Florida Energy Resiliency

FLORIDA ENERGY RESILIENCY REPORT

2013

ECONOMIC ANALYSIS, CASE STUDIES, AND STRATEGY RECOMMENDATIONS

FRCA
FLORIDA REGIONAL COUNCILS ASSOCIATION
Partnerships for the Future

U.S. DEPARTMENT OF COMMERCE
ECONOMIC DEVELOPMENT ADMINISTRATION

ACKNOWLEDGMENTS

AND CREDITS

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This document was prepared with funding from the U.S. Economic Development Administration, U.S. Department of Energy, Florida Department of Agriculture and Consumer Services Office of Energy and Florida's eleven Regional Planning Councils. All product or service references are for comparative analytical purposes only. Reference herein to any specific commercial product, process, or service by trade name, trademark manufacturer, or otherwise, does not constitute or imply its endorsement, recommendation, or favoring by the United States Government, the Florida Department of Agriculture and Consumer Services, or Florida's Regional Planning Councils.

EXECUTIVE SUMMARY

OVERVIEW

In an effort to provide context and policy and programmatic options to federal, state and local decision makers, the Florida Regional Councils Association undertook a study of energy resiliency in Florida. Energy resiliency means the ability to adapt with minimal negative impact to change or disruption. The report was informed by a survey of residents and businesses, which overall indicated that over 50% of Floridians were willing to invest in energy efficiency. It was also informed by stakeholders from each of five "Energy Planning Areas". Inputs from these groups resulted in strategies thought appropriate for Florida or for specific regions, most of which are included in the report as options for consideration. Where there are working examples of approaches or strategies, these are included as case studies.

The report also considers the economic impact of scenarios that may be of interest to decision makers and Floridians in general. Overall, these scenarios were analyzed with the following results:

- Natural Gas Disruption: This fuel has become increasingly important in Florida, and currently is plentiful and inexpensive. Analysis shows however that a mere six month disruption or period of significant price increase could cause the state to lose $4.2B in Gross Domestic Product in that short timeframe.
- Gas Price Increase: Florida is very dependent on gasoline. Increase prices by 50%-175% for five years and the State loses $28B-$82B in Gross Domestic Product.
- Renewable Portfolio Standards: Increase the percentage of renewable fuel sources used in Florida from the current 1% to 10% in five years, and $6B is added to Gross Domestic Product.
- Private Energy Market: An increase in solar installations that added 1% to construction sales and reduced electric costs by .05% each year has only a minimal impact on Gross Domestic Product.
- Electric Vehicles: If 1% of all new vehicles sold in Florida in 2030 were electric, $27M would be added to Gross Domestic Product.

In short, no one strategy will address the issue of energy resiliency in Florida. Only a combination of conservation and consumer education, to preserve the individual bottom line, coupled with concurrent implementation of strategies with positive benefits to the economy and those which diversify energy sources will move the needle toward a more resilient state. Once implemented, this preparation will counter concerns related to Florida's energy vulnerability.

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INTRODUCTION
AND OVERVIEW

Florida's eleven Regional Planning Councils (RPCs) in their capacity as Economic Development Districts (EDDs), began work on developing an Energy Resiliency Report in November 2011. This effort was a result of the BP Deepwater Horizon oil spill that led to the discharge of an estimated 206 million gallons of oil into the Gulf of Mexico.

VULNERABILITIES

The oil spill posed a serious threat not only to the environment but also to the economy along the coastal areas of Louisiana, Mississippi, Alabama, and Florida. While the oil spill was stopped, hundreds of oil rigs remain pumping off of the coast. A domestic drilling ban will not prevent drilling in the areas that could impact the U.S. Even if the U.S. was to ban off shore drilling, Mexico, Cuba, the Bahamas, and other countries could drill within their territorial limits and still threaten the Gulf of Mexico or the Atlantic Coastline.

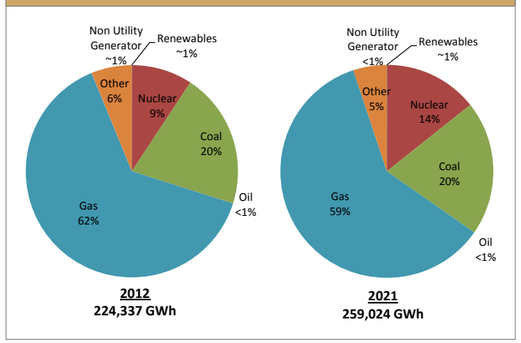
The location and geography of Florida contributes to a higher risk for natural disasters such as hurricanes, heavy rain events, tornadoes, major wild fires and droughts. Previous natural catastrophes such as Hurricanes Andrew, Charley, Wilma, Katrina and more recently Sandy, have highlighted the need for better energy assurance planning, resiliency policies, and a more resilient infrastructure.

Looking ahead, there is no shortage of foreseeable risks that could cause disruptions to the energy sector. Given America's ongoing dependency on foreign sources of crude oil, external events such as instability in the Middle East, South America, and West Africa can cause price volatility. Even though the United States gets most of its imported petroleum from nearby places such as South America, Mexico, and Canada, oil is an international commodity, and prices are affected by events on a global scale. As key components of the electrical power grid age, with many of them 40 years old or more, they are susceptible to mechanical and structural failure. For example, Duke Energy announced that the Crystal River Nuclear Plant in Central Florida will be permanently closed, thereby limiting the amount of nuclear energy that is likely to be produced in the state, given costs and siting difficulties.

Rail and mass transit, highways, canals, dams, water systems, wastewater systems, information technology, and communications provide functions and services that are essential to maintaining modern society. All these sectors, in turn, rely on a dependable supply of energy that is currently provided primarily by fossil fuels and nuclear power.

Florida needs to be innovative when planning for energy. Diversity in Florida's future energy supply could come from a variety of technologies that would not only create thousands of jobs locally, but would also allow for greater resiliency should current sources of oil, coal, natural gas, and nuclear power become reduced in supply or too expensive to remain viable.

FIGURE 1: FLORIDA FUEL MIX (ENERGY)



Source: Florida Reliability Coordinating Council, 2012

The extent of the impacts of the BP oil spill, as well as lessons learned from previous disruptions in Gulf Coast refineries from hurricanes, spill rightly shifted focus to the potential for disaster or disruption in energy supply. Oil is only one of the many energy sources that the nation relies upon. For example, a homeowner or business seeking to mitigate for risks before hurricane season, the State of Florida has options that can build resiliency into its energy systems so they are better able to withstand change. Actions that diversify our energy supply with an emphasis on domestic energy have the dual benefit of building resiliency and supporting domestic jobs.

INTRODUCTION

RESILIENCY AND ASSURANCE

In its effort to update the Florida Energy Assurance Plan (FEAP), the Florida Office of Energy engaged the regional planning councils (RPCs) to address energy assurance issues in its ongoing resiliency study efforts. The focus of the study was to conduct economic impact analyses, research case studies, and develop strategies related to energy assurance for use by those engaged in energy assurance planning.

The Florida Energy Assurance Plan ensures there are policies and procedures in place to respond to situations involving an energy disruption. The FEAP provides information and guidance on how to respond to an energy emergency caused by a large-scale disruption of electricity, natural gas, or petroleum products in the State of Florida.

The FEAP is divided into three sections. Section One provides the roles and responsibilities of key stakeholders in an energy emergency and identifies the operational response to an energy disruption occurring in Florida. Section Two identifies energy assurance best practices based on the experiences of other states. Section Three focuses on enhancing Florida's resiliency and protecting critical infrastructure.

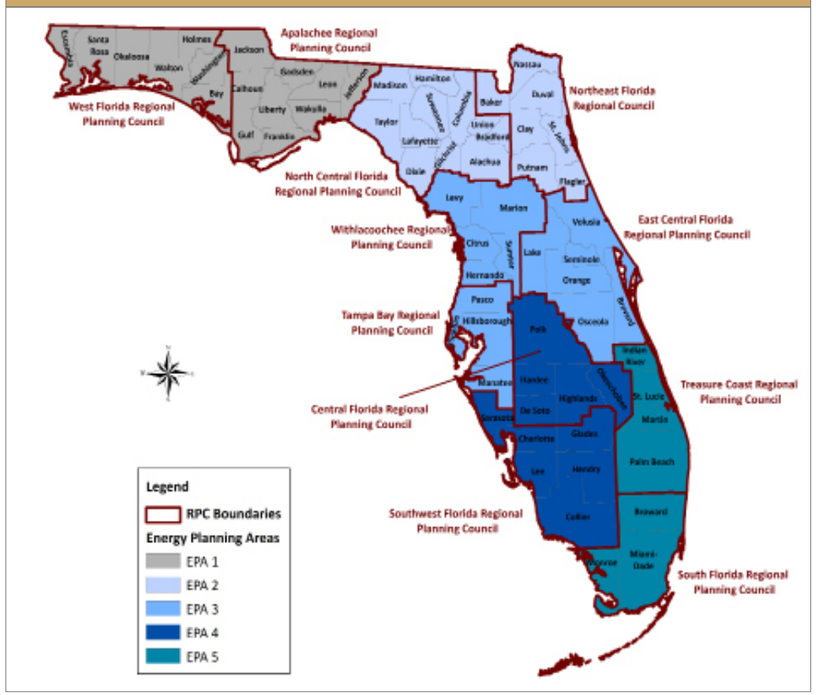
Energy assurance represents a comprehensive approach to ensure the availability of energy. This includes actions and activities to address the post event impacts of an emergency for a quicker recovery; restore the energy supply or mitigate impacts of a disruption; reduce the likelihood of energy emergencies; reduce the potential severity and duration of energy emergencies; and increase the reliability of access to energy both before and after a potential emergency or disruption event. The Florida Energy Assurance Study may be found at http://florida-energy.org and is a resource that is aligned with and complementary to the Energy Resiliency Report.

Energy resiliency represents efforts to improve the ability or capability to recover from an energy supply disruption. This includes actions or activities that lessen the impact by reducing the magnitude, geographic extent, or time frame associated with an energy supply disruption. A system that is more energy resilient is expected to experience a less widespread energy supply disruption and may experience the disruption for a shorter length of time. The diversification of energy sources through the increased use of domestically available renewable energy is a critical element in enhancing energy resiliency in Florida.

STRATEGY DEVELOPMENT PROCESS

In order to address the uniqueness of Florida's regions, for purposes of this study the state is divided into five Energy Planning Areas (EPAs), which are comprised of partnerships among the eleven regional planning councils Figure 2.

FIGURE 2: ENERGY PLANNING AREAS



Source: Regional Planning Councils, 2013

Regional Planning Councils in Florida have the same boundaries as Economic Development Districts, so it was possible to consolidate these regional entities into cohesive EPAs. Although diverse, EPAs have similar energy profiles and are compact enough for stakeholders to travel for face-to-face collaboration. In many cases, stakeholders within EPAs were already partners on energy related issues.

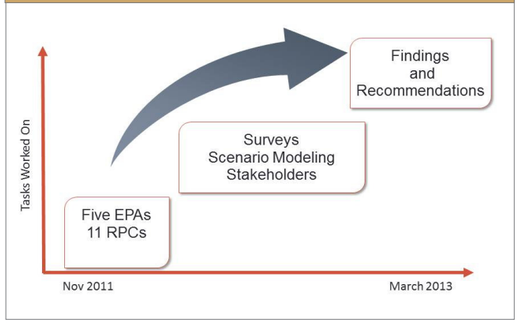
The first step in the development of the Energy Resiliency Report was a survey of statewide energy usage characteristics, which focused on the willingness to invest in alternatives and price tolerances with regards to increases in energy prices. The second step included detailed analyses with scenario building. The third step focused on gathering stakeholder feedback through workshops held throughout the state, with at least one in each EPA. The survey and analysis identified the major stakeholders and in the context of current energy usage by type, surveyed citizens regarding their energy usage, identified current and planned alternative energy uses, questioned attitudes and logistics of distributive power. The fourth step involved collating and sharing the information gathered from these workshops across the state. The final step included developing strategies and implementation methods to make the state more resilient. Each EPA in the state addressed their respective region to utilize local knowledge, reduce costs and coordinate with statewide efforts to ensure consistency, proper vision, and synergy Figure 3.

Utilizing the information gathered from the preliminary survey and analysis, a detailed analysis was performed on the scenarios it suggested. The analysis used existing econometric models, such as REMI PI+ and CFAPT to analyze the impact of sudden energy price increase or disruptions, often referred to as price shocks. Additional resources, such as the Quarterly Census Employment Wage (QCEW) data, regional disaster resiliency studies, Targeted Industry Cluster, Strategic Regional Policy Plans (SRPPs), Comprehensive Economic Development Strategies (CEDS) and the Workforce Skills Competency Study were utilized in the analysis. Alternative energy technologies, installations, and benefits were also modeled.

Each energy planning area conducted at least one energy workshop with the stakeholders in each area. These events focused on the various vulnerabilities related to energy, such as security, natural or man made disasters, state and national policies, and external factors. Local policy makers, energy producers, users, and others gathered to discuss furthering strategies and recommendations from the workshops. All of the data from the meetings were collected and analyzed and additional modeling was conducted. Once this phase was complete, findings and recommendations were drafted including local, regional and state strategies and implementation options.

The findings and recommendations from the Energy Assurance Study were combined with the findings on resiliency in this Energy Resiliency Report. The regional planning counicls and stakeholders will incorporate the strategies into the CEDS, visioning efforts, SRPPs and other planning documents to help create a more energy resilient Florida. In addition to the FEAP, planning efforts like the county and state Comprehensive Emergency Management Plans (CEMPs) and the related Emergency Support Function 12 – Energy will utilize the study's findings and recommendations.

FIGURE 3: BASIC PROCESS OVERVIEW



Source: Regional Planning Councils, 2013

PROJECT TIMELINE

RESILIENCY

The expansive timeframe of the Energy Resiliency Report allowed the RPCs to thoroughly analyze Florida's energy needs and concerns. The RPCs began to develop a roadmap to energy resiliency in November of 2011. Online and statistically-valid phone survey were conducted to understand the residential and business price elasticity, temperament towards energy policies, and potential energy-related investments. Over 2,000 survey results helped create discussions to craft strategies and future scenarios at 9 statewide workshops with over 200 participants. Over 10 hypothetical scenarios were modeled to determine what would happen if the scenario came to fruition. Twenty-one Case Studies were analyzed to identify early adopters and programs for new energy resiliency solutions. Two confabs between the RPCs helped develop 27 strategies to help Florida become more energy resilient.

ENERGY AND PERSISTENCE CONQUER ALL THINGS.

BENJAMIN FRANKLIN

MIAMI, FLORIDA

WHY WE NEED ENERGY RESILIENCY

RESILIENCY AND COMPETITIVENESS

Florida is distinguished by its geography as a peninsula, the importance of tourism as an economic driver, its climate, its growth patterns, and its large population.

Florida is the fourth most populous state in the nation, and nearly half of its population can participate in the labor force Table 1. Despite its large population, Florida lags in the lower half of states for per capita personal income. Reasons for the lower per captia income include the low cost of living, low taxes, and the large number of retirees.

TABLE 1: GENERAL POPULATION AND EMPLOYMENT DATA

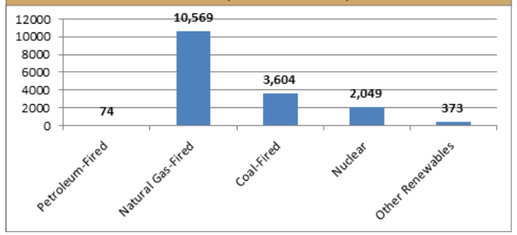
Population and Employment	Florida	U.S. Rank	Period
Population	19.3 MILLION	4	2012
Civilian Labor Force	9.4 MILLION	4	MAY, 2013
Per Capita Personal Income	$40,344	28	2012

Source: U.S. EIA, taken July 2013.

ENERGY RESOURCES

Florida's large population and above average temperatures demand a significant amount of energy. The majority of the energy is currently produced by Natural Gas Fired Power plants, as shown in Figure 4. Unlike states with traditional energy resources such as coal mining or oil drilling, Florida has only minor oil and gas re¬sources on land, as shown in Table 2. Geologists believe there may be reserves off the coast, but current regulations do not allow off-shore/near-shore drilling. Florida is well positioned for alternative energy investments. Florida boasts one of the longest growing seasons due to its climate, which presents the potential for biofuel production. Sugarcane, sorghum, citrus waste, and tree farming are just a few of the crops that are being used to create or experiment with biofuels. Universities in Florida have various pro¬grams and partnerships aiming to create viable biofuels using Florida's waste or agriculture. Florida has sunshine much of the year, with the potential for solar power generation. It also has tropical storms and hurricanes, making the in-state re¬sources needed for renewable energy vulnerable to disruption and damage. With no oil refineries in the State, non-renewable fossil fuels must be brought in by pipeline or tanker and barge. This means the potential for weather events, terrorism, short¬ages, price hikes, or disruptions in other states or even nations can leave Florida vulnerable to disruption in the flow of energy. This means the potential for weather events, terrorism, shortages, price hikes, or disruptions in other states or even nations can leave Florida vulnerable to disruption in the flow of energy.

FIGURE 4: NET ELECTRICITY GENERATION IN FLORIDA IN 2013 (Thousand MWh)



Source: U.S. EIA, taken July 2013.

Q. Why do energy resiliency planning? Why reduce our dependence of on foreign energy (primarily petroleum)? Why protect and diversify our energy supplies?

A. It is good for the economy. On the national level, high energy prices (primarily imported oil) can have a direct impact on the economy. The following graphic depicts the rather tight correlation between the increase in the price of oil and the decline in Gross Domestic Product (GDP).

The following comparison includes data from the U.S. Energy Information Administration, Florida State Energy Profile and the Electric Power Annual report, each with data for 2011.

TABLE 2: GENERAL ENERGY RESERVE AND SUPPLY DATA

Reserves	Florida	Share of U.S.	Period
Crude Oil	18 million barrels	0.10%	2010
Dry Natural Gas	56 billion cu ft	*	2010
Natural Gas Plant Liquids	0 million barrels	0.00%	2010
Recoverable Coal at Producing Mines	--	--	2011
Rotary Rigs & Wells	**Florida**	**Share of U.S.**	**Period**
Rotary Rigs in Operation	1 Rigs	0.10%	2012
Natural Gas Producing Wells	--	--	2011
Production	**Florida**	**Share of U.S.**	**Period**
Total Energy	524 Trillion Btu	0.70%	2011
Crude Oil	99 thousand barrels	*	2013
Natural Gas - Marketed	15,125 million cu ft	0.10%	2011
Coal	--	--	2011
Capacity	**Florida**	**Share of U.S.**	**Period**
Crude Oil Refinery Capacity (as of Jan. 1)	0 Barrels/Calendar Day	0.00%	2012
Electric Power Industry Net Summer Capability	59,627 MW	5.70%	2011
Stocks	**Florida**	**Share of U.S.**	**Period**
Motor Gasoline (Excludes Pipelines)	635 thousand barrels	2.00%	2013
Distillate Fuel Oil (Excludes Pipelines)	2,246 thousand barrels	2.50%	2013
Natural Gas in Underground Storage	--	--	2013
Petroleum Stocks at Electric Power Producers	6,801 thousand barrels	21.70%	2013
Coal Stocks at Electric Power Producers	5,882 thousand tons	3.40%	2013

Source: U.S. EIA, taken July 2013.

CONSUMPTION AND SOURCES

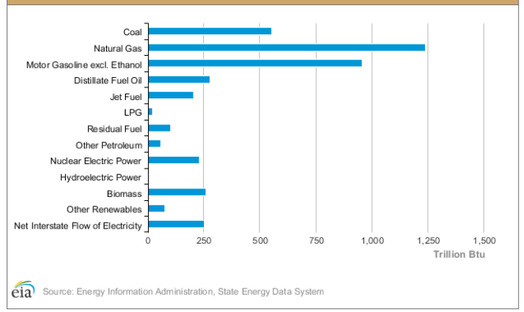
While Florida's total energy consumption is among the highest in the nation, per capita energy consumption is among the lowest in the country, as shown in Table 3. This energy efficiency is due to relatively low energy use by the industrial sector. Figure 5 details the energy consumption estimates by energy source.

TABLE 3: TOTAL CONSUMPTION OF ALL GOODS

Per Capita	Florida	U.S. Rank	Period
Total Energy	221 million Btu	44	2011
By Source	**Florida**	**Share of U.S.**	**Period**
Total Energy	4,217 trillion Btu	4.30%	2011
Total Petroleum	309.9 million barrels	4.50%	2011
Motor Gasoline	196.0 million barrels	6.10%	2011
Distillate Fuel	47.6 million barrels	3.30%	2011
Liquefied Petroleum Gases	5.4 million barrels	0.60%	2011
Jet Fuel	35.7 million barrels	6.90%	2011
Natural Gas	1,218,340 million cu ft	5.00%	2011
Coal	23,294 thousand short tons	2.30%	2011

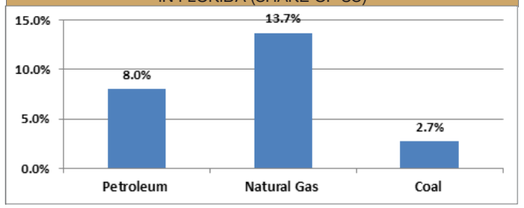
Source: U.S. EIA, taken July 2013.

FIGURE 5: FLORIDA ENERGY CONSUMPTION ESTIMATES, 2011



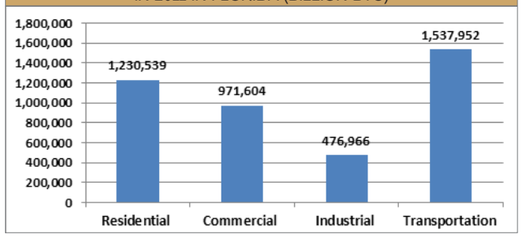
The transportation and residential sectors lead State energy demand. The tourism industry and lack of mobility choices contribute to the consumption of petroleum-based transportation fuels (gasoline, diesel, and jet fuel) at one of the highest levels in the nation. Electricity accounts for 90% of the site energy consumed by Florida households. Figure 6 depicts the source of electricity generation, while Figure 7 details the end user of the energy. The widespread use of air conditioning in the summer, combined with the prevalence of electricity as the energy for home heating Figure 8 leads to retail electricity sales that are the second highest in the nation. Only Texas sales are higher, Figure 9 shows the national average.

FIGURE 6: CONSUMPTION FOR ELECTRICITY GENERATION IN 2013 IN FLORIDA (SHARE OF US)



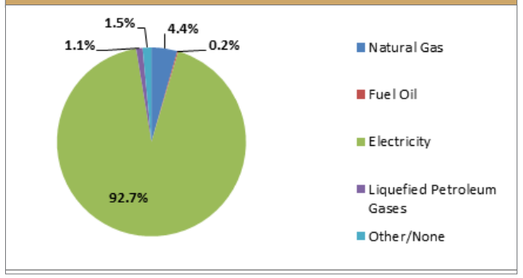
Source: U.S. EIA, taken July 2013.

FIGURE 7: CONSUMPTION BY END-USE SECTOR IN 2011 IN FLORIDA (BILLION BTU)



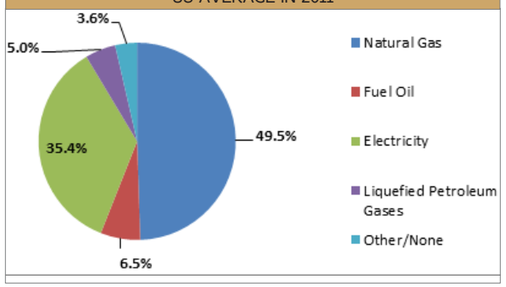
Source: U.S. EIA, taken July 2013.

FIGURE 8: HOME HEATING (SHARE OF HOUSEHOLDS) IN FLORIDA



Source: U.S. EIA, taken July 2013.

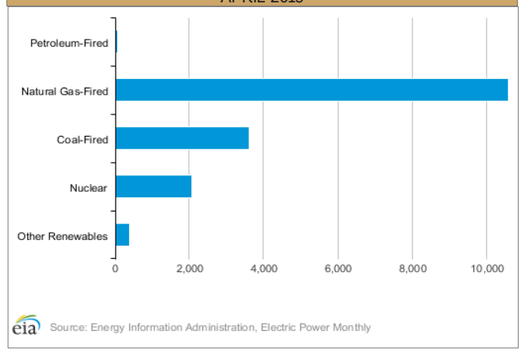
FIGURE 9: HOME HEATING (SHARE OF HOUSEHOLDS) US AVERAGE IN 2011



Source: U.S. EIA, taken July 2013.

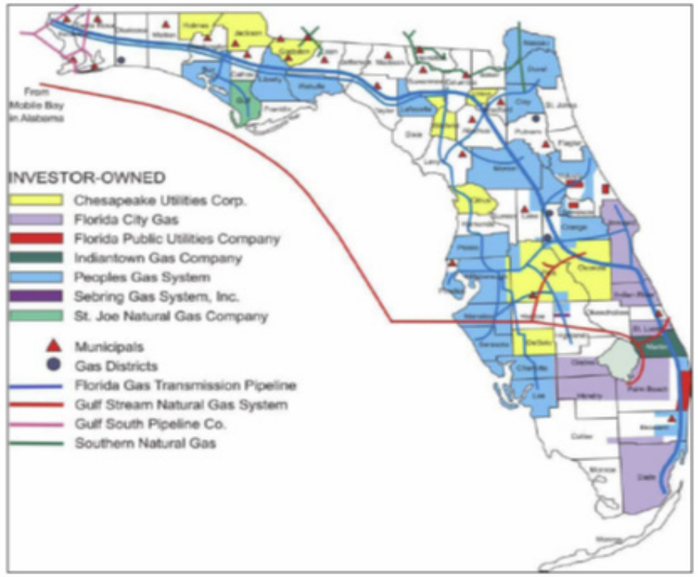
Texas also exceeds Florida in the percentage of net electricity generated from natural gas, but it was the only state to do so in 2011. In 2011, 62% of Florida's net electricity generation came from natural gas, 23% from coal, 9.8% from nuclear plants, with the remaining 5.2% from other sources. Florida's net electricity generation renewable energy sources was 2.2% in 2011. Florida ranked third in the nation in 2011 in net electricity generation from solar energy. The complete breakdown of Florida's energy generation by source is shown in Figure 10.

FIGURE 10: FLORIDA NET ELECTRICITY GENERATION BY SOURCE, APRIL 2013



As shown in the preceding figures, all industries and households in Florida rely on electricity. It is critical for the health of Florida for electricity to remain available and inexpensive. The rising and declining prices of commodities provide a slippery slope of which commodities to rely upon while inexpensive and which ones to continue to use in order to ensure access if the inexpensive commodity's price surges. Natural Gas has become a staple with the sudden access to an abundance of wells by using the Fracking methods. Florida has become increasing reliant upon this source of energy as the prices and availability are unmatched by coal. Figure 11 is map of the transmission lines running along Florida. These pipelines help ensure access throughout the state.

FIGURE 11: FLORIDA NATURAL GAS TRANSMISSION LINES



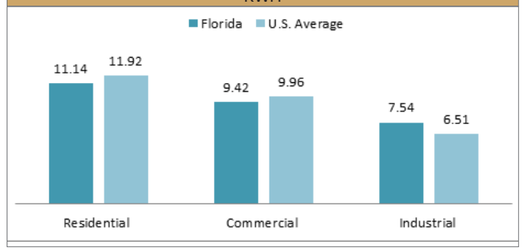
Distributors and Pipelines	Number of Service Providers
Municipal	27
Gas Districts	4
IOU	5
Intrastate Pipeline	1
Interstate Pipelines	4

Source: Florida Gas Transmission Company, 2012

PRICES

Florida has lower electricity prices than the national average in residential and commercial sectors, but is higher for industrial customers, as shown in Figure 12. However, in 2011, Floridians paid 10.61 cents per kilowatt hour, approximately 0.71 cents above the national average electricity rate of 9.90 cents per Kilowatt hour.

FIGURE 12: AVERAGE ELECTRICITY PRICES BY SECTOR, CENTS/KWH



Source: U.S. EIA, April 2013

Overall, Florida's gasoline prices track national averages fairly closely. A chart showing the past decade of gasoline prices illustrates the price instability in the petroleum market as shown in Figure 13. In addition, the general trend toward higher prices is also evident. It is possible, although not certain, that the last year or two of data indicate that the market is finding a new equilibrium point; but for how long?

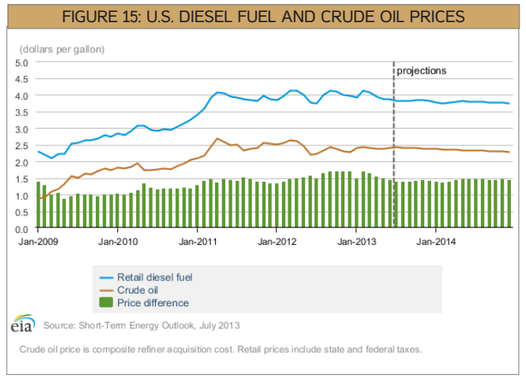
FIGURE 13: WEEKLY RETAIL GASOLINE AND DIESEL PRICES

This chart shows past and projected prices for retail gasoline and the crude oil from which it is refined, as shown in Figure 14. It is interesting to note that the price differential between the two is fairly constant at around $0.80 to $1.20 per gallon. This means that, in general, consumers can expect changes in gasoline prices to mimic those in crude oil prices.

FIGURE 14: U.S. GASOLINE AND CRUDE OIL PRICES

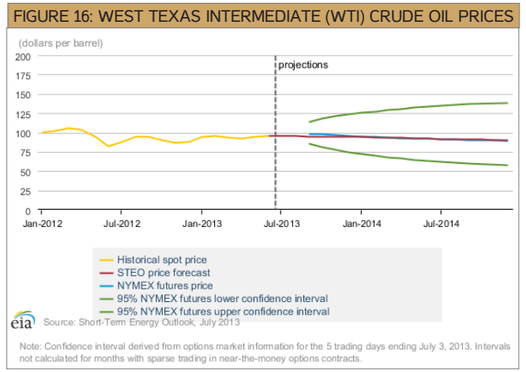
Price relationships between diesel fuel and crude oil follow a similar pattern as those between gasoline and crude oil, as shown in Figure 15. The price differential between diesel and crude oil appears to be slightly higher, at about $1.50 per gallon. The majority of overland freight movement depends on diesel as its fuel. Similar to gasoline, companies should expect prices in diesel fuel to follow changes in crude oil.

FIGURE 15: U.S. DIESEL FUEL AND CRUDE OIL PRICES



Projections for the price of West Texas Intermediate (WTI) Crude Oil, an indicator for consumer gasoline prices vary widely, as shown in Figure 16. Recently, spot prices have varied by about one quarter of the current price. Just one year into the future, the range between high and low projections is roughly $72. The range for next year gas prices estimated by the WTI index are between 62% to 132% of the current price. This instability in future commodity prices leads to uncertainty in the market, and this uncertainty has economic effects across the state and nation.

FIGURE 16: WEST TEXAS INTERMEDIATE (WTI) CRUDE OIL PRICES



Comparison Conclusion

Florida's growing population indicate the state will have high energy needs in the long term. When coupled with its currently-developed energy resources, infrastructure, and growth patterns, potentially places the state at a disadvantage against other states. However, the opportunities presented by renew¬able energy sources, energy conservation, and changes in growth patterns are all within the control of the state, and are all viable routes to make Florida energy resilient and to ensure that the special place that is our State retains the competitive advantages given to it by its special climate, geography and people.

IMPACTS ON ECONOMY

Alternative energy or "green-collar" jobs are on the rise — the current tally of 8.5 million U.S. jobs in renewable-energy and energy efficiency industries could grow to as many as 40 million by 2030, according to a November 2011 report commissioned by the American Solar Energy Society. The growing industry is beginning to employ scores of experienced workers who can put to use the skills they've acquired in more established fields such as construction, finance, and marketing.

According to the World Energy Outlook, oil remains the dominant fuel in the primary energy mix to 2035. Nonetheless, its share of the primary fuel mix diminishes as higher oil prices and government measures to promote fuel efficiency lead to further switching away from oil in all sectors. Demand for coal rises through to around 2020, and starts to decline towards the end of the outlook period. The share of nuclear power increases from 6% in 2008, to 8% in 2035. The use of modern renewable energy — including hydro, wind, solar, geothermal, modern biomass and marine energy — triples between 2008 and 2035, its share in total energy demand increasing from 7% to 14%.3 Natural gas is forecast to become a larger share of the global energy. Energy security is enhanced by a greater diversity of the energy mix. By creating an energy resiliency strategy and fully participating in the global shift to more sustainable energy sources, Florida's annual share of jobs created is estimated to be 60,000 jobs per year or an average growth rate of 7% in the sector per year.

The U.S. Energy Information Administration projects the following growth rates in energy sectors in the Americas between 2010 and 2040: Petroleum: 0.1%, Natural Gas: 1.2%, Nuclear: 0.6%, Coal: 0% and other sources, 1.9%. [3]

If Florida is positioned in the forefront of diversifying energy sources, it has the potential to reap the benefits of this growth[1]. If it is not, it runs the risk of having few alternatives to simply paying higher prices for traditional fuels. According to the U.S. Department of Labor, Bureau of Labor Statistics in 2012, more than one fourth of the projected fastest growing occupations are construction-related. While construction is not projected to recover the full percentage of the labor force that it used to account for, it will be a growth area in this decade. Florida, with its tradition of a robust construction industry, can leverage the growth in this employment sector with new technologies and diversification of energy sources. New jobs, increasing skill sets within the workforce and saving future energy related costs, either by assurance against disasters or resiliency in diverse energy sources, is a desirable path for the state.

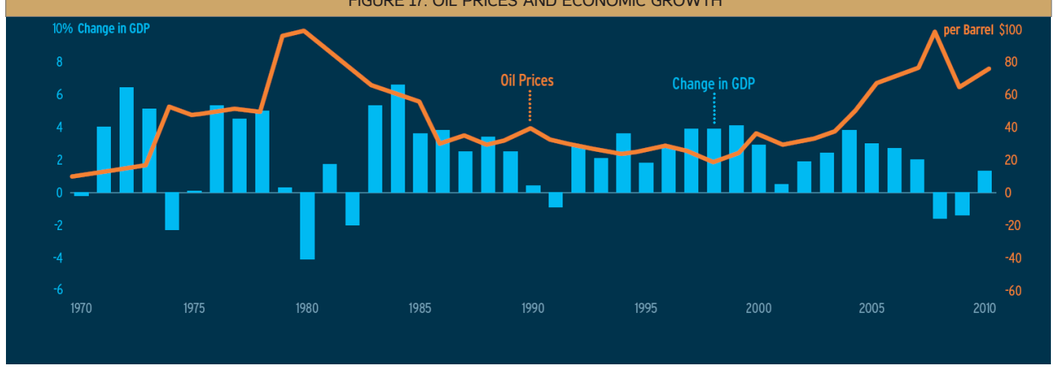
IMPACTS ON TRANSPORTATION

Affordable transportation of people and goods is vital to the nation's economic health. When the price of oil rises, the State of Florida suffers as costs for transportation, food and other goods increase. Transportation and the infrastructure are increasingly interdependent, particularly transportation and energy infrastructures, so a disruption in one will have an effect on others. With the increasing reliance on distribution systems, any failure of transportation, due to intentional or non-intentional causes, can have very disruptive in the following areas:

- Transportation supply. Ensuring that transportation modes, routes, terminals and information systems are able to function.
- Transportation vulnerability. Reducing the vulnerability of the transportation modes, terminals and users to intentional harm or disruption from natural events.

1 U.S. Energy Information Administration, World Energy Consumption by Region and Fuel, 2011

FIGURE 17: OIL PRICES AND ECONOMIC GROWTH

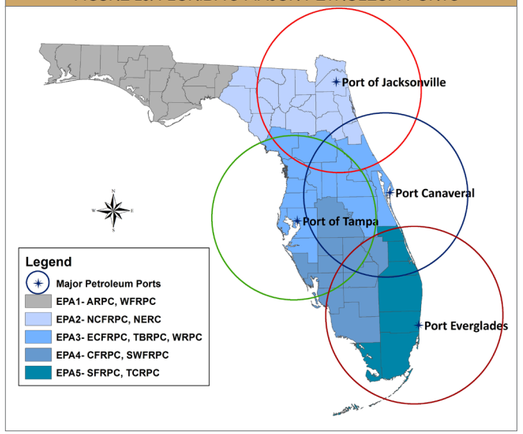


Source: U.S. EIA, April 2013

Petroleum and Diesel
American consumers are supplied with the transportation fuels they need every day through a complex yet extremely efficient system that transports gasoline and diesel fuel from the refineries where they are produced to their local gasoline station. The fuel that consumers use in their vehicles may have travelled a thousand miles or more between its point of production and the local retail gasoline station, as shown in Figure 18.

Florida has no oil refineries and relies on delivery by tanker and barge to marine terminals near coastal cities, or transported to distribution terminals by pipeline. Deliveries occur 365 days a year in order to ensure supplies to consumers that may be a million barrels/day of gasoline and diesel fuel that they rely on.

FIGURE 18: FLORIDA'S MAJOR PETROLEUM PORTS



Source: Regional Planning Councils

Biofuels are produced at bio-refineries and then transported to distribution terminals by rail or barge. At the distribution terminal, the gasoline and diesel are blended with biofuels as the fuel is put into a tanker truck for delivery to retail service stations.

Natural Gas
Similar to the petroleum distribution, the natural gas distribution system relies on a nationwide network of pipelines to distribute natural gas from well to consumer. Florida receives most of its natural gas supply from the Gulf Coast region via pipelines. The Cypress Pipeline is the most recent to provide service, from Georgia to the Jacksonville area. Florida's consumption of natural gas accounts for a 5% share of the total consumption in the U.S. (EIA, Florida Profile, 2011) Natural gas use in vehicles nearly doubled between 2003 and 2009 and, according to the American Public Transit Association, about 18% of transit buses run on natural gas. More than 100,000 natural gas vehicles (NGVs) are operating on U.S. roads, although they account for less than 1% of NGVs worldwide. Domestic natural gas production is predicted to grow in the coming decades, reducing the need for natural gas imports. Shale gas is expected to be the largest source of natural gas in the future due to an abundance of newly found shalefields and more efficient technologies. However, it is a new technology and could face regulatory hurdles or other challenges in the future.

Electric Vehicles
Electric vehicles (EVs) are becoming more popular nationally due to incentives, advanced motor and battery technologies, higher gasoline prices and environmental concerns. There are approximately 310 charging stations in the state (www.carstation.com, 2012).

Electricity prices fluctuate far less than oil prices, so increased reliance on electricity for transportation could help make transportation costs more predictable and reduce the negative economic effects of oil price fluctuations.

Depending on where the EV is charged its power will currently come from a varying mix of coal, natural gas, nuclear and renewable energy. Electric or hybrid vehicles are charged with charging units that can be installed at home, the workplace or in public areas. For EVs to appeal to a wider range of consumers, a broader charging infrastructure in workplaces, malls and other public places may be necessary.

Diversity of Fuels and Transportation
Increasing the diversity of transportation options would not remove the risk of disruption. Consumers relying on electric vehicles could not instantaneously switch to a natural gas powered vehicle in the event of a power disruption. However, flexible or dual-fueled vehicles have this option. An increase of alternative fuel/vehicle systems provides a more diversified supply capability, which should reduce reliance on a single energy source. Increased diversification of fuel-vehicle systems in the light-duty (cars and small trucks) sector and a reduction in oil use is driven by increasing cost competitiveness of alternative fuels and vehicles. These diverse fuel options include hydrogen, propane and biodiesel. Propane, also known as liquefied petroleum gas (LPG), as well as Hydrogen are con-

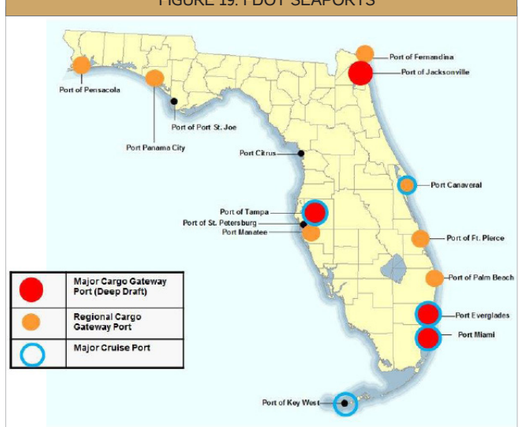
sidered alternative fuels under the Energy Policy Act of 1992. Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in diesel vehicles. The Clean Cities Coalition is a non-profit organization that serves business, government and non-profit agencies to bring more viable alternative fuels. Biodiesel, which is most often used as a blend with regular diesel fuel, can be used in many diesel vehicles without any engine modification.

PORTS

Florida's seaports are essential to the local and state economy. In 2011, more than three million containers were moved from one of the 15 different seaports in Florida. This cargo included imports and exports that had an estimated value of $83 Billion. The ports and their local activities are estimated to generate over 550,000 direct and indirect jobs and $1.7 billion in state and local tax revenues.

The wide range of goods that flows through the seaports include aggregates, asphalt, automobiles, automotive parts, aviation fuel, building materials, clothing, coffee, concrete, cooper, dairy products, feeds, fertilizers, fruits, furniture, gasoline, grain, household appliances, leather goods, lumber, newsprint, orange juice, paper products, power plant fuel, refrigerated products, salt, and steel. The seaports interact with the world. This diversity among the goods provided and countries used could play a critical role in the case of a hurricane that has damaged different ports, countries or goods. The seaports are also home to vibrant cruise industry, in which 13.3 million customers experienced in 2011, as shown in Figure 19.

