	2534	2625	2685	2774	2945	3108	3201	3269	3269
Lighting	1844	1854	1868	1882	1936	1998	2036	2061	2097	2168	2235	2273	2301	2301
Refrigerator	1335	1335	1335	1211	1211	1033	969	969	749	749	607	610	610	613
Dryer	891	891	891	891	891	891	891	891	891	891	891	891	891	891
Range	447	447	447	447	447	447	447	447	447	447	447	447	447	447
Dishwasher	145	145	145	145	145	145	145	145	145	145	145	145	145	145
Cloths washer	105	105	105	105	105	105	105	105	105	105	105	105	105	105
Pool pump	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceiling fans	Vary by climate zone													
North	382	382	382	382	382	382	382	382	382	382	382	382	382	382
Central	491	491	491	491	491	491	491	491	491	491	491	491	491	491
South	652	652	652	652	652	652	652	652	652	652	652	652	652	652

Sources

1979: Section 502.2, "Model Energy Efficiency Building Code." Florida Department of Administration, State Energy Office, November, 1978.

1980: Section 502.2, "Model Energy Efficiency Code for Building Construction." Florida Department of Community Affairs, Bureau of Codes and Standards, October 1, 1980

1982: Section 903.11, "Model Energy Efficiency Code fo Building Construction." Florida Department of Community Affairs, Codes and Standards Section, September, 1982.

1984: Section 1002.1, "Energy Efficiency Code for Building Construction." Florida Department of Community Affairs Energy Code Program, April 1984.

1986: Form 900-A-84, "Energy Efficiency Code for Building Construction 1986." Florida Department of Community Affairs Energy Code Program, Revised January 1987.

1989: Form 900-A-89, "Energy Efficiency Code for Building Construction 1989." Florida Department of Community Affairs Energy Code Program, 1989.

1991: Form 900-A-91, "Energy Efficiency Code for Building Construction 1991." Florida Department of Community Affairs Energy Code Program, 1991.

1993: Form 600A-93, "1993 Energy Efficiency Code for Building Construction." Florida Department of Community Affairs Energy Code Program, 1993.

1997: Form 600A-97, "Energy Efficiency Code for Building Construction, 1997 Edition." Florida Department of Community Affairs, Building Codes and Standards Office, 1997.

2001: Form 600A-01, "Florida Building Code 2001, Chapter 13, Florida Energy Efficiency for Building Construction."

2004: Form 600A-04, "Florida Building Code 2004, Chapter 13, Florida Energy Efficiency for Building Construction."

2007: Section 13-613, Proposed Modification No. 2367, "Florida Building Code 2007, Chapter 13, Florida Energy Efficiency for Building Construction."

Changes in Code Stringency Over Time

The initial question to be answered by the analysis is how much did code stringency change over the past 30 years? This is answered by comparing the "energy budgets" for each code cycle to those of the previous code cycle and to that of the 1979 code cycle. Although the code did not have a designated Baseline prior to 1986, it had an effective Baseline in its prescriptive Code in overall compliance. Figure 1 presents the results from this analysis.

Figure 1 shows that, while the overall reduction in energy budget over the years has been significant at 65 percent, the reduction has occurred in spurts. First, in 1982 there was a substantial increase in code stringency caused by the fact that ducts were placed in the interior of the home to arrive at the energy budget for that year. This provision also existed in the 1984 code cycle but has not been used since. The 1989 code cycle shows a slight increase in energy budget, however, this entire increase is due to the increase in house size between the two code cycles.

