Energy Assurance Study: Interim Report

Economic Analyses, Case Studies, and Strategy Recommendations

FRCA
FLORIDA REGIONAL COUNCILS ASSOCIATION
Partnerships for the Future

Florida
Energy Assurance

GREAT SEAL OF THE STATE OF FLORIDA
IN GOD WE TRUST

Florida Energy Assurance

Acknowledgments

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ARPC - Apalachee Regional Planning Council

ARRA - American Recovery & Reinvestment Act of 2009

ASTM – American Society for the Testing on Materials

Btu - British thermal unit

CATI – Computer Assisted Telephone Interviewing

CEMP – Comprehensive Emergency Management Plan

CFRPC - Central Florida Regional Planning Council

CNG – Compressed Natural Gas

COOP – Continuity of Operations Plan

DGE – Diesel Gallon Equivalent

DOE - U.S. Department of Energy

ECFRPC - East Central Florida Regional Planning Council

EDD – Economic Development Districts

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

ENERGY STAR® on first reference, followed by ENERGY STAR thereafter. Note: Should be all capitals.

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 Associations

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

km - kilometer

kV - kilovolt

KVA - kilovolt-ampere (transformer size rating)

KVAR - kilovolt-ampere reactive

KW - Kilowatt

KWh - Kilowatt Hour

LEED–Leadership in Engineering and Environmental Design

LNG - Liquefied Natural Gas

LPG - Liquified 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 Model Inc.

ROI – Return on Investment

RPC – Regional Planning Council

RPS – Renewable Portfolio Standard

RSC – Restaurant Support Center

SB - Senate Bill

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

TPDE – Third-Party Distributed Energy

UF – University of Florida

U.S. DOE - (United States) Department of Energy

U.S. EPA (not EPA) - United States Environmental Protection Agency

U.S. - United States

U.S. COE - U.S. Corps of Engineers

W - Watt

WRPC - Withlacoochee Regional Planning Council

WFRPC - West Florida Regional Planning Council

Introduction

Florida's Economic Development Districts (EDDs), working in coordination with the Florida Regional Councils Association (FRCA), began work on developing an Energy Resiliency Strategy in November 2011. This effort was a result of the BP Horizon West oil spill that led to an estimated 206 million gallons of oil hemorrhaged into the Gulf of Mexico. 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. The Gulf of Mexico region represents the 6th largest economy in the world. 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 gulf, even if the U.S. was to ban 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. Oil is only one of the many energy sources that the nation relies upon. In that context, Energy Resiliency is seen as the actions taken to diversify our energy supply with an emphasis on domestic energy. Domestic energy means domestic jobs.

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 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 South America, Mexico, and Canada. As key components of the electrical power grid turn 40 and 50+ years old, they are susceptible to mechanical and structural failure. Recently, Duke Energy announced the Crystal River Nuclear Plant in Central Florida will be closed permanently.

Infrastructure and Energy Assurance in Florida

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 infrastructure and assurance. 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 our current sources of oil, coal, natural gas, and nuclear power become severely reduced in supply.

Purpose of Assurance Study (Resiliency vs. Assurance)

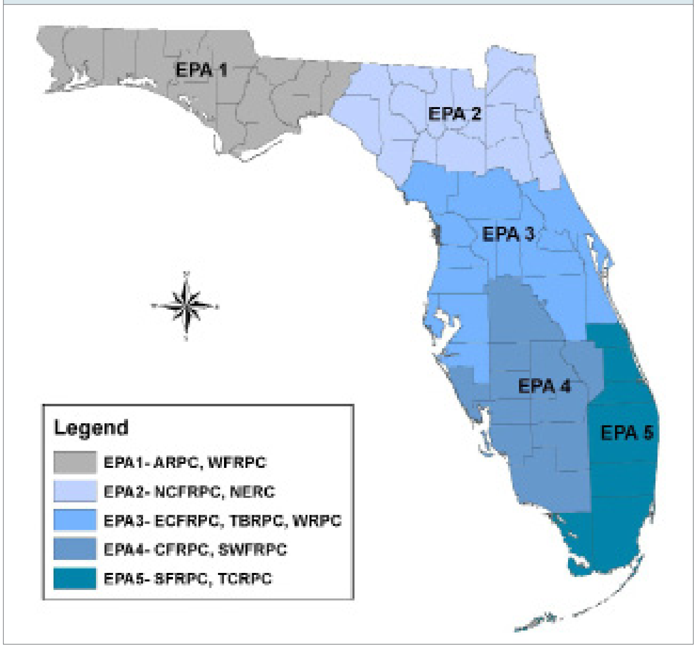
Upon learning that the Florida Florida Department of Agriculture and Consumer Services' (FDACS) Office of Energy was engaged in updating the Florida Energy Assurance Plan (FEAP) and that the work on Energy Resiliency Strategies were complementary; the FDACS Office of Energy engaged FRCA to address energy assurance issues in its ongoing resiliency study efforts. The focus of the FRCA Energy Assurance Study is to conduct economic impact analyses, research case studies, and develop strategies related to energy assurance for use by those engaged in energy assurance planning.