FIGURE 19: FDOT SEAPORTS



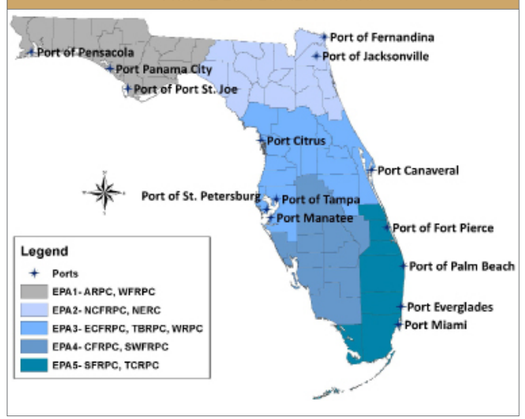
Source: FDOT 2013

While the Ports are responsible for generating a significant amount by the goods and merchandise that they collect from the cargo ships, they play an even more important role with the deliveries of fuel through ships and pipelines. The State's 5th largest import through its seaports is oil and coal. Natural gas is pumped off ships at Port Manatee and arrives in containers at the Port of Palm Beach. Jet fuel arrives by tanker at the Port of Tampa and is conveyed by pipeline to airports. Petroleum products arrive by tanker at Port of Jacksonville, Port Canaveral, Port

Everglades and Port of Tampa. Port Panama City exports wood pellets for use as biofuel. Each of these ports responds to market interest as it arises, so other ports could import or export in the future. Additional fuels are present through the ports and help diversify the locations of where the fuel is while also helping to distribute gasoline, petroleum, natural gas, etc. throughout the state, as shown in Figure 20.

The airports within the state are of critical importance as well. The 20 primary commercial airports in the state serves over 70 million passengers. The airports are essential to a recovery due to the ability to quickly move goods, services, and response teams.

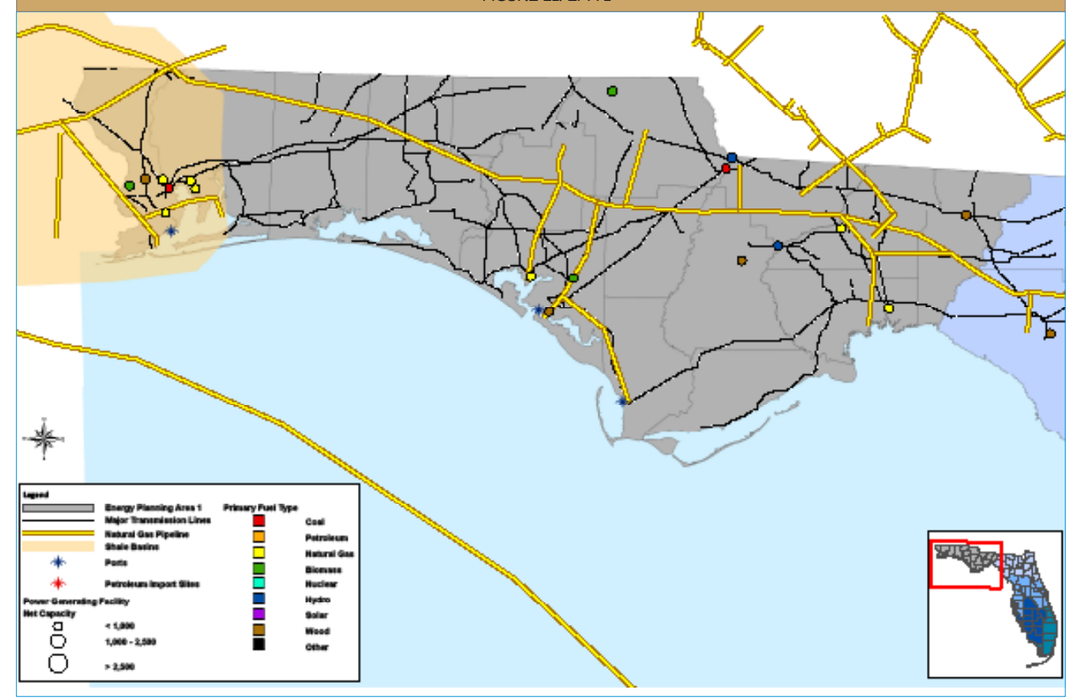
FIGURE 20: FLORIDA PORTS



Source: Regional Planning Councils

EPA 1 has three major ports, although none are identified as petroleum importation sites. A natural gas pipeline enters the state from the west from refineries in Louisana, and runs eastward and then down through the rest of the peninsula. The most numerous type of generating facilities run primarily on natural gas, with coal, hydro, wood, and biomass playing minority roles in regional power supply. Major electrical transmission lines criss-cross the panhandle, except in areas that are largely unpopulated or represent large tracts of undeveloped or conserved land – like Appalachicola National Forest or other state-owned lands.

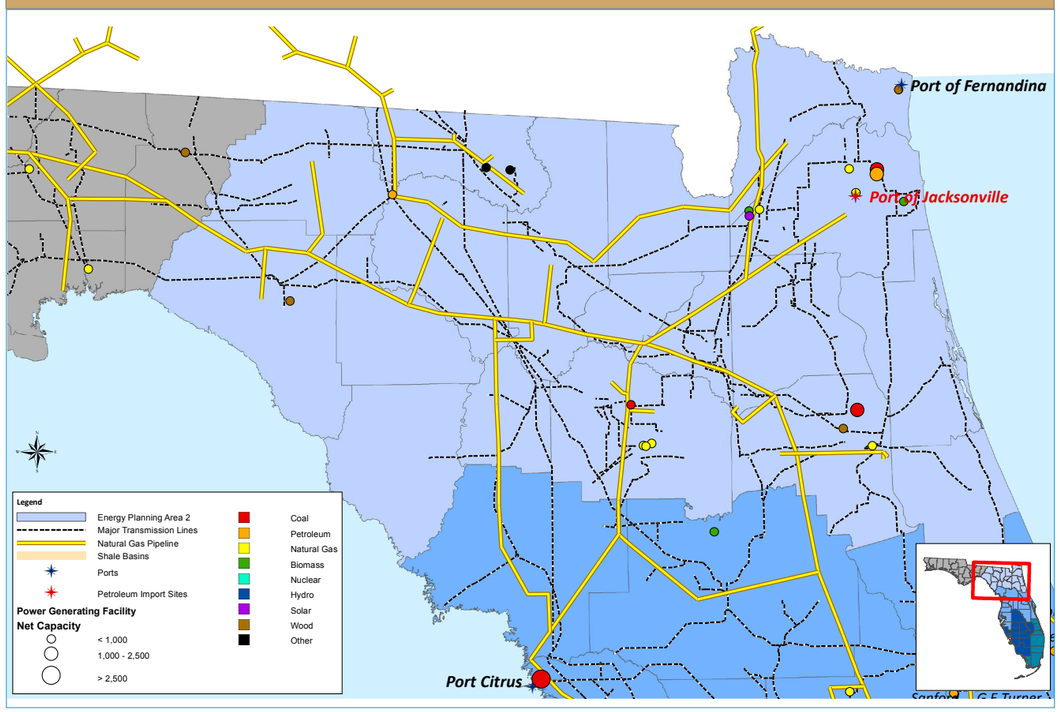
FIGURE 21: EPA 1



Source: Regional Planning Councils

EPA 2 has two major ports. The largest port in the region, and one of the top five in the state, is the Port of Jacksonville, which is also a petroleum importation site. Several natural gas pipelines run through EPA2; one coming from the west, and several coming from the north via Georgia. The highest output power generating facilities in EPA 2 run on coal and petroleum. Numerous natural gas facilities also support power generation in the region, with three of those facilities in Gainesville alone. Wood, solar, biomass, and other types of fuel are the primary fuel source for the remainder of smaller power generating facilities in the region.

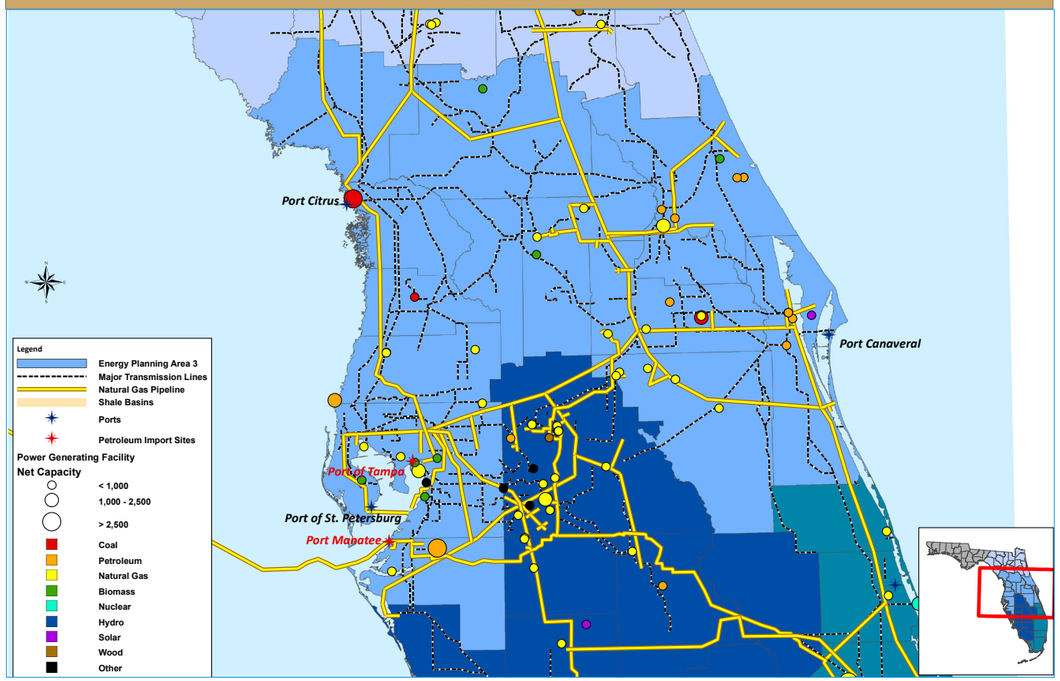
FIGURE 22: EPA 2



Source: Regional Planning Councils

EPA 3 has five ports, two of which are petroleum importation sites – Port of Tampa and Port Manatee. All but one port – Port Canaveral – in EPA 3 is on the west coast, primarily clustered in Tampa Bay. Two main natural gas pipelines run north-to-south through the region, one on the west coast, and just east of the center of the peninsula which serves Orlando and surrounding municipalities. EPA 3 has some very high output power generation facilities, which primarily run on coal and petroleum. Other relatively high capacity facilities in the region primarily utilize coal, natural gas and petroleum. Numerous other smaller power generation facilities utilize solar, petroleum, biomass, coal, and other fuels as their primary fuel sources. The primary fuel source most used by number of stations in EPA 2 is natural gas.

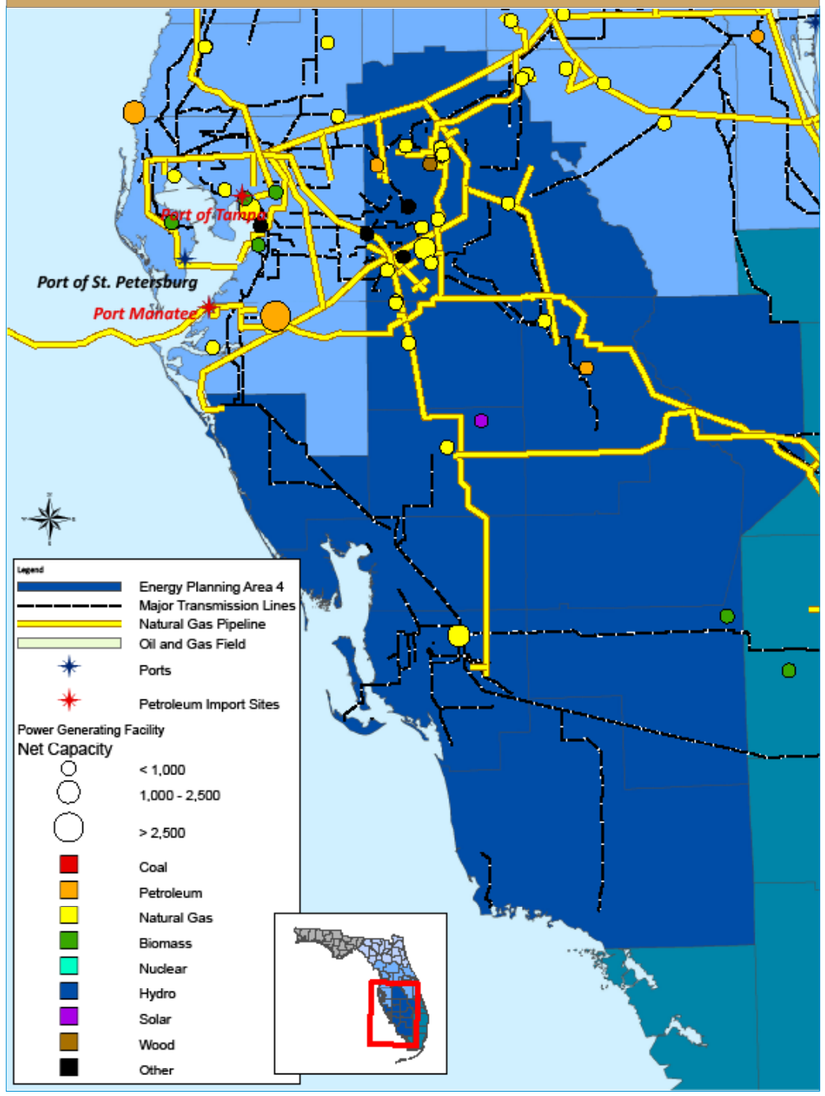
FIGURE 23: EPA 3



Source: Regional Planning Councils

EPA 4 has no major ports identified. Natural gas pipelines enter the region from the northwest from EPA 3, and run southward and southeastward in two main trunks that connect to the Fort Myers area and EPA 5. The most numerous type of generating facilities run primarily on natural gas, and this includes the largest two facilities in the region. Smaller power generating facilities are numerous and utilize primary fuel sources of natural gas, petroleum, solar, wood, biomass, and other fuels. Major electrical transmission lines run down the west coast and connect the major coastal population centers. These lines then connect to the east to major population centers in EPA 5. Other major transmission lines also run from the Tampa area into the northern part of EPA 4 and connect the northern population centers in Polk and Highlands Counties.

FIGURE 24: EPA 4

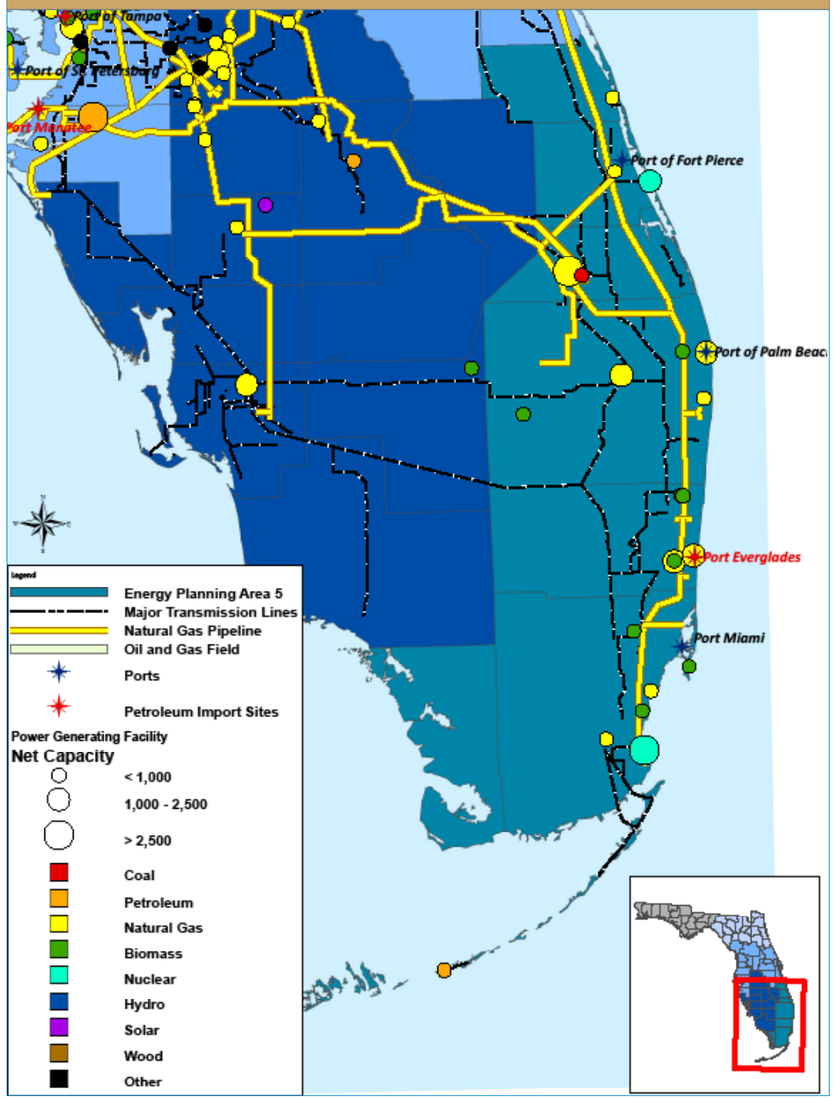


Source: Regional Planning Councils

WHY WE NEED ENERGY RESILIENCY

EPA 5 has four major ports, one of which – Port Everglades – is a petroleum importation site. All four ports are on the east coast. The major natural gas pipelines in the area run north-to-south, primarily along the east coast, and serve the major coastal population centers. One pipeline enters from EPA 4 and one pipeline enters from EPA 2. EPA 5 has two very high output power generation facilities, which primarily run on natural gas and nuclear fuel. Other relatively high capacity facilities in the region primarily utilize natural gas (four facilities) and nuclear fuel. Numerous other smaller power generation facilities utilize natural gas, biomass, and petroleum as their primary fuel sources. The paths of major electrical transmission lines and natural gas pipelines generally avoid the Florida Everglades, which are mostly unpop\ulated and inaccessible.

FIGURE 25: EPA 5



Source: Regional Planning Councils

DISASTER PREPAREDNESS

Infrastructure vulnerability to storm damage was keenly felt in Florida during the 2004 and 2005 hurricane seasons. The four hurricanes that struck the state during each of those two years resulted in damage restoration costs for Florida's privately owned electric utilities of over $1.2 billion in 2004, and $0.9 billion in 2005. As of January 2013, there are 15 plants, representing 22% of Florida's total generation capacity (13 GW) located in storm surge zones for Category 1 hurricanes, and up to 36 plants (over 37.8% of capacity) are vulnerable to Category 5 hurricanes. Some of Florida's largest coastal resources are also the most vulnerable, as estimated from the state's "surge zones" (Florida State Emergency Response Team).

The long history of vulnerability to disasters has resulted in a robust network in support of emergency preparedness. Emergency Management in Florida is guided by the Florida Division of Emergency Management and the Florida Comprehensive Emergency Management Plan. Florida takes an "all hazards" approach to emergency preparedness which recognizes that the functions that many agencies conduct will be similar during many types of disasters. It is possible that any of the following could disrupt energy supplies: natural disasters, unexpected operational failure, and/or unusual economic/international political events.

The Comprehensive Emergency Management Plan (CEMP) is divided into 18 different Emergency Support Functions (ESF). Depending on the threat, the appropriate functions may be activated. ESF 12 has primary responsibility for energy issues. The primary function is to respond to shortages and disruptions in the supply and delivery of electricity, natural gas, and other forms of energy and fuels. The following partners may participate during activation:

- Florida Public Service Commission
- Department of Agriculture and Consumer Services, FDACS Office of Energy
- Florida Reliability Coordinating Council - (FRCC)
- Florida Electric Cooperatives Association, Inc.
- Duke Energy Florida
- Florida Power and Light Company
- Central Florida Electric Cooperative, Inc.
- Gainesville Regional Utilities
- North American Electric Reliability Council
- TSIN.COM - Transmission System Information Networks
- U.S. Department of Energy
- Nuclear Regulatory Commission

ESF 12 is divided into two different functional areas - electricity and fuels. The Florida Public Service Commission and Florida's larger electrical utility companies provide the staff support during an activation. Typically hurricanes are the most common reason for the activation of ESF 12. Prior to landfall, estimates are made on how many homes are expected to lose power. Based on this estimate, potential resources are identified from both in house and mutual aid sources. Once a hurricane has made landfall, the number of homes that have actually lost power are identified as well as the progress being made to restore electricity. ESF 12 has a small office in the State Emergency Operations Center located in Tallahassee. The utility companies also have their own operations centers to direct their responses.

OPPORTUNITIES FOR ENERGY RESILIENCY

Renewable Power Sources

The source of Florida's wonderful climate is also its most promising source of renewable energy – sunshine. Florida's climate also bodes well for fast-growing energy crops such as sugarcane and sweet sorghum. With 47,500 farms, Florida could become an important producer of biofuels, and as the state comparison section indicates above, only a small percentage of Florida's energy sources are renewable. Florida has an Energy Systems Consortium, which combines the efforts of 11 universities to work on efficiency, conservation, renewables, solar, and marine energy projects. During the 2012 legislative session, the Florida Legislature passed its first statewide energy policy in four years, which reinstated tax incentives for the production of renewable energy, reduced burdens on businesses, promoted energy efficiency, and repealed the renewable portfolio standard mandate. Florida has created a property assessed clean energy program to allow investments to be paid over time as part of property tax bills, and counties are being encouraged to join this program and make this option available to residents and businesses.

The following is an assessment of the resiliency potential for various renewable energy technologies and fuels in Florida. (See also Case Studies section).

Solar Energy

Florida has the potential to develop solar energy capacity as sunlight is abundant in the Sunshine State. A study by the Florida Solar Energy Center found that Florida has 85% of the maximum solar energy potential of any place in the country, at 7.2 kilowatt-hours per day. Solar energy can help Florida secure its energy future since it is not subject to oil supply disruptions or price volatility. As noted, Florida ranked third in the nation in 2011 in net electricity generation from solar energy (EIA, Florida Profile, 2011). Buck Martinez of Florida Power and Light (FPL) told participants at the 2012 Florida Energy Summit that solar energy should be a critical component of a diversified, reliable and cost efficient energy policy. He noted that solar is reliable, requires no water, produces no emissions, requires minimal operation or maintenance costs, and has a proven track record of working in Florida. For example, FPL has deployed a number of solar arrays at its power plants to create energy during the peak demand time frame.

The FPL Martin Next Generation Solar Energy Center is the first hybrid solar plant to connect to an existing combined cycle power plant. It is the largest solar thermal plant outside of California and is estimated to generate enough power to serve about 11,000 homes. This project addresses jobs, resiliency, and cost savings in the following ways:

- During construction, the project provided around 1,100 construction jobs along with several full-time positions after completion;
- Over 30 years, the solar facility will prevent the emission of more than 2.75 million tons of greenhouse gases. According to the U.S. EPA, this is the equivalent of removing more than 18,700 cars from the road every year for the entire life of the project;
- It decreases fossil-fuel usage by approximately 41 billion cubic feet of natural gas and 600,000 barrels of oil; and,
- It does not require additional cooling water.

More information is available at the FPL website: http://www.fpl.com/environment/solar/martin.shtml

Biomass Energy and Cellulosic Ethanol

Ethanol consumption in Florida accounted for 6.4% of the U.S. share in 2011, as shown in Table 4. Emissions from the electric power industry account for 5% or less, relative to the nation, across the greenhouse gases Carbon Dioxide, Sulfur Dioxide, and Nitrogen Oxide.

TABLE 4: GENERAL ENVIRONMENTAL DATA

Alternative Fuels	Florida	Share of U.S.	Period
Alternative Fueled Vehicles in Use	44,531 Vehicles	3.70%	2011
Ethanol Plants	0 Plants	0.00%	2013
Ethanol Plant Capacity	0 Million Gal/Year	0.00%	2013
Ethanol Consumption	19,710 Thousand Barrels	6.40%	2011
Total Emissions	Florida	Share of U.S.	Period
Carbon Dioxide	246.0 million metric tons	4.40%	2010
Electric Power Industry Emissions	**Florida**	**Share of U.S.**	**Period**
Carbon Dioxide	114,441,236 Metric Tons	5.00%	2011
Sulfur Dioxide	113,046 Metric Tons	2.30%	2011
Nitrogen Oxide	82,935 Metric Tons	3.40%	2011

Source: U.S. EIA, taken July 2013.

Florida is actively involved in the research and development of biofuels, taking advantage of the interest of agriculture in growing profitable crops and in access to energy. Biomass fuels can be used locally and at small facilities. The potential exists for benefits that include profitable farms that grow and harvest biomass fuel stocks to be used in local facilities, creating wealth that supports Florida's rural areas. Corn is not ideal to grow in Florida to produce ethanol, so the University of Florida has begun biomass research that focuses primarily on traditional Florida agriculture sugarcane and switchgrass and other biofuels. Sugarcane is Florida's third-largest commercial crop, trailing only nursery and citrus. Other alternatives include using fast-growing trees or grasses as a renewable fuel source.

WHY WE NEED ENERGY RESILIENCY

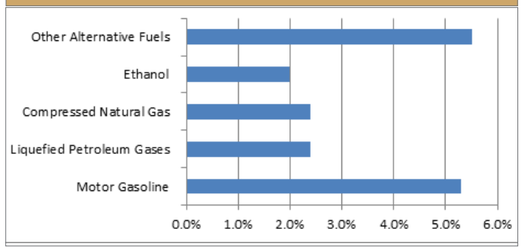
Florida had a fleet of over 44,000 alternative fuel vehicles in operation and 51 ethanol fueling stations in 2011, as shown in Table 5 and Figure 26. The prevalence of alternative fueling stations is partially due to the I-75 Green Corridor Project which seeks to increase the abundance of alternative fuel accessibility along the I-75 highway across the entire nation.

TABLE 5: GENERAL FUELING STATION DATA

Fueling Stations	Florida	Share of U.S.
Motor Gasoline	5,839 Stations	5.30%
Liquefied Petroleum Gases	68 Stations	2.40%
Compressed Natural Gas	28 Stations	2.40%
Ethanol	51 Stations	2.00%
Other Alternative Fuels	877 Stations	5.50%

Source: U.S. EIA, taken July 2013.

FIGURE 26: FLORIDA SHARE OF U.S. FUELING STATIONS BY TYPE



Source: Regional Planning Councils

In fall 2013, the INEOS Bio Indian River County BioEnergy Center in Vero Beach is producing cellulosic ethanol at commercial scale and exporting power. The facility has been converting vegetative, yard, citrus, oak, pine, and wood pallet waste. The Center is also permitted to process Municipal Solid Waste, and may begin its conversion in 2014. Dr. Peter Williams of INEOS Bio said "All that we have seen so far validates the technical and economic viability of the technology. We remain convinced that the ability to divert waste materials from communities by converting them into competitively priced renewable fuel and power offers an excellent value proposition. It helps solve waste disposal issues, contributes to the supply of affordable and renewable fuel and energy, creates attractive jobs, and provides a sustainable source of value for the community. We look forward to taking the next steps in building a global business based on the broad deployment of this advanced technology." More information may be found at www.ineos.com.

Wind Energy

Relative to other places in the US, Florida does not have the required sustained wind speeds to make large commercial wind farms viable. At typical heights for utility-scale wind turbine installation - 80 meters above surrounding land - average annual wind speeds need to be equal to or greater than 6.5 m/s. Virtually nowhere in Florida, with the exception of small areas on Cape Canaveral, meets this threshold (http://www.windpoweringamerica.gov/windmaps). However, it is important to take notice of future developments as small-scale wind installations might make sense in windy areas. Currently, only smaller, residential-scale wind turbine installations are considered feasible in select locations. Average annual wind speeds of 4 m/s or greater at 30 m above surrounding land are considered feasible for the operation of small-scale residential wind turbines. These occur in select microclimates distributed throughout Florida (http://www.windpoweringamerica.gov/windmaps). Additionally, offshore wind farms may become more feasible as research delves further into the process.

Biogas Energy

Methane emissions account for 7% of Florida's greenhouse gas emissions and present a clear opportunity for capturing and creating useful energy. There are several examples of municipal landfills that capture the methane gas produced by the garbage and use the gas to produce energy. Orlando Utilities Commission burns methane from municipal landfills to produce electricity for 10,000 homes each day, and to offset about 44,000 tons of coal each year. More information is at www.ouc.com. Every year, Florida livestock emit 19,000 tons of methane that could be captured to generate clean electricity. The University of Florida Dairy Research Unit is working on animal manure management, and maintains lagoons and fixed-film digesters to suit Florida's farms. Fed by 500 dairy cows, the digester generates 237,000 kilowatt-hours of power -- enough to power about 20 homes for a year -- and its patented process reduces odors, flies, and pathogens by as much as 95% from conventional waste-management techniques.

7 SELECTED STRATEGIES

FOR IMMEDIATE IMPLEMENTATION

This report presents 27 strategies to address Florida's energy resiliency and assurance. To facilitate the implementation process, the top five strategies were ranked by ease of implementation, as shown in Table 6. All these strategies were deemed to be easy or moderate to carry out, and could be implemented by different stakeholders but facilitated by Regional Planning Councils. The majority of these strategies also have a strong outreach and educational component, and some might require changes to local policies and ordinances. A summary of the identified strategies is provided below.

TABLE 6: TOP FIVE STRATEGIES

Rank	STRATEGY	Strategy #	CATEGORY	IMPLEMENTATION LEVEL	IMPLEMENTATION EASE
1	Provide comprehensive education on the goals, costs and benefits, obstacles, and quality of life implications related to energy efficient community design and planning.	3	Outreach & Education; Energy Conservation & Demand/Supply; Policy	State, Regional, Local, Public/Private	Very Easy
2	Adopt a broad-based program to promote efficiency and conservation using all available tools, and market a consistent message of energy efficiency and conservation through comprehensive planning and school district curricula.	2	Outreach & Education; Energy Conservation & Demand/Supply; Policy	All	Easy
3	Continue to conduct public opinion polling and economic modeling to support the adoption of renewable energy goals by the state and its public and private partners.	14	Outreach & Education; Researcg & Development; Policy	State, Regional	Very Easy
4	Encourage innovative energy project development through collaboration of universities, entrepreneurs, and regional expertise.	15	Policy; Research & Development	All	Easy
5	Develop and encourage Property Assessed Clean Energy (PACE) and other locally established financing programs for energy efficiency, energy conservation, and energy generation improvement programs and make available to all sectors (residential, commercial, industrial, government, institutional, etc.).	8	Financing and Implementation; Energy Conservation & Demand/Supply; Policy	All	Easy

Source: Regional Planning Councils

1. **Provide comprehensive, all-inclusive education on the goals, costs and benefits, obstacles, and quality of life implications related to energy efficient community design.**

   Many communities have worked to control urban sprawl because of the negative impacts this type of development pattern has on farmland and natural resources. Moreover, urban sprawl creates new infrastructure costs and promotes the decline of older urban areas. Add to these problems energy inefficiency and a higher cost-of-living for residents Floridians waste large amounts of energy just commuting from suburban residential areas to employment centers near the urban core. An efficient community design pattern that favors a mix of uses could help alleviate this problem, and increase the state's energy and economic resiliency. Furthermore, the integration of energy efficiency design features such as "green" building materials, rooftop solar thermal and photovoltaic systems, and native landscaping could help to maximize energy efficiency and resiliency.

   The implementation of this strategy would require an intensive outreach and education campaign to local governments, school districts, developers, and the general public. Local governments are a key stakeholder for this strategy. Most jurisdictions may need to audit their building and land development regulations to make sure that they promote compact development. Similar to this effort, school districts could locate their facilities within walking/bicycling distance of the communities they serve. An educational campaign focused on developers and the general public conveying benefits of compact development and energy efficient design should be implemented. The regional planning councils are well suited to implement this strategy because they have experience leading similar initiatives and collaborating with multiple stakeholders at the regional level.

2. **Adopt a broad-based program to promote efficiency and conservation using all available tools, and market a consistent message of energy efficiency and conservation through comprehensive planning and school district curricula.**

   Besides community design, programs that promote energy efficiency and conservation are also important part for attaining energy resiliency. These programs may be implemented at the state, regional, and local levels by public and private organizations, as well as by individuals.

   At the state level, the Legislature provides the regulatory framework and incentives that promote energy conservation and mandate efficiency standards. The adoption of the Florida Energy Efficiency and Conservation Act in 2006, which promoted the creation of state energy conservation goals, is an example of this effort. Public utilities are also an important partner in this effort by providing its customers with electricity demand reduction programs. These include energy audits and assistance with the installation of more energy efficient lighting and appliances, additional insulation, and solar thermal and photovoltaic systems. These programs could benefit from an outreach component that could be better implemented by the utility companies with assistance from local governments, school districts, and regional planning councils. These agencies could also help by incorporating energy conservation principles in their plans, ordinances, and curricula.

3. **Continue to conduct public opinion polling and economic modeling to support the adoption of renewable energy goals by the state and its public and private partners.**

   If public education and information dissemination is one half of the picture, then public opinion polling is the other half. Both measuring the effect of the education and outreach component, and determining which issues have enough popular backing to pursue through implementation, are both valid uses of continuing public opinion polling regarding energy issues. Regular public opinion polling is also useful to inform and update the often ever-present institutional lag that may occur in entrenched energy camps at the state level. With the increasingly innovative energy technology landscape, polling is essential to knowing the minds of the public, and ensuring that Florida can become more resilient and innovative.

   Likewise, economic modeling regarding energy issues should be used as a follow-up and integral part of this process. Issues raised should be vetted through the lens of economic impact, in the near-term and long-term. Although not all economic modeling software accounts for all societal impacts, the easily quantifiable benefits are still worth of investigation.

   Since this strategy involves polling of the electorate regarding energy issues, which are often large-scale, if not statewide, issues, it naturally should be conducted across large geographic areas. The Energy Planning Areas created as part of this report should be the minimum area acceptable for viable public opinion polling. These similarly-aligned areas represent a linkage between local energy-related economies, economic development, and resiliency. The Regional Planning Councils are well-suited to conducting this type of public polling, as well as conducting the economic modeling of energy issues that would also arise. The assembled, in-house expertise relating to public outreach, economic modeling, regional perspective, and connections to local governments make the RPCs a natural bridge from statewide to locally-relevant.

4. **Encourage innovative energy project development through collaboration of universities, entrepreneurs, and regional expertise.**

   Recent trends show a considerable increase in private and public investment in green and renewable energy technologies. The federal government has played an important role in this process by providing funding for companies that develop solar and wind technologies through Department of Energy grants. At the state level, the Florida Renewable Energy Grant Program was instrumental in helping to develop technology-based projects that promoted energy efficiency. Universities and entrepreneurs could also be important partners in the energy resiliency process by creating and commercializing technologies that foster energy efficiency. Moreover, universities continue to develop their research centers to assist faculty and student research on leading edge energy topics, assist in technology transfer to non-academic entities and to help with the commercialization of new developments. They could also partner with other agencies to create "green business" incubators to help local entrepreneurs develop energy saving technologies.

   As the economic development districts for Florida's regions, regional planning councils can play a significant role in implementing this strategy. Some of these initiatives could be incorporated as strategic projects in the CEDS, which could help facilitate the funding of these projects. Additionally, the RPCs could help bring to bear regional economies and constituents that can coordinate their efforts for greater outcomes.

5. **Develop and encourage Property Assessed Clean Energy (PACE) and other locally established financing programs for energy efficiency, energy conservation, and energy generation improvement programs and make available to all sectors (residential, commercial, industrial, government, institutional, etc.).**

   Encouraging PACE and local established financing programs across the state would also help to increase Florida's energy resiliency. These programs offer financing for energy improvements through loans that are repaid through annual increases in property tax assessments. Enabling legislation for the establishment of this type of program was passed in 2010, and it is currently being used by several Florida jurisdictions. The successful implementation of this strategy would depend on the collaboration of several stakeholders including the local Tax Collector Office, the Property Appraiser Office, and local governments. The biggest barrier to this program is finding a stable source of funding for the program. The regional planning councils can help local jurisdictions to identify potential funding opportunities and/or coordinate with the State to distribute and allocate funding programs appropriately.

STRATEGY
RECOMMENDATIONS

As part of the Energy Resiliency Study, energy workshops were held to determine each Energy Planning Area's strengths, weaknesses, opportunities, and threats, as well as general happenings in each EPA related to energy. These findings also included relative strengths of each area with respect to renewable and alternative energy technologies.

Strategies were developed independently, during and informed by summits. They were later grouped into categories to organize the underlying conceptual areas that each strategy addressed. The Strategies were also later analyzed to determine potential ease of implementation and level of implementation, to allow a better understanding of their potential cost-benefit considerations if they are pursued.

The seven categories are Outreach & Education, Financing & Implementation, Energy Conservation & Demand/Supply Management, Transportation, Policy, Emergency Preparedness, and Research & Development. Each strategy's subject material fits into one or more of these categories, and they may be viewed as being approached through or relating to each other based upon the category(ies) indicated.

Seven different categories were chosen because the strategies they encompass share some or all of the following characteristics:

- Outreach & Education - Public or professional education or certification.
- Financing & Implementation - A mechanism for achieving other purposes; revolves around facilitation.
- Energy Conservation & Demand/Supply - Increases in energy efficiency and conservation, often through improvements to equipment, real property, or other capital improvement; or changes in operations, procedures, or fuel sources in electrical generation facilities.
- Transportation - Non-electric side of energy consumption, namely the movement of goods and people that relies on petroleum fuels (gasoline and diesel, mostly).
- Policy - Action from decision-makers, policy-makers, elected or appointed boards, and/or legislators.
- Emergency Preparedness- response structures, protocols, and infrastructure.
- Research & Development - advances in technological expertise or information sharing and implementation related to those increases in knowledge.

The "Ease of Implementation" bar indicates the potential relative ease of executing a particular strategy.

- Very easy strategies involve communication, support, or sharing and can be started simply by individuals and groups that are committed to a goal.

- Easy strategies can be implemented by a community, a corporation or a utility without requiring a change to State or Federal law or policy. Easy strategies can be implemented locally, or build on existing systems and programs. Easy strategies can be started quickly without significant investment. Activities like education and advocacy are usually easier to begin than other strategies.

- Strategies with a moderate degree of difficulty may require a change in policy at the local or State level, or require partnerships among organizations with little history of collaboration. They may also require significant investment of time and money. Because their implementation is predicated upon a change, they may require significant lead time to get started.

- Difficult strategies may require changes to State and/or Federal laws, policies or programs. For this reason, their implementation may be difficult in the near term. They may take a sustained effort over a long period or cost a great deal.

- Very difficult strategies go against recent policy or regulatory changes, or are so broad in scope as to be prohibitively expensive. Their accomplishment may take many related actions and many diverse partnerships, including those not currently in place.

The ease of implementation does not indicate the potential returns from enacting a strategy, and so it is possible that the returns from executing a very difficult strategy may well outweigh the difficulties involved in implementing it. The text of each strategy contains discussion regarding the potential viability and returns associated with each strategy. Critical evaluation is necessary to estimate the risks and gains that might be associated with the implementation of any particular strategy.

Strategies were also organized around the concept of potential best level of implementation, from the federal government, to the state, to regional bodies, to local government, and to the private sector. Some strategies can fit into several levels, even though they may be best implemented at one level or another. This was an attempt to help focus decision-makers as to where their best efforts might be devoted within each strategy. In some respects, but not all, the level of implementation may be somewhat linked to the ease of implementation.

The "Strategy at a Glance" dashboard was developed to help quickly categorize and evaluate potential energy assurance and resiliency strategies. It provides a common ground upon which all strategies are evaluated to determine at first-glance compatibility or applicability. The dashboard consists of three key criteria for organizing the strategies: Category, Level of Implementation, and Ease of Implementation. Some strategies represent low-hanging fruit and may be essentially effortless to implement; others may be very difficult to implement.

The dashboard indicates where each strategy might be most effectively implemented. The different tiers of government, public, and private involvement indicated in the "Level of Implementation" suggest potential avenues of initiation for executing each strategy. Some strategies are more effectively implemented at particular levels of government, but may also be implemented at other levels. The nuances of implementation are discussed in the text of the strategy itself, but the dashboard provides the broader points.

STRATEGY 1

Increase energy efficiency education for appraisers, builders, buyers, sellers, and renters and require energy efficiency ratings (such as HERS ratings) to be posted on all new buildings, and on all existing buildings at time of sale or rental.

A major step to further energy resiliency is to increase education and knowledge about energy efficiency, particularly for builders, appraisers, buyers, sellers, and renters. The main thrust of the education component would be to implement a standardized way of rating buildings to make their energy consumption transparent. Similar to the Energy Star program, the Home Energy Rating System (HERS) is a good example, and ranks buildings based on their energy efficiency and projected annual energy usage. The system tells customers what they can expect their annual energy consumption (in kWh and dollars) to use or occupy any particular building. This allows for comparisons to be made between buildings based on a standardized set of measurements and would incentivize additional efficiency investment in new structures.