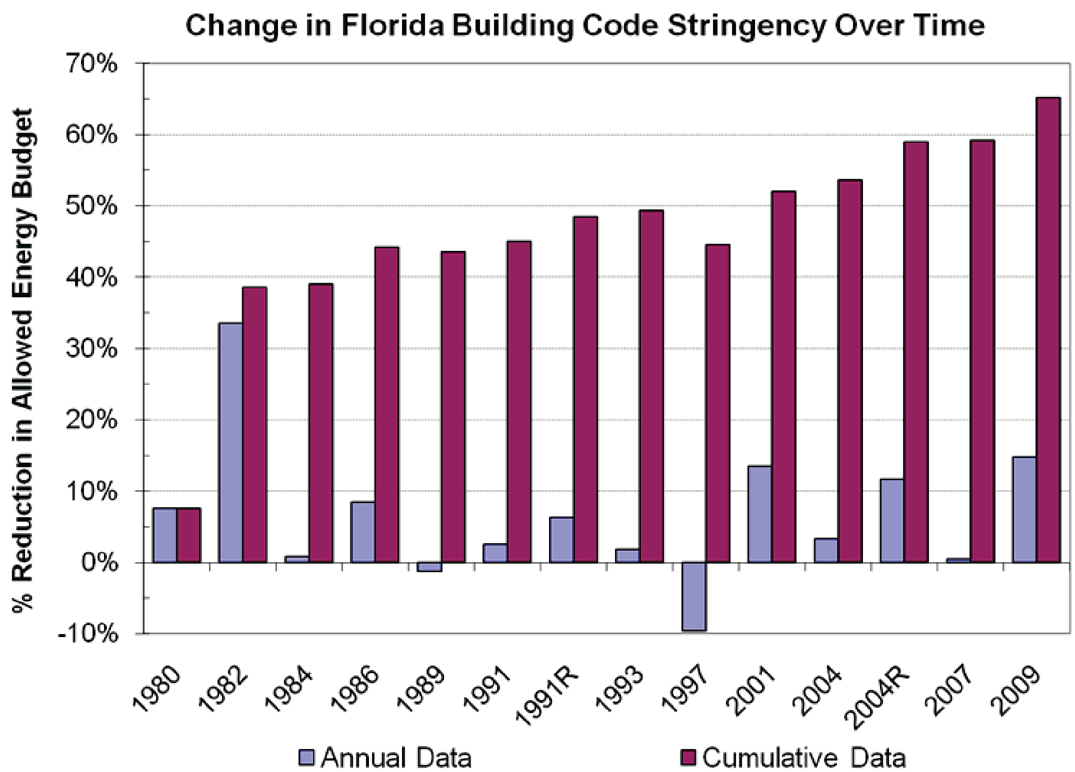


Figure 1. Comparison of Code Cycle Stringency from 1979 - 2009.

In 1997, there was a 9.9 percent increase in the allowed energy budget. This is due to two things that occurred during the 1997 code cycle changes. First, the method of calculating the energy use attributable to windows in homes was made much more accurate, eliminating a significant winter credit for windows. Second, to compensate for this substantial change in the impact of windows, two other Baseline Home characteristics changed significantly in 1997. The percentage of windows as a function of the conditioned floor area was increased from 15 percent to 18 percent

and the value of the wall insulation was decreased from R-19 to R-11. These code changes combined to make Florida's 1997 Code less stringent than the 1993 Code.
This reduction in stringency was overcome, plus some, in the 2001 code cycle, when the Baseline heating system was changed from strip heat to a heat pump in both central and south Florida. An additional jump in code stringency occurred in code-cycle 2004R, when the 2004 Code was revised to account for the January 2006 federal revision of the minimum NAECA standards for air conditioners and heat pumps. The final increase of 15 percent occurred with the 2009 Supplement to the 2007 Florida Energy Code. This change is a direct result of an Executive Order of the Governor (EO #127-06) requesting the Florida Building Commission increase Florida Energy Code stringency by 15 percent effective 2009.

Overall, these Florida Code changes have resulted in significant energy savings. It is informative to examine where these savings have occurred. Figure 2 presents an analysis of the achieved savings by end use. Clearly, the largest savings have occurred in space cooling, with significant improvements in both envelope efficiency requirements and air conditioning equipment efficiency over time. Florida has also seen savings, albeit not nearly as pronounced, in space heating for much the same reason. There have been small reductions in hot water energy use and an increase in energy use for all "other" energy uses. In 1979 the other energy uses represented only 28 percent of total energy use, while, for the 2009 Code, they represent more than 55 percent of total home energy use.