The energy efficiency rating of buildings should be posted visibly and communicated to buyers, sellers, and renters, so that they can make informed decisions. By educating appraisers and builders on the energy efficiency rating system, they will be able to make the best decisions regarding adding value through energy efficiency improvements. This education will lead to an overall increased demand for more energy efficient buildings, and will allow all parties to make more educated decisions.

Florida ranks in the middle of the pack 29th, nationwide for energy efficiency (American Council for an Energy Efficient Economy, http://aceee.org/sector/state-policy/scorecard, 2012).

By increasing awareness of energy efficiency of buildings, consumers can make informed decisions about how they spend their own money. Higher energy efficiency buildings will command a higher price on the market, and will return that investment to owners and renters through decreased operating costs. The end result is increased economic activity through increased sale and rental prices (for sellers and owners of energy efficient buildings), increased energy efficiency retrofitting (for owners that invest in upgrades to increase the desirability of their buildings), and reduced energy costs (for owners and renters). All of these savings would result in gains in disposable income in the long term. Another synergistic effect is increased overall economic resiliency to fluctuations and increases in building energy costs.

A standardized energy efficiency education strategy would be best implemented at the state level via policy, but can also be implemented well on a regional basis. A state, or even utility-level, certification program that qualified energy efficiency appraisers would be a step in furthering this strategy, especially if coupled with a large scale outreach program to educate the public about how the energy efficiency ranking system works. This strategy is easy, as long as there is goodwill and common purpose among all of the partners at the local level.

STRATEGY 2

Adopt a broad-based program to promote efficiency and conservation using all available tools, and promote a consistent message of energy efficiency and conservation through comprehensive planning and school district curricula.

Florida has the potential to save a significant amount of energy through energy efficiency and conservation programs. Energy efficiency and conservation enhance resiliency by reducing the demand for electricity and other energy resources. These programs may be implemented at the state, regional, and local levels by public and private organizations, and individuals.

The Florida Legislature has recognized the importance of energy efficiency and conservation by adopting the Florida Energy Efficiency and Conservation Act (Sections 366.80-366.85 and 403.519, Florida Statutes). The legislation promotes efficient and cost-effective demand-side renewable energy and conservation systems. All forms of energy must be used wisely and efficienctly so our buildings and vehicles can do more with less. Reductions of electrical consumption during weather-sensitive peak demand periods are of particular importance. The Florida Public Service Commission adopts goals and approves plans to promote conservation and efficiency. The Legislation requires each utility to develop plans and programs for increasing energy efficiency, conservation and demand-side renewable energy systems.

Florida electric utility companies now offer demand-side management programs for residential, commercial, and industrial users. These include the installation of more energy efficient insulation, lighting, and appliances such as air conditioners and water heaters. The power providers benefit because they reduce the demand for electricity during peak hours or shift the demand to non-peak hours. Currently only conservation programs found to be cost-effective can be implemented. There may be opportunities to modify the regulatory framework to encourage more conservation programs. A utilities' profit could be related to the amount of energy saved, rather than to the amount of money invested. The state could benefit by increasing energy efficiency and conservation. For example, a new tool that could be promoted is the non-profit Solar and Energy Loan Fund (SELF), which recently started administering the Clean Energy Loan Program in St. Lucie County. SELF provides energy expertise and favorable financing to help property owners identify and make cost-effective energy retrofits, including energy conservation, energy efficiency, and renewable energy alternatives such as solar. Local contractors are benefiting from an increase in business and the workforce is expanding because of related job training and education programs at Indian River State College. SELF is now expanding into neighboring counties and will soon be adding Property Assessed Clean Energy (PACE) as one of the options for financing commercial loans.

The success of this strategy is more likely in a state where all citizens understand the benefits of efficiency and conservation. The place to start to get this message out is to ask all school districts to teach these concepts. This should also be included in strategic regional policy plans, and local government plans. The Energy Planning Guide by Treasure Coast Regional Planning Council in 2009, and a Strategic Energy Master Plan adopted by Martin County are good examples. Implementation of this outreach strategy could be easy, and might begin by using volunteer subject matter experts to develop materials and educate.

STRATEGY 3

Provide comprehensive education on the goals, costs and benefits, obstacles, and quality of life implications related to energy efficient community design and planning.

In recent decades our growing cities and metropolitan areas have spread into the countryside and replaced farmland and natural areas. Sprawling development is not energy efficient. Energy is wasted by making mass transit expensive and impractical. Increased commuting distances are often in the most energy-burning form of transportation, the private automobile. It leaves unused much of the capacity of schools, hospitals, fire stations, and other urban infrastructure that still has to be maintained. It requires the duplication of this same infrastructure outside the city. Also, it hastens the decay of existing commercial centers and fosters new ones far from where people live and work.

Researchers at the National Energy Center for Sustainable Communities recently examined the potential economic and environmental benefit and costs of two communities. Each utilized different energy technology and community design strategies in large-scale projects (California Energy Commission's Public Interest Energy Research Program Technical Report CEC-500-2011-TB-002). The modeling showed that strategic integration of energy efficiency measures, technologies, and design features had the potential to reduce aggregate energy consumption by as much as 43 percent.

The creation of an energy efficient community starts early in the design phase, including a compact community design. Compact urban developments are more energy efficient than sprawling development patterns. Design features that can be incorporated to make a community more energy efficient include alignment of streets for optimal breezes, proper orientation of buildings to maximize solar capture, passive architectural designs, and energy efficient building materials, integral rooftop solar thermal and photovoltaic systems. The, integration of transportation, landscaping, and infrastructure strategies, with the use of native and drought tolerant plants can provide shade and minimize irrigation. The ultimate goal of an energy efficient community is to produce equal or more energy than it consumes from conventional sources.

The retrofit of a community not designed this way can be lengthy and may not optimize some design features. But efficient features can be added as buildings and infrastructure are rebuilt and maintained, leading to increased efficiency over time.

There is a need for school districts to become directly involved in planning their facilities for community-wide energy efficiency. New schools should be constructed in locations so that safe walking and bicycling by children can be accomplished. Schools should not be built as islands accessible only to motor vehicles and buses.

Potential barriers that could impede the establishment of energy efficient communities include::

- Existing land use and zoning regulations that do not provide for mixed use development patterns
- Misalignment between those who invest in energy efficiency and those that would benefit
- Inadequate financial support for efficiency innovation the building industry
- Insufficient local capacity and incentives to encourage energy efficient projects
- Consumers reluctance to pay premiums for energy efficiency
- Investment risk that inhibits capital project financing

Local governments, with assistance from regional planning councils and the state could take a leadership role in overcoming these barriers. Efficient community planning is best implemented at a local or regional level. Developers and land use planners should be encouraged to consider the opportunities and benefits of an energy efficiency philosophy early in the design-phase of the project, and the long-term quality of life benefits of energy efficiency. It will be easy to implement this educational strategy, especially once a community is aware of its value.

STRATEGY 4

Create and maintain a database of building stock data relating to energy efficiency and building condition to assist with future retrofit opportunities.

An important tenet of energy resiliency is to increase the efficiency of existing structures so less energy is used for building operations. Compiling and maintaining information on building conditions and energy efficiency can assist in the prioritization of future retrofit needs and opportunities, strategically target energy reduction strategies, and free-up energy for other users and uses. Retrofit activity would also provide employment opportunities for construction and energy-improvement related sectors.

Information about primary energy users from utility providers by activity and economic sector can be obtained using the North American Industry Classification System codes. Since user data is protected, client waivers would need to be obtained before the database is created. Building usage by industry, square footage, amount of heated/cooled space, and monthly energy use data would be collected from utility companies once client waivers are obtained.

Outreach strategies to reduce energy user consumption can be created based on usage type. Energy audits; energy performance contracts; and public financing of energy improvements are important retrofit tools. Energy reduction strategies can also be linked to local programs like housing retrofit assistance and community development block grants (CDBG). Energy consumption over time could be monitored and tracked by the regional planning councils through a networked database. The regional planning councils could also gather data from county property appraisers and other sources, map it using existing geographic information systems, and recommend strategies to local governments.

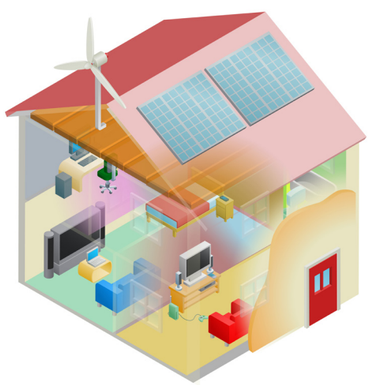
Implementations partners could include Florida's Office of Energy, utility providers, counties, municipalities, and community redevelopment agencies (CRAs). Collaboration would lead to a pooling of resources and would identify existing local and state aligned programs to prioritize funding to incentivize retrofits.

STRATEGY 5

Conduct a State Energy Infrastructure Assessment.

The intent of this strategy is to collect data and evaluate the current state of energy infrastructure in Florida. The assessment would inventory the assets and capacity related to all energy. This would include the electrical grid as maintained by utilities, the capacity and facilities of third party producers, the location and capacity of alternative energy generators, and the location and capacity of traditional fuels such as coal and natural gas. This assessment will allow regions to determine energy infrastructure strengths, needs and the options to address the needs to build in resiliency. Identifying energy infrastructure strengths, weaknesses, opportunities, and threats could allow regions to recover quickly after a disruption like a hurricane, as local governments will be better able to direct recovery efforts with the knowledge gained from the assessment.

Some of the data regarding energy infrastructure is current and available, but no comprehensive database exists that is accessible and easy to use for planners. Because there are so many providers, especially cooperatives and local government providers, and because service area boundaries change, coordination among all of the partners, as well as compilation of a consistent data may be cumbersome.



A better understanding of energy infrastructure in Florida might also reveal in which alternative energy industries investment would be most beneficial. An economic impact would be a reduction in recovery costs and time after a disruption, as local governments will be better able to allocate assistance. Also, knowledge of the state of energy infrastructure in Florida could result in improved grant applications for emergency management, as well as alternative energy innovation and development.

Lead agencies and implementation partners could include regional planning councils, utility and fuel providers, counties, municipalities, and other local government units, as well as state agencies, such as the Public Service Commission, Department of Environmental Protection, and Department of Economic Opportunity. Partnerships among all lead agencies and implementation partners would be optimal. Local and regional implementation would be appropriate. However implementation would be dependent on availability of funding and staff for regional planning councils and state agencies to seek and compile data. Change in legislation and revision of local regulations would not be necessary for this assessment, but it would involve a moderate level of difficulty given that it is proposed as a statewide approach.

STRATEGY 6

Create and facilitate a publicly-accessible home energy auditing program designed to increase energy efficiency and conservation.

The intent of this strategy is to develop a program to conduct energy audits for single-family residential dwellings. This program would follow the same programmatic guidelines as the now defunct My Safe Florida Home program. However, unlike the My Safe Florida Home program, energy audits should be available to modular and mobile home owners as well as site built home owners. The program could help Floridians identify and make improvements to strengthen their homes against energy loss, thus making communities more resilient, through free energy audits and grant funds.

This program could be a phased-in project by starting with the most economically challenged residents where the bulk of the funding would be spent. These audits should not only consist of appliance and infrastructure upgrades and specific recommendations for retrofit or replacement credits, but also education to ensure the residents know and understand the consequences of their inaction.

In its three-year funding period, the My Safe Florida Home program provided approximately 400,000 free wind inspections and retrofitted nearly 33,000 homes. The energy audit program could have a similar scope and by providing the needed residential infrastructure upgrades and education, Floridians could expect to see increased energy savings while reducing Florida's dependence on energy.

A significant advantage would be that there would be savings to the individual homeowner with reference to their energy usage. This savings would allow the homeowner to either re-invest in additional energy saving modifications or to stimulate the local economy by purchasing local goods or services that otherwise would not be purchased.

Another major advantage would be to change the mindset of accepting the status quo to an educated understanding of the importance of energy conservation. In this case, the education provided to the public could provide the recognition needed to affect residential energy conservation.

This program would work in any county or region as a pilot and could easily be transferable to all counties within the state. This program would allow homeowners to realize an immediate energy savings which in turn would allow residents to possibly re-invest their savings into other items that would improve their quality of life. This program would also allow energy producers to scale back the production of electricity and would place less stress on the electrical grid. This strategy when coupled with Strategy 7 could allow for the realization of a significant cost avoidance during times of peak demand and affecting a statewide cost savings and a reduction in the overall production of greenhouse gases.

The lead agencies could be the Florida Department of Financial Services and the Florida Department of Agriculture and Consumer Services, Office of Energy, with the regional planning councils being designated as the regional coordinators and local electric utility companies as implementation partners.

There are utility-sponsored examples in Florida already that could serve as models. Examples of these include: City of Tallahassee Utilities, Tampa Electric, Talquin Electric, Gulf Power, and West Florida Electric. Best practices would be derived from these examples to serve as a model for all regions not currently benefiting from an aggressive energy audit program.

This program would require significant funding from the state with possible federal assistance, as well as a statewide energy policy change, in order to be successful.

STRATEGY 7

Expand the use of smart grid technology with real time power management and pricing at all residences, buildings, and businesses.

A smart grid is an electrical grid that uses data and communications technology to react to the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. The U.S. Department of Energy developed an approach to assessing the benefits of the Smart Grid, which is being applied to the Smart Grid Demonstration Program and Smart Grid Investment Grant projects, which were funded through the American Recovery and Reinvestment Act.

Increased availability of a Smart Grid System is an advantage to economic development because the technology enables new products, services, and market by utilizing the grid's open-access market to reveal waste and inefficiency. Also, this technology could offer new consumer choices such as green power products and a new generation of electric vehicles. Smart grids could also offer an energy resiliency factor not previously available with low technology meters and the need for manual repair and reading.

Smart grid technologies are currently being installed at many locations throughout the State of Florida. For example, Florida Power and Light, the state's largest electric utility, has completed the installation of 4.5 million smart meters in a project partially funded by a $200 million grant from the U.S. Department of Energy. Talquin Electric Cooperative's service in northern Florida is another example where the U.S. Department of Energy's Smart Grid Investment Grant program has provided funds to assist in deploying advanced metering infrastructure to approximately 56,000 customers. At its headquarters, Talquin Electric Cooperative's distribution control center has the capability to send signals remotely to operate capacitor banks on substations and feeder lines to optimize power flows and lower power delivery costs. During peak periods, it is possible to reduce voltages in ways that do not affect customers but which reduce Talquin Electric Cooperative's overall requirements for purchasing electricity. Talquin Electric Cooperative's recently reduced voltage levels at a single substation during a winter peak event and saved $12,000 in demand charges from their wholesale electricity provider.

The installation of smart grid technologies cost money, making this a strategy of moderate difficulty, but contribute to more reliable and more efficient electrical infrastructure. However, the potential benefits of smart grid technologies will not be realized until customers use the new technology to monitor their power usage and make adjustments to use electricity more efficiently. The education of customers on how to most effectively use smart meters for real time power management is critical to achieving the full potential of smart grid technologies. This type of energy resiliency strategy might be best implemented at state, regional, and local levels. Implementation should correspond with the jurisdictions of different utility providers. Statewide and regional implementation would likely have the largest impact on energy resiliency for existing electric customers. An educational program in local school districts could be an effective way for future electric customers to understand the benefits of using smart grid technologies.

STRATEGY 8

Develop and encourage Property Assessed Clean Energy (PACE) programs and make available to all sectors (residential, commercial, industrial, government, institutional, etc.).

The Property Assessed Clean Energy (PACE) program is a way to finance energy efficiency, energy conservation, and energy generation improvements by a loan that is repaid through an increased property tax assessment. PACE-enabling legislation passed in Florida in 2010 (Section 163.08, F.S.). The process generally starts with an energy audit, which determines the savings that can be achieved by implementing different energy efficiency, conservation, or generation improvements. These improvements can be as simple as increasing ceiling insulation or installing energy efficient windows. They can be as basic as the purchase and installation of a high efficiency central heating and cooling system, or as intricate as the installation of a full solar photovoltaic array.

The costs savings of these facility improvements are calculated during the initial energy audit. The loan is repaid along with regular annual property tax assessments, and this assessment transfers with the property along with the improvements, even if it the property is sold before full repayment. Additional gains are realized by each participating household or business by energy savings above and beyond the amount of the annual loan repayment amount.

Of the synergies created locally through the PACE program, the increased economic activity due to energy efficiency installations is the most important. Since the PACE program generally supports piecemeal projects, this type of work is rarely outsourced and usually utilizes local workforce for installations and upgrades. Additional gains are realized by each participating household or business, which can receive energy savings above and beyond the amount of the annual loan repayment amount.

The PACE program can function as a standalone program but also has a mechanism for realizing the demand from other strategies, such as a renewable portfolio strategies, increased energy efficiency standards and education, and optional third-party energy sales. Coupled with the strategies for increasing energy efficiency education and standards, the PACE program becomes more effective because it encourages improvements to rental properties, and conveys energy savings to renters. Florida communities, including Leon County, the Town of Lantana, and Village of Pinecrest are amongst several jurisdictions implementing local PACE programs. Lead implementation partners under this program include Property Appraiser Offices, local governments, and Utility companies.

In addition to PACE, local established financing programs for energy efficiency, energy conservation, and energy generation improvements, such as the Solar and Energy Loan Fund program, can be established to augment PACE and or meet local requirements.

STRATEGY 9

Encourage incentives and/or rebates for energy conservation, innovation, and/or renewable energy.

The intent of this strategy is to support the creation of state energy conservation and innovation programs, such as incentives and rebates, and to promote participation in these programs. By encouraging conservation and the integration of renewable energy technologies, local energy mix would be more diverse and potentially less vulnerable to disaster events or disruptions. The success of these incentive and rebate programs would result in decreased energy consumption and innovative technology for reduced or more efficient consumption. Other potential impacts include increased productivity of available energy supplies, increased diversity of the statewide fuel mix, reduction of overall energy cost, and the likely improvement of the overall environmental quality in Florida.

Incentives such as Property-Assessed Clean Energy (PACE), locally established financing options, and utility loan programs would allow property owners to borrow money to pay for energy improvements. With PACE financing, the amount borrowed is typically repaid via a special assessment by participating municipalities while rebate programs might offer participants rebates per watt or for installation of energy efficient appliances.

Currently, Florida universities and research centers are contributing to innovative research in alternative energy and conservation. The Space Coast workforce provides an advantage to Florida (relative to other states) when pursuing innovation in energy conservation and renewable energy technologies. These advantages could entice alternative energy enterprises to seek opportunities in Florida. By supporting a culture of innovation, research, and venture businesses, Florida could also synergistically capture talent and capital.

Participation in energy incentive and rebate programs could stimulate the economy in the short term by creating jobs and potentially attracting energy industry businesses with specialized technical knowledge and skills. In addition, energy incentive and rebate programs could also create opportunities for growth and technical training for current workforce. Over the long-term, economic impacts could potentially include an increase in employment, a potential decrease in energy cost, and accompanying increased interest in residential and business development.

Lead agencies and implementation partners include the private sector, universities and research centers, utility providers, regional planning councils, counties, municipalities, and other local government entities, as well as federal and state agencies, such as the Public Service Commission, Department of Environmental Protection, and Department of Economic Opportunity. Partnerships between the private sector and local governments would be optimal, especially in seeking grants. Implementation of this strategy is easy to start by encouraging utilities to incentivize conservation activities and the use of renewable energy. Other funding opportunities may include leveraging incentive programs from local governments. Change in legislation and revision of local regulations would be beneficial to encourage participation in incentive programs and generate more competitive grant applications.

STRATEGY 10

Research, legislate, and implement an aspirational and achievable Renewable Portfolio Standard.

A Renewable Portfolio Standard (RPS) is a regulation, that requires utilities to generate or purchase a certain amount of their energy from renewable sources. One of the purposes of a renewable portfolio standard is to diversify the fuels used by utility companies to generate energy. For example, a renewable portfolio standard might suggest shifting some portion of power generation from fossil fuels to renewable energy sources like solar, wind, hydroelectric, biomass, and/or waste.

Currently, approximately 30 other states have passed legislation with RPS elements. However, Florida has not established any standards. The lack of a RPS is a an impediment to Florida's energy resiliency because a RPS encourages fuel source diversification through locally available, non-fossil fuel-based fuels. The shift away from non-renewable fossil fuels to locally available fuels could shorten supply chains and increase Florida's energy resiliency by reducing the need to import fossil fuels and nuclear materials from foreign countries. This could also increase local economic activity.

Moreover, a RPS could be an economic benefit for local, high-technology industries and generate new jobs. For example, Central Florida is well-suited due to the abudance of inexpensive lands to develop the ethanol and biofuels industries. A RPS is best implemented at the state level, ensuring that all utilities are on a level playing field. Although there is potential for loss of economic activity along the border with other non-RPS states, the geography of Florida – large land area and isolated from other states – makes this less likely to have a significant impact. It is also possible to implement a RPS at a regional or local level by a particular utility especially a municipal or cooperative. Regardless, further research into an RPS could serve to create a platform for enhanced energy resiliency in Florida. This strategy will be at least moderately difficult to implement because it will take time and require change.

Although a RPS is often a state requirement, locally-based utility providers might be able to implement energy diversification strategies through other options. For example, Lakeland Electric, has already partnered with a waste-to-energy facility and a solar photovoltaic field. Both of these facilities use local fuels (in this case trash and sunshine, respectively), which reduces reliance on non-Florida fuel sources.

STRATEGY 11

Streamline regulations and develop an expedited permitting process to encourage the use of renewable energy resources.

Some public sector entities have regulations and permitting requirements that hinder the expanded use of renewable energy resources including local land use regulations, building codes, and transportation policies. Streamlining regulations and developing an expedited permitting process can be incentives to encourage the use of renewable energy

The Go Solar Broward Rooftop Solar Challenge program is an example of how streamlining the permitting process could encourage the use of renewable energy resources. This is a U.S. Department of Energy grant-funded program that makes it easier for Broward County residents and businesses to convert to solar energy by reducing the cost and wait time associated with the installation of photovoltaic rooftop solar systems. Solar energy has long-term economic and environmental benefits, but the traditional application and permitting process for photovoltaic systems, which varies across local jurisdictions, can be a barrier to those interested in retrofitting their home or business to use solar energy. Permitting and interconnection charges make up as much as 40 percent of the total installation costs of a rooftop photovoltaic system. The Go Solar Broward Rooftop Solar Challenge program offers home and business owners and/or their contractors in participating municipalities, a streamlined online application system with standardized fees and uniform interconnection to utility systems. At least 14 municipalities have already signed on to this program, which could be used as a model for streamlining permitting processes throughout Florida.

Streamlining the permitting process could also be extremely beneficial for the electric vehicle industry. According to Florida Public Service Commission data, the state of Florida is projected to have 226,579 plug-in electric vehicles on the road by the year 2021. The availability of plug-in electric vehicle charging infrastructure is a determinant affecting plug-in electric vehicle sales. However, private sector investment in plug-in electric vehicle charging infrastructure could be discouraged by permitting requirements that vary significantly by jurisdiction.

The establishment of a standard permitting process for plug-in electric vehicle charging infrastructure could reduce approval time, installation costs, public sector resources, and stimulate private sector investments in charging infrastructure. It will also facilitate market demand for plug-in electric vehicle charging infrastructure. Sales of plug-in electric vehicles are linked to the availability of electric vehicle charging infrastructure. Moreover, new job opportunities could be created for plug-in charging station installers, electric vehicle salesmen, and mechanics. The increased use of plug-in electric vehicles could also provide the economic benefits associated with improved air quality and reduced dependence on foreign oil.

States such as California, Oregon, and Washington have created policy guidelines to reduce regulatory barriers to plug-in electric vehicle charging infrastructure. Florida's lack of standardized and streamlined permitting procedures could place the state at a competitive disadvantage. The development of a model ordinance and permitting procedures, as well as the creation of education and outreach materials for consumers and contractors, could also facilitate the installation of plug-in electric vehicle charging infrastructure. The implementation of a streamlined permitting process in Florida would be moderately difficult, requiring cooperation from number of organizations.

STRATEGY 12

Promote the accelerated development of renewable energy technologies.

The expanded use of renewable energy for electrical power generation in Florida is critical for enhancing resiliency during supply interruptions. As of October 2012, renewable energy accounted for only 2.1 percent of Florida's net electrical generation by source (U.S. Energy Information Administration). Renewable energy includes forms of energy whose fuels theoretically can last indefinitely without reducing the available supply because it is replaced through natural processes, or because it is essentially inexhaustible. Examples of renewable sources include biomass, biogas, ocean energy (wave, tides, and currents), solar, hydropower, wind, geothermal, and biofuels such as ethanol, biobutanol, and biodiesel.

The leading source of renewable energy currently used in Florida is solid biomass from municipal solid waste, agricultural byproducts, and wood industry residues (Navigant Consulting Inc. 2008, Florida Renewable Energy Potential Assessment, prepared for the Florida Public Service Commission, Florida's Energy Office, and Lawrence Berkeley National Laboratory).

The study found that solar technologies, including residential rooftop, commercial rooftop, and ground-mounted photovoltaic systems have a large renewable energy technical potential in Florida. Offshore wind, including wind projects that could be installed in water less than 60 meters deep, also has potential for renewable energy in Florida.

However, more research is needed to identify offshore areas suitable for wind generation. Regarding ocean resources, ocean current is an emerging technology considered to have a technical potential in Florida in the future.

The expansion of renewable energy in Florida is dependent on research and development to make existing renewable technologies more efficient and cost-effective and to develop new technologies. Florida's universities are at the forefront of advancing renewable energy technologies. For example, the Florida Solar Energy Center, a research institute of the University of Central Florida, has been researching, testing and evaluating solar and renewable energy technologies since 1975. The Florida Solar Energy Center is the largest and most active state-supported institute focusing on renewable research in the United States.

Another important program is the newly formed Southeast National Marine Renewable Energy Center at Florida Atlantic University, which is focusing on the commercialization of ocean current, ocean thermal, and hydrogen technologies. The potential for the use of ocean technology is unique to southeast Florida, because of the proximity of the Gulf Stream current, which has an average velocity of 5.5 km/hour and represents a significant energy source. Areas in northern and western Florida are positioned to use advances in biomass energy production, because of vast timber resources, while central and southern Florida can also tap into equivalent resources in non-woody crops.

STRATEGY 13

Create and support policies that allow utilities to take greater advantage of renewable energy generation technologies and include them in utility supply plans, even if they do not currently represent the least-cost alternative.

The intent of this strategy is to create a flexible and supportive environment for supplementing conventional utility supply plans with renewable energy options. Advocacy of policy changes related to alternative energy sources and utility supply plan requirements could result in a greater diversity of energy sources, which should result in decreased vulnerability to and easier recovery after disaster and supply disruption events. Other potential benefits include increased market accessibility, increased productivity of available energy supplies, decreased energy consumption or innovative technology for reduced and/or more efficient consumption, reduced overall energy cost, and improved environmental quality.

By utilities incorporating renewable energy technologies, it is possible to generate electricity using more local sources, which are potentially less subject to supply chain disruptions. Renewable energy is currently part of Florida's energy portfolio. However, it is a very small proportion of the energy and fuel mix – roughly 2 percent. Utility providers and Florida universtities and research center are contributing to research and pilot programs for innovation in renewable energy technologies.

Inclusion of renewable energy in utility plans could stimulate the economy in the short term, creating jobs and potentially attracting renewable energy industry businesses with specialized technological knowledge and skills. In addition, the inclusion of reusuable energy in utility plans could also create opportunities for growth and new technical training for current workforce. Other, long-term economic impacts could include overall increase in employment, a potential decrease in energy cost, and increased interest in residential and business development.

Additionally, the most common renewable energy technologies for electrical generation – solar photovoltaic and wind power – require little freshwater inputs, thus making water available for other interests, such as industry and residential use. With less vulnerability to energy disruptions, costs associated with post-disaster recovery, such as local government support services and closed business functional losses may be reduced. Functional losses are indirect effects that usually involve interruptions in asset operations as a result of a disaster or disruption. Businesses are especially vulnerable to disasters and disruptions. FEMA estimates that 40 percent of businesses do not reopen and another 25 percent fail within one year after a disaster. Similar statistics from the United States Small Business Administration indicate that over 90 percent of businesses fail within two years after being struck by a disaster. Policies, incentives and rebates for renewable energy innovations could reduce reliance on vulnerable energy sources, improve energy diversity and reduce energy related business disruptions.

Lead agencies and implementation partners primarily include utility providers, the Florida Legislature, the Public Service Commission, private sector businesses, universities and research centers, regional planning councils, counties, municipalities, and other approriate local and state agencies. Leveraging resources between state and utility providers might enhance opportunities in seeking federal grant awards. Change in legislation and revision of local regulations might also be advantageous in implementing this type of energy resiliency strategy. Because policy change is involved, this strategy will be of difficult ease of implementation.

STRATEGY 14

Continue to conduct public opinion polling and economic modeling to support the adoption of renewable energy goals by the state and its public and private partners.

The discussion of renewable energy goals is a challenging issue because it highlights the oftern higher costs of renewable energy over traditional (fossil fuel-based) energy sources given current fiscal subsidy structures; environmental impacts related with the use of each fuel type and associated processes, especially hydraulic fracturing technology and nuclear fuels; and debate on the degree to which the use of fossil fuels contributes to climate change.

More research and economic modeling should be conducted to provide to determine the level of energy resiliency of regions in Florida. The information from these studies could provide the basis for setting renewable energy portfolio standards and making recommendations about energy investments as well as to ensure adequate preparation for an event that could disrupt the energy supply.

This strategy calls for continue public opinion polling to determine the level of support that Florida residents and businesses have for the development of renewable energy in the state. It also calls for the preparation of additional economic impact modeling studies to demonstrate the long-term costs and benefits of pursuing a broad range of renewable energy supplies for the state. Some municipalities have renewable energy goals as part of their sustainability plans that could serve as the foundation for statewide renewable energy goals. Renewable energy goals could establish the State's priorities and help to provide incentives for investments in the development of renewable energy resources. Ideally, renewable energy goals would be expressed as a percentage of overall State energy supply that is derived from renewable sources. Goals could be set for a 10-20 year horizon, which would provide guidance to investors.

The renewable energy market has the potential to create employment opportunities and bring revenue to Florida. Warm climate, agricultural industry, and growing biotech industry provide Florida an opportunity to develop and promote renewable energy. For example, Chemergy Inc. is a Miami-based company that has created a biowaste-to-biofuel process to create a renewable energy source from biowaste feedstock; including wastewater, sewage, manure, paper, and waste. Other similar opportunities to create renewable energy sources with emerging technologies could be fostered through partnerships with area colleges and universities, municipal planning organizations, regional planning councils, developers, utilities, and related professional organizations. These partnerships could collaborate on research, substantiate results, disseminate findings, and promote resulting strategies.

Educational institutions and workforce agencies could play a role in developing education and training standards and the intellectual infrastructure to ensure the talent is available to develop these emerging industries. Public-private partnerships will be critical to developing renewable energy business incubators. The establishment of renewable energy goals would provide a framework to organize the efforts of public and private sector stakeholders as the State endeavors to diversify its energy supply and become more energy resilient.

STRATEGY 15

Encourage innovative energy project development through collaboration of universities, entrepreneurs, and a network of regional expertise.

The establishment of a statewide energy information network is important to: 1) future energy development and innovation; 2) job and economic growth; and 3) strengthening Florida's higher education facilities and research centers. Innovative energy project development requires widespread collaboration to be effective regionally and statewide.

An objective of this strategy would be to align efforts to maximize grant funding potential and cultivate innovation. Another desired outcome would be to use student intellectual capacity as an available resource to identify and move innovative energy projects forward. For example, in North Florida, expanding collaboration with the University of Florida, other universities and entrepreneurs throughout the region could expand the research capacity of all partners. Setting up incubators to nurture businesses that arise from and research is important to implementing this strategy.

Florida's State University System and research centers could promote existing strengths in the energy field and develop new energy research, talent, and technologies. The training, research and funding capacities of the State University System would be aligned and expanded by an energy development network that could include economic development agencies, small business incubators, chambers of commerce, and energy and technology companies. Other potential partners include investors and the financial community. Integration with existing policies, programs, and structures, with the assistance of the regional planning councils would also be encouraged.

STRATEGY 16

Develop regional strategies promoting coordination of energy issues, policies and programs that take advantage of the energy policy, production and distribution assets of Florida's regions.

Regional strategies should be developed by regional planning councils in partnership with stakeholders to develop programs that can be undertaken regionally. In developing this energy resiliency study the regional planning councils partnered to form energy planning areas. This network bridges together stakeholders and organizations with unique energy issues. This framework can be built upon to implement any of the strategies outline in this report. Each region need not wait for state or federal goals or requirements to address energy issues unique to many region.

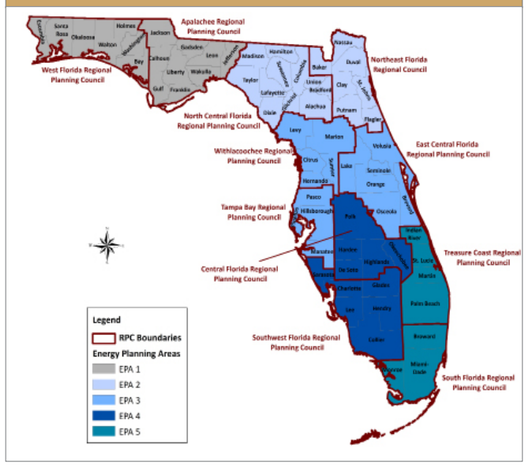
When stakeholders were gathered at the five regional energy summits, they came up with this overarching idea and suggested using this approach rather than waiting for state or federal guidance.

Efficiency, conservation, cost savings, and resiliency are all desired outcomes, but the focus could also be on energy assurance. For example, if local mitigation strategies in a region were aligned on the contingency plans for energy disruption. A shut down of a natural gas pipeline could result in pre-identified fleets of trucks and barges to be deployed to another source, and to provide natural gas to users. A concentrated effort to get users to invest in solar, wind, or other renewable energy could allow for them to provide power to the grid in the event of disruption or excessive power needs. The ability to switch power plants quickly to wood pellets, a resource available from our state, is another strategy that could ensure quick restoration of power in the event of coal or natural gas disruption. An effort to convert commercial fleets to natural gas could ensure that business and emergency deliveries are uninterrupted in the event of disruption of gasoline.

Alternative energy strengths in Florida vary by region. For example, one region may have vast silvicultural acreage, access to and interest in biomass, another region may have interest in natural gas as fuel for transportation and solar energy options. While other regions may have wind and hydro turbines potential. More specifically, some local governments and commercial fleets may have a greater opportunity to take advantage of cleaner less expensive natural gas to fuel vehicles.

Regional implementation of this strategy does not require any legislation or policy changes. All things start off easy, as it requires only communication to begin. Stakeholders involved in this study expressed their willingness to collaborate. However, implementation will take collaboration among non-traditional partners, and will take time and effort.

ENERGY PLANNING AREAS



Source: Regional Planning Councils

STRATEGY 17

Encourage and/or develop natural gas infrastructure for direct residential usage.

The expansion of natural gas infrastructure to residential and commercial buildings will enhance resiliency of the state by allowing more energy options, especially during emergency situations when one source of energy may be disrupted. Greater use of natural gas in residential and commercial applications also will increase the productivity of available energy supplies, reduce overall energy cost, and reduce related carbon dioxide emissions.

Natural gas already represents a portion of Florida's energy consumption, and this means some infrastructure exists. However, there are currently only five existing pipelines, all of them interstate. These five pipelines serve 59 of 67 counties in the state. Local distribution systems may need improvement for greater accessibility. As Florida's population continues to grow, the number of businesses and residents using natural gas will also likely grow.

An expansion of Florida's five existing pipelines could stimulate the economy in the short-term, creating jobs and potentially attracting energy industry businesses with specialized technological knowledge and skills, also create opportunities for growth and new technical training for current workforce. Long-term economic impacts may include overall increase in employment, a potential decrease in energy cost, and increased interest in residential and business development.

Lead agencies and implementation partners include utility providers, regional planning councils, counties, municipalities, and other local governments, as well as state agencies, such as the Public Service Commission, Department of Environmental Protection, and Department of Economic Opportunity. Partnerships between private utility providers and local governments would be optimal, especially in seeking grants. Other funding opportunities might include incentive programs from local governments. Local implementation is most viable, as expansion of natural gas infrastructure should be congruent with population and business growth patterns. Implementation of this strategy is possible where markets exist and the private sector is motivated to provide infrastructure and to make natural gas available. Change in legislation and revision of local regulations may be advantageous, but not necessary, in order to encourage participation in incentive programs and submit improved grant applications.

STRATEGY 18

Allow and encourage third-party energy sales and power purchase agreements.

Third-party energy sales and power purchase agreements are between private entities, and often bypass utilities. One example is a building owner offering to sell rooftop solar photovoltaic electricity generated on site to tenants in the building. This is a way for businesses to lock in or stabilize power costs over an extended timeframe.

Allowing third-party energy sales and power purchase agreements will create mini "power islands" where electricity is generated and consumed on-site. This would increase energy assurance by diversifying responsibility for energy supply partly away from utilities. Furthermore, third-party generators could use renewable energy technologies, which would reduce reliance on fuels imported into Florida.

During supply disruption events, energy assurance would be enhanced by reducing the effect of wide-scale energy disruption, since more energy will be generated and consumed locally. This would shift utilities towards energy supply coordination, facilitation, and distribution and less on energy generation. Currently, third-party energy sales are prohibited in Florida, although they are allowed in some form or another in over 30 states nationwide. This could increase energy assurance by allowing private companies to contract to produce and purchase electricity for each other. Utility infrastructure costs can be recouped by supply management fees or other mechanisms. Potential synergistic economic benefits include the local installation and operation of energy generation sites. Additionally, some utilization of contract specialists will be necessary for the negotiations between purchasers and suppliers. Utility companies will likely still be integral as power managers and stewards of transmission infrastructure.

Allowing third-party energy sales and power purchase agreements would facilitate a distributed energy generation and consumption network. This type of strategy could complement other strategies, such as enhanced interconnection protocols which allow for localized power generation during outage events and integration with smart grid technology.

If utilities move toward third-party energy sales regionally, distributed energy storage could also be part of this strategy as well as part of the plan to store energy in the event of a natural disaster or other supply interruption. Distributed energy storage would allow increased energy resilience during supply shortages, and also would help facilitate energy supply management with increased intermittent renewable energy generation.

The implementation of third-party energy sales would necessarily involve smart grid technologies for real-time management of consumption, supply, and distribution. In addition, it might be beneficial to phase in third-party sales gradually, particularly to fill demand gaps as older power plants are retired, in lieu of constructing or expanding new facilities. Third-party energy sales could be a private market alternative to centralized, wholesale power generation and sale. This type of strategy could probably only be implemented on a state level. More research is necessary to determine the available implementation and management measures necessary for fully realizing this strategy.

STRATEGY 19

Support the use of alternative energy sources for transportation and the development of alternative fueling infrastructure.

The intent of this strategy is to encourage increased interest in and accessibility of alternative energy sources, such as compressed natural gas (CNG), biofuels, as well as electric vehicles (EVs), for transportation. Greater use of alternative energy sources for transportation would increase diversity of the fuel mix, thus decreasing dependence on foreign sources. Other impacts would include the opportunity for research, manufacturing, and installation of alternative energy innovation and technology; reduction of carbon dioxide emissions; and greater productivity of available energy supplies.

The Florida economy is heavily reliant on vehicles to get workers to their place of employment, to get goods to market and to move tourists in and around the state. However, use of and access to alternative fuels remains minimal. As of 2010, the transportation sector accounted for 35.6 percent of Florida's energy consumption by end-use sector (U.S. Energy Information Administration). Of the 24 existing CNG fuel stations in Florida, only eight are public. Of the 15 existing biodiesel fuel stations in Florida, only four are public. Of the 51 existing E85 fuel (ethanol fuel blend) stations in Florida, 44 are public. However, one advantage is that Florida has five natural gas pipelines that serve 59 of 67 counties, creating opportunity for expansion of this infrastructure. Also, the agriculture sector in Florida may be conducive to biofuel production.

Greater use of alternative energy sources and development of an alternative energy infrastructure in Florida could stimulate the economy by creating jobs and potentially attracting energy industry businesses with specialized technological knowledge and skills. In addition, greater use of alternative energy sources and development of alternative energy infrastructure could create opportunities for growth and new technical training for current workforce. Long-term economic impacts could include overall increase in employment and a potential decrease in fuel cost.

The U.S. Department of Energy Clean Cities program is an example of an existing government-industry partnership designed to reduce petroleum consumption by advancing the use of alternative fuel vehicles. The Clean Cities program is represented throughout Florida by regional Clean Cities Coalitions. Lead agencies and implementation partners include the private sector, regional planning councils, counties, municipalities, and other local government entities, as well as state agencies. Regional implementation is most viable, as development of alternative energy infrastructure should be congruent with population and business growth patterns. Change in legislation and revision of local regulations might be advantageous in order to encourage participation in incentive programs and stimulate improved grant applications.

STRATEGY 20

Increase fleet adoption of alternative and blended fuels and fueling infrastructure and accessibility of these fuels, especially for government and publicly-funded fleets.