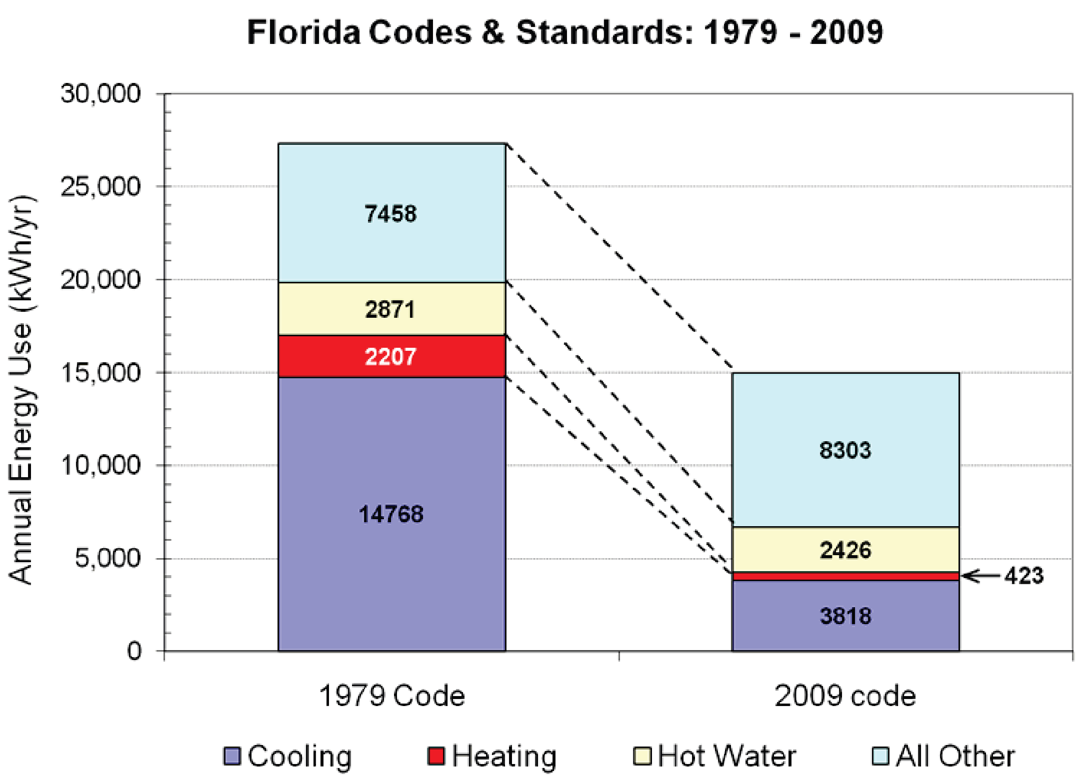


Figure 2 Average Florida Home Savings Resulting from Florida Code Implementation.

Cumulative Energy Savings Over Time

To determine how these increases in code stringency have impacted statewide energy use in Florida, it is necessary to know how many new homes were constructed during each of the 14 code cycles. The raw data for permits and new home construction starts are collected from the *Florida Statistical Abstracts*, maintained by the Bureau of Economic and Business Development at the University of Florida and from the *Statistical Abstracts of the United States*, maintained by the U.S. Census Bureau. The resulting data are presented in Table B.

Table B. Florida New Home Starts 1980-2007 [18]

Year	Permits	Starts	Year	Permits	Starts
1980	174,451	167,836	1995	122,903	123,400
1981	146,557	141,000	1996	125,020	140,100
1982	103,813	100,100	1997	133,990	145,100
1983	189,440	180,400	1998	148,603	138,100
1984	204,925	196,700	1999	164,722	152,800
1985	202,615	193,800	2000	155,269	147,900
1986	195,525	193,000	2001	167,035	161,200
1987	178,764	193,900	2002	185,431	177,000
1988	170,597	185,100	2003	213,567	197,300
1989	164,985	165,400	2004	255,893	185,700
1990	126,347	126,800	2005	287,250	175,374
1991	95,308	102,100	2006	N/A	165,400
1992	102,022	116,200	2007	N/A	182,000
1993	115,103	115,100	*2008	N/A	120,000
1994	128,602	131,000	*2009	N/A	80,000

* Values for 2008 and 2009 Starts is an estimate by the author

Table B presents both permit activity and new construction start data. The permit data are not used in the analysis but were collected as a reasonableness check on the new start data.

The effective dates of the code cycles do not necessarily line up with the beginning and end of calendar years so it is necessary to modify the data in Table B to line up with the various code cycles. This is done by linearly proportioning the housing starts for the periods of the calendar years that cross code cycles, resulting in the data given in Table C.

Table C. Code Cycle Housing Starts

Code Effective Dates			Housing Starts		
Vintage	Begin	End	Year	%Starts	#Starts
1979	1/1/1980	5/1/1980	1979	33.06%	55,487
1980	5/1/1980	1/1/1981	1980	67.12%	112,657
	1/1/1981	1/1/1982	1981	100.00%	141,000
	1/1/1982	8/31/1982	1982	66.30%	66,368
1982	9/1/1982	1/1/1983	1982	33.42%	33,458
	1/1/1983	1/1/1984	1983	100.00%	180,400
	1/1/1984	4/1/1984	1984	24.86%	48,906
1984	4/1/1984	1/1/1985	1984	75.34%	148,199
	1/1/1985	1/1/1986	1985	100.00%	193,800
1986	1/1/1986	1/1/1987	1986	100.00%	193,000
	1/1/1987	1/1/1988	1987	100.00%	193,900
	1/1/1988	1/1/1989	1988	100.00%	185,100
1989	1/1/1989	1/1/1990	1989	100.00%	165,400
	1/1/1990	1/1/1991	1990	100.00%	126,800
1991	1/1/1991	1/1/1992	1991	100.00%	102,100
1991R	1/1/1992	1/1/1993	1992	100.00%	116,200
1993	1/1/1993	1/1/1994	1993	100.00%	115,100
	1/1/1994	1/1/1995	1994	100.00%	131,000
	1/1/1995	1/1/1996	1995	100.00%	123,400
	1/1/1996	1/1/1997	1996	100.00%	140,100
	1/1/1997	11/1/1997	1987	83.29%	120,850
1997	11/1/1997	1/1/1998	1997	16.71%	24,250
	1/1/1998	1/1/1999	1998	100.00%	138,100
	1/1/1999	1/1/2000	1999	100.00%	152,800
	1/1/2000	1/1/2001	2000	100.00%	147,900
	1/1/2001	1/1/2002	2001	100.00%	161,200
	1/1/2002	3/1/2002	2002	16.16%	28,611
2001	3/1/2002	1/1/2003	2002	83.84%	148,389
	1/1/2003	1/1/2004	2003	100.00%	197,300
	1/1/2004	1/1/2005	2004	100.00%	185,700
	1/1/2005	10/1/2005	2005	74.79%	129,843
2004	10/1/2005	1/1/2006	2005	25.21%	43,757
	1/1/2006	12/8/2006	2006	93.42%	154,524
2004R	12/8/2006	1/1/2007	2006	6.58%	10,876
	1/1/2007	1/1/2008	2007	100.00%	150,000
	1/1/2008	1/1/2009	2008	100.00%	120,000
	1/1/2009	3/1/2009	2009	16.16%	12,932
2009	3/1/2009	1/1/2010	2009	83.84%	67,068

From the data presented in Table C, it is possible to determine the cumulative statewide energy savings that have been achieved by increases in stringency in each of Florida's code cycles. The results are presented in Figure 3.