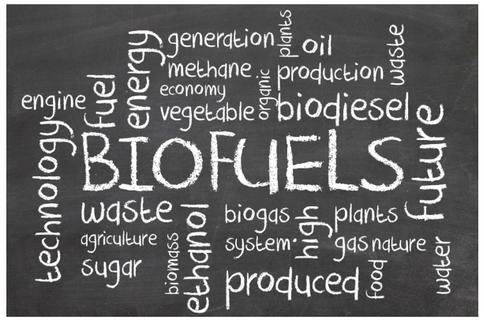
Vehicle fleet conversion presents an opportunity to implement a strategy to increase energy resiliency by increasing the amount of fuel that could be stored prior to events that have the potential to interrupt the fuel supply. Fleets often are operated by one entity and utilize a small number of maintenance and/or refueling facilities. Examples of fleets include law enforcement, buses (both mass transit and public schools), government fleets such as county vehicles, trash pickup, or property appraiser vehicles, or large commercial operations that may include on-road vehicles like semi-trailers or off-road vehicles like forklifts or tractors.

Because of the centralized ownership and often-fixed routes of operation, an entire fleet can be converted to an alternative fuel relatively easily, and utilize one (or a few) common fueling station and maintenance facility. This could decrease the operating costs of the particular fleet. In addition, it could provide a bulk demand for the alternative fuel and specially trained technicians to maintain the fleet. Depending on the alternative fuel source (natural gas, biofuels, electricity, etc.), it might require specialized maintenance technicians for retrofits and repairs, and potentially new infrastructure for fueling and could potentially create demand for new skill sets needed to retrofit and maintain the infrastructure in a region that where the fleet operates.

One impediment to vehicle fuel resiliency is the lack of publicly-accessible fueling infrastructure for alternative fuel vehicles. This includes fuels like electricity, pure ethanol and blends like E-85, pure biodiesel and blends like B-20, and Compressed Natural Gas. Most publicly-accessible fueling stations serve only petroleum products like gasoline or diesel. This fueling infrastructure has taken time to develop, and is now fully imbedded throughout the state.

The introduction of alternative fuel vehicles increases the need to have a fueling infrastructure to support those vehicles. Having alternative fuels or blends as a viable option to traditional gasoline or diesel could reduce reliance on these fuels. Public or private fleets implementing alternative fuel vehicles should be encouraged to make some portion of their fueling infrastructure available for public usage. This would enhance the provision of public fueling stations for alternative fuels. Currently there are physical, legal, and regulatory impediments to private companies allowing public access to their fueling infrastructure. If private companies are to be incentivized, then any regulatory or permitting issues impeding this process should be reexamined in the light of the benefits gained from furthering state energy resiliency and assurance.

Implementation of this strategy could best be realized as a state or local government initiative in operations and maintenance. The conversion of government and publicly-owned fleets to alternative fuels should be implemented concurrently with the provision of fueling infrastructure. Some private companies have already taken the initiative to switch to alternative fuels, and it may be possible to provide initiatives to encourage them to grant the general public access to their fueling infrastructure. This strategy is of moderate difficulty in part because significant financial investment is required.



STRATEGY 21

Research, legislate, and implement a statewide Renewable Fuel Standard for biofuels blended into, or replacing petroleum fuels.

A Renewable Fuel Standard is a policy that requires vehicle and transportation fuels (primarily gasoline and diesel) to be blended with renewable fuels (primarily ethanol and biodiesel, respectively). This means that every mile driven uses less of traditional, non-renewable, fossil fuel-based fuels. Florida already grows several of the feedstocks used to produce biofuels, and can thus decrease dependence on non-Florida fuel sources. This could increase resiliency, particularly if Florida's RFS specified that a certain percentage of the renewable fuels must come from Florida sources.

Florida has long growing seasons and abundant agricultural areas provide a significant opportunity to have a state RFS for fuels that can reduce dependence on gasoline and diesel, and enhance the local agricultural industry. The I-75 Green Corridor Project (http://eerc.ra.utk.edu/etcfc/cleanfuelscorridor/project.html) provides an opportunity to enhance local and state vehicle fuel resiliency by providing a market for biofuels.

The current Federal Renewable standard requires oil refineries to produce gasoline mixed with 10 percent ethanol. A waiver of standards allows for a 15 percent ethanol mix in gasoline for use in some new vehicles. Other initiatives include gasoline that includes 85 percent ethanol (E85) for use in flex-fuel vehicles or diesel that has varying mixes of biodiesel (B5 or B20). Recent research has shown that some current vehicle models would be damaged by using higher blends of ethanol. However, some states are moving to a higher ethanol blend to further reduce reliance on petroleum fuels by adopting their own renewable fuel standard. Florida could adopt renewable fuel standard similar to that of states like California, which requires vehicles already engineered to their particular standards. It might help implementation to use a currently successful renewable fuel standard, because it would ease implementation by utilizing a previously tested technology and regulatory structure that could be quickly adapted to use in Florida. This type of strategy would have to be implemented on the statewide level, and is unrealistic at any smaller scale.

Finally, further research into renewable fuel standard would serve to create a platform for enhanced energy resiliency in Florida. A more developed state renewable fuel standard policy might call for further vehicle fuel diversification to include biofuels, electricity, or other fuels, such as natural gas, for fleet vehicles. This would particularly be effective as a government requirement for large fleets, such as in school buses, public transit, or government vehicles.

STRATEGY 22

Promote land development regulations and patterns that incentivize transit-oriented development and complement a broad, multi-modal transportation network.

Transit Oriented Development (TOD) is a compact area of development, with moderate to high intensity and density, and comprises a mix of uses occurring within one-half mile of a premium transit stop or station (Florida TOD Guidebook 2012). TODs are designed to maximize pedestrian activity, increase access to transit, and provide an environment that reduces the need for automobile circulation. They are characterized by well-defined streetscapes and an urban form that is oriented to pedestrians to promote walking trips to and from stations and other uses within station areas.

The benefits of TOD (and other compact land use design strategies) include economic, transportation, land use and environmental. They reduce vehicle miles traveled, dependence on fossil fuels and associated greenhouse gas emissions through increases in walking and biking trips, transit trips, and shorter-length auto trips. Bailey (2007, Public Transportation and Petroleum Savings in the U.S.: Reducing Dependence on Oil, ICF International for the American Public Transportation Association) found that a typical household reduces its energy consumption and pollution emissions about 45 percent by shifting from automobile-dependent to transit-oriented development. They reduce combined housing and transportation costs for households by providing options to auto miles travel. They reduce the cost and energy expended by local governments in the delivery of public services by encouraging infill and redevelopment in existing urban areas with existing infrastructure. TODs could increase Florida's energy resiliency and free up capital for other uses since less energy is being used in the normal course of daily life.

Opportunities for TODs are currently being examined in southeast Florida in association with passenger rail service in the region. For several years, the Florida Department of Transportation has been spearheading the South Florida East Coast Corridor Study, which is a long-term, comprehensive, multi-agency analysis of premium transit alternatives for traversing Palm Beach, Broward, and Miami-Dade counties. The Study is designed to produce a regional master plan for premium transit service, focused on the Florida East Coast rail corridor, over a 20-year build-out. Additionally, in early 2012, Florida East Coast Industries introduced a privately-funded service known as "All Aboard Florida," which proposes intercity express rail service between downtown Miami and Orlando, with additional stations in downtown Fort Lauderdale and downtown West Palm Beach.

Transit Oriented Developments are only feasible in urban areas that have access to existing or future premium transit services. The implementation of successful TODs in Florida requires coordination and collaboration among many different stakeholders, both public and private, from the local to the federal level. These efforts are needed order to address land use and transportation issues, increased ridership, a reduction of vehicle miles travelled, and increased economic development opportunity. A key factor to implement TODs is to promote land development regulations and patterns that incentivize transit-oriented development and complement a broad, multi-modal transportation network. The new Florida Department of Transportation TOD Guidebook (2012) provides a comprehensive framework for planning, designing, and implementing TODs in Florida.

STRATEGY 23

Facilitate and enhance third-party distributed energy generation and power feed-in.

Third-party distributed energy (TPDE) is a strategy for enhancing regional energy resiliency by providing locally generated energy that is spatially dispersed, and potentially more resilient to natural disasters or external supply shortages. TPDE generally means geographically dispersed, local electricity generation. Regionally, this primarily means rooftop solar photovoltaic arrays or wind turbines, although in some regions it might mean small-scale hydroelectric or other generation techniques. Even large industrial facilities that have co-generation plants, such as the biomass generators at sugar mills, could be considered as TPDE, if they feed into the grid.

An inclusive third-party distributed energy strategy requires that feed-in be allowed by all energy generators, with little regard to size or frequency. At the full, logical extension of this strategy, the utility companies would tend to engage in relatively less power generation activities and relatively more supply management and distribution balancing activities. The transmission infrastructure becomes a more publicly-accessible structure, and the power from numerous energy generating sources is managed by the utility company.

Third-party distributed energy program could be implemented by a utility using a "smart grid" which is underway in many parts of the state. A smart grid allows real-time information transfer regarding energy consumption, production, and other information relevant to energy management. A smart grid combined with accurate weather forecasting would greatly reduce uncertainties regarding supply management, and is a necessary part of implementing this strategy. In addition, stronger connections between utilities and agreements between national electricity grids might be beneficial to to ensure continuous supply delivery.

Consideration has been given recently to legislation that would increase the temporal energy supply certainty to utilities from renewable energy sources. States have enacted legislation that requires renewable energy production forecasts be provided to the utility in 15-minute increments, which would potentially allow the utility to appropriately scale-up or scale-down their own energy production to accommodate the energy produced from intermittent, renewable sources. Thus sudden, intense wind storm events or sun-blocking thunderstorms would have less effect on the ability of utilities to provide consistent, reliable energy to customers whose power grid involves renewable energy generators.

This type of coordination and facilitation is important if TPDE is going to be realized. If utilities and regions move toward third-party distributed energy, then distributed energy storage becomes an appropriately complimentary resiliency and assurance strategy. Distributed energy storage would allow increased assurance during supply shortages, and also would help facilitate energy supply management with increased intermittent renewable energy generation, especially if smart grid technology could also access and manage the distributed energy storage network.

Economic benefits from TPDE could involve increased local economic activity. Distributed installations and sales could generate local jobs and economic growth. The potential of residents and businesses selling energy via a feed-in program could also generate local economic gains. By generating more electricity locally, more money stays local, and is not used to purchase fuel imports to generate electricity. The potential for third-party energy sales is a potential extension of this strategy for increasing energy assurance. Third-party distributed energy is probably best implemented at the state level, through the Public Services Commission (PSC). This strategy regionally at the utility service area level could be implemented. Implementation by local governments is most likely not achievable, unless the locality owns its own utility.

STRATEGY 24

Facilitate and encourage distributed energy storage capacity.

Encouraging and facilitating distributed energy storage could increase energy assurance by reducing downtime following outage or supply disruption events. Distributed energy storage seeks to improve energy capacity and responsiveness by advancing power distribution and providing greater holding potential. The goal of energy storage is to develop advanced energy storage systems and technologies. A strategy such as this could potentially mitigate a large proportion of losses due to high magnitude electrical supply disruptions.

Hospitals and large food storage facilities already maintain emergency generators to provide power during large outage events. In this case, the energy storage unit is the fossil fuel that powers the generator, which is often the diesel fuel that powers the generator. This strategy refers more to distributed energy storage as storage of electrical energy, as supplied by the utility, or possibly on-site renewable energy technologies. This electricity would likely be stored in battery banks, and would be able to power critical equipment for some time following an outage event, depending on the size of the system.

Aside from being useful in terms of energy assurance, this strategy could also potentially increase energy resiliency during non-emergency conditions. For example, smart grid technology allows battery banks to charge up at night, and then during peak loads the battery banks can help offset peak energy usage. This would reduce costs on the utility as well as the customer, by avoiding extra peak load generation operation and costs. Currently, such a program is being implemented in parts of Australia, particularly those areas that have tiered energy pricing.

Distributed energy storage could also be facilitated by strategies such as a locally established financing program for energy efficiency, energy conservation, and energy generation improvements program or other incentive programs coordinated with utility providers. Mutual benefits would provide an incentive for both parties.

This type of strategy would be best implemented on a statewide level, making it of moderate difficulty. Regional implementation may also be effective. As technologies and industries develop, distributed energy storage could become an increasingly effective way for managing the intermittent nature of renewable energy technologies and the relatively predictable nature of power consumption.

Key industry stakeholders and electric utilities are positioned to support energy storage applications. By testing, evaluating, and deploying resources in different sections of the electricity value and supply chain, they can provide myried benefits. The wide range of potential applications indicate that storage is not a homogeneous product and that a wide range of products and options may be needed.

Utilities are a candidate for ownership of emergency storage at all levels. Government could respond by implementing strategies and a vision for energy storage; facilitating the removal of barriers; and analyzing costs and benefits associated with energy storage within their own facilities. Furthermore, the Florida Department of Economic Opportunity could analyze state and federal policies affecting energy storage; highlight policies of other states; and identify the most favorable policies to implement energy storage, particularly as an energy assurance strategy.

STRATEGY 25

Facilitate modular, off-grid operation of tied-in electricity generation units and interconnection protocols for third-party generation to allow localized power generation and coverage during power outage events.

Residences and other buildings utilizing renewable energy generation technologies, such as solar photovoltaic arrays or small wind turbines that remain tied into the larger electric grid are still as vulnerable as non-generating buildings during small- or large-scale outage and disaster events. For example, during Hurricane Sandy, even houses with solar photovoltaic arrays had their electricity shut down as part of the larger outages associated with hurricane preparedness, damages, and repairs. This shutdown occurs for several reasons under the current infrastructure environment, but could be mitigated to provide a more resilient system in the future. Buildings with their own power generation infrastructure and equipment could be less vulnerable because they could be producing electricity for themselves during outage events.

Interconnection protocols could be developed for energy generating buildings that allow for off-grid operation during and/or after disruption events. This would allow local energy generation and consumption from these technologies regardless of overall grid integrity. This would reduce damage and impacts from outage events by allowing local energy generating systems to continue generating. This is achieved physically (for example, by using a separate breaker box with physical disconnection from the grid) or organizationally (via a smart grid or remote control). It would need to be coordinated statewide. Care would need to be taken so that worker safety is not jeopardized by this interconnection and post-event operation, such as electrical feedback causing difficulty repair procedures for downed power lines. Facilitating distributed, local energy generating infrastructure to operate during and after disruption events would likely result in a more resilient system and decrease losses associated with these events.

This strategy would probably be best realized if also implemented with smart grid technology that would allow utilities and consumers to have real-time information available for decision-making. This type of strategy would also be enhanced by any facilitating strategies that increase adoption of distributed energy generation technologies. Existing technical requirements for interconnection already permit the operation of distributed generation systems in an off-grid configuration, either independently or as part of a larger micro-grid. Utility policies also in some cases include tariffs that allow for a site to receive "interruptible service," wherein upon a utility request, the site operates off a generator in stand-alone mode, disconnected from the utility grid. This is done either under periods of high stress on the grid when load threatens to exceed available generation, or during a utility-initiated test to ensure that the customer is able to quickly disconnect from the utility system. However, this "interruptible service" does not allow generators to operate in parallel with the utility system or even to export excess power from the site when the utility system requires it.

The development of interconnection protocols that allow for off-grid operation of distributed, local energy generation could best be implemented at the state, or possibly regional, level. This type of strategy is best realized as an understanding reached by states and/or utilities across their entire service areas, although it is possible some coordination may be required nationwide to ensure worker safety.

STRATEGY 26

Support a Rapid Action Utility Workgroup as part of Emergency Management Plans, and add Energy Response to the Comprehensive Emergency Management Plans Emergency Support Function 12.

The intent of this strategy is to coordinate with local emergency management agencies for improved preparedness and recovery of energy disruptions, especially disasters to which Florida is vulnerable, such as tropical storms and hurricanes. A rapid action utility workgroup should be comprised of members from the emergency management community, including law enforcement and fire rescue, and the energy and utility industries, including investor-owned energy providers, cooperatives, and other private sector representatives. Impacts could include a faster and more efficient recovery, more effective use of local government resources, and increased resiliency by having the assurance that sufficient fuel would be available for a large scale evacuation.

Florida already has a strong, coordinated emergency management community. Existing energy recovery to comprehensive emergency management plans (CEMPs) already have Emergency Support Function 12 - Energy included in their plans. This contains relevant information specific to their locations and populations.

Including energy in the local CEMPs would also help to ameliorate the economic impact of energy disruptions. Communities could have their power restored more rapidly and businesses would be able to return to regular operations sooner. A reduction in recovery time would also help to decrease the reliance on government programs and costs associated with post-disaster recovery. Finally, the addition of energy to these plans might benefit communities by improving grant applications for disaster mitigation and recovery funds.

Lead agencies and implementation partners include local emergency management departments, regional planning councils, utility and fuel providers, and local governments, as well as state agencies, such as the Division of Emergency Management, the Public Service Commission, and the Department of Economic Opportunity. Partnerships among all lead agencies and implementation partners would be optimal, especially in seeking grants. Local and regional implementation would be viable. Change in legislation and revision of local regulations would not be necessary. However, revision of the local CEMP based upon the proposed fuel availability study would be required, as well as submission for review by the state Division of Emergency Management.

STRATEGY 27

Research the viability of a distributed power generation and storage network, composed of semi-autonomous power blocks, possibly centered on disaster shelters or other community venues.

Distributed power generation and storage refers to a method of generating and storing electricity from multiple small energy sources in close proximity to where the electricity is used. Distributed energy storage, when coupled with smart grid technology for real-time communication and coordination, could be used as a way to efficiently, effectively, and safely maintain the supply of electricity during an energy supply disruption event. The integration of a dispersed energy generation infrastructure could also enhance the effectiveness of this strategy.

The "power block" is also known as a micro-grid. Semi-autonomous cells acting in coordination as a power block would be partially self-sufficient and self-regulating while also fitting into the larger power grid. The location and operations of power blocks would be arranged to increase energy reliability during outage events, while also allowing operation and power provision during non-emergency times. This semi-autonomous cell structure would create a more resilient system by allowing at least partial operational capability, even when the larger network is disrupted.

The power block concept consists of four components:

- an energy storage unit, such as a battery bank;
- an internal communication system, such as a smart grid, for regulating and distributing energy on a local scale;
- at least one type of autonomous power generation technology, such as a solar photovoltaic array or wind turbine; and
- some form of external communication for regulating and distributing energy in coordination on a regional scale.

The autonomous energy generating unit(s) would not necessarily have to generate all of the power used by the area covered by the power block. Their primary function, when combined with the power storage system, would be to provide enough power to sustain critical infrastructure during disaster-type outage events. These generating units would not need regular external fuel inputs. The potential redundancy of using two generating units, utilizing different energy sources (for instance, wind and solar) means increased energy reliability, regardless of weather conditions. They could be part of a larger third-party distributed energy network.

During regular conditions, the internal communication system and energy storage unit would also serve as a way to regulate the power generated from the local generating units, which would likely be intermittent, renewable technologies. External communication would allow for regional master control and coordination, which would be essential both during normal operation, and when recovering from a disruption event.

This new energy infrastructure framework would allow for faster recovery from a disruption event because critical infrastructure could continue to function, wholly or partially, based on the output and storage from the power blocks. Recovery workers would recover the area around one power block at a time, restoring grid integrity and full energy supply throughout the region.

Local or regional economic activity would likely increase in response to the construction and connection of these power blocks. Disaster preparedness plans should be revisited once these sites are established. Utilities might find that peak hour energy demands could be regulated, at least in part, with energy generated from these power blocks, which may reduce overall costs of operation. Some programs (such as the SunSmart Schools E-Shelter Program by the Florida Solar Energy Center at the University of Central Florida) already exist that, at least partially, create situations lending themselves to development into the power block strategy.

The power block could best be implemented as a statewide strategy, although it can also be implemented by utilities across their service areas. Implementation is probably less conducive at a federal or local level, due to scale and coordination issues, although disaster shelters do provide an opportunity for local and/or regional action. These power blocks could be coordinated with local utilities so that the infrastructure does not sit idle during times of non-emergency energy provision.

CONCLUSION

NEXT STEPS

Florida's Regional Planning Councils have developed expertise in energy resiliency and assurance. This positions the regional planning councils as leaders for implementation of energy resiliency and assurance planning. As convenors of the region, the ability of regional planning councils to coordinate and collaborate with diverse stakeholders can lead to successful implementation of the strategis identified. Strategies identified in Table 7 provide first steps for successful energy resiliency initiatives.

A myriad of energy sources, oil, gas, solar, biofuel, nuclear, coal, and wind and other options exist for continued energy supply for the state. In large part, economics will continue to play a major role in how Florida suppliers, businesses, and residents solve the need of future energy consumption. Public policy can shape which source of energy is implemented, which is phased out and which shows promise for further development. Florida does not yet have a renewable portfolio standard or a strong political voice guiding or incentivizing producers. Florida does not have a renewable portfolio standard and needs to elevate action to requiring or incentivizing producers. Addressing these gaps may be a strong first step toward increasing Florida's energy resiliency, and consequently its economic resiliency as well.

This Florida Energy Resiliency Report is intended to inform citizens, policy makers, and interested parties on various aspects of energy resiliency. The report includes an investigation of innovative case studies and modeling of the fiscal impacts of several possible future outcomes to ensure a resilient energy production, delivery, and consumer network. Stakeholders, from producer to purchaser, share the responsibility of ensuring that future investments and public policy strengthen Florida's capability to produce and deliver energy. The demand for energy needs to be resistant to natural and man-made disasters while being flexible and diverse enough to minimize damage caused by economic fluctuations and potential external threats.

Sea level rise, hurricanes, and tornadoes could affect the existing system with varying degrees of warning. Political instability or frictions abroad can cause market instability and price spikes. Successfully identifying specific threats and vulnerabilities will mitigate potential losses and allow faster reaction times, shorter outage periods, and ensure uninterupted service. Pipelines from the Texas coast, railways from the Appalachian coal fields, fleets of mega-tankers full of Middle Eastern crude, and hundreds of miles of transmission lines all contribute to Florida's energy supply. Created at great public and private capital investment outlay, the costs of disruption to these delivery systems are high. These could be supplemented by production scale solar farms, wind farms, tidal or current driven turbines. These potential solutions could decrease Florida's dependence on energy imports. Developing Florida's native energy resources is a powerful move toward increasing energy resiliency and stabilizing future energy costs and supply.

Resiliency to disruption could require diversification of the supply, delivery, and consumer systems. Continued refinement of leading edge technologies, development of fossil fuel alternatives from renewable sources, retrofit of existing systems, and the wider use of intelligent demand reduction systems will all play an increasing role. Producers range from the big regional suppliers, to small municipal suppliers, to homeowners and businesses with rooftop solar photovoltaic or waste-to-fuel distilleries. There is a role for all levels of producers. Consumers too, have a similar responsibility as municipalities retrofit street lights, convert fleets to natural gas, and homeowners install smart metering systems to better manage peak demands.

With all parties involved in the solution, Florida can enjoy a more resilient energy supply that provides lower long-term operating costs for everyone, reduced vulnerability to natural and man-made threats.

TABLE 7: TOP FIVE STRATEGIES BY EASE OF IMPLEMENTATION

RANK	STRATEGY	STRATEGY
1	Provide comprehensive education on the goals, costs and benefits, obstacles, and quality of life implications related to energy efficient community design and planning.	3
2	Adopt a broad-based program to promote efficiency and conservation using all available tools, and market a consistent message of energy efficiency and conservation through comprehensive planning and school district curricula.	2
3	Continue to conduct public opinion polling and economic modeling to support the adoption of renewable energy goals by the state and its public and private partners.	14
4	Encourage innovative energy project development through collaboration of universities, entrepreneurs, and regional expertise.	15
5	Develop and encourage Property Assessed Clean Energy (PACE) and other locally established financing programs for energy efficiency, energy conservation, and energy generation improvement programs and make available to all sectors (residential, commercial, industrial, government, institutional, etc.).	8

Source: Regional Planning Councils, 2013

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REGIONAL PLANNING COUNCILS

ABOUT THE ECONOMIC DEVELOPMENT DISTRICTS

Energy Resiliency Planning is crucial to economic development efforts by assuring a reliable, continuous, diverse, and affordable supply of energy to businesses and consumers. Energy resiliency places an emphasis on domestic energy. Domestic energy means domestic jobs. The economic development programs of the RPCs strive to promote sustainable, long-term economic prosperity throughout Florida by conducting comprehensive economic development planning and assisting the state, local governments, and economic development organizations with the activities described below.

A FIVE-YEAR STATEWIDE STRATEGIC PLAN FOR ECONOMIC DEVELOPMENT

The Florida Department of Economic Opportunity's (DEO) Division of Strategic Business Development, as provided for in Section 20.60, Florida Statutes, is required to create a Five-Year Statewide Strategic Plan designed to help guide the future of Florida's economy. Through the in-kind donation of staff time and resources, and at no cost to the state, RPCs collaborated with the DEO to host ten Five-Year Statewide Strategic Plan regional forums, reaching out to over 1,000 Floridians representing local and state-elected officials, economic development organizations, chambers of commerce, workforce boards, members of the business community, educational institutions, as well as other federal, state, regional, and local entities.

The purpose of the regional forums was to gather strategies and recommendations for the five year strategic plan, which was developed by the DEO staff. Using the Six Pillars of Florida's Future Economy™ as the Plan's organizing foundation, RPCs and other stakeholders are continuing to collaborate with DEO and other state agencies to develop the Plan.

ECONOMIC DEVELOPMENT DISTRICTS

Comprehensive Economic Development Strategies

RPCs are designated by the U.S. Economic Development Administration (EDA) as Florida's Economic Development Districts (EDDs). Each EDD is required to develop a Comprehensive Economic Development Strategy (CEDS), which is an economic development plan designed to bring public and private sectors together to create an economic road map to diversify and strengthen the regional economy.

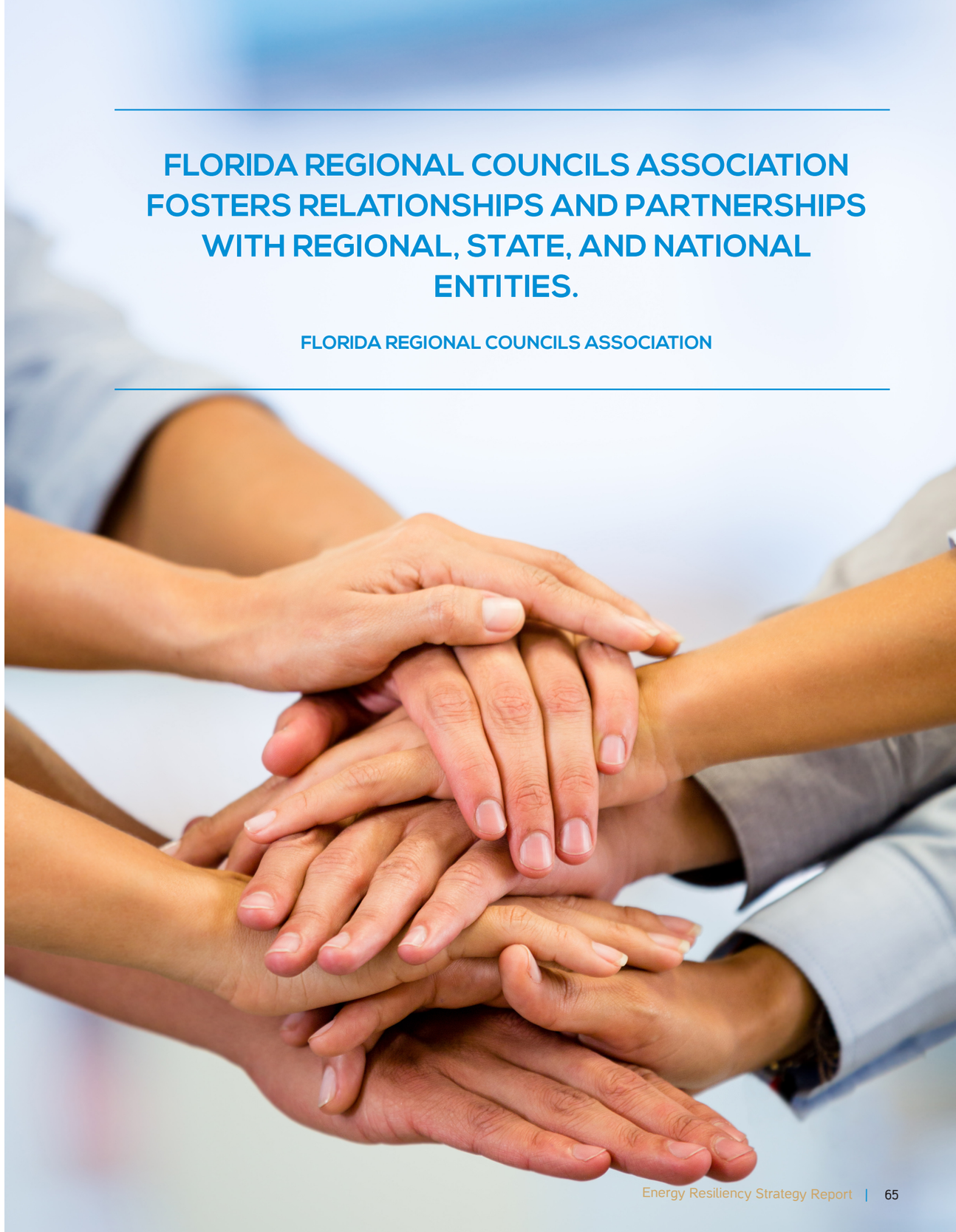
It serves as a guide for establishing regional goals and objectives, developing and implementing a regional plan of action, and identifying investment priorities and funding sources. Projects advanced by the Strategy function broadly to promote higher wage/higher skill job creation, diversify the regional economy, increase exports, and build regional competitive advantages. Once a project is listed in the Strategy, it becomes eligible to seek funding from the EDA's Public Works and Economic Adjustment Programs.

These awards can fund up to one-half of the qualifying infrastructure costs of a project. From January 2003 to August 2010, the EDA invested $66 million in 60 projects in Florida to create or retain 13,700 jobs and leverage $1 billion in private capital.

In 2012, the eleven RPCs produced a concurrent update of their respective Strategies using the Florida Chamber Foundation's Six-Pillars of Florida's Future Economy™ as the organizing foundation. This results in the alignment of the Strategies with the Five-Year Statewide Strategic Plan, providing a framework for improving regional development partnerships and encouraging a stable and diverse economy.

ECONOMIC DEVELOPMENT TECHNICAL ASSISTANCE

Promoting regional economic development in conjunction with local economic development organizations is a priority for RPCs. In furtherance of that priority, RPCs serve on economic development organization boards, councils, or stakeholder groups. In addition, RPCs prepare grant applications for federal and state economic development infrastructure funds for economic development projects at the request of local economic development organizations and local governments. Finally, some RPCs administer a revolving loan fund portfolio composed of federal and state funds to help grow small businesses and create jobs. Over the past ten years, a total of 150 loans in the amount of $38.6 million have been made, resulting in the creation of over 1,800 jobs.



FLORIDA REGIONAL COUNCILS ASSOCIATION FOSTERS RELATIONSHIPS AND PARTNERSHIPS WITH REGIONAL, STATE, AND NATIONAL ENTITIES.

FLORIDA REGIONAL COUNCILS ASSOCIATION

STATEWIDE COORDINATION

WORKSHOPS

From August 2012 through December 2012, all five Energy Planning Areas (EPAs) and their corresponding Regional Planning Councils (RPCs) hosted workshops for the Energy Resiliency project, as shown in Figure 27. Stakeholders including representatives from the energy and utility industries, research centers, industry and energy advocates, colleges and universities, local governments, private organizations, and the public were invited to attend actively participate.

Each summit or workshop began with an overview of the study, as well as a general energy profile of the respective EPA and the State of Florida. Results from the telephone surveys were discussed and attendees were urged to participate in the online surveys. Scenarios constructed and run through REMI, the economic modeling program used by Florida's RPCs, were also presented and feedback from the stakeholders was encouraged. Finally, participants were asked to develop strategies integral to energy resiliency in their respective regions and the state. Participants were informed that these strategies would be incorporated and developed further and incorporated in the final report.

EPA Workshop Discussion

Stakeholder involvement throughout the state reached over 230 attendees actively participating in the workshops. Each workshop involved group activities, in which participants were divided into smaller groups that would break out and discuss an assigned topic related to energy resiliency. Each group developed assigned topics further, examining the strengths, weaknesses, opportunities, and threats, as well as applicability and potential implementation in the region and state. The groups created strategies for each topic and shared with all workshop attendees at the end of the group activities. It was interesting to find that, across all energy planning areas and regional planning councils in the state, several common themes arose.

Great importance was placed upon outreach, education, and training. Participants expressed that they wanted more information about local energy projects, more partnering with universities and research centers, and more education and training for programs assessing energy efficiency and conservation potential for local building stock. It was pointed out by attendees, particularly those representing utility providers, that some of the survey responses may reveal a lack of knowledge about alternative energies and their related costs. It was also recognized that outreach and education were also necessary in shifting attitudes toward consumption for better management of peak demand.

Conservation and peak demand management were popular topics of discussion among all workshops. There was great interest expressed in peak demand management pilot programs and different approaches across the state and nation. Participants were interested in success stories and determined that, while exploring alternatives is necessary to meet demand, conservation must be considered also.

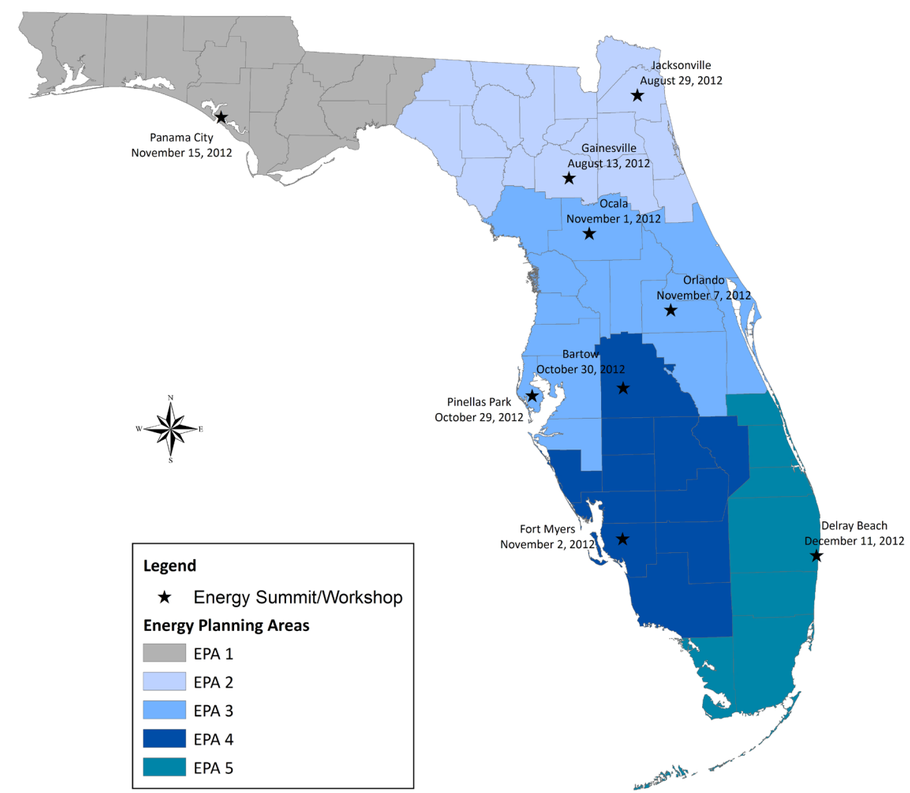
Another common understanding held was that Florida has great potential for advance development of alternative energy resources. Workshop presenters focused on solar energy and biofuels, including sugarcane and algae. It was pointed out that Florida has some of the highest irradiance levels, a measure of the amount of sunlight falling on a particular area, and has greater solar potential than Germany, the leading country in solar energy production and consumption. This abundance of solar irradiance can also be harnessed for the growth of crops that can be converted into biofuels, such as ethanol. It was also noted that there is notable shift in Florida toward retrofitting and otherwise increasing the efficiency of current infrastructure. In particular, businesses and local governments have completed or are beginning the process of retrofitting or converting entire fleets to Compressed Natural Gas (CNG) as a fuel, hybrid-electric, and all-electric vehicles. The conversion, particularly to CNG, has become more favorable recently as a cost saving option, especially as the price of natural gas trends lower than gasoline.

Adoption of Renewable Portfolio Standards (RPS) by the State of Florida, and the importance of diversification of energy sources were also common topics of discussion at the workshops. A RPS would require utilities to provide a certain amount of their energy from renewable sources. A RPS can also be used to diversify vehicle fuels, much the same way that it is doing so for automobiles on the national level, with the 10% ethanol blend required for gasoline. In Florida, and particularly Central and Southwest Florida, long growing seasons and abundant agricultural areas provide a significant opportunity to have a state RPS for fuels that can reduce dependence on gasoline and diesel, through the use of ethanol blends and biodiesel, as long as blending and distribution systems are in place.

Although this is often a state mandate, and in the case of Florida would have to come from the state legislature or the Public Services Commission (PSC), it is possible that locally-based utility providers might be able to implement something similar to a RPS through other channels. Currently, about 30 states have some type of legislation resembling an RPS.

Finally, Property Assessed Clean Energy (PACE) programs were discussed. PACE is a way of financing energy efficiency, energy conservation, and energy generation improvements by a loan that is repaid through an increased property tax assessment. The process generally starts with an energy audit, which determines the savings that can be achieved by implementing different energy efficiency, energy conservation, or energy generation improvements. Improvements can be as simple as increased ceiling insulation or the installation of higher efficiency windows, as basic as the purchase and installation of a solar hot water heater or high efficiency energy savings clothes dryer, or as intricate as the installation of a full solar photovoltaic array.

FIGURE 27: ENERGY WORKSHOPS



Source: Regional Planning Councils

Florida Energy Resiliency

EPA WORKSHOP DESCRIPTIONS

EPA 1 Workshop Description

The West Florida Regional Planning Council and the Appalachee Regional Planning Council held an Energy Resiliency Workshop on November 15, 2012 at the Gulf State Community College in Panama City Florida. The attendees represented electric, gas, utility, and construction industries as well as representation from the Florida Emerald Coast Clean Cities Coalition.

Attendees participated in lively discussion of energy topics, such as oil and natural gas price disruptions, solar power buyback programs, and reduction of demand by use of energy efficient residential appliances and windows. Participants received a presentation by Gulf Power on electric vehicles. The Emerald Coast Utilities Authority gave a presentation on their on-going fleet conversion of trash collection vehicles to Compressed Natural Gas (CNG). Attendees also received a presentation on the potential of substituting sugarcane biomass for coal in Florida.

EPA 2 Workshop Description

The Northeast Florida Regional Council and the North Central Florida Regional Planning Council partnered to host two North Florida Energy Policy Workshops. The first of these took place in Gainesville on August 13, 2012. The second energy workshop was held on August 29th, 2012 in Jacksonville. The North Florida Workshops were designed in consultation with a group of energy stakeholders from North Central and Northeast Florida. The stakeholder groups included representatives from the following:

- Energy Providers: Oil, Natural Gas, Solar, Biofuel and Utilities;
- Universities with programs or research related to energy;
- Transportation planners and providers;
- Builders, contractors and consultants with interest or expertise in energy systems and efficiency; and,
- Local government representatives.

The stakeholder groups were invited to both workshops, and stakeholders participated as presenters in their areas of expertise. The regional planning councils invited other interested parties through their mailing lists and web postings.

EPA 3 Workshop Description

The Tampa Bay Regional Planning Council, Withlacoochee Regional Planning Council, and East Central Florida Regional Planning Council held workshops on October 29, 2012, November 1, 2012, and November 7, 2012, respectively.

Presentations were delivered to the stakeholders at each meeting covering the specifics of the project and the funding partners. A detailed analysis of the statistical energy survey was also delivered. RPC staff walked meeting participants through each economic impact analysis and the results. Time was given for questions about the analysis and input.

The stakeholders were also given the opportunity to participate in the meeting by using an audience response system to anonymously answer the survey questions. This allowed the group to compare the stakeholders' responses with the statistical survey results.

The stakeholders were also given notecards toward the end of the meeting to fill out with strategy and policy ideas as well as questions. The cards were collected by the RPC staff facilitator and discussed as a group. This gave each RPC a good idea of how stakeholders viewed energy policies and what strategies they would like to see implemented.

EPA 4 Workshop Description

The Central Florida Regional Planning Council's workshop was held at the Bartow Civic Center in Bartow, Polk County on October 30, 2012. The Southwest Florida Regional Planning Council held a workshop on November 2, 2012.

Despite hosting separate workshops, both RPCs worked together and followed a very similar workshop format. Participants at both workshops represented a broad range, from the public and private sector, to industry experts and entrepreneurs, to environmental and technology-advocacy groups. The subject area experts each gave 10-15 minute presentations on topics ranging from state and federal energy policy, electricity generation, vehicles and petroleum fuels, natural gas infrastructure, alternative energy sources and biofuels, land use patterns, and resiliency modeling. Attendees were also presented with a copy of preliminary results of the Energy Survey that was also produced as part of this project.

Participants then formed several breakout groups to discuss specific topics. Each breakout group reviewed current happenings in their topic area in the region, state, and other regions, identified regional vulnerabilities and advantages, and developed strategies to increase energy resiliency.

EPA 5 Workshop Description

The workshop was held in Delray Beach, Florida on December 11, 2012. The workshop included a series of presentations providing an overview of the Statewide Energy Resiliency project and a discussion of the energy profile of Southeast Florida.

Participants were asked to divide into breakout groups to discuss energy resiliency in relation to several topic areas. Each group was guided through two exercises. Exercise 1 entailed the development of separate lists of Strengths, Weaknesses, Opportunities, and Threats (SWOT) related to the breakout group topic. Exercise 2 involved listing strategies related to the breakout group topic to make the region more energy resilient. All of the exercise results were then presented to the entire group.

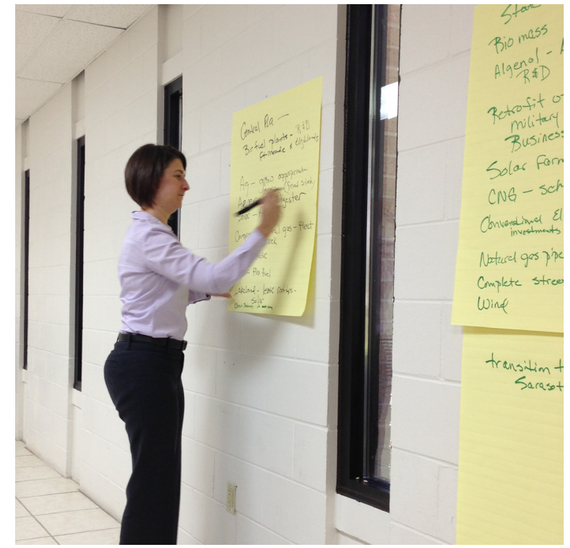


TABLE 8: EPA WORKSHOPS

EPA	DATE	LOCATIONS
1	11/15/2012	Panama City
2	08/13/2012 08/29/2012	Gainsville Jacksonville
3	10/29/2012 11/01/2012 11/07/2012	Pinellas Park Ocala Orlando
4	10/30/2012 11/02/2012	Bartow Fort Myers
5	12/11/2012	Delray Beach

Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

STAKEHOLDER INVOLVEMENT

WORKSHOPS

Representatives from stakeholder organizations in all five Energy Planning Areas met at a series of statewide workshops to provide the necessary collaborative vision and suggestions on ways to improve Florida's Energy Resiliency.

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

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Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

THE FUEL IN THE EARTH WILL BE EXHAUSTED IN A THOUSAND OR MORE YEARS, AND ITS MINERAL WEALTH, BUT MAN WILL FIND SUBSTITUTES FOR THESE IN THE WINDS, THE WAVES, THE SUN'S HEAT, AND SO FORTH. (1916)

JOHN BURROUGHS

SURVEY RESULTS

SUMMARY

The Florida Regional Planning Councils contracted with Kerr & Downs Research to conduct a statewide, statistically-significant, energy survey. Two surveys were administered, a residential survey and a business survey. These surveys examine Florida residents' and businesses' reactions to a broad range of issues including energy conservation, investment in energy saving devices, motivations for conserving energy, impact of energy cost increases on lifestyle, and government policies affecting energy.

As part of the Florida Energy Resiliency study, the Florida Regional Planning Councils contracted Kerr & Downs Research to conduct a statewide telephone survey to gather opinions about energy usage in Florida. The survey examined Floridians' energy use and opinions regarding a broad range of issues including energy conservation, investment in energy saving devices, motivations for conserving energy, impact of energy cost increases on lifestyle, and government policies affecting energy. The results of this survey will help decision-makers create options for Floridians with respect to state energy planning and energy security issues.

Two surveys – one for private residences and one for businesses – were created to understand current energy infrastructure opinions from both a residential and a non-residential perspective. Each group included a randomly selected sample of 750 establishments (150 for each Energy Planning Area) taken from all working cellular and landline telephone numbers. The telephone surveys were conducted from May to June 2012.

FIGURE 28: BUSINESS SURVEY RESULTS - ENERGY SOURCES

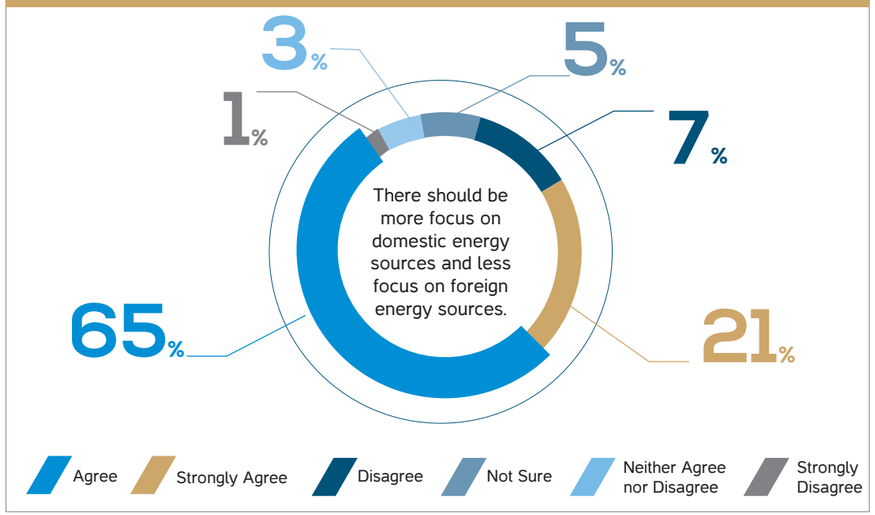


TABLE 9: BUSINESS SURVEY RESULTS - QUESTION: WHAT WOULD A BUSINESS DO WITH THE FUNDS SAVED FROM ENERGY COST SAVINGS RELATED INVESTMENTS?

	Add to business savings and investments	Improvements to buildings and operations	Extra profits/ bonuses/pay	Reinvest in other alternative/renewable energy	Other
Total	49%	29%	19%	14%	8%
EPA 1	39%	27%	20%	11%	12%
EPA 2	57%	29%	14%	14%	6%
EPA 3	46%	32%	19%	15%	9%
EPA 4	52%	36%	22%	16%	7%
EPA 5	52%	24%	23%	13%	5%

Source: Business Survey Results

The results of the two surveys show the following general trends:

- A majority of those unwilling to pay more for electricity just because it is derived from renewable energy sources
- A strong majority consensus on the importance of state energy conservation and focus on domestic energy sources for energy security
- Strong support from residents to the state's intervention on energy issues. Businesses are less receptive to this idea

The following section explores the results for each survey with more detail.

RESIDENTIAL SURVEY

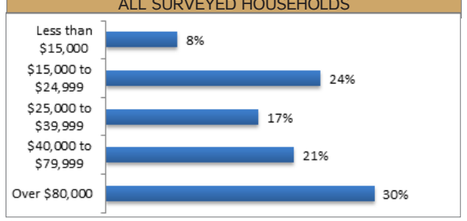
Demographic profile of a typical resident:

- 46 years old (median age)
- 60% had no children living at home
- 62% White
- 51% Female
- Has an associate's degree or higher
- Annual household incomes of $41,000

Most of the people who answered the survey were White (62%) and Female (51%). The median age of those interviewed was 48 years old. Sixty percent of the households interviewed had no children living at home at the time of the survey.

The level of education of these households was relatively high. Sixty five percent of the people who participated in the survey had at least an Associate's Degree. A majority of the interviewees were homeowners (74%), and had an annual household income of $41,000. Figure 29, shows the distribution of income for all the households interviewed.

FIGURE 29: DISTRIBUTION OF HOUSEHOLD INCOME FOR ALL SURVEYED HOUSEHOLDS



Source: Residential Survey Results:

Business profile:

- The typical business had 4 employees
- 22% of businesses were office/professional
  - 17% retail
  - 19% service industry

Based on the survey results, the typical resident is willing to invest no more than $2,000 for energy saving improvements. Homeowners are more willing to invest than those who lease their properties. However, individuals are only willing to invest in energy saving equipment if the payback periods (time to recoup their investment) meets their expectations. The investment and payback periods vary by the type of equipment or treatment as seen on Table 10.

TABLE 10: RESIDENCE ENERGY IMPROVEMENTS

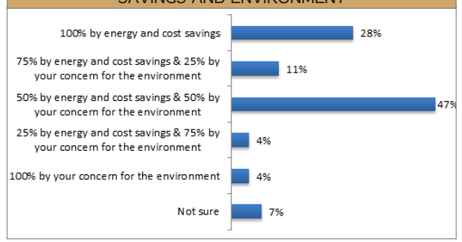
Type of Energy Saving Equipment	Amount to be Spent	Percent of Residents willing to invest	Median Payback Period
Window Tinting	$500	46%	1 year
Energy Efficient Heat and Air Conditioning	$5,000	53%	5 Year
Solar Panels	$10,000	52%	5 years

Source: Residential Survey Results:

Most residents are willing to spend on energy saving equipment: 46% would invest $500 in window tinting, 53% would invest $5,000 in energy efficient heating and air-conditioning systems, and 52% would invest $10,000 in solar panels. Window tinting had the lowest payback period at one year, which is understandable because of the lower investment threshold. On each of these items, over twenty percent of the residents were not sure if they would invest in an energy saving technology. This might be because the interviewees are unfamiliar with these technologies. This could be addressed with an education campaign for residents. On the other hand, this might point out the need for incentives to encourage households to invest in energy efficiency technologies. Most of the residents interviewed would use any prospective energy savings to invest (40%) or make home improvements/buy a new house (24%).

Personal motivation is an important part of why individuals invest in energy conservation technologies and products. As per Figure 30, most homeowners (47%) stated that they were equally motivated by saving on energy costs and by concern for the environment. However, 39% expressed that energy and cost savings were their main reason to invest in energy saving equipment. On the other hand, only eight percent said that the environment was their main concern. Therefore, there may be an opportunity to provide economic incentives to persuade Florida residents to invest in these types of products.

FIGURE 30: HOMEOWNERS MOTIVATED BY ENERGY COST SAVINGS AND ENVIRONMENT



Source: Residential Survey Results::

An increase in energy costs can have an impact on a household's spending habits and expenses. The typical resident surveyed had a monthly utility bill of $150. Their utility bill would have to increase by $70 per month for them to cut back on entertainment expenses and their bill would have to increase by $100 per month for them to make a major lifestyle change. With the typical resident surveyed already spending $200 a month on gas, expenditures would have to increase by $55 per month for the typical resident to have to cut back on entertainment expenses and increase by $100 per month, or 50%, for them to make major lifestyles changes. It is significant to note that slightly more than half of the residents surveyed (51%), do not have a plan for keeping their total energy costs stable if energy prices were to increase sharply. This might help explain why sudden increases in gas prices had so much impact on consumer expenditure at the national level over the past couple of years.

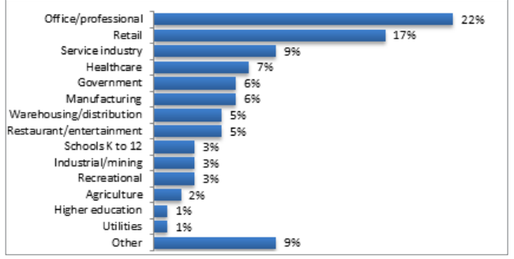
Most of the surveyed residents support state government intervention in the electricity markets. Eighty-six percent of residents agree that the State of Florida should take a more active role in promoting energy conservation, and 88% of residents agree that there should be more focus on producing energy from domestic energy sources. Also, 55% of the people interviewed supported government requiring utility companies to match renewable or alternative energy sources. However, few residents are willing to pay higher utility rates to use renewable or alternative energy sources (32%). Of those willing to pay higher rates, the majority would be willing to pay 5-10% more.

The results of the residential survey show that there is an interest from residents in addressing energy issues as long as it does not cost them additional money. This is understandable, because Florida is barely recuperating from the economic recession of the last years. The responses might have been different if the economy was doing better. These results also point to a need for economic incentives to help residents adopt energy conservation technologies.

BUSINESS SURVEY

Most of the businesses contacted were small businesses with less than ten employees. Fifty seven percent of them owned the building where the firm was located. Figure 31 looks at the percentage of firms by business sector. The more prevalent categories were office/professional (22%), retail (17%), and personal services (9%). Overall there was a good representation of many different industries in the survey sample.

FIGURE 31: DISTRIBUTION OF SURVEYED ESTABLISHMENTS BY INDUSTRY

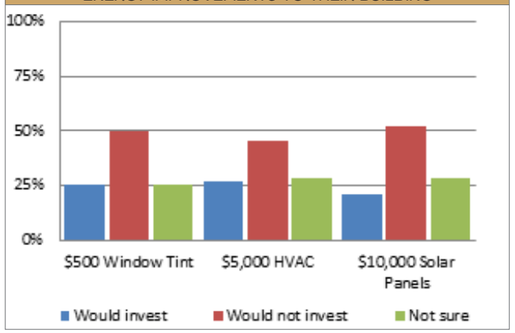


Source: Business Survey Results:

The business survey asked generally the same questions as the residential survey, but was phrased to be more applicable to businesses. The business community's responses showed less enthusiasm toward energy efficiency and conservation technologies. As per Figure 32, almost half of the businesses stated that they were not willing to purchase any energy conservation technologies. Another 25% of the interviewed firms were not sure if they would invest any money on these products.

It is difficult to pinpoint the exact reason why there was such antipathy from the business community to investing in clean technologies. However, it looks like fuel costs might not be the biggest expense for the companies interviewed. For example, the median businesses stated that they spend $400 on energy costs. Thirty four percent of those companies stated that they do not have any fuel costs associated with their business. The median amount spent on fuel costs by all businesses was $500. Office and retail establishments, which account for most businesses interviewed, are less energy intensive industries than manufacturing or transportation. These businesses might spend more on rent and labor than energy costs so there would not be a lot of economic relief from adopting conservation technologies.

FIGURE 32: RESPONSES OF SURVEYED BUSINESSES REGARDING ENERGY IMPROVEMENTS TO THEIR BUILDING

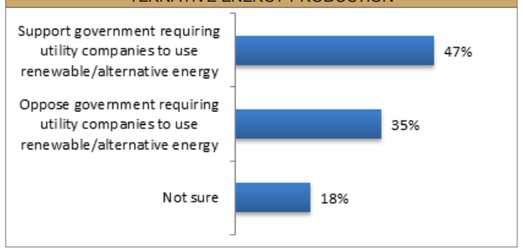


Source: Business Survey Results:

Similar to households, 51% of office and retail establishements have no alternatives to keep production and delivery costs down if energy costs increase sharply. However, most of these businesses would not close because of a spike in energy costs or pass the increase in costs to their customers. Furthermore, more than half of the businesses interviewed believe that they are already paying higher utility rates because of the use of alternative energy or renewable resources. Forty three percent of these businesses are willing to pay more for domestically produced energy.

As per Figure 33, there is not a lot of support from businesses for government mandates to require utilities to use renewable/alternative energy. Only 47% of businesses support government intervention versus over 55% of residents. The tolerance level for energy cost increases to businesses was between 5 and 10 percent, which is similar to the residents response.

FIGURE 33: BUSINESS SUPPORT FOR REQUIRING RENEWABLE/ALTERNATIVE ENERGY PRODUCTION



Source: Business Survey Results:

Based on the results of this survey, there is some resistance from businesses to the adoption of renewable and conservation technologies as shown in Figure 34. This might be because energy is not the highest cost for many of these businesses. Focusing education and incentive efforts on industries with high electricity and transportation costs such as manufacturing and logistics might lead to more impact.

ONLINE SURVEY

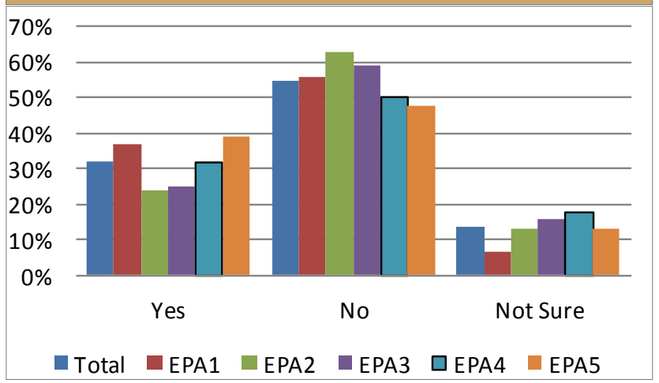
To complement the telephone surveys, the RPCs created an online survey, adapted from questions in the original telephone survey. Two surveys, one for residents and one for businesses, were distributed throughout the entire state using different online platforms and emails.

There were several demographic differences between the sample populations of the telephone and online surveys. On the residential survey, 51% of those surveyed online had an annual household income of over $80,000 as opposed to $41,000 for the telephone survey. Additionally, 55% of those surveyed online had a Master's, Professional, or Doctorate degree compared to just 23% on the statistical survey. There were also some differences in the business survey. The businesses that answered the online survey had more employees and the majority belonged to the professional and technical services industry. These demographic differences probably account for some of the disparities in survey results.

Online residential survey takers were more likely to spend on energy conservation equipment and activities than the telephone survey takers. This may have been due to a different amount of discretionary income and different levels of understanding about energy alternatives.

It is significant to note that regardless of income and education levels, a majority of both online and telephone residential survey respondents do not have a plan in place if energy costs were to increase sharply (51% from the telephone survey and 62% from the online survey). Again, this is an important finding and underscores the need to ensure that more residents are prepared for energy disruptions or price increases, whether large or small. The results of these surveys were taken into account when staff developed this report's energy resiliency strategies as well as the assumptions for the economic modeling scenarios.

FIGURE 34: TELEPHONE SURVEY RESULTS
QUESTION: ARE YOU WILLING TO PAY HIGHER UTILITY RATES FOR YOUR UTILITY COMPANY TO USE RENEWABLE OR ALTERNATIVE ENERGY SOURCES?



Source: Business Survey Results:

ENERGY INNOVATION IS NOT A NATIONALISTIC GAME.

BILL GATES

SWOT ANALYSIS

STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS

INTRODUCTION

Energy resiliency will increase the State's ability to withstand or recover from energy disruption or disaster. Energy resilient communities will have primary, alternative, and renewable energy sources making total energy disruption from a major event less likely and bolster a community's ability to reasonably resume normal levels of activity. A systematic approach for identifying and analyzing potential action plans is needed as communities take the first step toward resiliency.

A SWOT analysis is one such approach that seeks to identify the Strengths, Weaknesses, Opportunities, and Threats related to a potential idea or plan of action. Strengths are the internal characteristics of a project, or in this case, a concept or strategy that give it an advantage over others. Weaknesses are the internal characteristics that place the concept or strategy at a disadvantage relative to others. Opportunities are the external chances to improve performance in the environment. Threats are the external elements in the environment that could potentially endanger the concept, strategy, or project.

A modified SWOT analysis was conducted to identify impediments and opportunities to wide-scale implementation of energy resiliency strategies and programs. Representatives from the regional planning councils were arranged by Energy Planning Areas (EPAs) and asked to identify the strengths, weaknesses, opportunities, and threats associated with "Energy Usage in Florida." Some of the resulting responses were region-specific and others had statewide applicability. For the purposes of this discussion the "weaknesses and threats" have been combined and "strengths and opportunities" have been similarly grouped. The resulting lists were grouped by topic area and developed into this section of the report. Some of the SWOT responses were used to identify regional and statewide strategies.

Regional SWOT Themes

EPA 1 observed that distributed supply coordination across multiple vendors was viewed as a regional strength, as was the Emerald Coast Utilities Authority's experience with fleet conversion to CNG.

EPA 2 cited local talent that was knowledgeable and cared about energy resiliency. This area has the support of several local high-tech companies including an electric car battery manufacturer. Stakeholders in the region have indicated support for a regional task force that could be leveraged to maintain interest and activity in energy-related projects.

EPA 3 benefits from the Kennedy Space Center Infrastructure and NASA workforce. The I-4 Corridor which includes the Universities of South and Central Florida and the Florida Solar Energy Center functions as a high-tech corridor for the region. Partnerships with Clean Cities, Space Coast Energy Consortium, and Space Florida can be leveraged to promote and develop resiliency efforts.

EPA 4 strengths include abundant agricultural lands and centralized land ownership, which provides opportunities for developing biomass for electrical generation. The Institute for Food and Agricultural Sciences at University of Florida supports research and development.

EPA 5 can leverage the regional platforms of the Climate Compact and the Seven50 Visioning Plan. This region is also home to three major ports that can provide fuel storage. Florida Power and Light is a cooperative partner.

GENERALIZED SWOT THEMES

Weaknesses and Threats

Some of the negative factors that impact our ability to achieve energy resiliency statewide include high electric consumption, sprawl, inadequate transit infrastructure, over-reliance on fossil fuels, limited renewable energy sources, and insufficient general knowledge of energy efficient practices.

While Florida's climate does not require energy to be used for heating for much of the year in much of the state, a relatively higher volume of energy consumption is required to cool and operate homes and businesses. Florida's hot climate and high humidity makes living without air conditioning potentially uncomfortable. The fear of mold leads some to air condition buildings even when unoccupied. Newer structures can be built to more energy efficient specifications, but the occupants may waste energy if they have insufficient knowledge of efficiency practices. Given the age of many buildings in Florida, there is a challenge in retrofitting buildings for energy resiliency. The costs associated with retrofits may be deemed high, but energy inefficient housing and commercial building stock often have many more years of useful life and unfortunately, not many decisions to retrofit have included return on investment.

Large-scale developments are often built where large amounts of "cheap" land is available. Too often, housing is not sited near transit, resulting in reliance on automobiles. People are less likely to take public transportation if transit options are in the wrong location or are inefficient or inadequate. Transit is sometimes viewed as used only by the poor and minorities, making it hard to achieve consensus on investments that would make it more accessible and efficient for all.

Our existing energy grid is vulnerable to various types of disasters, both natural and man-made. Electric power lines are especially susceptible to high-wind events such as hurricanes and tornados. Utility infrastructure needs to be upgraded to withstand the effects of climate change. Gas lines and nuclear facilities located along the coast are especially at risk, and this will increase due to anticipated rising sea levels.

Limited focus on fuel diversity may be due in part to a lack of general knowledge about energy sources, costs, and efficiencies. While utilities may make mention of renewable energy sources in their portfolio, there are no consequences for not using diverse energy sources. Limited government funding is a major impediment to programs that could encourage energy diversity, energy retrofit, and efficient community design, or to address many of the challenges facing the state.

Strengths and Opportunities

Despite the challenges, there are efforts throughout Florida to use the state's natural resources as energy sources. Our sunny climate can be harnessed via solar photovoltaic panels. Several of the EPAs identified abundant sunshine as a strength and identified solar power investment as a feasible opportunity. Investment in solar options throughout the supply chain may spin off service companies and jobs. Abundant silviculture and agriculture provides the opportunity to use biomass for fuel production and electrical generation. Florida is bounded by the Atlantic Ocean and the Gulf of Mexico which provides options for wave based energy. Offshore wind can also be captured as an alternative energy source.

There are also policy opportunities that enhance energy resiliency. Goals, even if non-regulatory, could target reduction of reliance on imported energy and increase in local power sources that are not reliant on heavy water usage for greater energy resiliency. Communication and education does not cost much, but it can reap benefits to energy producers and users. Increased knowledge and interest in funding renewable energy research projects may support an expanded energy menu that includes solar and wind energy, electric vehicle infrastructure, liquid gas, and biofuels. State and regional leaders can make energy diversity a priority; incentivize renewable energy production; and explore ways to lessen the implementation costs of alternative energy technologies.

The Ten-Year Site Plan is a utility provider planning document required by the U.S. DOE. It is an important mechanism that can be used to facilitate alternative energy development goals and conservation policies and strategies.

Other opportunities for widespread implementation of energy resiliency projects include:

- Providing institutionalized demand management incentives from power companies and utilities
- Allowing public access to private CNG sites
- Implementing PACE
- Expanding the practice of methane-capture from landfills
- Encouraging thermal fleet conversions to alternative fuels such as CNG, biodiesel, ethanol, electricity, and hybrid
- Adopting energy-saving community design
- Prioritizing transit and non-automobile solutions
- Undergrounding of electrical transmission lines

SCENARIO DEVELOPMENT: ENERGY IMPACTS ON THE ECONOMY

All the scenarios presented in this section of the report were modeled utilizing Regional Economic Models, Inc. (REMI) PI+ Software (ver. 1.3.13). The results are presented by Energy Planning Areas (EPAs), depicting estimates on a statewide level.

NATURAL GAS

Recent developments in technology (hydraulic fracturing and horizontal drilling) have unlocked an enormous supply of natural gas.

RENEWABLE PORTFOLIO

Renewable Energy Portfolio Standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum amount of customer load with electricity from eligible renewable energy sources.

BIOFUEL DEVELOPMENT

A scenario was created based on developing adequate biofuel from sugarcane to produce 1717MW of electricity using pelletized cane solids as a replacement for or addition to coal in existing coal fired burners.

ELECTRIC CARS

The increased use of electric vehicles in Florida could reduce the demand for gasoline and diesel by using electricity.

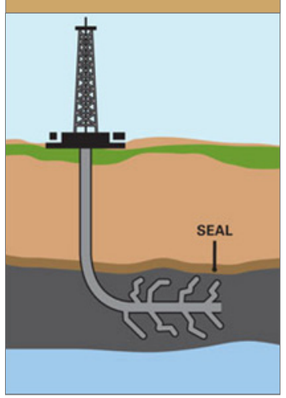
PRIVATE ENERGY

Fuel diversity is integral to energy resiliency, as it will contribute to the mitigation of phenomena such as supply disruptions and price shocks.

ECONOMIC ANALYSIS

OUR RESEARCH

FIGURE 35: DIAGRAM OF NATURAL GAS FRACKING TECHNOLOGY



Several different scenarios were modeled for the State of Florida to investigate the impact that potential energy price changes, potential supply disruptions, or resiliency or assurance strategies might have on the economy.

NATURAL GAS SUPPLY DISRUPTION

Introduction

Recent developments in technology (hydraulic fracturing and horizontal drilling) have unlocked an enormous supply of natural gas. This new technology allows previously inaccessible reserves to be tapped and extracted, as shown in Figure 35. This has led to vast increases in supply of natural gas. Subsequently, the price per unit has dropped substantially.

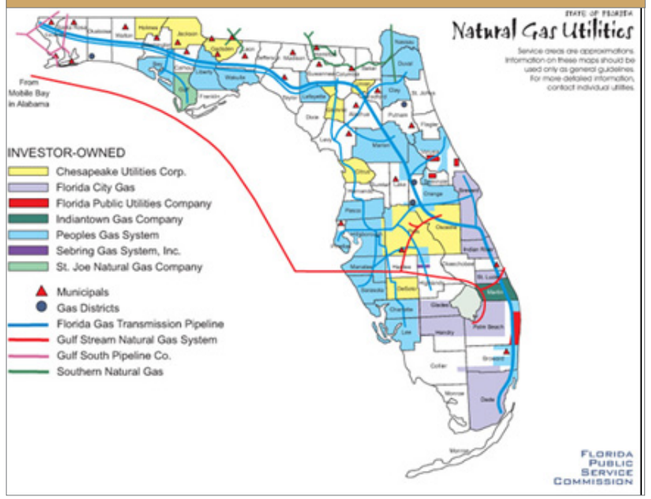
Some analysts predict 100-150 years of supply at current rates, with potentially 10-15 years at or near current pricing. All natural gas supply comes to Florida from out of state, primarily by two major pipelines entering the state from the panhandle and the west coast, as shown in Figure 36. The source of this natural gas is primarily the northern United States and Canada. Another pipeline is currently under development and will primarily be accessible to northern Florida. New capacity has been developed to mitigate supply disruptions following natural disasters that cut off the flow of natural gas, but the potential still exists for a bottle neck in supply.

Current benefits of high supply and low prices of natural gas include a greater share from domestic or near-domestic (Canada and Mexico) supply. When used in power plants to produce electricity, natural gas creates less air pollution than coal per unit electricity produced.

Combined with the low price of natural gas, these and other factors have led to natural gas fired power plants replacing coal plants in some areas as the baseload generation method of choice. Currently, natural gas is cheap, abundant, and available. Natural gas is responsible for producing approximately 54% of electricity in Florida in 2008, and most estimates say that it will be responsible for closer to 60% within a decade if these trends continue.

Some other reasons that natural gas has been

FIGURE 36: NATURAL GAS UTILITIES AND PIPELINES



Source: Florida Public Service Commission

gaining as a fuel source of choice among electricity providers include:

- Coal declining because of environmental regulations
- Nuclear has long, expensive permitting process (8-12 yrs)
- Renewable energy technologies require an adjustment to the current regulator and energy supply provision paradigms.

According to the 2011 Annual Energy Report as prepared by the Florida Office of Energy:

> "Natural gas and coal are the leading fuels for electricity production in Florida, typically accounting for about 51% and 25% of net generation, respectively. Nuclear and petroleum-fired power plants account for much of the remaining electricity production within the state. Florida is a leading producer of electricity from municipal solid waste and landfill gas, although generation from those sources contributes only minimally to the electricity grid. There are no coal mines in Florida and coal-fired power plants rely on supplies delivered by railroad and barge, mostly from Kentucky, Illinois, and West Virginia."

There are also no significant natural gas wells or nuclear material extraction areas in Florida to date. This means that Florida is extremely reliant upon external sources, including other states and nations, for its power supply. In addition, these fuels must be transported into the state, which means that supply lines are somewhat vulnerable to disruption.

Since natural gas plays a major role in electrical generation in Florida, it was chosen as a prime candidate for supply disruption and price spike modeling. In these modeling scenarios, the potential economic impact of natural gas supply disruption was explored to determine the potential impacts to Florida businesses and residents.

Historical and Forward Prices

Historical natural gas prices were determined using the data in Figure 37. The overall price drop around the year 2008 indicates the time during which fracking technology became widely implemented. From this data, the previous price of natural gas was estimated at approximately $6.00 per unit in the early 2000s, approximately $4.00 per unit in the period from 2009-2011, and the current price was estimated at about $2.00 per unit. The two major price spikes in the graph below (in 2005 and 2008) were likely due to supply disruptions of the major pipelines supplying Florida during severe hurricane events.

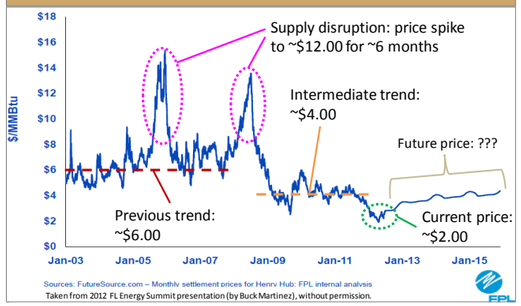
Potential impacts of higher natural gas prices or supply disruptions are:

- Low impact: Direct Residential Consumers
  - little direct consumption; effect negligible
- Moderate impact: Electric Utilities
  - Utilities using natural gas for electrical generation
  - Increased prices passed on to customers
- Non-uniform impact:
  - Specific industries are impacted more than others
  - Some counties have more electricity provided by natural gas than others

Scenario Modeled

Natural gas was chosen as the target of an energy assurance

FIGURE 37: NATURAL GAS SUPPLY DISRUPTION SCENARIO MODEL PRICE POINT



modeling scenario because it supplies such a large proportion of electricity to Floridians, and comes from a source outside of the state. Coal was initially deemed a possible modeling target, but after further investigation it was deemed less fruitful with respect to electricity assurance modeling. Coal prices are more determined by the cost of diesel fuel used to power the trains that deliver the coal, so modeling natural gas was determined to be a better scenario for investigating the economic impacts of electrical energy assurance.

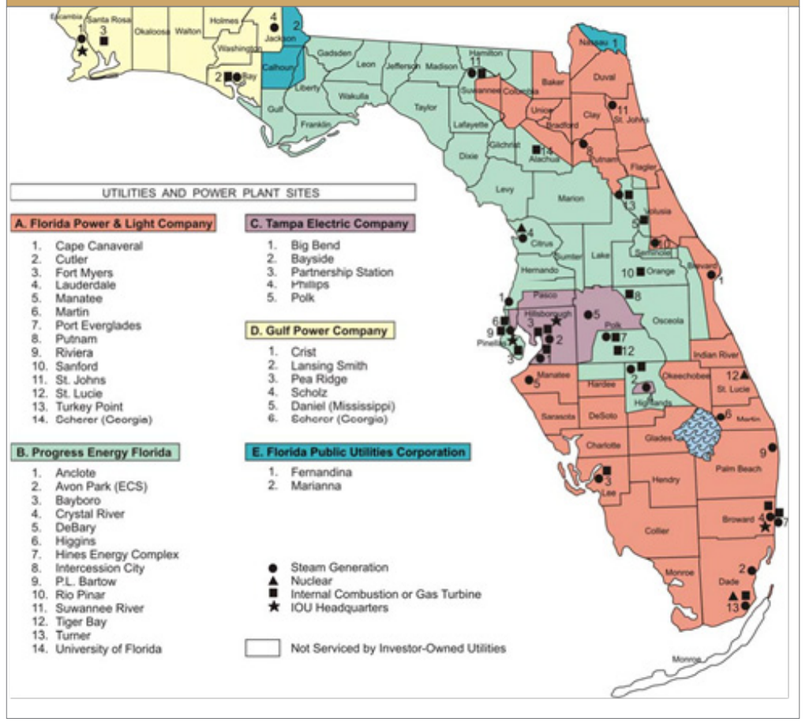
After Hurricane Katrina damaged natural gas pipelines in the panhandle, supply was disrupted for some period of time. This is apparent in the graph around September 2005 as a sharp spike in natural gas prices, lasting almost a year. This price spike was essentially an increase to six-times the current day price for almost six months. This formed the basis for a supply disruption scenario.

The scenario explored modeled the potential economic impact from natural gas supply disruption leading to a temporary increase in natural gas prices, as follows:

- A statewide supply disruption of natural gas, leading to a price of $12.00 per unit for a 6-month period, which is equivalent to approximately six times the current price for half a year.

There is not a directly proportionate relationship between natural gas prices and electrical prices from natural gas power plants. This is because there are non-fuel related costs associated with natural gas-produced electricity, such as transmission, labor, infrastructure, and management. Therefore,

FIGURE 38: UTILITIES AND POWER PLANT SITES



Investor-Owned Utilities, Company Service Areas are approximate.
Source: Florida Public Service Commission, 2009 report.

the relative amount of fuel-related cost increases that might be expected for each scenario was calculated for each utility provider and estimated for each county. Initially, the proportion of electricity generated from natural gas for each of the largest utilities in the state was estimated, then the proportion of electricity costs attributable to natural gas as a fuel source was estimated. This approximated the increase that customers could expect to see in their electrical costs as a function of rises in natural gas costs. This modeling assumes that increases in fuel costs will be passed directly to the consumer. Direct natural gas consumption was also modeled as being affected by either of the two scenarios for natural gas. However, since there is little direct consumption in Florida, this may have had little effect overall depending on the consumer, especially when compared to the potential impact for a northern state, where natural gas is more likely directly consumed for building heating uses. However, some industries do directly consume natural gas, and these were obviously projected to be more affected by changes in the price of that commodity.

Economic Impact

The economic impact to the state and each EPA was estimated using a suite of standard indicators. These indicators are:

- total employment – measured in jobs
- gross domestic product (GDP) (which refers to either regional or state geography, depending on context) – measured in billions of 2005 dollars
- real disposable personal income (PI) - measured in billions of 2005 dollars

The results of the modeled scenario is summarized in Figure 13. The annual loss over the first five years is presented as a standard time period over which this scenario can be analyzed. In the modeling of the price spike scenario due to supply disruption, the prices are assumed to return to normal within two years.

The results from the assurance scenario modeling are summarized here by Energy Planning Area (EPA) and for the state as a whole.

The following Figure 14 displays the graphical differences between EPAs with respect to the barometer indicators, for comparative purposes. The chart compares the impacts to regional GDP of the two scenarios modeled by regional planning councils. This level of detail reveals differences between the RPCs that are likely primarily driven by differences in the dominance of natural gas-reliant industries or by differences in fuel source composition of electricity providers that serve each region.

TABLE 11: ANALYSIS OF NATURAL GAS AS A COMPONENT OF ELECTRICITY PRODUCTION

Company		GWh generated Year 2010	GWh generated Year 2011	% GWh from Natural Gas	
Progress Energy Florida (now Duke Energy)	Natural gas	23,692	23,581		
	Net Energy for Load	46,160	42,490		
	% from Natural gas	51.33%	55.50%	53.41%	avg.
	Source: http://www.psc.state.fl.us/library/filings/12/01878-12/01878-12.pdf page 2-12				
Florida Power & Light	Natural gas	66,771	74,388		
	Net Energy for Load	114,475	112,454		
	% from Natural gas	58.33%	66.15%	62.24%	avg.
	Source: http://www.psc.state.fl.us/library/filings/12/01983-12/01983-12.pdf page 91				
Gulf Power	Natural gas	4,811	7,195		
	Net Energy for Load	12,518	12,086		
	% from Natural gas	38.43%	59.53%	48.98%	avg.
	Source: http://www.psc.state.fl.us/library/filings/12/01935-12/01935-12.pdf page 38				
Tampa Electric Company (TECo)	Natural gas	8,375	7,392		
	Net Energy for Load	20,667	19,325		
	% from Natural gas	40.52%	38.25%	39.39%	avg.
	Source: http://www.psc.state.fl.us/library/filings/12/01955-12/01955-12.pdf page 38				

Statewide Value Added and Existing Infrastructure

There are some readily apparent alternatives to the existing infrastructure and reliance on natural gas as a primary fuel source for electricity. Using the existing infrastructure, but expanding to a more diverse fuel portfolio would reduce dependence on natural gas. However, the costs associated with such diversification may outweigh the gains of potentially avoiding a fuel supply shortage event, up to a point. Co-firing or switching to other fuel sources for diversification would also create reliance on those other fuel sources, so further investigation would be necessary to determine the potential advantages and disadvantages and weigh those against the current mode. Obviously with natural gas current low cost, it is likely to continue to be the fuel of choice for many centralized electrical generation plants. In spite of that, it would probably be beneficial to energy assurance to further develop the natural gas storage infrastructure to mitigate and smooth out potential future shortage events.

Another possible assurance enhancement strategy would involve diversifying some of the existing electrical generation capacity to local renewable or local fuels, such as solar photovoltaic, wind turbines, or even biomass or waste-to-energy. This would create a local, more distributed fuel source base that would be subject to different assurance concerns, but most notably would not require the importation of fuel from out-of-state. This additional infrastructure would also have to be evaluated for efficacy, but would no doubt reduce Florida's dependence on out-of-state fuel sources. This would increase Florida's energy assurance.

TABLE 12: PERCENTAGE OF ELECTRICITY COSTS AFFECTED BY CHANGES IN NATURAL GAS PRICES

Company	% revenue spent on fuel (i.e.- this is the non-infrastructure costs of natural gas electricity) 2009	2010	Company avg.	
FP&L	42.46%	39.37%	40.92%	
Gulf Power Co.	42.55%	45.94%	44.25%	
Progress Energy	36.56%	37.72%	37.14%	
TECO	37.00%	34.84%	35.92%	
Year average	39.64%	39.47%	39.56%	overall average

Source: http://www.publicpower.com/pdf/stats/statistics-2010.pdf page 12

Note : In the actual economic modeling, county-specific utility rates were estimated for each county individually.

Leveraging Resources

Florida's natural climate, abundant sunshine, and long growing season are resources that can be leveraged to enhance energy assurance by diversifying the electrical generation portfolio of fuels. Abundant sunshine makes Florida ideally suited for solar photovoltaic electrical generation. Solar thermal water heating would also reduce the demand on utilities, enhancing assurance within the system. The long growing season can also be harnessed to produce local biomass for electrical generation or cogeneration, which shorten fuel supply logistics chains, and allow for in-state fuels to be maximized in the creation of electricity.

TABLE 13: ECONOMIC ANALYSIS OF STATEWIDE SIX-MONTH NATURAL GAS SHORTAGE SCENARIO

Scenario = Statewide six month natural gas shortage (with price spike to 6X current price)

Region = Entire State	Current day (2012)	Annual loss (over 5 years)	Annual loss (over 5 years)
Total Employment	10,234,017	-44,877	-0.41%
Gross Domestic Product (billions of 2005 dollars)	$767.7	-4.335	-.052%
Real Disposable Personal Income (billions of 2005 dollars)	$675.2	-6.014	-0.84%

Source: Florida Regional Planning Councils, Energy Assurance Strategies project, modeled using REMI PI+ v1.3.13, 2012.

TABLE 14: RESULTS OF NATURAL GAS SHORTAGE SCENARIO BY ENERGY PLANNING AREA

Scenario: Statewide six month natural gas shortage (with price spike to 6X current price)

Average annual changes over first five years

Energy Planning Area	Total Employment: Jobs	Total Employment: Percentage	Gross Domestic Product: Billions of 2005 dollars	Gross Domestic Product: Percentage	Real Disposable Personal Income: Billions of 2005 dollars	Real Disposable Personal Income: Percentage
EPA 1	-2,433	-0.31%	-$0.195	-0.36%	-$0.315	-0.71%
EPA 2	-4,217	-0.36%	-$0.402	-0.44%	-$0.601	-0.83%
EPA 3	-15,608	-0.40%	-$1.570	-0.50%	-$1.956	-0.80%
EPA 4	-5,260	-0.44%	-$0.446	-0.56%	-$0.752	-0.81%
EPA 5	-17,359	-0.47%	-$1.723	-0.59%	-$2.391	-0.92%
State	-44,877	-0.41%	-$4.335	-0.52%	-$6.014	-0.84%

Source: Florida Regional Planning Councils, Energy Assurance Strategies project, modeled using REMI PI+ v1.3.13, 2012.