Figure 3 is relatively unremarkable except for the magnitude of the energy savings that have been achieved by Florida's Energy Code. Total electricity savings of more than 39 billion kWh are sufficient to power more than 3 million new Florida homes for a year and avoid more than 30 million tons of CO_2 emissions.

In order to determine the cost impacts of the energy savings given in Figure 3, it is necessary to determine the statewide retail cost of electricity for each of the years shown in Figure 3. This is done in terms of the revenue-based retail cost of electricity. The revenue-based cost is calculated as the total annual statewide residential revenue collected, divided by the total annual statewide electricity provided. Thus, it includes all costs paid by the retail customers for electricity.

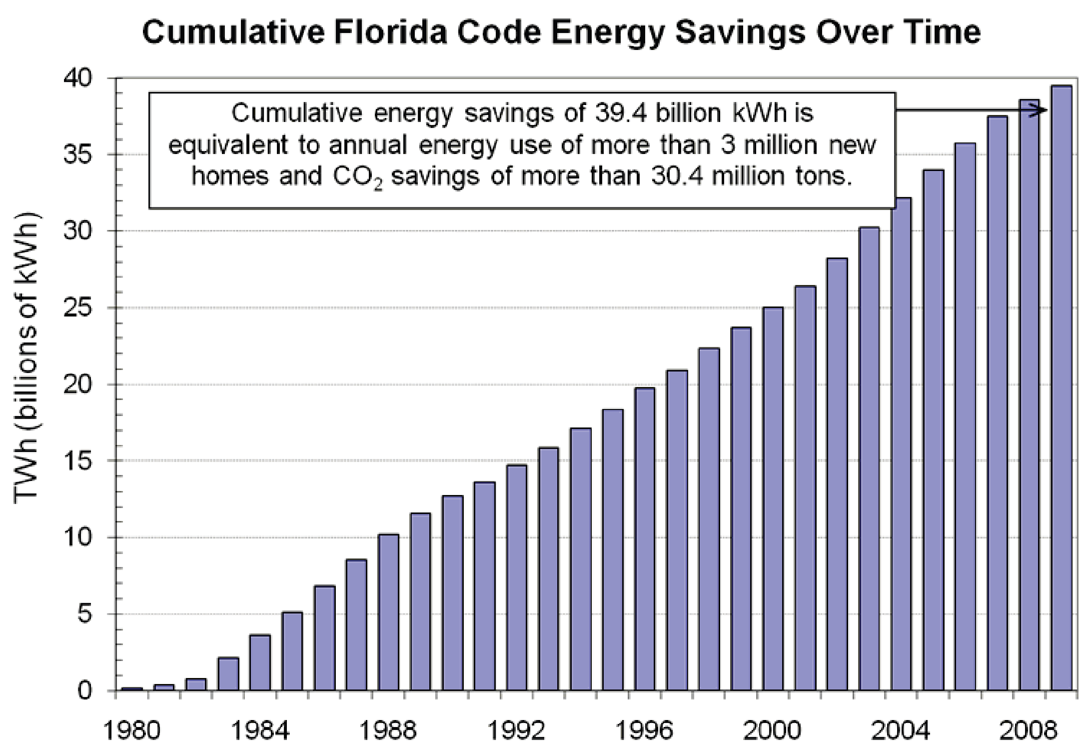


Figure 3 Cumulative Florida Residential Energy Code Savings Over Time.

Figure 4 presents the statewide average revenue-based Florida retail electricity costs from 1980 - 2009. This figure shows that Florida's retail residential costs remained relatively constant across the period until about 2004 when a distinct trend in price increases began that has persisted up through the present. Given the national and international trends in fuel costs, there is no logical reason to predict that Florida's retail residential electricity prices will moderate in the future.

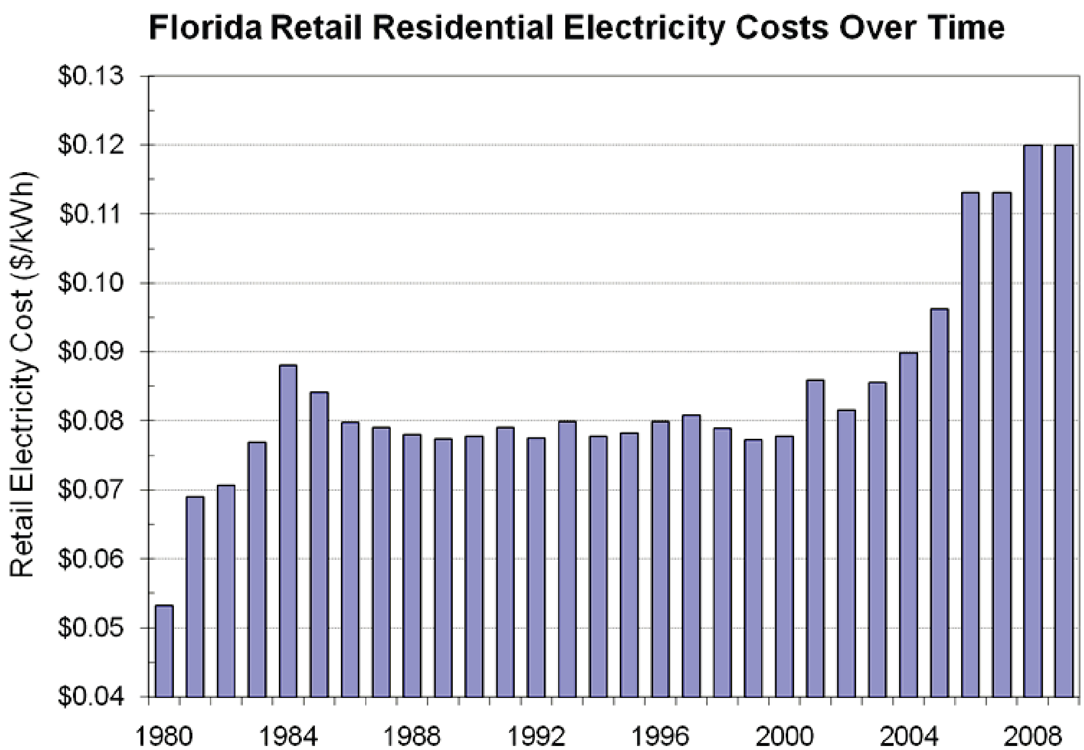


Figure 4 Florida's Retail Residential Electricity Cost from 1980 - 2009.

Combining the data from Figures 3 and 4 then, the cumulative cost savings from the Florida Residential Energy Efficiency Code may be obtained. Figure 5 presents these results, clearly illustrating the impact of recent increases in retail residential electricity prices. The cumulative cost savings are significant at a total of almost $5 billion. The annual savings from the estimated 80,000 new homes that will be constructed in Florida in 2009 is more than $123 million per year.