Conclusion

It is important to fully understand the limitations of the scenario modeled and the assumptions present in the economic modeling software when drawing conclusions about the economic impacts. Room for improvement exists within this scenario for further refinement of the exact fuel mix for each electricity generation facility within the state and the exact population they serve. Additionally, fuel substitution determinations could be made that might enhance the accuracy of the modeling, particularly with respect to long term forecasting and long-term price increases.

Broader conclusions from the natural gas supply disruption and price increase scenarios as modeled include the following:

- Currently, Florida is reliant upon natural gas for electrical generation. This is unlikely to change over the next decade, and in all likelihood Florida will become more dependent upon this one fuel source during that time frame unless other actions are taken
- Energy assurance is important to (and linked to) economic resiliency
- Energy price increases due to supply disruptions have varying economic impacts in different regions of the state
- Longer or more severe events likely have the potential to have more severe economic impacts
- Planning for energy assurance and mitigation of supply disruptions can potentially avert large economic damages

When compared with the outcomes predicted by the gasoline price increase scenario due to supply disruption, it becomes apparent that the economy of Florida is more affected by price increases in gasoline than natural gas. This is likely because gasoline affects not only direct consumption, but is also an essential component input of many other industries and activities. Additionally, nearly all transportation relies on gasoline, but only about half of electricity fuel comes from natural gas, and only a portion of the price of electricity is affected by those fuel prices.

GASOLINE PRICE INCREASE

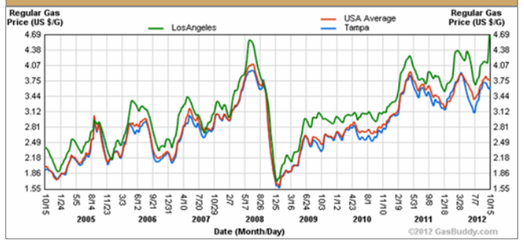
Introduction

Florida and the nation are heavily dependent on transportation for personal use and the movement of goods, both in terms of freight and employment. The majority of this movement comes in terms of the automobile. Roughly 98% of the automobiles in the United States use diesel or unleaded gasoline. As a result, commuting and transportation related expenses are directly tied to the cost of gasoline. Recent trends, possibly in reaction to unstable gasoline prices, suggest a movement towards electric, hybrid, CNG, or other alternative fuel driven vehicles. The nation has a goal to have one million electric vehicles on the road by 2020. If this goal is accomplished, the amount of electric vehicles would still comprise less than 10% of all of the automobiles in service. The price of gasoline is going to be a significant cost of transportation in the future, regardless of the alternatives.

Historical and Forward Prices

Gasoline has seen its peaks and valleys as various factors have influenced the supply, demand, and price. From the early 1900's through the 1960's gasoline was approximately 25 cents a gallon and has exceeded a monthly average of $4.50 in recent years. However, when factoring in inflation, the cost of gasoline now is about what it cost in the early 1900s. In the late 1990s, when gasoline was retailing for $1.25, the inflation adjusted price was the cheapest ranging from $1.50 - $2.00. Comparing the price of gasoline to other industrialized nations shows that the U.S.'s cost of gasoline is relatively inexpensive. Most nations in Europe pay an equivalent of over $8/gallon, with Norway paying an equivalent of almost $10/gallon.

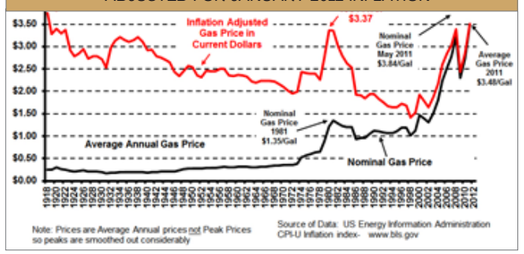
FIGURE 39: 96 MONTH AVERAGE RETAIL PRICE CHART



Source: Regional Planning Councils

The forecast of the price of gas is difficult to obtain due to the uncertainty of a number of factors. The supply of gasoline comes from a number of regions and the price is influenced by a few cartels based on the estimates of oil reserves. Any conflicts within the regions would affect the price and supply. Any policy decisions against the U.S. interests also could impact the nation's ability to purchase or the international supply. Other external factors include environmental related regulations, impacts or spills, as well as any other natural disasters that could affect the supply chains.

FIGURE 40: ANNUAL AVERAGE GASOLINE PRICES
1918 - CURRENT
ADJUSTED FOR JANUARY 2012 INFLATION

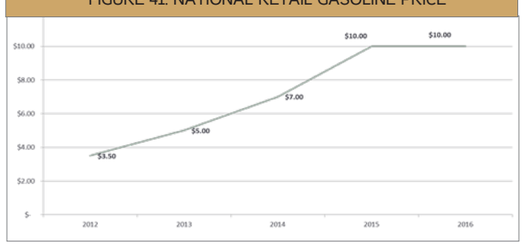


Scenarios Modeled

Three Scenarios were considered when modeling gasoline:

- The Increase in price of gasoline to $5, $7,and $10, roughly a 50%, 100%, and 175% increase, over a 5 year time frame.

FIGURE 41: NATIONAL RETAIL GASOLINE PRICE



Source: Regional Planning Councils

Economic Impact

As shown in the chart below, the price of gasoline is a key factor in the price of goods produced. If the cost of doing business was to increase in such a fashion, the economy would immediately contract. The national and state employment losses would reduce employment by 3% at $5/gallon, 5% at $7.5/gallon, and 8% at $10/gallon. The loss in Gross Domestic Product (GDP) for Florida would equate to $28 billion, $49 billion, and $82 billion, respectively. The loss of income to the residents of Florida would equate to $15 billion, $26 billion, and $45 billion, respectively.

TABLE 15: NATIONWIDE INCREASING GASOLINE PRICES

	Today (2012)	Annual loss @ $5/ gallon	Annual loss @ $7.5/ gallon	Annual loss @ $10/ gallon
US Employment	178,913,875	-65,000	-170,000	-270,000
FL Employment	10,284,524	-322,000	-536,000	-885,000
Percent of Employment	100%	-3.06%	-5.01%	-8.12%
FL GDP (2012 $Bil)	883	-$28	-$49	-$82
FL Income ('12 $Bil)	927	-$15	-$26	-$45

Source: Florida Regional Planning Councils, Energy Assurance Strategies project, modeled using REMI PI+ v1.3.13, 2012.

Conclusion

The price of gasoline is a key variable in the equation that businesses make when deciding which ventures to pursue. If the price of the variable is too high, the equation makes the business unprofitable. Unfortunately, there aren't many substitutes for gasoline, which makes necessary the need to keep the price inexpensive and stable.

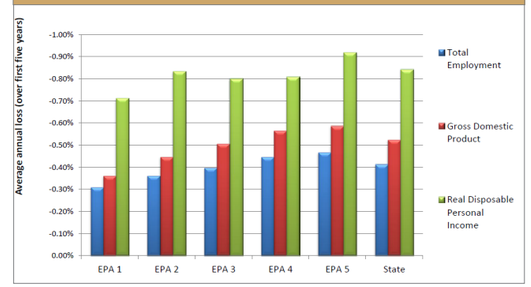
RENEWABLE PORTFOLIO STANDARD

Introduction

A Renewable Energy Portfolio Standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum amount of customer load with electricity from eligible renewable energy sources. RPS requirements can be used in both regulated and unregulated state electricity markets and can help states achieve their renewable policy objectives.

As of March 2009, RPS requirements or goals have been established in 33 states plus the District of Columbia. However, no RPS currently exists in Florida. Since 2006, lawmakers in Florida have tried to establish an RPS for the State but failed. In 2006, the Florida Legislature added Section 366.92, F.S., authorizing the Florida Public Services Commission (PSC) to establish appropriate "goals" for renewable energy generation in the state. In 2009, the PSC sent a draft RPS plan to be considered by the Florida Legislature. The RPS was considered but never ratified in the two legislative sessions after the draft was submitted. In 2012, Florida passed on the opportunity to grow a renewable energy industry by eliminating any reference to a RPS from the Florida Statutes.

FIGURE 42: COMPARISON OF STATEWIDE SIX-MONTH NATURAL GAS SHORTAGE SCENARIO BY ENERGY PLANNING AREA



Source: Regional Planning Councils

Current Status of Renewable Energy in Electricity Generation in the State of Florida

Section 366.91(2)(d), F.S., defines "Renewable energy" as "electrical energy produced from a method that uses one or more of the following fuels or energy sources: hydrogen produced from sources other than fossil fuels, biomass, solar energy, geothermal energy, wind energy, ocean energy, and hydroelectric power. The term includes the alternative energy resource, waste heat, from sulfuric acid manufacturing operations and electrical energy produced using pipeline-quality synthetic gas produced from waste petroleum coke with carbon capture and sequestration."

Florida utilities purchase 384.3 megawatts (MW) of firm renewable energy and 732 MW of non-firm (sporadically available) renewable energy (2011 FRCC). Florida utilities currently own 83.5 MW of renewable energy, as follows:

- Only 1% in Net Energy for Load (GWh) is generated from renewable energy in 2011 and planned for 2020
- Existing Renewables Capacity is 1,282 MW (2.4% of total summer capacity)
  - Planned Renewables Capacity increases to 2,047 MW in 2020 (3.5% of total summer capacity)

Scenarios Modeled

Florida RPS Assumptions are:

- By 2020, the State of Florida would meet the target - 10% of total Net Energy for Load (26,066 GWh) comes from renewables
- In order to achieve this goal, additional capacity of 4,984 MW needs to be added on top of the currently planned 765 MW from Renewables
- Additional capacity is assumed to come from Solar Photovoltaic and Biomass
- Reduced planned capacity is from Natural Gas and Coal
- Electric Utility Rates - according to the U.S. DOE Energy Information Administration (EIA) state electricity statistics, the average retail price for a kilowatt hour (KWh) of electricity in Florida is 11.49 cents
- Relative Costs and prices of energy generated from Solar PV, Biomass, Natural gas, and Coal

Based on the assumptions, we develop an alternative summer capacity and actual energy generation. The impact summary is shown in Table 16.

Variables/factors considered in REMI modeling:

1. Capital investment in renewable energy power plants (increase)
2. Capital investment in traditional energy power plants (decrease)
3. Sales from renewable energy power plants (increase)
4. Sales from traditional energy power plants (decrease)
5. Price for electricity (increase)

Economic Impact

TABLE 16: SUMMARY OF ECONOMIC IMPACT FOR THE RENEWABLE PORTFOLIO STANDARD SCENARIO

Region = Entire State	Today (2012)	Gain/Loss over six years (2017)	Difference over 5 years	Gain/ Loss over ten years (2021)	Difference over 10 years
Total Employment	10,234,017	7,054	0.07%	5,599	0.05%
Gross Domestic Product (billions of 2005 dollars)	767.70	5.99	0.78%	8.16	1.06%
Real Disposable Personal Income (billions of 2005 dollars)	675.2	-7.99	-1.18%	-18.39	-2.72%
Population	19,313,984	(24,607)	-0.13%	(42,115)	-0.22%

Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

Conclusion

Setting up a Renewable Portfolio Standard could reduce the dependence on fossil fuel as well as stimulate job growth in the State of Florida.

PRIVATE ENERGY MARKET SCENARIO

Introduction

Fuel diversity is integral to energy resiliency, as it will contribute to the mitigation of phenomena such as supply disruptions and price shocks. Interest in alternative and renewable energy sources continues to increase, revealing the potential for more advantageous diversity in fuel mix. Results from the residential and business surveys support this trend, as participants indicated that they would invest in alternative energies, even if associated electricity costs increase.

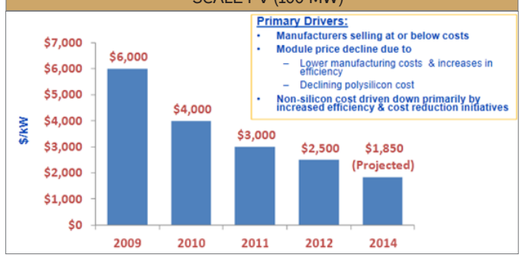
From 2000 to 2009, Florida's percent consumption of renewable energy (including biomass, geothermal, solar thermal and photovoltaic energy, and wind) increased from 4.76% to 6.37% (2011 Florida Statistical Abstract, Table 15.06). While these gains may seem modest, it is important to note that during this same period, renewables was the only category that increased its proportion of total consumption by energy sources (including petroleum, coal, natural gas, nuclear, and renewables) other than natural gas, which doubled.

In this scenario, the potential effects of a more open energy market, where individuals become generators, are examined. Although a more open market would most likely stimulate interest in various alternative energy sources, photovoltaic (PV) solar power is the alternative energy used in this scenario.

Historical and Forward Prices

The cost of PV electricity is currently (and historically has been) higher than electricity from conventional sources, including natural gas. However, the cost of PV has decreased at a significant rate over the last few years and is projected to continue to decrease. Better, more efficient technology and reductions in panel costs are major factors contributing to the decline in PV costs. According to Florida Power & Light, the projected cost in 2014 of a 100 MW utility scale PV operation will be approximately $1,850 per kW (see below, Florida Power & Light presentation, 2012 Florida Energy Summit). That is a decrease in cost of about 70% from 2009 ($6,000 per kW).

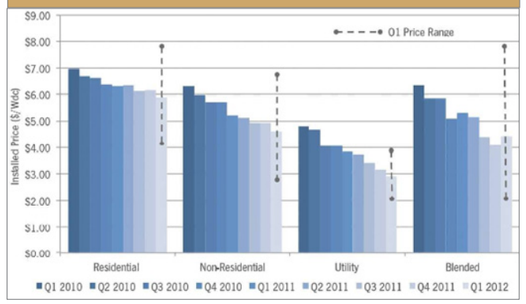
FIGURE 43: FPL'S ESTIMATED COST TREND - FLORIDA UTILITY SCALE PV (100 MW)



Source: Regional Planning Councils

While the cost of Utility scale PV energy has decreased significantly, Residential, Non-Residential, and Blended PV operation costs have also decreased. Below is a graph depicting the national decrease in installed price (in $/Wdc) from Quarter 1 of 2010 to Quarter 1 of 2012 for Residential, Non-Residential, Utility, and Blended PV (Florida Solar Energy Center presentation, 2012 Florida Energy Summit).

FIGURE 44: INSTALLED PRICE OF PV



Source: Regional Planning Councils

Scenarios Modeled

Two sub-scenarios were modeled separately: overall decrease in electricity cost and increase in construction sales due to an increase in PV system installations.

One assumption is that there will be an inverse, or negative correlation between diversity in fuel mix and cost of electricity. In other words, with increased diversity in energy sources, electricity costs will decrease. Conservative figures were entered into the REMI model, lowering the cost of electricity for industrial and commercial sectors, as well as residents:

- 0.5% Decrease over 10 years from 2013
- 1% Decrease over 10 years from 2013

It was also assumed that, with a more open energy market, interest in and thus installation and construction of alternative energy technology, such as PV, will increase. Results from the business and resident surveys support this assumption, as survey participants expressed willingness to invest in alternative energy. Again, conservative figures were used to calculate the number of households and businesses statewide that would install PV systems over 10 years from 2013:

- 0.5% of Businesses annually for 10 years from 2013
- 1% of Households annually for 10 years from 2013

NREL's Photovoltaic Jobs and Economic Development Impact (JEDI) model was used to calculate the total construction costs of small commercial PV systems for businesses and residential retrofit PV systems for households. The total construction costs were entered into the REMI model as construction sales.

Expansion or Investment

NREL's Photovoltaic JEDI model was used to estimate the construction costs of small commercial PV systems for businesses and residential retrofit PV systems for households. The projected annual number of Florida households was calculated using REMI's projected annual population and the current Census household size figure (2.53). Again, it was assumed that 1% of Florida households would install a residential retrofit system per year, starting in 2013.

To estimate the projected annual number of Florida businesses installing small commercial PV systems, the number of Florida firms from the most current Census SUSB data was used. It was assumed that projected growth in number of firms would be parallel to the growth in households. Finally, it was assumed that 0.5% of Florida businesses would install a small commercial system per year, starting in 2013.

The calculated numbers of residential retrofit systems and small commercial systems to be expanded or invested annually were multiplied by their respective installation (construction) costs. The sum of these construction costs were entered into the REMI model as construction sales per year. Table 18, (under the 2013 Scenario section) expresses the quantity of systems and their associated total construction costs for each system in 2013.

The economic impact of an increase in construction sales in Florida in 2013, due to PV system installations is represented in Table 18. The installation of 77,450 residential retrofit systems and 2,028 small commercial systems for businesses in 2013 would amount to approximately $237 million in construction sales. REMI analysis indicates that this investment would create 3,480 jobs, $0.245 billion in additional GDP, and $0.138 billion in Real Disposable Personal Income in Florida in 2013 alone, as shown in Table 19.

TABLE 18: PV SYSTEM INSTALLATION

	Average Estimates		2013 Scenario		
	System Size – DC Nameplate Capacity (KW)	Installation (Construction)	Annual Installation of Total Households/ Businesses	# Systems	Installation (Construction)
Households (Residential Retrofit System)	5	$2,967	1%	77,450	$230 Million
Businesses (Small Commercial System)	20	$8,289	.5%	2,028	$17 Million
Total Activity				79,078	$237 Million

Source: NREL PV JEDI Model

Economic Impact

Table 17 shows the economic impact of decreasing the cost of electricity in 2013. A decrease of 0.5% would yield 380 jobs, $25 million in additional GDP, and $63 million in Real Disposable Personal Income, while a decrease of 1% would create 764 jobs, $50 million in additional GDP, and $126 million in Real Disposable Personal Income in Florida in 2013.

TABLE 17: SCENARIO = DECREASE IN COST OF ELECTRICITY

		0.5% Decrease		1% Decrease	
Region = Entire State	Today (2012)	Change in first year (2013)	% Change over first year	Change in first year (2013)	% Change over first year
Total Employment	10,234,017	380	0.0037%	764	0.0075%
Gross Domestic Product ('12 $B)	883	0.025	0.0027%	0.050	0.0056%
Personal Income ('12 $B)	927	0.063	0.008%	0.126	0.016%

Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

TABLE 19: SCENARIO = INCREASE IN CONSTRUCTION/INSTALLATION OF PHOTOVOLTAICS

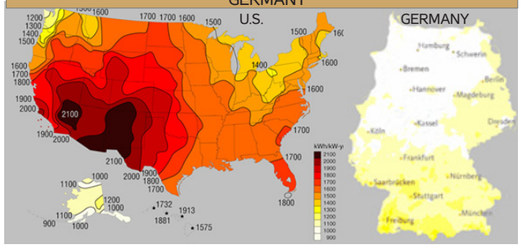
Region = Entire State	Today (2012)	Change in first year (2013)	% Change over first year
Total Employment	10,234,017	3,480	0.0340%
Gross Domestic Product ('12 $ Bil)	767.728	.245	0.0272%
Real Disposable Personal Income ('12 $ Bil)	675.189	0.138	0.0175%

Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

Leveraging Resources

While Germany leads the world in solar energy production and consumption, Florida has twice the solar resource of Germany (see Figure 45 below, Florida Solar Energy Center presentation, 2012 Florida Energy Summit). Leveraging this resource, as well as Floridians' growing interest in alternative/renewable energy sources, and the numerous existing solar projects in Florida will produce positive economic impacts and contribute to successful diversity of energy sources, thus augmenting the state's energy resiliency.

FIGURE 45: SOLAR POTENTIAL IN THE UNITED STATES AND GERMANY



Source: Regional Planning Councils

BIOFUEL DEVELOPMENT

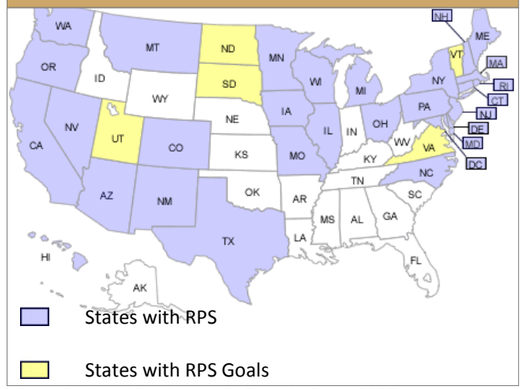
Introduction

The following scenario is based on developing adequate biofuel from sugarcane to produce 1717MW of electricity using pelletized cane solids as a replacement for or addition to coal in existing coal fired burners.

Historical and Forward Prices

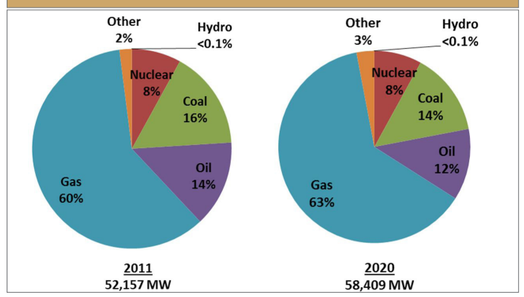
Currently coal prices have been relatively stable at about $60 per short ton. Per the published reports to the Public Services Commission's 10-year site plans, the major coal companies in Florida have plans to purchase and consume coal at about current levels into the foreseeable future. There are sufficient coal reserves in the U.S. to supply coal for the design life-time of the existing generating facilities, thus delaying any alternative fuel source implementation considered. However, development of a biomass substitute solid fuel in Florida's Rural Areas of Critical Economic Concern (RACEC) counties may have a substantial economic benefit for the regions and diversify the local energy portfolio. The targeted level production was set to reach the 2020 estimated Biomass component in a renewable portfolio standard, if Florida adopted the guidelines of the National Renewable Energy Labs. This benchmark required the development of 1,717 MW of generating capacity by 2020, the target for these scenarios. In order to not impact existing agricultural markets for sugar, for this scenario, we assumed that the biomass product will be the 'energy cane' cultivated under continuing development at the IFAS research stations across Florida.

FIGURE 46: STATES WITH RPS REQUIREMENTS, 2009



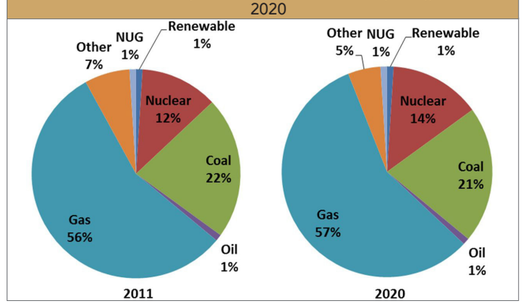
Source: Database of State Incentives for Renewable Energy (DSIRE), March 2009, www.dsireusa.org

FIGURE 47: FUEL MIX (SUMMER CAPACITY (MW)), 2011 AND 2020



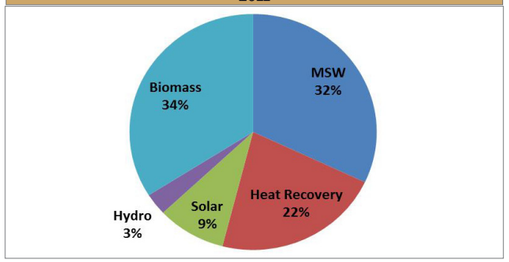
Source: Florida Reliability Coordinating Council

FIGURE 48: FUEL MIX (NET ENERGY FOR LOAD (GWH)), 2011 AND 2020



Source: Florida Reliability Coordinating Council

FIGURE 49: RENEWABLE RESOURCE CAPACITY (OF 1,282 MW), 2011



Source: Florida Reliability Coordinating Council

TABLE 20: RENEWABLES CAPACITY FORECAST	
Existing Renewables Capacity	1,282 MW
Planned Additions (thru 2020)*	
Biomass	308 MW
Landfill Gas	18 MW
Municipal Solid Waste	75 MW
Solar PV	325 MW
Solar Projects (other)	39 MW
Wind	0 MW
Total	765 MW
**Contains non-TYSP data*	

Source: Florida Reliability Coordinating Council

Productivity of cane used in the model's development is taken from gross income values reported by University of Florida research. Costs per acre for the cyclic planting, harvesting and fallow periods as well as value of the harvest are taken from UF research and brought to 2012 dollars. Total costs for cultivation over the crop cycle used are $1,061 at 2010 rates. Sales per gross acre were set at $1,200 per acre. While modeling uses today's 2012 dollars, planting does not begin until 2014 and full production is not realized until 2020. Coal costs are taken from industry reports for coal delivered on-site at the Crystal River facility in Citrus County at $64/ton in 2012.

Scenarios Modeled

Three policy changes were made to the standard forecast in the REMI model that were run simultaneously. The first model the costs of production as an economic stimulus in Florida's three RACECs Economic assistance might be available as a value added agricultural stimulus, but would require a policy change from current state investment policy which does not reward valued added agriculture as an economic investment. The sudden production of 130 to 200 thousand acres in the RACECs is mitigated by spreading the investment over a five year period. This reduces shock on the supply side of equipment sales and manpower shortages. Preparation begins in year 2014 with initial harvesting beginning at 2016. Full scale harvesting is achieved in 2020. Due to reduced growing efficiencies in the northern tier counties in Florida, acreage is increased from the 130,000 acres proposed for the FHREDI region to 200,000 total acres proposed for the Opportunity Florida and the North Florida Economic Development Partnership (NFEDP). The increased acreage compensates for reduced growth potential and nets the same yield per RACEC.

TABLE 21: CAPITAL INVESTMENT AND RELATIVE COSTS/ PRICES

	Bio-mass	Solar PV	Natural Gas	Coal
Overnight capital cost ($/KW)	$2,620	$5,200	$920	$1,920
Fixed operating cost ($/KW)	$66.63	$19.67	$12.48	$27.53
Variable operating cost ($/MWh)	$4.32	$0	$2.86	$4.23
Relative average cost/price per KWh (baseline =1)	1.27	5.08	1	1

Source: National Renewable Energy Lab, Transparent Cost Database collects program (http://en.openei.org/apps/TCDB/)

TABLE 22: ADDED SUMMER CAPACITY (MW) THROUGH 2020

	Biomass	Solar PV	Natural Gas	Coal
Baseline	+308	+325	+5,503	+791
Alternative	+1,717	+3,135	+2,857	+0
Difference	+1,409	+2,810	-2,646	-791

Source: Baseline summer capacity is from Florida Public Service Commission Presentation, 2011 Ten-Year Site Plan Workshop, September 7, 2011; alternative summer capacity is calculated by SFRPC.

TABLE 23: ADDED NET ENERGY FOR LOAD (GWH) THROUGH 2020

	Biomass	Solar PV	Natural Gas	Coal
Baseline	+2,266	+797	+22,394	+5,167
Alternative	+12,635	+7,689	+11,521	+0
Difference	+10,369	+6,891	-10,872	-5,167

Source: Baseline NEL is from Florida Public Service Commission Presentation, 2011 Ten-Year Site Plan Workshop, September 7, 2011; alternative NEL is calculated by SFRPC.

Each RACEC has varying numbers of participating counties. For each county, investment is allocated per its equal share of the total acreage. No counties outside of the RACECs were allocated any cane production investments. In recognition of the extremely small acreage available in Franklin County, its allocation was reduced and the remaining share redistributed among the other eight Opportunity Florida Counties.

The second scenario modeled sales of product from the region. Per the recommendation of the REMI economists, this was modeled in the utilities block as the sales constitute purchase of a fuel stock. Again as in the first model, impacts of sales are

distributed among the RACEC counties in ratios dependant on the number of member counties in each region. Sales inputs lag investment inputs by three years due to the delay time in maturation of the crop. Using a very simple cost-return calculation, profitability was calculated. FHREDI becomes profitable in the fifth year while Opportunity Florida and the NFEDP do not turn a profit until year six.

FIGURE 50: THERMAL COAL CAPP PRICE (OF 1,282 MW), 2008-2012

Source: InfoMine.com

The third scenario models the reduction of coal as an import to the region, which will also have a smaller but detectable impact. To determine the effect of this change, locations and proposed consumption patterns of coal-fired facilities of the four major power companies in Florida were modeled with reductions of coal demand distributed among Florida's coal-fired plants in proportion to the intended use, as outlined in site plan reports filed with the Public Service Commission. Figure 50 depicts the programmed coal use of Florida's coal burning utilities and the proportional reduction of use as biomass replaces a portion of that component. By 2020, the modeled scenario produces sufficient Cane biomass to produce 1,717MW of electricity and displaces 11.2% of the state's proposed coal budget or 3.84M tons of coal.

Expansion or Investment

It is not anticipated that the proposed scenario could be expanded upon to any large degree. The conversion of less productive agricultural uses to cane is already impressive. It is considered that these conversions to cane would take place on lands going out of production due to losses in the tomato and truck farming sectors and in conversion of former timber lands which are suffering economically.

Economic Impact

If undertaken, the project would increase the land dedicated to cane production in south Florida by about 34%. In north Florida, where cane is considered a 'hobby crop' for the production of molasses, new plantings of 200,000 acres each in northeast and northwest Florida are implemented. The model predicts corresponding increases in population to service this agricultural venture. Even mechanized, cane is far more labor intensive per acre than timberland.

The following table Table 24 presents the effect on employment in the three regions.

TABLE 24: TOTAL EMPLOYMENT

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	466	3,409	3,163	2,925
North Fl. E. D. Partnership	343	3,804	3,510	3,234
Fl. Heartland Reg. E. D. Initiative	181	1,133	996	892
Florida Total	1,412	10,688	10,567	10,082

Source: Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

Following the increase in employment, the REMI model compensates for currently unavailable labor and induces population growth to meet the demand imposed by the new activity Table 25.

TABLE 25: POPULATION

RACEC Region	2015	2020	2025	2030
Opportunity Florida	213	12,746	29,253	36,502
North Fl. E. D. Partnership	158	3,001	5,454	6,502
Fl. Heartland Reg. E. D. Initiative	15	544	967	1,120
Florida Total	588	17,804	39,790	50,800

Source: Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

The proposed project would also have an impact on the region's economy as these region's experience economic benefits from both the initial and ongoing agricultural investments in equipment, consumables, and labor and the sales from the regions' cane production. Table 26 shows the impact to the regions' Gross Domestic Product measured in Millions of dollars annually.

TABLE 26: GROSS DOMESTIC PRODUCT $MILLIONS

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	31	116	115	115
North Fl. E. D. Partnership	28	122	121	121
Fl. Heartland Reg. E. D. Initiative	17	98	95	94
Florida Total	116	601	696	735

Source: Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

At the family level, overall salaries will show improvement across the regions as the new activity translates into Personal Income levels Table 27.

TABLE 27: PERSONAL INCOME ($MILLIONS)

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	22	111	162	203
North Fl. E. D. Partnership	12	60	79	88
Fl. Heartland Reg. E. D. Initiative	6	45	46	46
Florida Total	59	324	424	468

Source: Source: Florida Regional Planning Councils, Energy Resiliency Strategies project, modeled using REMI PI+ v1.4, 2012.

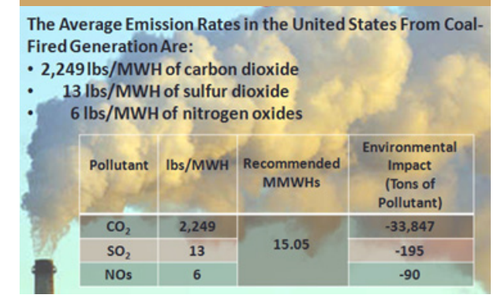
Statewide Value Added and Existing Infrastructure

The scenario models only the agricultural inputs, or demands on the local economy to produce the biomass product, the resultant sales of that product, and the reduced demand for coal by Florida's utilities. A requisite step in the process would be the conversion of the harvested cane to pelletized solid fuel for co-burning with coal. Costs are not readily available for the construction in each region of a drying and pelletizing facility. Providing fuel for approximately 570MW with biomass per region would require the processing of 7.5M tons per year in each region. (Based on similar studies for other King Grass). No data was discovered on the capital cost of these facilities as they are usually ancillary to energy reduction costs for generation of power to fuel sugar refineries in south Florida. As value added agricultural processes are allowed in most jurisdictions as a use by right, only environmental permitting and local site plan approvals of each site is foreseen.

Transfer of product from farm to pellet plant would be by bulk trucking with lift bed trucks similar to those used by the pulp chipping industry. Transfer from pellet plant to generating plants should be considered to be by rail. Some retrofitting to existing fueling processes would be required at each facility as well. Co-combustion with coal is seen as the typical use. Cane produces less ash than coal so there would be some savings in cleaning and waste operations at a co-combustion facility.

Although not modeled in the REMI scenarios, there is an environmental benefit derived from reducing coal consumption. Biomass is considered to be carbon neutral, that is, it sequesters carbon from the atmosphere as it grows, most of which would be returned by burning except for that component captured by existing scrubbing technologies. Coal produces millions of tons of new carbon each year. Reducing the relatively minor 11% consumption would have beneficial environmental effects and could have significant economic impact for the utilities, as they may be able to sell carbon credits on the world market. As shown on the following graphic, the 1,717 targeted MWs (15.05MMW hours) will have a significant positive environmental effect. Total annual reduction at full biomass production rates would eliminate 33,847 tons of new atmospheric carbon per year. Ancillary minor contributions would include elimination of diesel required for transport of coal from America's heartland to Florida's heartland, and use of waste on site to heat the dryers themselves, and to power the pelletizing equipment.

FIGURE 51: POLLUTION MITIGATION



Source: Regional Planning Councils

Leveraging Resources

Square miles of agricultural lands will be required to affect this scenario. Most of these are currently in production as timberlands or other agriculture uses that would be transitioned as they reached an end of a cycle. Siting of facilities should be done to take advantage of existing state road intersections with existing rail. These would include short rail lines that connect to the CSX mainline and would widen the choices or available sites.

The selection of the RACEC regions for this scenario is predicated on their special status in terms of economic development incentives. It would be assumed that policy changes would need to be made to allow for loan guarantees and tax rebates for equipment. In addition, hiring incentives could be incorporated into statute and rule to facilitate and encourage large front end investment. To avoid the costs of land acquisition by mega-farms, co-op formation to permit joint ownership of drying and pelletizing facilities would spread theses costs and provide greater return to the growers.

Conclusion

There would be economic and environmental benefits reaped by substituting locally grown biomass for coal. Future technologies will someday render use of coal for bulk power generation cleaner and safer. Refitting from coal to natural gas makes for a cleaner burn, but does not significantly reduce carbon, as combustion of any fossil fuel generates new atmospheric carbon.

ELECTRIC VEHICLE INTEGRATION

The increased use of electric vehicles in Florida could reduce the demand for gasoline and diesel. Electric vehicles (EVs) are the same as regular vehicles in many ways:

- Chassis
- Body
- Passenger compartments
- Steering
- Tires, windows

ECONOMIC ANALYSIS

The Nissan Leaf and Chevrolet Volt are current examples of 100% or hybrid electric mix vehicles that typically cost between $25,000 and $28,500 each after rebates and tax credits. The Nissan Leaf can travel a distance of 100 miles per charge while the Chevrolet Volt can travel approximately 40 miles on a full charge before a small gas motor starts to turn the generator that provides the charge. For each vehicle, a power consumption of 37 kWh is typical for 100 miles of highway driving. It is believed that the current power generation and distribution system is capable of handling the increase of electrical consumption.

This Electric Vehicle study was designed to determine the economic impact of and increase in electricity with a 1% electric car penetration rate for the State of Florida as well as the five Energy Planning Areas (EPA). The study assumes that 1% of all Florida motor vehicle sales from 2013 to 2030 are comprised of electric vehicles and that the owners of half of all new electric vehicles install either a Level 1 or Level 2 electric vehicle charging station. It also assumes that two additional Level 1 or Level 2 electric vehicle charging stations are installed elsewhere in the state for every residential charging station installed by a new electric vehicle car owner.

Methodology and Assumptions:
The average purchase and installation cost of an electric vehicle charging station was estimated to be $3,000. Since automobiles wear out, it was assumed that the electric vehicles had an average length of service of 10 years. This resulted in an estimated 13,251 EV charging station installs and an estimated 8,883 electric vehicles on the road in 2013, gradually increasing over time to 15,669 EV charging station installs and 101,376 electric vehicles on the road in 2030.

Total motor vehicle sales were based on a reported 14,500,000 light duty vehicles sold in 2012 ("Strong December Sales Builds Momentum for 2013", Automotive News, January 3, 2013). Total vehicle sales was divided by total U.S. population to determine vehicle sales per capita which, in turn, was held constant and multiplied by the projected annual state population to determine total vehicle and electric vehicle sales per year for the study period.

Once the annual number of electrical vehicles was determined, electricity and fuel costs were computed for the study period. It was assumed that gasoline cost $3.50 per gallon in 2013, and gradually increased to $5.00 per gallon in 2021. Gasoline costs per gallon were assumed to hold steady at $5.00 per gallon between 2021 and 2030. Electricity kilowatt-hour costs were assumed to increase at half the rate of gasoline for the same period and were also assumed to hold steady between 2021 and 2030.

An average fuel cost per vehicle was calculated as total motor vehicle fuel costs per year divided by the estimated number of Florida light motor vehicles on the road per year. The average fuel cost per vehicle was multiplied by the number of electric vehicles on the road each year to determine annual motor vehicle fuel savings. The average vehicle miles per year for Florida vehicles were multiplied by the number of electric vehicles to determine the total electric vehicle miles driven per year. This number was then multiplied by the average electrical consumption per mile of a 2011 Nissan Leaf to determine the total kilowatt hours consumed per year per electric vehicle.

The total kilowatt hours consumed per year per electric vehicle, in turn, was multiplied by the number of electric vehicles on the road per year to determine the annual electrical consumption of the electric vehicles. The total kilowatt hours consumed by electric vehicles was multiplied by an average kilowatt-hour cost of $0.09174 to determine total additional annual electrical costs.

As to be expected with the introduction of electric vehicles, fuel consumption costs declined while electricity costs increased. Additionally, the net motor vehicle energy cost (additional electricity costs minus fuel cost savings) declined with the introduction of electric vehicles. The net savings in energy costs are considered to be an increase in disposable income and were fed into the REMI Policy Insight Plus Consumption Reallocation variable, along with net increases in electricity costs and net decreases in fuel costs. Finally, to take into account the sale of electric vehicle charging stations, the annual electric vehicle charging station purchase and installation costs were added to REMI Policy Insight Plus as construction costs using the Exogenous Final Demand variable.

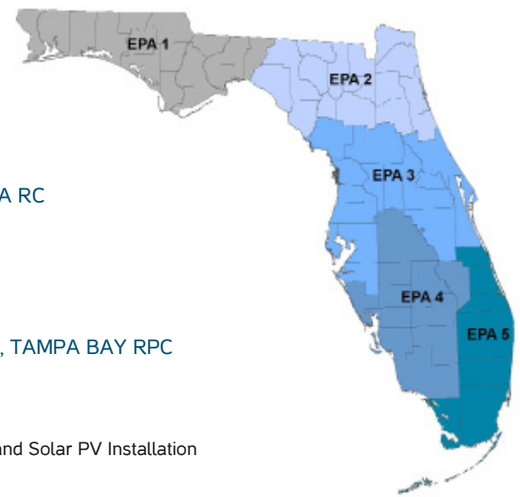
Results:
Converting to electric vehicles for 1% of new sales of all passenger vehicles sold in Florida had a minimal impact on job creation, population increase and the increase in gross domestic product. In the year 2030, there was a statewide increase in jobs of 403 jobs with a net increase of $27 million in GDP.

CASE STUDIES

OUR ANALYSIS

The Florida Regional Planning Councils have identified different ways to encourage assurance and resiliency from a bottom up supply. Through these specific case studies, RPCs present information from early adopter residential and non-residential entities that are active in employing available alternative technologies to achieve redundancy in their energy supply or a reduction in use of traditional energy sources. In the case studies detailed in the section below, the benefits of distributive power as an alternative and contingency source of energy is explored. Also examined is why the specific alternative was chosen, what obstacles (if any) were overcome, and what could be improved.

Each Energy Planning Area selected several case studies they felt best addressed the issue of energy assurance and resiliency in their planning area. This regional approach ensures that no planning area is examined in isolation.



EPA 1 WEST FLORIDA RPC, APALACHEE RPC

- Parsons Residence Near Solar Photovoltaic Retrofit
- City of Tallahassee Peak Load Demand Management
- Alys Beach Conservation Neighborhood
- Florida Electric Utilities Storm Hardening Effort

EPA 2 NORTH CENTRAL FLORIDA RPC, NORTHEAST FLORIDA RC

- Gainesville Residence Solar Photovoltaic Installation
- Duval County Unified Courthouse Building Certification Programs
- St. Johns County Biodiesel Fuel Program
- Tree Hill Nature Center Geothermal Heating and Cooling System

EPA 3 WITHLACOOCHEE RPC, EAST CENTRAL FLORIDA RPC, TAMPA BAY RPC

- All Florida Management Net Zero Energy Office Building
- Marion County Compressed Natural Gas Initative
- Darden Commercial Headquarters Solar Photovoltaic Installation
- Orange County Convention Center Climate Change Education Center and Solar PV Installation
- Lynx Biodiesel Fleet and Fueling Station

EPA 4 CENTRAL FLORIDA RPC, SOUTHWEST FLORIDA RPC

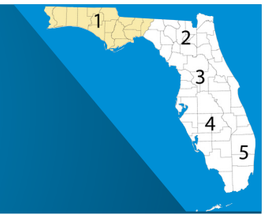
- Florida Gulf Coast University Solar Photovoltaic Installs
- Saddle Creek Logistics Services Compressed Natural Gas Fleet Conversion
- Lee County Climate Vulnerability Assessment
- Sarasota County Energy Economic Zone

EPA 5 TREASURE COAST RPC, SOUTH FLORIDA RPC

- Miami-Dade County Methane Sequestration Project
- Miami-Dade County Sustainable Buildings Program
- Cooper Residence Energy Efficient Residence
- Florida Solar Energy Center SunSmart E-Shelter Program

PARSONS RESIDENCE

NEAR ZERO SOLAR PHOTOVOLTAIC RETROFIT



Description: Residential solar photovoltaic electric systems can be sized to provide full electric power required for sustained usage. Installation costs still present the primary obstacle to widespread adoption. The Parsons residence, near Chattahoochee, Florida, is a 2,400 square foot residential home, with wood frame construction, joist supported floors, R19 ceiling insulation, and double pane wood frame windows. Interior paneling is wood with standard wall insulation. There is partial shade on the roof in all seasons.