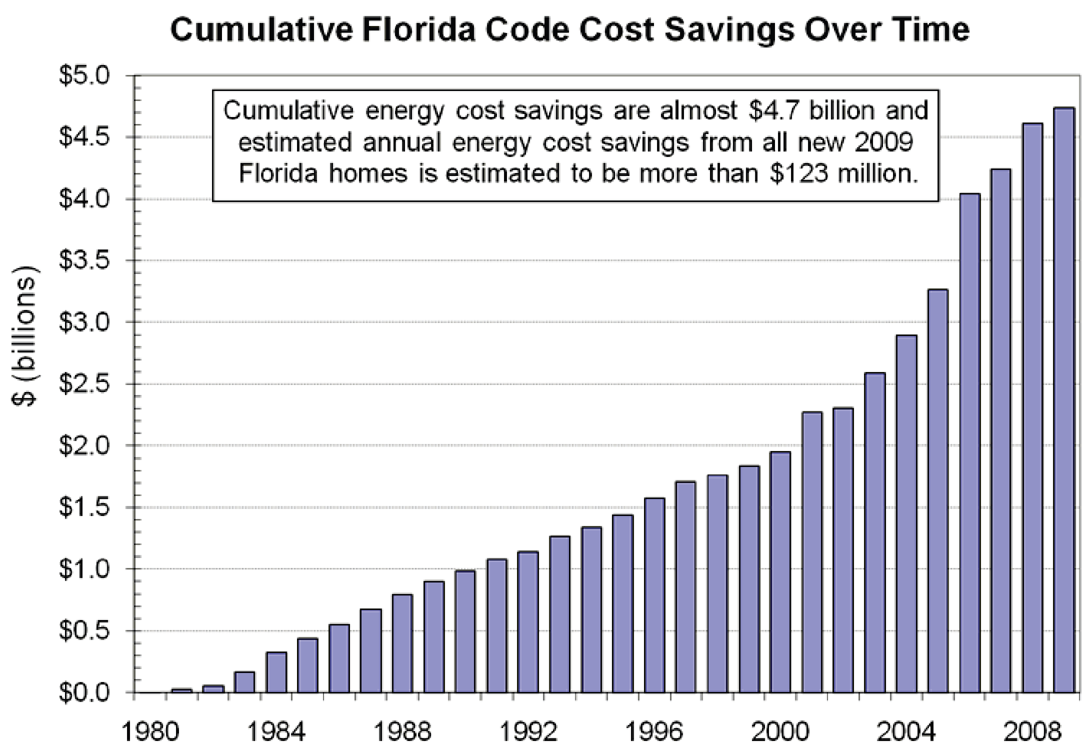


Figure 5 Cumulative Cost Savings from Florida Residential Energy Efficiency Code for Building Construction.

Impacts of Florida House Size Increase Over Time

So far the values that have been presented include the impacts of the increases of house size that have occurred over the past 30 years. However, two full sets of analysis were accomplished; one that increased house size from code cycle to code cycle and one that held house size constant at its 1979 value for the entire period. The difference between these two sets of simulations represents the “takeback” resulting from the increases in house size over the years. In other words, if house size had not increased over time, the savings would have been even greater.

Figure 6 illustrates this impact. It is important to point out that the data for Figure 6 includes whole-home energy use rather than just the code energy uses of heating, cooling and hot water. These “other” energy uses are quite important because they increase as house size increases. The result is that the house size “takeback” effect has a 20 percent impact on whole-house energy use.