The PV installation consists of 24-3'x5' ground mounted PV panels generating 5KW. Tie-in to Talquin Electric Co-op provides resale of surplus energy to the grid through conventional net-metering. The home is in a rural setting permitting ground mount with optimal exposure. The last two years of operation have resulted in minor payments to the home owner with zero payments to the utility for energy. If the site had battery storage capability it could be a stand-alone, off-grid residence. The utility account is currently carrying a negative balance. The PV system provides the power for an on-site well, and the residence is served by a septic system. The entire utility bill is for electricity. A split system HVAC isolates living and sleeping areas. Conscientious attention to timers and scheduled heat/cool needs. 78° summer, and 68° winter settings when used.

The picture to the right shows panel installation with the home in the background. Ground mount provides easy access for twice a year squeegee cleaning of panels.

Photo Source: Regional Planning Councils

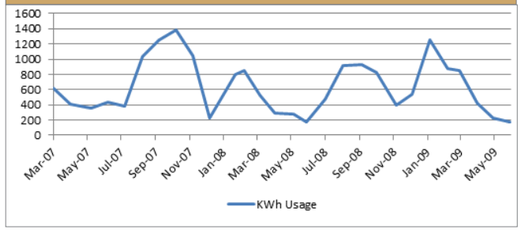
Total Costs:

5KW Solar PV installed:	$42,000	Cost
Installed Jan/2009:	-20,000	State credit
	-2,000	Fed tax credit
	$20,000	Total cost to homeowner

Figure 24 represents full occupancy (2 Adults) and normal energy usage. Year 2008-9 mark the beginning of energy reduction strategies. Records stop in this chart just prior to installation of 5KW Photovoltaic system.

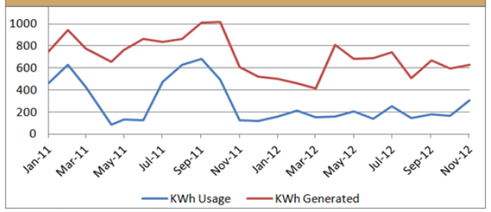
Return on Investment: Figure 25 depicts the differential between the amount of energy generated by the PV system and the amount the homeowner actually used. The levels between the red and blue lines represent the energy generated by the residence and put into the utility provider's system. The use comparisons shown above are important as they affect payback period. If the home had continued to be operated as it had been in the pre-PV period, payback for the system, at the relatively low cost of 0.13/KWh, would be 22 years. With the home energy systems being used much more conscientiously, the payback period, based on energy usage and energy credits, the payback period rises to 48 years. That noted, the home's use is atypical in that it is the residence of a senior couple with no children at home. For a standard residence, with more typical energy usage, higher by at least a factor of 50%, even with energy conscious usage, the payback period would be expected to be much lower. The investment in a solar hot water system as well as the PV system also increases the payback period of the PV system.

FIGURE 52: KWH USAGE PRIOR TO SOLAR INSTALLATION



Source: Regional Planning Councils

FIGURE 53: KWH USED AND GENERATED 2011-12



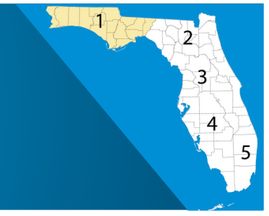
Source: Regional Planning Councils

Solar HW installed:	$5,000	Cost
Installed 2008:	-1,500	Utility credit
	-500	State credit
	-1,000	Fed tax credit
	$2,500	Total cost to homeowner

The PV system was installed with an up-front cost of $42,000. Without loan support from the utility, this would prohibit most homeowners from participating. With the loss of the State participation funding, almost no one would be willing to make an investment that would take longer than the mortgage period on the house and the design life of the PV panels to break even. Loss of tax credits is seen as the biggest barrier to homeowner optional PV systems at this time.

CITY OF TALLAHASSEE

PEAK LOAD DEMAND MANAGEMENT



Description: Peak Smart is a Commercial energy conservation program built on the City of Tallahassee's Smart Grid platform. It is supported with federal funding from the U.S. Department of Energy's (U.S. DOE) Smart Grid Investment Grant program, an ARRA project. It is a 2-year voluntary pilot program launched in July 2012.

Participation:

- Target audience is large commercial customers.
- Early adopters include: City Hall, Tallahassee Airport, Publix, Target, Kohls, and Marpan Recycling.
- Participating customers lower their energy usage for brief periods during peak utility events, the process is automated and effortless.
- Participating customers are able to identify future energy saving opportunities through near real-time monitoring of energy consumption.
- Participating customers receive a demand credit on their monthly utility bill.
- Eligible customers enroll for free. The utility covers equipment and installation costs.

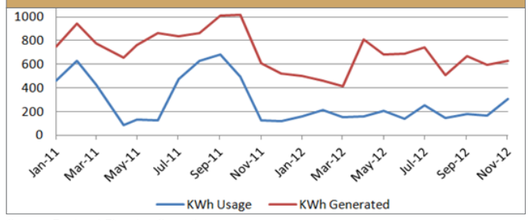
Benefits:

- Improves electric grid reliability, reducing the likelihood of outages
- Helps defer the future need to build costly power plants
- Provides lower cost alternative to running older power plants or purchasing energy off the grid
- Helps keep utility operating costs low so that savings can be passed on to everyone.

Publix Supermarkets example:
There are 9 Publix supermarkets in Tallahassee and Leon County that participated in the Peak Smart program. All of these stores are equipped with dozens of chillers and freezers for product protection and a multiple air handlers and heat and cool units for customer comfort. A few were designed with skylights to augment interior lighting, but that feature is not part of the stores' energy balance. The participating stores each have on-site generating capability of 350 to 400KW. Joining the City's program early in August of 2012, the store's managers are to be notified at least 24 hours ahead of a forecasted peak demand. This is based on prior day's experience in the grid and forecast temperatures. Each store is equipped with a large emergency generator installed primarily to protect chilled or frozen food product during temporary outages and to permit the safe evacuation of a facility during a power outage.

When called upon, the stores would be switched over to emergency generator power, going off-grid during the peak, saving the electric utility higher charges, preventing overheating of transmission lines, and preventing premature construction of additional generating capacity. For their participation in the study, the participants are charged a lower rate year-round and receive a fuel cost rebate for fuel used during the voluntary switch to on-site generation. The incentive offered is a 3.00/KW credit each month. Each manager is allowed two voluntary opt outs if the planned generator powered peak is not convenient for maintenance or other reasons.

FIGURE 54: KWH USED AND GENERATED 2011-12



Source: Regional Planning Councils

Total Cost: The Project is funded by a 50:50 grant from the U.S. DOE and is implemented through a contract with Honeywell for installation of automated equipment, internet interfacing, and program management. It is uncertain if the City of Tallahassee would have pursued the project without ARRA/DOE funding. Fiscal cutbacks shadow future funding of U.S. DOE programs and the expansion of similar programs to other utilities. Total cost for the installed control and override systems at the participating private commercial institutions was $16 million with half of the investment shared by the City. Each facility already had an appropriately sized emergency stand-by generator.

Return on Investment: The project's ROI is not calibrated in dollars saved, but in peak generating capacity and cost avoidance for additional units. No hard dollar value was expressed by the City of Tallahassee for this report.

Photo Source: Regional Planning Councils

ALYS BEACH

CONSERVATION NEIGHBORHOOD

Description: Alys Beach is a planned urban development that combines the principles of traditional town planning and environmental architecture. Located in Walton County, between Seaside and Rosemary Beach, this 160 acre development was planned with sustainability and energy efficiency in mind. The homes and buildings in this development are certified by the Florida Green Building Coalition as far exceeding the criteria.

Prior to the start of the construction, a study of local wind patterns was conducted in order to take advantage of natural ventilation. This study revealed that the most energy efficient orientation for the homes was east to west due to the distribution of the sunlight throughout the year. The homes in the Alys Beach development are constructed with poured concrete masonry construction and cement-tile roofs and are white in color. This allows the reflective white surfaces and thickness of roofs and walls provide excellent insulation and cause the sunlight to be reflected, thereby keeping homes cooler and using less energy while reducing urban heat islands. Homes in this development are insulated with spray foam insulation and their windows have a low solar heat gain coefficient that lets light in but filters out the wavelengths of light that would cause the interior of the house to heat up.

This development also includes the first grid-tied solar home built in the Gulf Power service area. This home features a 4.8 kw photovoltaic array with a backup generator system of batteries to provide limited power in the event of an outage.

The homes in Alys Beach are built with energy efficiency and outdoor living in mind. The Home Energy Rating System (HERS) Index, a nationally recognized scoring system for measuring a home's energy performance, was used to rate the energy efficiency of the Alys Beach development. It was found that these units were rated lower than existing building code with the lowest unit being rated at 43, which is 57% more energy efficient than the existing building code. These features in the building design and construction increase the energy resiliency by allowing the owners the ability to be prepared for energy interruption events without taking additional steps such as generators or other temporary backup systems.

The development itself is compact and mixed use in the same traditional pattern as all towns built prior to 1945. This provides for ample space that allows its residents to walk or bicycle, whereby reducing the requirements for parking and allowing for narrow street widths with bike racks located at parks and shops. This community is further connected to a multi-purpose path that connects communities along most of the Walton County coast. These features reduce the energy required for transportation.

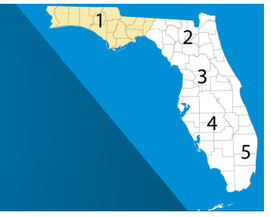
Total Costs: The costs of homes in this development vary based on lot location and home options; however, the lots range in price from $330,000 to $935,000 with homes on the current market for over $1.7 million.

Return on Investment: There is no information available on a return on investment since most of the homes in this development are constructed to appeal to the environmentally conscious home owner.

Photo Source: Alys Beach.com

FLORIDA ELECTRIC UTILIT IES

INFRASTRUCTURE STORM HARDENING EFFORT

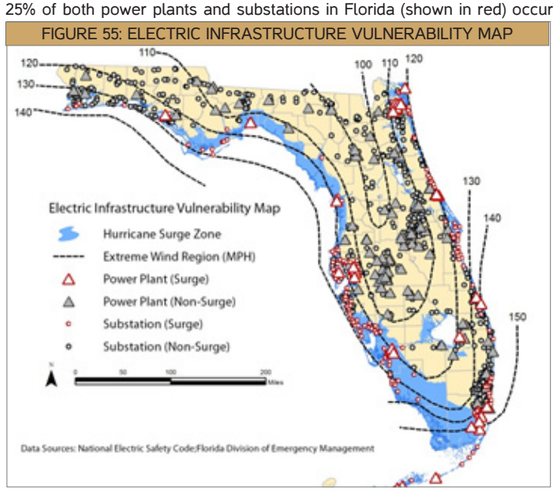


Description: Reliable electricity is a key component in the daily workings of a modern economy. A study by the Lawrence Berkeley National Laboratory estimates the economic cost for electric power interruptions in the U.S. ranges between $22 and $135 billion annually with commercial and industrial customers suffering the greatest losses. The potential high cost of power interruptions makes electric reliability an important business consideration in competitive markets.

Following the active hurricane seasons of 2004 and 2005, the Florida Legislature directed the state's Public Service Commission (PSC) to determine what should be done to harden the state's electrical infrastructure. Beginning in 2006, the PSC has developed a comprehensive, long term approach for hardening electrical utility infrastructure that includes strict construction standards, increased system inspections, vegetation management programs, and a requirement for the five investor owned utilities (IOU) to prepare Storm Hardening Plans that explain the systematic approach the utilities will follow to achieve the desired intent of enhancing reliability and reducing restoration costs and outage times associated with extreme weather events. The state's 53 municipal and cooperative utilities have a separate requirement to submit an annual report of storm hardening practices and procedures including pole inspections and vegetation management programs.

The Electric Infrastructure Vulnerability Map, as shown in Figure 55 shows extreme wind and hurricane surge threats against which electric power plants and substations must harden. The extreme wind regions are designated by the National Electric Safety Code as the design standard for above ground electric infrastructure. The Hurricane Surge inundation area is the maximum surge projected by National Oceanographic and Atmospheric Administration's SLOSH model for a Category 5 hurricane. Approximately 25% of both power plants and substations in Florida (shown in red) occur within the Category 5 surge inundation area. Energy infrastructure located in hurricane surge zones is also at risk from sea level rise and increasing storm intensity that may result from climate change.

FIGURE 55: ELECTRIC INFRASTRUCTURE VULNERABILITY MAP



Total Costs: The overall objectives of the PSC's Storm Hardening programs are to enhance reliability and reduce restoration costs and outage times associated with extreme weather events in a prudent, practical, and cost-effective manner. Total costs associated with storm hardening varies depending on the utility's size and approach outlined in its adopted plan. Large IOU's have reported spending hundreds of thousands of dollars annually for storm hardening activities and projects. For example, Florida Power and Light, the state's largest IOU, recently announced has invested more than $1 billion to upgrade the electrical system against major storms since 2006.

Return on Investment: Most experts agree that storm hardening will prevent some storm-related outages, and speed restoration times, as well as and reduce storm restoration costs; a concept known as "Restoration Cost Savings". However, utilities don't have enough data at this time to accurately estimate the benefits associated with every storm hardening activity.

One analysis released by Florida Power and Light (FPL) estimates the Restoration Cost Savings per mile of a hardened distribution feeder lines at between 45% and 70% of the cost to harden the feeder line when major storm frequencies occur in a three to five year range over a 30 year period. If major storms were to occur more frequently as in 2004 and 2005, then Restoration Cost Savings could exceed the hardening costs. In addition to Restoration Cost Savings, FPL noted that customers also benefit in many direct and indirect ways from the reduced number and duration of storm and non-storm outages resulting from storm hardening investments.

The PSC is encouraged by the progress electrical utilities have made in implementing their storm hardening plans since 2006 and remains committed to the overall objectives of its hardening effort. As utilities gain additional storm experience the PSC expects to provide more detailed cost and benefit information. The PSC's effort also includes ongoing research at Florida universities which are investigating new methods to reduce storm damage costs and assessing the costs and benefits of various storm hardening measures.

Sources:

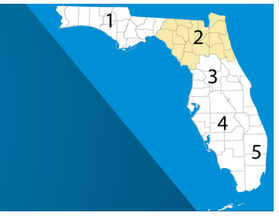
Florida Public Service Commission Storm Hardening Activities http://www.floridapsc.com/utilities/electricgas/eiproject/

Lawrence Berkeley National Laboratory Cost of Power Interruptions to Electricity Consumers in the United States http://emp.lbl.gov/sites/all/files/REPORT%20lbnl%20-%2058164.pdf

Florida Power and Light 2013 – 2015 Storm Hardening Plan http://www.floridapsc.com/library/FILINGS/13/02408-13/02408-13.pdf

GAINESVILLE RESIDENCE

SOLAR PHOTOVOLTAIC INSTALLATION



Description: One Gainesville resident installed a 4.8 KW solar voltaic system at the beginning of 2011. The array of 20 solar panels is mounted on top of a carport that was designed for this purpose. This project enhances energy assurance since it can supply electricity during a disaster when the electrical grid may be down.

Total Costs: The system cost an initial $22,000 before the 30% tax credit. Any excess energy generated is sold back to Gainesville Regional Utilities using a net metering agreement. Purchased energy consumption at this residence dropped from 10,276 KWh to 4, 472 KWh following the installation of the PV array. This has resulted in an annual savings of $1,122 in electrical expense.

Payback period: The home owner reports that a 10-year payback period is anticipated based on current energy costs. In March and April of 2012, the system generated more energy than was consumed and the homeowner received a credit on those bills. All of the utilities in the house are electric except a wood stove that is used for heating. The solar system has also encouraged the home owners to modify their energy consumption habits. For example, they try to do laundry during sunny days when generation is at a peak. Future energy conservation projects include reviewing options for updating the hot water system.

Return on Investment: Once the payback period of 10 years is met, the system should continue to operate for an additional 20 years. During this time period, it is assumed to continue to provide an annual savings of $1,122 in defrayed electric expenses.

Photo Source: Regional Planning Councils

DUVAL COUNTY UNIFIED COURTHOUSE

BUILDING CERTIFICATION PROGRAMS

Photo Source: KBJ Architects, Inc.

Description: Through green building programs such as those promoted by Florida Green Building Coalition, or through Leadership in Energy and Environmental Design (LEED), the long term energy needs of buildings can be planned for and monitored. Certification programs allow for consistent measurement and assessment of energy savings. Robust lists of certified structures in Florida exist on websites such as www.floridagreenbuilding.org or www.gbig.org.

This new judicial facility is a seven-story concrete structure, which was built to replace a courthouse built in 1959. The new building has a two-story base that is forty feet high, a seven-story tower that is 140 feet high with a pediment of 188 feet high. The facade materials are precast concrete and glass. The facility is designed with 51 courtrooms including associated judicial spaces, court administration, clerk of courts, and corrections.

As of the date of LEED Silver certification in November 2012, the 800,000 square foot Duval County Courthouse is the largest LEED certified building of its type in the United States. It is also the second largest LEED project in the state of Florida and the first LEED Certified County Courthouse in Florida. Housing over 650 employees and approximately 1,500 daily visitors, the high-profile project made a huge impact on sustainability in the area. Sustainable strategies included energy performance goals, low VOC materials, water use reduction, low impact site design, and occupant comfort.

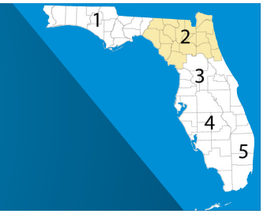
Total Costs: The building cost about $228 Million.

Payback Period and Return on Investment: While the building is too new to have a history of performance measures, the following baseline performance metrics apply and were considered for LEED certification:

- Diverted (57%) of construction waste from landfill/5,611 tons
- 20.5% Recycled Content Materials utilized based on total material costs
- 36.7% Regional Materials utilized based on total material costs
- 72% reduction in water use for landscaping and irrigation systems/22,000 gallons of water savings per year. Native plantings were used and high efficiency drip irrigation in other areas to achieve this.
- 48% Interior Water Use Reduction
- Baseline Annual Water Consumption (gal): 3,627,702 gallons/year
- Design Case Annual Water Consumption (gal): 1,864,896 gallons/year (Under LEED Version 2.2, the baseline calculations were based on 1992 EPAC fixtures)
- 14% Energy Reduction compared to ASHRAE 90.1 2004 baseline
- 17.7% Design Cost reduction for Energy Performance
- 19.4% Design Energy Reduction

ST. JOHNS COUNTY

BIODIESEL FUEL PROGRAM



Description: The St. Johns County Biodiesel Program is operated by the Public Works Department. They process used cooking oils into environmentally friendly fuel which is blended with regular petroleum diesel and used in county vehicles. This biodiesel fuel is produced at a cost less than the purchase price of petroleum diesel, and meets all of the established quality standards established by the American Society for the Testing on Materials (ASTM). It is also independent of external supply disruptions and price fluctuations since the source material is donated waste vegetable oil produced locally.

This project enhances energy assurance since it can supply a motor vehicle fuel during a disaster when there are often shortages of fuel. Joe Stephenson, Public Works Director says that, "Of all the things I've tried to do to make public works green, this is the most win, win, win situation that I have found."

Total Costs: The costs of the equipment and operations needed to produce the biodiesel were unavailable.

Return on Investment: In 2010, this program saved the County approximately $147,000. Approximately $7,000 of this savings results from the reduction of diesel fuel expenses, $140,000 from avoiding the cost of sanitary sewer overflows, and the balance in avoiding waste oil disposal from other public entities. The County produces ASTM compliant biodiesel for approximately $2.00 per gallon and has the capacity to generate up to 70,000 gallons per year.

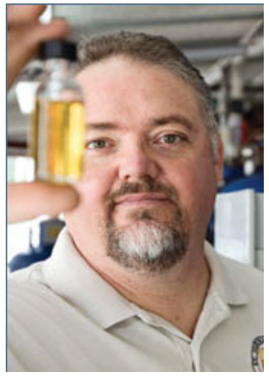
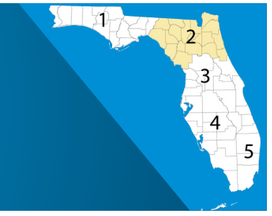


Photo Source: St. Johns County Website

http://www.co.st-johns.fl.us/PublicWorks/Biodiesel.aspx

TREE HILL NATURE CENTER

GEOTHERMAL HEATING AND COOLING SYSTEM



Description: Tree Hill Nature Center in Jacksonville Florida installed a Modern Energy Efficient Geothermal heating and cooling system in 2012 by using the Intermediate Aquifer System (IAS) (Hawthorn Group soil) as the heat transfer medium instead of the underlying Floridan Aquifer System that is the primary source of drinking water for Jacksonville. Working closely with key stakeholders and regulators, Tree Hill replaced an existing antiquated air to air HVAC system with a new Open Loop Geothermal Heating and Cooling System. Wells (supply/return) were drilled into the IAS to accommodate this system. A Geothermal HVAC system was connected to the supply and return wells. Signage and test systems were installed to allow for education and performance assessment. The following data will be monitored to assess performance:

- Energy usage and cost compared to existing system.
- Pre and post project temperature stratifications in the building (i.e. comfort levels).
- Well flow capacity conformance to specifications.
- Supply and return well temperature levels within tolerances.
- Other various water and well quality parameters.

Total Costs: The project cost was $66,000 for materials and installation.

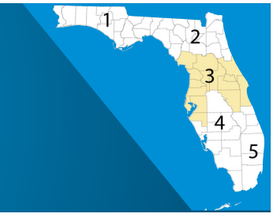
Payback period: The system will pay for itself in 18-20 years. The average monthly savings in energy consumption is 3,000 KWh. The cost savings compared to traditional systems are $3,240 per year or $270 per month.

Return on investment: With a life expectancy of 25 or more years, the last five to seven years should provide a return on the investment. In the event of a power outage, the nature center has emergency plans to use a generator to support the geothermal system so that animals and people are kept safe and comfortable. This enhances energy assurance since it can continue operating during a disaster when the electrical grid may be down.

Photo Source: Tree Hill Nature Center

ALL FLORIDA MANAGEMENT

NET ZERO ENERGY OFFICE BUILDING



Description: The first net zero energy commercial building in the city of St. Petersburg opened in December 2012. The 5,000-square-foot building, located in the city's historic Grand Central Distict adjacent to downtown, includes a 50-kilowatt solar panel roof along with a 40-kilowatt solar panel carport.

"These days, green businesses aren't just focused on developing earth-friendly technologies, they are committed to offering a product or service that consumers know has little to no environmental impact," said Tom Hall, Managing Partner of All Florida Management. "The emergence of this new green building culture has allowed our company to focus on meeting the needs of the small business community by dedicating ourselves to cultivating environmentally conscious commercial building platforms that reflect both our clients' personal and professional values."

St. Petersburg first net zero energy commercial building is a LEED Platinum applicant. In addition to boasting one of the largest solar energy systems in the Tampa Bay region with its array of solar photovoltaic (PV) panels, the building also includes a number of other features that reduce energy consumption. The building's heating and air conditioning system is a high–efficiency water-to-air geothermal heat exchange system. Tankless "point of use" water heaters are equipped with low kilowatt settings that provide the building's tenants with hot water at 99% efficiency with minimal stand-by loss. The building's roof insulation exceeds R-40. Double-insulated windows are tinted with a glare-reducing high-performance glazing solution that helps maintain internal temperature and reduces solar heat gain by up to 75%. In addition, there is a public-use electric vehicle charging station under the building's carport that is powered by the rooftop solar panels. Some of the building's other environmentally-friendly features include neighborhood-specific native landscaping that needs less water for irrigation, and a planned rainwater harvesting system to be used in the building sanitary system, thereby reducing water consumption. All Florida Management of St. Petersburg developed the building.

"Not only was the idea of never having an electricity or water bill appealing, but so was an opportunity to claim a work environment that perfectly complements our own personal values," notes Andrew Lee, owner of Roundhouse Creative Studio, one of the building's tenants. Another tenant is Big Sea Design & Development, a web design and development agency whose principal Andi Graham adds," We know that a sustainable studio environment will appeal to our target clients, so relocating was an easy decision."

Mary Ann Hitt of the Sierra Club, another tenant in the net zero energy building, is pleased that her organization has a presence in a facility that makes such extensive use of alternative energy. "Now, our volunteers and staff in Florida can come to work for the clean energy future in an office building that matches our values," said Hitt. "We hope this building will serve as an inspiration and an example for others thinking about construction and renovation in Florida and beyond."

Photo Source: Roundhouse Creative

Total Costs: The cost of this solar project was $545,000, according to the Tampa Bay Times. Half of the cost of the project was covered by grants, including one from Progress Energy's SunSense Solar program.

Payback Period: The amount of time expected to recover the intial costs was not available at the time of publication. However, with a half of the costs covered by grants and the infrastructure being used predominantley during the peak daytime hours, it is expected to payback sooner than a typical residential installation.

Return on Investment: The return on investment estimate was not available at the time of publication. However, the installation is not only saving monthly expenses but also creating a marketable asset. The building has a unique style, making it a landmark in the area as well as creating a buzz and attracting a number of consumers. In return for this, the landlord can charge a premium on rent and the tenant can take advantage of the additional press. Furthermore, with free public charging stations for electric vehicles, advertising could be deployed to try to capture the electric vehicle driver.

For more information: www.sierraclubnetzerobuilding.com

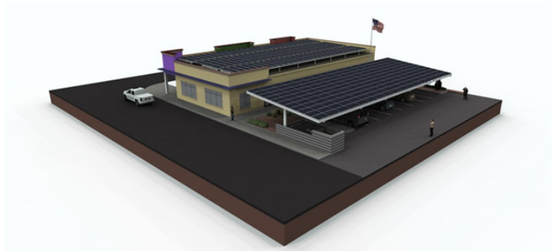
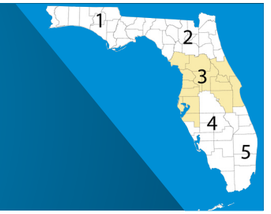


Photo: Roundhouse Creative

Photo Source: Roundhouse Creative

MARION COUNTY

COMPRESSED NATURAL GAS INITIATIVE



Description: In a continuing effort to reduce fuel cost and greenhouse emissions, the Marion County Board of County Commissioners (MCBCC) is exploring the use of Compressed Natural Gas (CNG) fuel. The MCBCC has introduced the Marion County Compressed Natural Gas Initiative, which will include construction of CNG fueling facilities and County fleet conversion to CNG-fueled vehicles.

During fiscal year 2011/2012, Marion County purchased 568,000 gallons of diesel and 474,000 gallons of unleaded fuel at a total cost of $3,332,000 to fuel its fleet of vehicles and equipment. The average cost of CNG, which currently is more stable than the cost of diesel/gasoline, is approximately $1.85 to $2.25 less per gallon than diesel, resulting in significant cost savings. Besides the reduction in cost of fuel, many other savings are associated with CNG-fueled vehicles. While CNG-fueled roll-off trucks have three 25-gallon CNG tanks and diesel-fueled roll-off trucks have one 80-gallon fuel tank, CNG delivers better miles per gallon (MPG). Diesel trucks average 1.83 MPG and a 146.40 mile range, while CNG trucks average 3.33 MPG and a 249.75 mile range. Also, CNG-fueled vehicles generally have lower maintenance costs because of extended service intervals.

There are many other advantages of CNG-fueled vehicles. CNG is the cleanest burning fuel available, reducing greenhouse gas (GHG) emissions by 30% and nitrogen oxides by 85%. It is also safer than gasoline/diesel. Lighter than air, CNG is non-toxic, it evaporates quickly, and has an ignition point of 600 Celsius. CNG vehicles also generate less noise than diesel vehicles.

The Marion County CNG Initiative includes a plan to establish multiple public/private CNG fueling stations. After reviewing proposals from qualified vendors, for the design, construction, and maintenance of CNG fueling facilities, the County ratified an agreement in September 2012 with Reliance Alternative Fuels LLC, a local vendor, for the creation of the first CNG fuel station in Marion County. The station is expected to open in August 2013 and will support the county fleet and private commercial fleets, and will also be open to the public.

Total Cost: Construction of the station will cost the owners approximately $1.105 Million. Under this first phase of the CNG Initiative, the County will commit to a minimum usage of 100,000 gasoline gallon equivalents (gge) of CNG per year. At $1.75 per gge, the total cost for 100,000 gge is $175,000. Marion County is also converting a portion of its fleet to run on CNG, initially converting high fuel-usage vehicles to use CNG and purchasing CNG-fueled vehicles as older units are retired. A fuel upgrade package for the conversion of part of the County's fleet will cost $10,500, $12,500, and $39,310 for Sedans/ SUVs/ Vans/ Pick-up Trucks, Ambulances, and Medium/Heavy Duty Vehicles, respectively (see table). This strategy is estimated to save at least $175,000 in fuel costs in just the first year (a savings of anywhere from $2,500 to $15,000 in fuel per CNG-converted vehicle). Additional savings would continue to be realized if petroleum prices increase past the $3.55 per gallon ($3.85 per gallon diesel) mark.

The most advantageous vehicles in Marion County's fleet for conversion to CNG are: roll-offs, ambulances, and high fuel-usage pickups. Per Marion County Fleet Management's recommendations, 18 new CNG-fueled vehicles were approved for purchase and have already been delivered. These vehicles were already budgeted, but the incremental cost needed to be approved and funded. Twelve additional CNG-fueled vehicles are in the process of being approved for purchase. With available funding, Fleet Management is proposing a long term (10yr) plan to incrementally convert 5% of its targeted fleet (high fuel usage vehicles) to CNG. It is estimated that annual fuel savings from CNG fleet conversion would be $3,710, $20,485, and $17,925 for County-operated Sedans/ SUVs/ Vans/ Pick-up Trucks, Ambulances, and Medium/Heavy Duty Vehicles, respectively (see table).

Return on Investment: Implementing a CNG vehicle replacement strategy will ensure maximum Return on Investment (ROI) and lower overall operating costs. The station owners project that ROI for construction of the station will be approximately 15 years. It is estimated that ROI for conversion of Sedans/ SUVs/ Vans/ Pick-up Trucks, Ambulances, and Medium/Heavy Duty Vehicles to CNG would be 2.83, 0.61, and 2.19 years, respectively Table 28.

TABLE 28: MARION COUNTY CURRENT FLEET USAGE BY VEHICLE TYPE

	SEDANS, SUV, VANS, PICK-UP TRUCKS	AMBULANCE	MEDIUM/ HEAVY
Annual Miles	21,000	60,000	30,000
Fuel Economy (MPG)	12	7	4
Fuel Usage (Gallons/year)	1,750	8,571	7,500

COMPARISON OF GASOLINE/DIESEL AND CNG BASED ON CURRENT COUNTY FLEET USAGE

	Gasoline	CNG	Diesel	CNG	Diesel	CNG
Fuel Price	$ 3.46	$ 1.84	$ 3.73	$ 1.84	$ 3.73	$ 1.84
U.S. DOE Fuel Tax Credit		$ 0.50		$ 0.50		$ 0.50
Annual Fuel Cost	$6,055	$2,345	$31,971.43	$11,485.71	$27,975	$10,050

SAVINGS, COST, AND ROI OF VEHICLE CONVERSION TO CNG

Annual Fuel Savings	**$3,710**	**$20,485.71**	**$17,925**
CNG Fuel Upgrade package	$10,500	$12,500	$39,310
ROI (years)	2.83	0.61	2.19

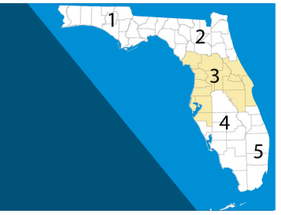
Source: Regional Planning Councils

In addition to taking steps to make its fleet more efficient, MCBCC is committed to partnering with commercial fleets to uncover opportunities to reduce operating costs, protect the environment and lead the way to energy independence through the use of clean fuel technology. "The Marion County Board of County Commissioners is leading the way to energy independence, saving taxpayer dollars, and reducing operating costs through the use of CNG," Commissioner Zalak said. "This initiative puts Marion County ahead of the other counties in North Central Florida and even the nation, when it comes to promoting American energy that is affordable and abundant."

Photo Source: Regional Planning Councils

DARDEN COMMERCIAL HEADQUARTERS

SOLAR PHOTOVOLTAIC INSTALLATION



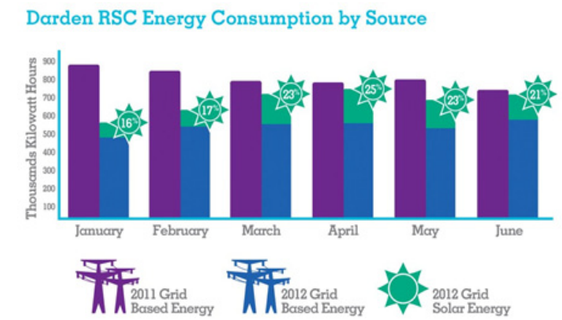
Description: Darden's new 489,000 square foot Restaurant Support Center opened in Orlando, Florida in 2009 and is home to 1,500 employees. Thirteen buildings were consolidated into 1 RSC, making the building the largest LEED Gold corporate headquarters in Florida. Through a strategic partnership with Progress Energy, Darden unveiled an 1.1 megawatt solar panel system. In 2012, Darden's Restaurant Support Center began drawing 15 to 20% of its annual power usage from solar panels mounted on the parking garage and portions of the roof. The 4,404 solar panel installation is designed to produce 1.9 million kilowatt-hours of electricity a year. This is enough energy to supply as much as 15 to 20% of the electricity used at company headquarters.

Other improvements included a gray water supply to all toilets and irrigation, which has saved almost 40 million gallons of water since September 2009. They also diverted over 90% of all construction debris away from the landfill changing the operational landfill diversion rate from 28% to 42% since 2009. Overall, the new Restaurant Support Center is 32% more efficient than the former headquarters (KWh/sqft/yr), 16% more efficient than required by code, and +/- 20% of energy required is being produced by a solar array. Darden has even received the Energy Star rating for Top Quartile Energy Performance.

Total Costs: Total costs of the materials and installation of the construction are estimated at $5.6 million, with a conservation rebate of $260,000 from Progress Energy, the utility that serves Darden's headquarters. A Jacksonville based contractor, Kenyon Energy, installed 4,404 Solar World mono crystalline panels covering both the garage and part of the main building.

Payback Period: Darden expects the solar panel array to pay for itself within 10 to 12 years, depending on the weather.

Return on investment: Once the payback period is met Darden expects savings from the project, although the exact amount was not available at the time of publication of this report.



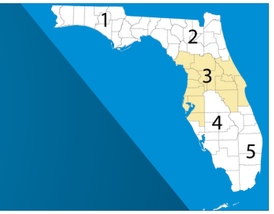
Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

ORANGE COUNTY CONVENTION CENTER

CLIMATE CHANGE EDUCATION CENTER AND SOLAR PV INSTALLATION



Description: Inspired by a similar project in San Francisco, the Orange County Convention Center (OCCC) installed a solar photovoltaic (PV) rooftop in 2009. The project, which occupies 200,000 square feet of roof space in the Convention Center's North/South Building, is comprised of one-megawatt PV system and four "experimental" 10-killowatt PV systems. In total, the PV installation has about 6,000 solar panels.

The project was partially funded with a state grant, which required the project to have an educational component. The Climate Change Education Center, operated by Orange County's Environmental Protection Division, is a 3,000 square foot facility inside the OCCC that showcases solar energy and other renewable energy technologies. The PV system's energy production is monitored live through a web-based open protocol data acquisition system. The OCCC PV rooftop is the largest renewable energy generation system of its kind in the southeastern United States. It was recognized by the U.S Department of Energy with a Solar American Showcase designation, which is given to large scale, highly visible solar energy projects.

Total Costs: The total cost of the project was $8.8 million. The project was partially funded through a $2.5 million Florida Renewable Energy Technologies Grant, and a $1.5 million contribution from the Orlando Utility Company (OUC). The OUC is expected to receive at least 10 years worth of Renewable Energy Credits in that amount. The rest of the money came from Orange County. The Florida Solar Energy Center provided technical assistance for this project.

Return on Investment and Payback Period: In its first year of operation, the OCCC PV installation produced 1,523,423 kWh of electricity or the equivalent to the annual energy use of 130 homes. This was 18 percent higher than the original projection. According to the Convention Center, the total value of the energy produced by the system during its first year of operation was $243,750.

It also resulted in the avoidance of 3.4 million pounds of carbon emissions. Orange County expects to recoup its investment ($3.9 million after incentives) in 12 to 14 years depending on annual electricity costs. The PV installation should last about 40 years so the benefits will be larger in the long run. Assuming a payback period of 14 years, an operational lifespan of 40 years, and annual returns as were seen in the first year, the return on investment may be close to $6.3 million.

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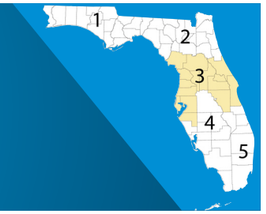
Photo Source: Orange County Convention Center, 2010

LYNX

BIODIESEL FLEET AND FUELING STATION



Description: Lynx, the Central Florida Regional Transportation Authority, uses 4.2 million gallons of fuel annually to power its 278 bus fleet. Lynx's buses run on a B20 blend formula comprised of 20 percent biomass based diesel and 80 percent petroleum diesel. The biodiesel comes from the agency's own blending station, located at the Lynx maintenance yard. The station is designed to produce 1.2 million gallons of fuel a year and is the first one owned and operated by a transit agency in the United States. Lynx was recognized with MetroPlan Orlando's 2010 Clean Air Award for its commitment to run its entire fleet on a B20 blend.

Total Costs: The project was built using a $2.5 million Florida Renewable Energy Grant that the agency won in 2008.

Return on Investment: The biodiesel plant accounts for only 840,000 gallons, or 20 percent of the 4.2 million gallons of fuel used by Lynx annually. Actual bus mileage and fuel costs remain the same because the cleaner fuel extends the life of the engine, offsetting maintenance expenses. Besides producing about 20 percent of the fuel used by Lynx buses, Orange County Public Schools and the Orlando Utilities Commission are also benefitting from this program. According to Nigel N. Clark, a mechanical and aerospace engineering professor from West Virginia University and a project partner, the blend should help to reduce carbon emissions by about 30 percent.

Sources:

Peddle, Matthew. Lynx hopes other bus operators will start fueling up on biodiesel. WFME News. Originally published on February 10, 2012. Retrieved May 22, 2013 from http://www.wmfe.org/site/News2?page=NewsArticle&id=12441&news_iv_ctrl=1041

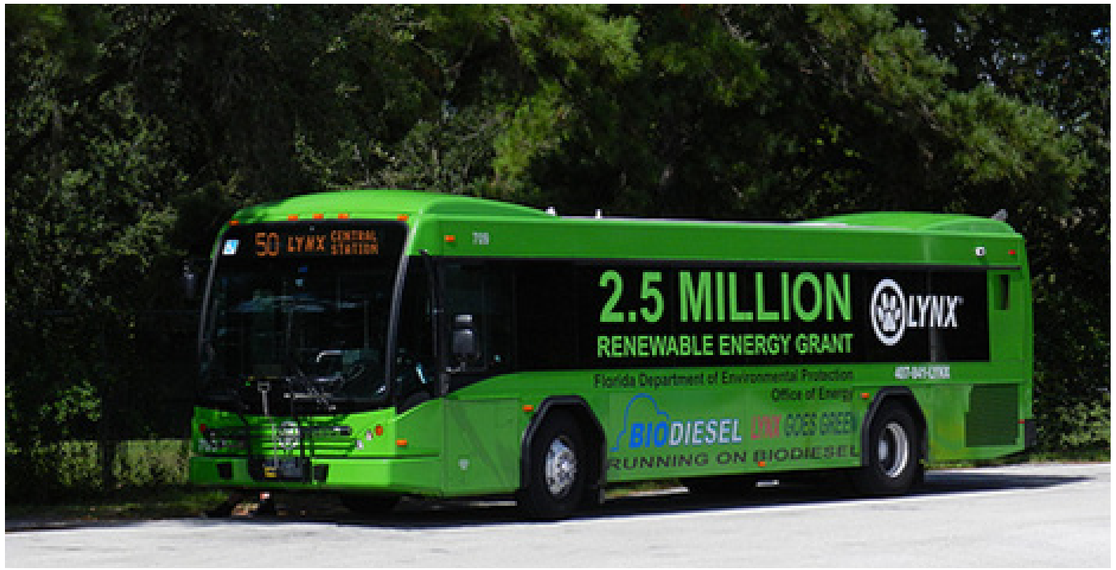
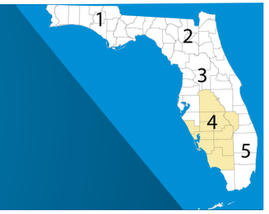


Photo Source: golynx.com

FLORIDA GULF COAST UNIVERSITY

SOLAR PHOTOVOLTAIC INSTALLATION



Description: Located on 760 acres in eastern Estero, Lee County, Florida Gulf Coast University (FGCU) has made environmental sustainability a high priority. Embodying their motto "Sustainability, Diversity, Excellence," FGCU has initiated many green and sustainable measures such as creating an environmental task force and setting aggressive targets for greenhouse gas emissions. At the same time, FGCU faces the challenge of delicately balancing their need for aggressive growth and expansion. The task on hand was to enable FGCU to achieve its "Energy Initiative" goal of purchasing or producing at least 15% of its electricity from renewable sources, while being mindful of the public university's budget constraints.