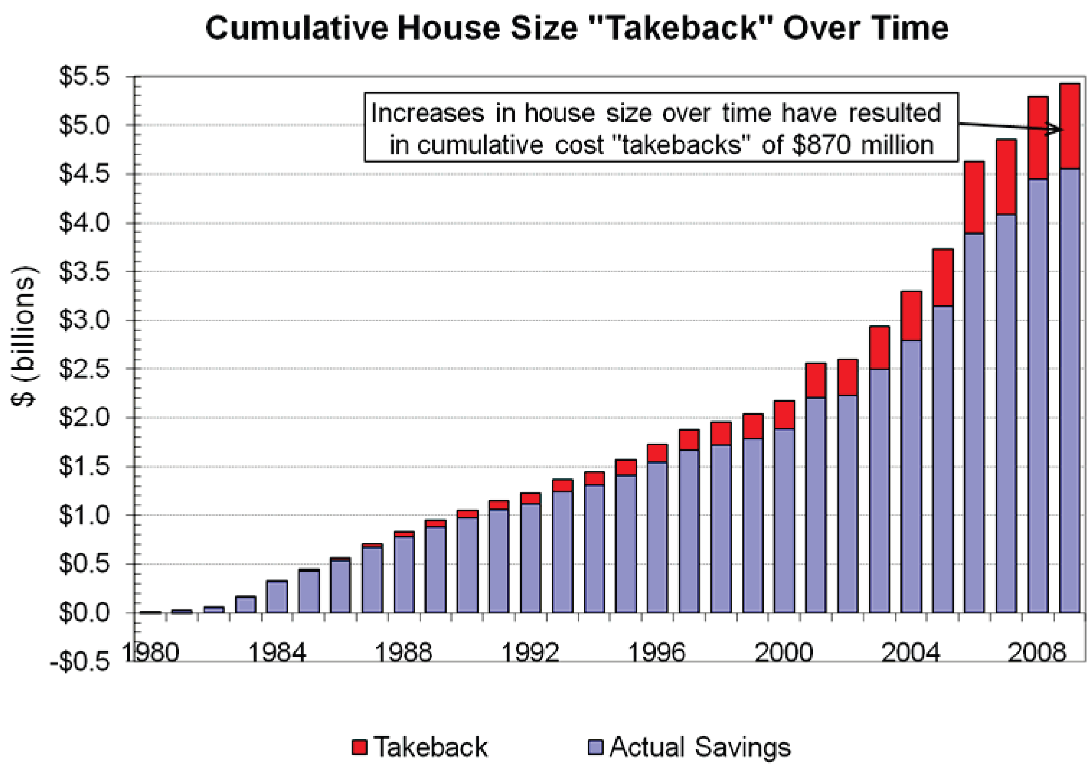


Figure 6 Impacts of House Size "Takeback" on Florida's Energy Code Savings.

CONCLUSION

The Florida Energy Code has been an effective tool for implementing state policy for energy conservation in buildings. It has been successful in part because it provides a system for incorporating a broad range of energy saving technologies and construction practice options that can be employed to comply with the energy performance standard it establishes. This allowed for rapid and affordable adaptation to significant increases in the energy performance standard over time. The flexibility provided by Florida's performance based code allows building designers an effective method to meet multiple design goals in addition to energy efficiency and has proven to be the compliance option used most by builders.

Going forward, the Florida Legislature has committed to law a schedule for increasing building energy efficiency standards that will be challenging for the construction industry. The Florida code provides a framework with sufficient flexibility to accommodate adaptation of the variety of buildings characteristic of Florida's market to the increasing standards. However, support services including extensive builder- and owner-education programs and innovative conservation measures evaluation programs will be essential to developing the knowledge base necessary for rapid change in the marketplace. Subsidy programs may even be necessary to provide the demonstration of reliability that builders seek before adopting new construction practices. The optimistic schedule for building code energy standard improvements will require much more market interaction than the state or federal governments can provide alone. Improved codes and effective implementation will not address all potentials for building energy sector energy conservation.

Two major sources of building sector energy use are not fully impacted by building codes. The first is existing buildings, which are impacted only to the extent that an alteration is made to the building or an air conditioner or water heater is replaced. Even then the code requires only minor upgrades to altered portions of buildings and replacement of equipment with the minimum efficiency allowed to be sold in the US. In this area, incentive programs that provide subsidies or financing options are essential for reaching the potential for building energy efficiency upgrades associated with repair, alteration and renovation projects. Emergency repair programs in particular are reported to have been very successful energy conservation programs and provide benefit well beyond code minimum efficiency benefits.

The second and growing source of energy use that must be addressed by a conservation tool other than building codes is the growing energy use of "plug load" appliances and electronic devices within homes and buildings. These loads now amount to 55 percent of home energy use and cannot be addressed by building codes. They contribute to energy use not only by direct consumption but by the heat they create that must be removed by air-conditioning systems. Education programs and incentive programs must be devised to move consumers to the more efficient options.

Florida devised and implemented a number of tools to address energy conservation policies during the era of rapidly rising power generation energy costs of the 1970s and 1980s. In this time of renewed interest in building sector energy efficiency there is an opportunity for viewing how these tools can work together to achieve the maximum potential for controlling energy-use growth and providing for a clean and efficient energy future for Florida. The participation and support of the private sector is key and the role utility companies will play is up to the Public Service Commission.