In January 2010, Regenesis Power (RP) delivered FGCU with a 2 MW solar photovoltaic system, which is the second largest system located on a university campus in the U.S. Along with a cost-effective solar energy plan, the University can continue to expand while adhering to its environmental values. RP collaborated closely with an FGCU subcommittee from the President's Environmental Stewardship Advisory Council to discuss, and then fully address the university's concerns and needs. These included the unique environmental and weather conditions of Florida, scalable solar design for an expanding University, and navigating local rebate and tax structures for solar power.

Photo Source: Regional Planning Councils

The project comprises 10,080 panels installed on 16 acres. The FGCU Solar design utilizes RP's proprietary solar tracking technology, enabling optimum energy generation and increased reliability to withstand up to Category 4 hurricane winds. It provides electricity to over 200,000 square feet of space in several main buildings on campus. Three main buildings are powered by the field: Lutgert Hall, Holmes Hall and Academic Building 7, the newest on campus.

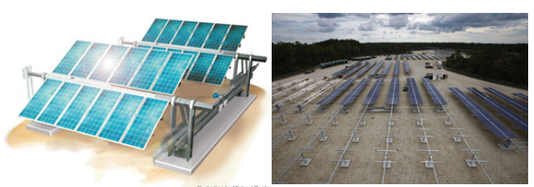


Photo Source: Regional Planning Councils

The 20-acre parcel where the solar field was built was slated for development at some point, and university officials have undertaken mitigation efforts on the land such as moving native plants and animals to a new habitat.

Total Costs: Materials plus installation - FGCU received $8.5 million in funding to start a 16-acre solar farm on its campus. The entire project was specified at $14 million. However it appears to have come in under budget. Although the final calculations need to be made before anyone knows how far under budget it will be. The capital construction and permitting cost is $5.60 per projected future kilowatt hour capacity.

Two federal incentives were available to the university if the solar field went on line before the end of 2010, including a treasury grant that once took the form of a tax credit. About half of the project's total cost has been funded with a state grant.

Payback period: The PV field is projected to save the university $700,000 to $800,000 a year in energy costs. If one considers a total project cost of $14 million then the project recoups the costs in 18.6 years. If the project cost turns out to be $11.2 million then the project recoups costs in 14.9 years.

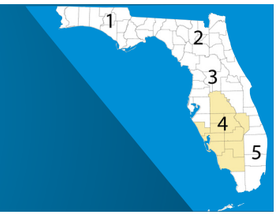
Return on investment: Once the payback period is met. The field is expected to save the university $700,000 to $800,000 a year in energy costs. Assuming a functional lifespan of 30 years and the 14.9 year payback period, the projected return on investment for the project lifespan would be over $10.5 million, in current dollars.

Economic impact: Extrapolating the project savings to all 12 State Universities would save the state $9 million in energy costs annually. If FGCU went totally solar with panels on all buildings and parking areas, the cost savings just for FGCU would be $5 million annually. If all the state universities applied the same amount, then the statewide savings to the university system would be $60 million.

Source: http://www.fgcu.edu/Facilities/SolarField.html

SADDLE CREEK LOGISTICS SERVICES

COMPRESSED NATURAL GAS FLEET CONVERSION



Description: Saddle Creek Logistics Services is a third party provider of warehousing, transportation, packaging, and fulfillment services. The transportation arm of Saddle Creek operates fleets of tractor trailers in markets across the country. In 2012, Saddle Creek converted part of their fleet from diesel to Compressed Natural Gas (CNG). In 2012, Saddle Creek replaced 40 of their diesel tractors with new ones that run on CNG. These trucks are fueled at their newly constructed CNG fueling station.

Approximately 87% of natural gas is produced in the continental United States and Canada. Saddle Creek has supplanted their reliance on foreign oil with a more price-stable, domestic fuel source. Due to recent advances in extraction technologies, natural gas prices are at an all-time low and supply is at an all-time high. The price volatility of natural gas is less than diesel, and so by switching to CNG fueled tractors, Saddle Creek has increased price stability and reduced fuel costs in their business model.

Photo Source: Regional Planning Councils

Other benefits of a fleet transition to natural gas include reduced carbon and emissions footprint, quieter operation, and reduced chance of environmental impacts if a spill should occur. Since CNG is a gas at normal pressures, any leak or spill disperses into the atmosphere instead of leaking onto the ground. The fuel tanks are reinforced with carbon fiber sheathing to reduce the possibility of leaks developing, even in a collision. And since natural gas is delivered to the CNG fueling station via underground pipeline instead of overland via tanker trucks (as with diesel), there is also a reduced risk of disruption to operations due to natural disasters that impact surface roads.

However, the range of natural gas tractors is currently somewhat limited by the lack of CNG fueling stations. From their location in Lakeland, Saddle Creek can essentially cover all of peninsular Florida. Their trucks have a range of about 550 miles, which means they can make round trips to Miami, or Jacksonville, and back to Lakeland on one tank of fuel. An additional Saddle Creek location in Atlanta is within a one-way trip range, and access to a CNG fueling station there allows for the return trip.

Total costs: The conversion to using CNG as a transportation fuel involved constructing a $2.2 million fueling station in Lakeland, FL that is supplied by a nearly 1-mile supply line spur off of a nearby natural gas pipeline. At current prices, Saddle Creek estimates that natural gas costs approximately 50% of the diesel gallon equivalent (dge).

The on-going maintenance and operations of the fueling station are also costs that factor into a fleet transition. Saddle Creek estimates that two thirds of the total fuel-related expenditures are fixed costs such as taxes, transmission, and the operation and maintenance of fueling stations. The market price of natural gas roughly accounts for the remaining third of fuel-related expenditures.

Photo Source: Regional Planning Councils

Another large, upfront cost is the new tractors themselves; they cost approximately 50% more than traditional diesel tractors. The impact can be reduced if a company can slowly transition its fleet by replacing diesel tractors with natural gas tractors as new replacements are required, but the increased cost is still a factor. Both diesel and CNG trucks have an expected operational lifespan of 10 years, or about one million miles.

Natural gas tractors also require more maintenance. Because natural gas burns hotter than diesel, it requires about three times more oil changes than a diesel rig. Due to the higher operating temperatures, CNG tractors also require a full engine rebuild every 6-7 years. Saddle Creek estimates that maintenance costs per mile for CNG trucks are about twice that of a regular diesel rig.

Payback period: Saddle Creek has been pleased with the success of their natural gas fleet, and has plans to replace another 60 diesel tractors in 2013. If current trends continue, they expect a payback period on their investment of four to five years. They have not received any special tax breaks or incentives to switch their fleet over, but have found that the risk was justifiable and made good sense for their particular business model. The conversion of this portion of their operations to run on CNG has increased energy resiliency and assurance for this business.

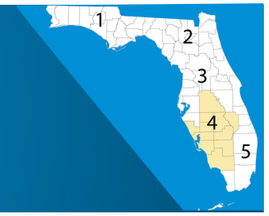
The construction of the CNG fueling station is a large, upfront purchase that many companies cannot justify, and could require many years to fully recoup the costs.

Return on investment: Saddle Creek declined to comment in detail on some of the financial particulars of their CNG station to protect their trade secrets and competitive business practices. Therefore, it is difficult to estimate a return on investment.

Economic impact: Due to a lack of detailed financial information, the potential economic impact for this type of fuel diversification implemented statewide cannot be projected.

LEE COUNTY

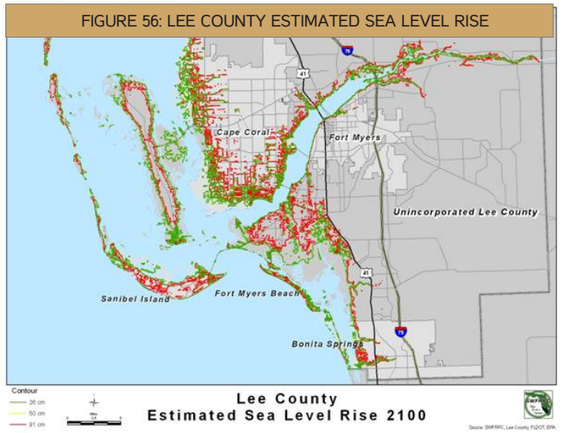
CLIMATE VULNERABILITY ASSESSMENT



Description: Climate change resilience is the capacity of an individual, community, or institution to dynamically and effectively respond to shifting climate impact circumstances while continuing to function at an acceptable level. It is the ability to survive, recover from, and/or live with the effects of climate change. It includes the ability to understand potential impacts and to take appropriate action before, during, and after a particular consequence to minimize negative effects and maintain the ability to respond to changing conditions.

On January 12, 2010 Lee County contracted with the Southwest Florida Regional Planning Council (SWFRPC) to develop a Climate Change Vulnerability Assessment (CCVA) for the unincorporated portions of the county. This was completed on March 18, 2010 and provided to the County for review. That project included an assessment of significant potential effects of climate change on the human and native ecosystems of Lee County, including consequences for human and natural resources resulting from and related to sea level rise, aquatic and atmospheric temperature rise, changes in rainfall patterns, increased storm intensity, waterbody chemistry, and general weather instability.

FIGURE 56: LEE COUNTY ESTIMATED SEA LEVEL RISE



Source: SWFRPC GIS Department

Additionally the Lee County Climate Change Resiliency Strategy (CCRS) was developed. The CCRS includes a process for identifying potential climate change resiliency strategies through coordination and consultation with local government leadership in 39 Lee County departments and divisions, including constitutional offices. Identification of resiliency strategies were utilized by Lee County to reduce the negative effects of climate change and help position the County to take advantage of potential climate prosperity opportunities. The CCRS is a toolbox that contains a wide variety of ideas and opportunities for the County to employ in climate change planning, energy savings, and cost savings.

For instance, in the 2009 fiscal year, the County's waste-to-energy plant generated approximately 355,000 megawatts of electricity. Of this, 60,000 megawatts were consumed by the facility and 295,000 megawatts were fed into the grid and sold to electric utility rate payers. The combustion of household waste reduces the volume of material that needs to be in Lee County by 90 percent. The combustion of waste also reduces the production of gases with high global warming potentials, such as methane. These gases are produced from the anaerobic decomposition of organic materials such as food waste. The combustion of these wastes at the waste to energy facility replaces this process.

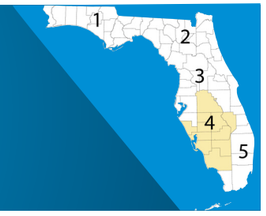
Total Cost: The cost of this project was $50,000 plus approximately $10,000 in-kind from county staff.

Payback Period: The project payback period is continuous and ongoing.

Return on Investment: Lee County has already made great strides in its efforts to increase energy efficiency, fuel economy, and water efficiency. Lee County has saved nearly $16 million and received more than $500,000 in rebates through energy conservation efforts, distinguishing itself as one of the most sustainable local governments in Florida. Lee County's energy costs are about half, including a 30.1% reduction in energy consumption, of what they would have been under a "business as usual" model. All of this occurred even as square footage nearly doubled to more than 4.8 million in more than 500 structures owned or maintained by the county.

SARASOTA COUNTY

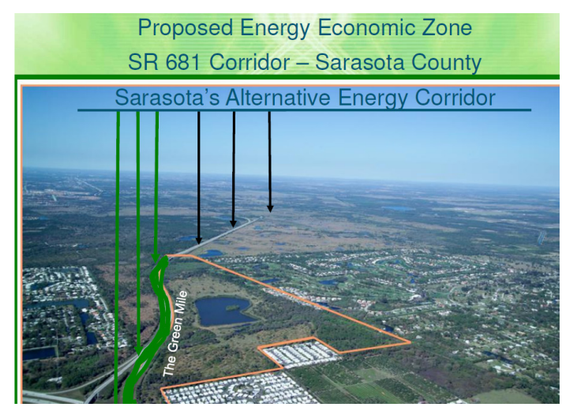
ENERGY ECONOMIC ZONE



Description: In 2009, the Florida Legislature created the Energy Economic Zone (EEZ) program (HB 5013). Florida's Department of Community Affairs then designated Sarasota County as one of only two pilot project EEZ communities statewide, with the other in Miami Beach. This new land planning approach will require changes to the county's comprehensive plan, including a change to the Future Land Use Plan Map for a Major Employment Center (MEC), a Commercial Center, a new collector road, and a full I-75 interchange at SR 681. The Energy Economic Zone (EEZ) is located at State Road 681 and I-75, roughly in the middle point of the county, and includes the largest tracts of undeveloped land within Sarasota County's urban boundaries. Three private landowners have committed to work with Sarasota County on green economic development. The EEZ is part of a long-range strategy started in 2010 complementing countywide initiatives including land uses that will help promote a diverse job market; low impact design (LID); greenhouse gas reduction; a platform to retain and attract clean technology, green businesses, and multimodal transportation opportunities.

The LID approach to land development aims to reduce the volume of stormwater runoff by controlling it close to its source and replicating natural hydrology. This interdisciplinary, collaborative, holistic approach is evolving in Sarasota County. Manual LID techniques including detention with bio-filtration, pervious pavement, stormwater harvesting, and green roofs can enhance the local environment, protect public health, and improve community livability.

The multimodal plan for land use and transportation enhances the "jobs to housing" balance. It includes a network of green radial corridors with opportunities for external connections, links Major Employment Center/ Commercial areas with residential areas, and includes the road network to accommodate Low-Speed and Neighborhood Electric Vehicles. The plan links habitats and facilitates movement of people and wildlife; and provides opportunities to connect to a regional system.



Sarasota County - Urban Service Area "Greenfield" Model
Although well intended, conventional zoning codes and plans dispersed development across regions, resulting in larger lots, greater water use, longer commutes and congestion, and energy inefficient building layouts. Thus, a shift to energy efficient land use requires attention to compact design, green building features, a mix of uses and job opportunities, and shared amenities such as parking, landscaping, stormwater control, and streets.

Sarasota County - Landfill Energy Conversion Model
The EEZ also proposes to develop a Landfill Gas-to-Energy project at the Central County Solid Waste Disposal Complex. With over 7,000 acres, the landfill site affords the county the opportunity to develop the first phase with a two-to three-megawatt energy facility, and continue with expansion of the facilities. In addition, the landfill site includes adequate area to locate research and development facilities necessary to advance energy production from alternative sources, such as solar power.

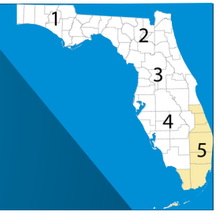
Total Costs: The U.S. Department of Energy has committed $1.5 funding for Sarasota County to explore energy efficient solutions under this legislation.

Payback Period: The payback period on these investment will be over decades and continuous with the operation of the Gas to Energy operation and occupancy of the development. No estimate has been provided in the planning or follow-up reports.

Return on Investment: There have been no projections on this specific project set. Significant economic benefits are expected in terms of energy savings, job creation, and tax resources but these have not been quantified.

MIAMI-DADE COUNTY

METHANE SEQUESTRATION PROJECT



Description: The Miami-Dade County (MDC) Methane Sequestration Project is designed to capture methane from a regional landfill to produce renewable energy and generate electricity for the South District Wastewater Treatment Plant (SDWWTP) operations. Methane sequestration increases the County's capacity to produce renewable energy at the existing SDWWTP Cogeneration Facility with the introduction of methane/landfill gas from the adjacent landfill that would otherwise be wasted. This demonstration project is part of MDC's initiative[1] to reduce commercial electrical consumption and produce renewable energy sources and is a collaborative effort amongst Miami-Dade County's Water and Sewer Department (WASD), Department of Solid Waste Management, Office of Sustainability, and the U.S. Department of Energy (DOE).

The existing cogeneration system generates electricity from the digester gases produced by sewage (sludge). Upon completion of the project, the SDWWTP Cogeneration Facility will have a firm capacity of 6 Megawatts electrical (MWe) and a maximum capacity of 8 MWe. The plan is to upgrade the existing SDWWTP cogeneration facility from the existing capacity of 0.9 MWe per unit, to match biogas production over the next 20 years. WASD will replace the existing three cogeneration units with more efficient units of greater output (2.0 MWe).

This project consists of two phases: 1) the construction of a landfill gas pipeline, which has been completed and 2) the upgrade of an existing cogeneration facility. A landfill gas pipeline was built consisting of a 5,206 linear feet of 8-in pipe, a 104 ft pipe bridge across the black Creek Canal, a metering station, and a compressor station as part of phase one. It will be routed from the existing flare station at the South Dade Landfill to the new metering station located at the existing SDWWTP cogeneration building and tied to existing digester gas system. Phase two is the upgrade of existing cogeneration systems and addition of four new generating units that will allow for an increased capacity to generate alternative energy by piping the wasted methane gas from the adjacent landfill.

The combined heat and power cogeneration project will simultaneously generate both electricity and useful heat. When the project is completed only 20% of the biogas energy will be lost to the environment as heat and noise, 40% of the biogas energy will be used for plant processes as heat, and the other 40% of the biogas energy will be used for plant processes as electricity. This project has the potential to produce an additional 63,800 KW per day and is expected to produce approximately 70% of the actual electricity consumed in the plant.

[1] The Miami-Dade County Electricity Master Plan: Establishing a Comprehensive Energy Management Program provides a systematic approach to efficient energy use within Miami-Dade County government operations. Although this Plan focuses on electric power consumption, in the future it will be revised to include all forms of energy that are used throughout County operations.

Total Costs: The estimated total project cost is between $27.47 million. The gas pipeline cost $2,416,807 of which $1,665,000 in DOE funds were used. The upgrade of the cogeneration facility is estimated to cost $25,000,000.

Payback Period: The payback period is approximately 8 years assuming a total project cost of $25M including planning, engineering and construction. The estimated payback is based on electricity only from predicted biogas production.

Return on Investment: The return on investment for the electrical generating portion of this project is estimated to be at $4.45M annually (assuming 2013 dollars), starting in 2021.

There are additional benefits when considereing the heat recovered for use in other plant processes. The heat recovered replaces approximately $1,000,000 of annual fuel purchases (based on natural gas at $6/mmBTU). When considering the electricity and heat, the expected payback is estimated at 7 years, and the ROI after that is approximately $5.4M (assuming 2013 dollars) annually in avoided electricity and fuel purchases. Additionally, construction of the pipeline and upgrade to the cogeneration facility is expected to create approximately 40 local jobs.

Economic Impacts: Completed SDWWTP Cogeneration Facility will:

- Be a leading energy utilization system
- Substantially increase biogas cogeneration capacity in the State of Florida
- Be the largest of its kind in the United States
- Join a select group of large wastewater treatment plants with cogeneration facilities in the United States

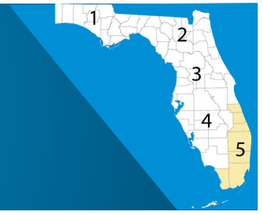
Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

MIAMI-DADE COUNTY

SUSTAINABLE BUILDINGS PROGRAM



Description: The "core and shell" of Miami-Dade County's West Lot Parking Garage and Office Building was completed in 2012 and has earned a Leadership in Energy and Environmental Design Gold certification from the U.S. Green Building Council. Located across the street from the Stephen P. Clark Government Center in downtown Miami, the six-level, 320,127 square foot structure includes 266,867 square feet of parking throughout the six levels; 51,997 square feet of office and storage space in four levels; and 1,263 square feet of retail area. The garage and office building occupies 1.67 acres, which was previously a surface parking lot.

The parking garage is an initiative of the Miami-Dade County Sustainable Buildings Program, which was adopted in 2005, aimed at improving the economic, social, and environmental performance of its operations. The program incorporates sustainable development measures into the design, construction, renovation, and maintenance of county-owned, financed, and operated buildings. Similar measures have been implemented nationally and were intended to conserve resources, reduce construction waste, increase facility energy efficiency, and increase occupant satisfaction. This program is part of the broader County's sustainability plan "GreenPrint" Design for a Sustainable Future.

Components of the project include the use of paint with low or zero volatile organic compounds content; native plants in the landscape design to reduce irrigation costs; and the preservation of existing trees by relocating them to other locations. The new structure consists of precast-masonry construction and has a white roof insulation system, which reflects sunlight and minimizes required cooling. The building envelope was designed so the heating, ventilation, air conditioning, lighting, and other systems maximize the overall energy performance. The building as designed will provide a 23.7% energy savings and a 20.7% cost savings, as compared to a "traditional" building design. A water booster pressure pump package is being used in the building, which will generate an estimated 33.6% savings on water usage. Special designated parking is also provided along the ground floor for fuel efficient vehicles. Future plans include adding electrical outlets for electric vehicles.

Total Costs: When considering the building components included in the energy calculations, there are wall insulation, roof insulation (including white roof), glass, and lighting. The difference in cost from a baseline design ("traditional" design) to this energy efficent design was about $28,000. The energy cost for the baseline design ("traditional" design) has been calculated as $63,959/year, equivalent to 4,106 Mbtu/year. The energy cost for this building design has been calculated as $50,734/year, equivalent to 3,133 MBtu/year. In other words, the estimated savings are $13,225/year.

Payback Period: It has been estimated that the number of years required to recover the additional costs is 10 years. Payback calculations do not include soft gains such as lower maintenance costs, increased employee morale, reduction in the number of sick days for employees, and reduction of greenhouse gases emissions.

Return on investment: It has been estimated that the annual savings are approximately $13,225/year, when considering energy and water savings. ROI will be contingent on the term and future value of the investment. This information that is not currently available.

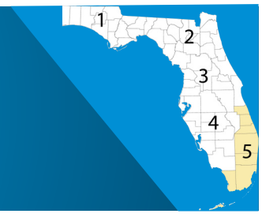
Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

COOPER RESIDENCE

ENERGY EFFICIENT RESIDENCE



Description: The Thomas Cooper residence is an energy efficient single-family home located in Jensen Beach, Martin County, Florida. The structure was designed and built by Thomas Cooper, an architect who specializes in sustainable design. The features making this structure energy efficient were included as part of the original construction, which was completed in 2007.

Photo Source: Regional Planning Councils

The core concept of the energy efficient design for this residence is the use of principles derived from the traditional mid-Florida vernacular architecture. The design takes into consideration features unique to the site location. This three-story structure is located on the crest of a secondary coastal sand dune, with fifty feet of elevation above the sea. The location provides the advantages of prevailing ocean breezes. The large overhangs and deep porches not only shade the walls, but pre-cool the breezes before they enter the main living space. The overhangs also provide protection for the windows during rain storms and allow them to remain open. Each room has tall ceilings and cross ventilation to take advantage of natural cooling in a subtropical environment. The basement, which is thermally protected by the earth, is not air-conditioned but does have cross ventilation in most areas. The living level and loft level are open to breezes seven months of the year.

The exterior walls of the structure were constructed with insulated concrete form walls filled with 6" of reinforced concrete that have a high thermal resistance R-value of 50. Low-emissivity coatings on the windows protect the structure from heat gain during the day. During the winter, selective opening and closing of the windows during the day and night helps to maintain comfortable indoor temperature levels. The rooms were designed for natural day lighting and the entire house features additional lighting provided by compact fluorescent and LED bulbs. Other features include Energy Star appliances, a highly reflective standing seam metal roof, and an insulated garage door. Solar hot water and 2.5 kW photovoltaic electrical systems also reduce the energy needs. Furthermore, the use of native drought tolerant plants, harvesting roof top rain water, and low flow plumbing fixtures and appliances greatly reduce the water requirements of this residence and contribute to the overall energy efficient design.

Total Costs: The cost of energy efficient improvements are not easily calculated, because many of the improvements are based on energy efficient design, rather than material items. These design features were incorporated into the original construction of the residence, which makes it difficult to separate the cost of the energy efficient improvements. Mr. Cooper has estimated that energy efficient features added approximately 2 - 5% to the overall cost to build the structure.

Photo Source: Regional Planning Councils

Photo Source: Regional Planning Councils

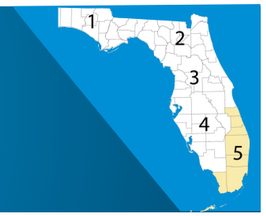
Payback Period: In June 2008, the Thomas Cooper residence received a Home Energy Rating System (HERS) Index rating of 49, which is close to the mid-point between a reference home with a rating of 100, and a zero energy use home with a rating of 0. The HERS report predicted that the residence would have an average annual electric utility bill in the amount of $1050. However, the actual cost for electricity during the two year period from August 2010 to July 2012 was $951 per year. This represents a savings of $1047 per year below the energy cost of the reference home ($1998) identified in the HERS report. Based on an estimated amount of $15,000 spent on energy efficient improvements, the payback period is predicted to be 14.3 years.

Return on Investment: Once the payback period of approximately 15 years is met, the energy efficient improvements are expected to save the owner over $1000 per year for the life of the home.

Economic Impacts: The HERS report estimated that the Thomas Cooper residence would consume 44.4 million British thermal units (BTU) a year. The house includes 2,900 square feet of air conditioned space; 2,880 square feet non-air conditioned space; and 1,200 square feet of decks, terraces, and porches. Considering the interior square footage of the house (a combined 5780 square feet), the residence was predicted to consume 7,682 BTU per square foot per year. In comparison, the Residential Energy Consumption Survey data from the U.S. Energy Information Office indicated that the annual energy consumption of 7 million housing units in Florida in 2009 was 33,400 BTU per square foot. Although a direct comparison of the data may not be appropriate because of variation in methodologies, the energy usage of the Thomas Cooper residence is far less that the average Florida house. Replication of many of the energy efficiency design principles included in the Thomas Cooper House has a great potential to reduce energy demand of future new development in Florida.

FLORIDA SOLAR ENERGY CENTER

SUNSMART E-SHELTER PROGRAM



Description: The SunSmart E-Shelter Program is an initiative of the Florida Solar Energy Center (FSEC), to install more than 100, 10-kW photovoltaic (PV) systems with battery backup at public schools designated as emergency shelters throughout Florida. The PV systems offset electrical costs to the schools during normal operation and the energy stored in the batteries is used to provide power during emergencies. The system includes the installation of a solar PV array, inverter, charge controller, batteries, and utility interface. The PV array is installed on a freestanding ground-mounted structure designed to withstand winds of over 150 miles per hour. The inverter, charge controller, and battery bank are installed in a dedicated enclosure. The battery system is composed of a bank of 16 lead acid rechargeable batteries. Other system components include the backup power sub panel, which is the panel containing protected loads, and the main utility breaker panel, which connects to the AC utility meter. The main utility panel provides power distribution for the emergency shelter building and provides the interface between the utility distribution and protected loads panel.

Photo Source: Nick Waters, FSEC

The SunSmart E-Shelter system uses three sources of energy, the PV array, battery bank, and electricity from the utility. There are two possible scenarios of operation. In normal operation, the system is connected to the utility system when the utility is fully operational. The inverter maintains continuous power to the protected loads panel, either with power from the PV panels or with power from the utility system is the PV power if insufficient. The batteries are kept fully charged. Under emergency operation, power from the utility is interrupted. The batteries and PV are the only sources of power under this scenario. The inverter senses that the utility is down and automatically disconnects from it, which prevents back feeding to the utility. The protected loads are then powered by the batteries or the PV panels when the sun is shining.

Photo Source: Nick Waters, FSEC

The SunSmart E-Shelter battery system stores enough energy to support protected loads at each shelter. The loads to be protected are determined by a team of experts at each facility. The load is expected to include 4-5 lights and 2-3 electrical outlets supporting communications or life support equipment, totaling about 25 kilowatt-hours (KWh)per day. The SunSmart E-Shelter system has the capability to power these loads continuously until power is restored. A load beyond the capability of the PV system will cause the system to stop working. If the energy stored in the batteries is depleted during an extended outage, the system will go offline until the batteries have been partially recharged by the PV array, then it will resume operation.

Total Costs: The SunSmart E-Shelter Program was made possible by initial funding of a $10 million grant from the American Recovery and Reinvestment Act of 2009 to facilitate and manage the program. This funding has been expanded to include additional revenues from private and public utilities. The cost for materials and professional installation of each SunSmart E-Shelter system was approximately $75,000. FSEC staff estimated that the same system purchased today would cost about $70,000. This cost includes about $45,000 for the 10-kW photovoltaic system, and $25,000 to integrate the battery backup capability.

Payback Period: The payback period for a 10-kW PV system with battery backup can be calculated by dividing the total cost of the system by the dollars saved per year as a result of operation of the system. The FSEC has estimated that each system reduces the electric bill of the school by about $1,500 per year. Based on the system cost of $70,000, the payback period is estimated to be 46.7 years. However, the federal government currently offers a 30% tax credit that would reduce the total cost of the system to $49,000 and yield a payback period of 32.7 years. In addition, many electric utilities offer a rebate for installing a PV system. In the case of Florida Power and Light, the State of Florida's largest electric utility, the rebate is equal to $2,000 per kilowatt, but opportunities to receive these rebates are extremely limited. If the rebate is applied to the 10-kW system it would result in a $20,000 savings and reduce the cost of the system to $50,000. Then, applying the 30% tax credit to this system would lower the total cost to $35,000, which results in a payback period of 23.3 years. Because of the long payback period, this system is not cost-effective for the majority of potential users without a grant or significant financial incentives. However, the benefits of this program are not strictly financial, since these systems also serve as emergency shelters in disaster situations.

Return on Investment: The payback period is estimated to range from 23.3 to 46.7 years, depending on the application of utility rebates and federal tax credits. Once the payback period is met, the 10-kW PV system with battery backup is expected to save the owner about $1,500 per year for the life of the system.

Economic Impacts: The SunSmart E-Shelter Program is helping schools reduce their energy costs by transferring excess energy to the grid. By the end of 2012, the SunSmart E-Shelter systems are estimated to have generated 1377 MWh of energy, which at current Florida energy costs is worth approximately $140,000. If all Florida high schools participated in the program, this would result in a 10% reduction in electricity use and a savings of $87,000 per day or $32,000,000 a year.

ENERGY FINANCING

SOLAR AND ENERGY LOAN FUND

There are a number of options for homeowners and other residential and commercial property owners who are looking to improve efficiency and reduce their energy costs by installing energy efficient upgrades. These options include renewable energy systems, such as solar hot water heaters, lighting and HVAC upgrades, and photovoltaic (PV) roof panels. New technologies are enabling widespread, large-scale adoption of energy efficient and renewable energy systems and making them cost-competitive with other forms of energy. Homeowners and businesses recognize the benefits of utilizing energy efficient systems and alternative energy sources, and are looking for cost-effective ways to implement these systems.

One way to encourage residential and commercial property owners to implement renewable energy systems is through an alternative energy finance program. An innovative alternative energy finance program increases access to lending for property owners to install energy efficient upgrades and alternative energy systems. The objective of an alternative energy finance program is to provide increased access to loans so that more residents and business owners are able to finance the upfront costs of these upgrades and retrofits. Property owners can then realize the savings in energy costs over an extended period of time, helping to offset the upfront installation and equipment costs of energy efficient upgrades and renewable energy systems.

An alternative energy finance program may be developed through a public-private partnership between a local or regional government agency, financial institutions, contractors, and other corporate and community partners. This partnership creates an innovative financing program to make energy efficient and alternative energy-producing systems more accessible to homeowners and businesses.

The core of an alternative energy finance program is a credit enhancement program which provides participating financial institutions with access to a loan loss reserve. The loan loss reserve reduces risks for participating lenders, enabling them to extend loan availability to a larger pool of customers. Participating lenders are able to offer favorable loan terms and interest rates that allow more property owners to make energy efficiency and renewable energy improvements.

Residential and commercial property owner participation in an energy financing program begins with a professional energy audit to determine what improvements are most appropriate and cost-effective. Typical energy efficiency improvements and renewable energy systems financed by an energy loan program included:

- Lighting retrofits/upgrades;
- HVAC retrofits/upgrades;
- Solar thermal systems;
- Solar electric photovoltaic (PV) systems; and,
- Energy efficient windows.

Property owners apply for alternative energy financing directly through the participating lender. Terms of the loan will vary by participating lender under the specific guidelines set forth by the program. Property owners are often able to select from a list of authorized contractors to complete the energy efficiency and renewable energy installations that are eligible for financing under this type of credit enhancement program.

Affordable financing programs for energy efficiency and renewable energy improvements have several potential economic benefits. First, property owners have reduced energy costs when the loans are paid off. Second, energy financing programs lead to job creation and increased business in the companies involved in completing the energy efficiency and renewable energy system installations. Also, energy financing programs enhance energy resiliency by reducing the demand for energy from existing development, which reduces the potential for power supply disruptions during emergency events.

The Solar and Energy Loan Fund described below is the most successful example of an organization providing enhanced consumer access to loans for clean energy improvements in Florida. The State of Florida would benefit from the expansion of this program or the development of similar programs throughout the state.

SOLAR AND ENERGY LOAN FUND

The Solar and Energy Loan Fund (SELF) is a relatively new Florida-based non-profit organization established to enhance consumer access to clean energy solutions. SELF administers the Clean Energy Loan Program, which is a low interest rate loan program created through partnerships among the U.S. Department of Energy, St. Lucie County, SELF, and local community leaders and organizations. The low interest rate program is designed to help reduce energy bills and provide access to two dozen energy-saving products, including energy conservation (e.g., weatherization and insulation), energy efficiency (e.g., air conditioning units), and solar (e.g., solar hot water and photovoltaic systems). SELF is the first revolving loan fund in the State of Florida specifically designed to making solar and energy efficiency improvements more affordable for residents.

SELF originated from the St. Lucie Board of County Commissioners in the fall of 2009, when they decided to develop a local clean energy financing program. The overall goal was to empower local residents and businesses to take advantage of cost-effective clean energy technologies. The primary strategy was to increase consumer access to clean energy technologies through favorable financing options. After reviewing existing clean energy financing programs from all across the country, St. Lucie County ultimately decided to pursue an entirely new clean energy-financing model based on the U.S. Department of Treasury's Community Development Financial Institutions (CDFI) Fund. The CDFI program was created for the purpose of promoting economic revitalization and community development in underserved markets. The majority of certified CDFI programs focus on affordable housing projects. However, St. Lucie County expanded the successful CDFI Fund into the energy sector, because it provided the best approach to attract and leverage private capital for the loan pool and could offer more favorable financing options.

In June 2010, St. Lucie County received an award totaling $2,941,500 from the U.S. Department of Energy's Energy Efficiency and Conservation Block Grant (EECBG) Program. St. Lucie County's EECBG application was selected as one of twenty programs in the entire country, and was the only award recipient in Florida. These grant funds were specifically earmarked for start-up costs, administration, and an initial loan pool of $1,654,215. In January 2011, St. Lucie County also secured a $300,000 grant from the Florida Energy & Climate Commission to help pay for professional grade energy assessments on 800 homes. In the spring of 2011, SELF began operation of the Clean Energy Loan Program, including the first energy assessment in February and the first loan in April. SELF was certified as a CDFI by the U.S. Department of the Treasury in December 2012.

Homeowners and businesses are eligible to apply for a low interest rate loans. The process begins with a comprehensive energy assessment performed at the home or business. This process helps to identify the best practices and clean energy technologies that will deliver the greatest savings and return on investment for the particular property. SELF strives to achieve a minimum of 15% reduction in energy usage per client, and to date has achieved an average of more than 20% per household. SELF's energy and financial experts work with applicants to finance the most cost-effective energy investments through low interest, no-money-down loans. The program also assists applicants in selecting qualified contractors to complete the work. The average loan size is approximately $10,000. The predominant types of improvements include: weatherization, insulation, energy efficient air conditioners, solar water heaters, and solar photovoltaic panels.

SELF has recently expanded its loan program into several counties surrounding St. Lucie County, and is investigating the potential for expansion into other parts of Florida. Furthermore, SELF is actively working with existing partners and other financial institutions interested in investing in the program. These private investments will supplement the existing loan pool and are a key component for expansion of the program.

The full economic impacts of SELF's loan program have not been realized. As of July 2013, SELF has performed more than 800 energy audits and dispersed over 200 loans totaling over $2 million. This has resulted in saving homeowners an average of 20% on their utility bills and SELF clients have cumulatively reduced their energy consumption by more than a million kilowatts. However, SELF is in the early stages of expansion and economic impacts are expected to grow with the program. Economic benefits are expected to include local employment and economic development opportunities. Furthermore, other program benefits include enhanced quality of life, making much-needed home improvements, and increasing the market value of properties. In the process, the resulting work is also stimulating local employment and economic development activity in the construction industry, one of the hardest hit job sectors in Florida. The program enhances energy resiliency by reducing demand for electricity from existing development.

SELF®
SOLAR AND ENERGY LOAN FUND

LIST OF ACRONYMS

ARPC – Apalachee Regional Planning Council

ARRA – American Recovery & Reinvestment Act of 2009

ASTM – American Society for the Testing on Materials

BP – British Petroleum

BTU – British thermal unit

CATI – Computer Assisted Telephone Interviewing

CEMP – Comprehensive Emergency Management Plan

CEDS – Comprehensive Economic Development Strategy

CFRPC – Central Florida Regional Planning Council

CNG – Compressed Natural Gas

CDBG - Community Development Block Grant Program

COOP – Continuity of Operations Plan

CRAs - Community Redevelopment Associations

DGE – Diesel Gallon Equivalent

DOE – U.S. Department of Energy

ECFRPC – East Central Florida Regional Planning Council

EDD – Economic Development District

EIA – U.S. Energy Information Administration (statistical arm of U.S. Department of Energy)

ENERGY STAR® on first reference, followed by ENERGY STAR thereafter.

EPA – Energy Planning Area

ESF – Emergency Support Function

EV – Electric Vehicle

FAU – Florida Atlantic University

FDACS – Florida Dept of Agriculture and Consumer Services

FDEM – Florida Division of Emergency Management

FDEO – Florida Department of Economic Opportunity

FEAP – Florida Energy Assurance Plan

FEMA – Federal Emergency Management Agency

FGCU – Florida Gulf Coast University

FHREDI – Florida's Heartland Regional Development Initiative

FPSC – Florida Public Service Commission

FRCA – Florida Regional Councils Association

FRCC – Florida Reliability Coordinating Council

FS – Florida Statutes

FSEC – Florida Solar Energy Center

FY – Fiscal Year

GDP – Gross Domestic Product

GHG – Greenhouse gas (e.g., CO2, methane)

GIS – Geographic Information System

GW – gigawatt

GWh – gigawatt-hour

HERS – Home Energy Rating System

HF – Hydraulic Fracturing

HVAC – Heating Ventilation and Air Conditioning

IAS – Intermediate Aquifer System

IFAS – UF Institute of Food and Agricultural Sciences

IOU – Investor-owned Utility

LIST OF ACRONYMS

km – kilometer

kV – kilovolt

KVA – kilovolt-ampere

KVAR – kilovolt-ampere reactive

KW – Kilowatt

KWh – Kilowatt Hour

LEED – Leadership in Engineering and Environmental Design

LNG – Liquefied Natural Gas

LPG – Liquefied petroleum gas (propane and butane)

m (M) – meter, million, mega, milli or thousand

MMBTU – Millions of British Thermal Units

MW – megawatt (million watts)

NCFRPC – North Central Florida Regional Planning Council

NEFRC – Northeast Florida Regional Council

NG – Natural Gas (mainly methane)

NRC – Nuclear Regulatory Commission

NGV – Natural Gas Vehicle

PACE – Property Assessed Clean Energy (energy financing)

PBP – payback period

PV – photovoltaic

QCEW – Quarterly Census of Employment and Wages

RACEC – Rural Area of Critical Economic Concern

REMI – Regional Economic Models Inc.

ROI – Return on Investment

RPC – Regional Planning Council

RPS – Renewable Portfolio Standard

RSC – Restaurant Support Center

SB – Senate Bill

SELF – Solar and Energy Loan Fund

SERT – State Emergency Response Team

SFRPC – South Florida Regional Planning Council

SNG – Synthetic Natural Gas

SRPP – Strategic Regional Policy Plan

SWFRPC - Southwest Florida Regional Planning Council

TBRPC –Tampa Bay Regional Planning Council

TCRPC – Treasure Coast Regional Planning Council

TEC – Talquin Electric Cooperative

TOD – Transit Oriented Development

TPDE – Third-Party Distributed Energy

UF – University of Florida

U.S. DOE – United States Department of Energy

U.S. EPA – United States Environmental Protection Agency

U.S. – United States

USACE – US Army Corps of Engineers

W – Watt

WFRPC – West Florida Regional Planning Council

WRPC – Withlacoochee Regional Planning Council

http://florida-energy.org

Florida Energy Resiliency

SCAN QR CODE WITH YOUR SMART DEVICE
FOR ADDITIONAL INFORMATION