When delving into the topic of resiliency, the EDDs were most interested in creating a more diverse energy supply that would be less susceptible to energy outages or supply constraints – and create jobs. In this context, resiliency planning are the actions that one does in advance or before an energy event to reduce or minimize the impact of an interruption of the energy supply. In the context of the FEAP, resiliency is one component of the energy assurance planning. The FEAP is prepared to ensure 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 reply 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 assure 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 the energy.

Energy resiliency is an important component of energy assurance. 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 one of the critical elements of enhancing energy resiliency in Florida.

Figure 1: Energy Planning Areas



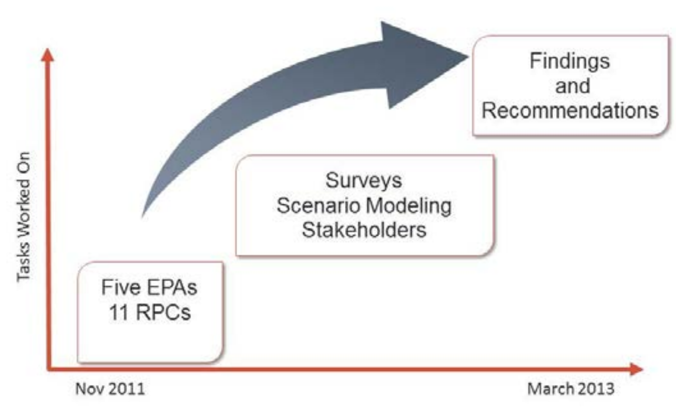
Strategy Development Process

In order to address the uniqueness of Florida's regions, Florida's Regional Council's Association divided the state into five Energy Planning Areas (EPA), which are comprised of partnerships between the eleven Regional Planning Councils. The first step in the study process was a survey of statewide energy usage characteristics with an emphasis on willingness to invest in alternatives and what price tolerances exist 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 in each EPA. The fourth step involved collating and sharing the information gathered from these summits across the state. The final step includes developing strategies and implementation methods to make the state more resilient. Each RPC/EDD in the state addressed their respective district in order to utilize the local knowledge and reduce costs and coordinated with the statewide effort to ensure consistency, proper vision, and synergy.

The Survey and Analysis identified the major stakeholders, determined the energy usage by type, surveyed citizens regarding their energy usage, identified current and planned alternative energy uses, and logistics of distributive power.

Figure 2: Basic Process Overview



Utilizing the information gathered from the preliminary survey and analysis, a detailed analysis was performed. The analysis leveraged existing econometric models, such as REMI PI+, Implan and CFAPT to analyze the impact to each region of energy 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 Workforce Skills Competency Study will be leveraged to maximize the impacts. Alternative energy uses, installations, and benefits were modeled. Each EDD in the state conducted an energy workshop or summit with the stakeholders in each area. These events focused on the various vulnerabilities to energy, such as security, natural or man made disaster, state and national policies, and external factors outside of the control of the USA. The local policy makers, energy producers, users, and other stakeholders gathered to reach a consensus on how to move forward. Strategies and recommendations were gathered from the workshops. All of the data from the meetings were collected and analyzed. Additional modeling was conducted on the information gathered. Once the information and analysis phase was completed, findings and recommendations were drafted including strategies with appropriate jurisdiction (local, state or regional) identified, the various impacted issue areas that were addressed, how to implement the strategies, as well as ease of implementation.

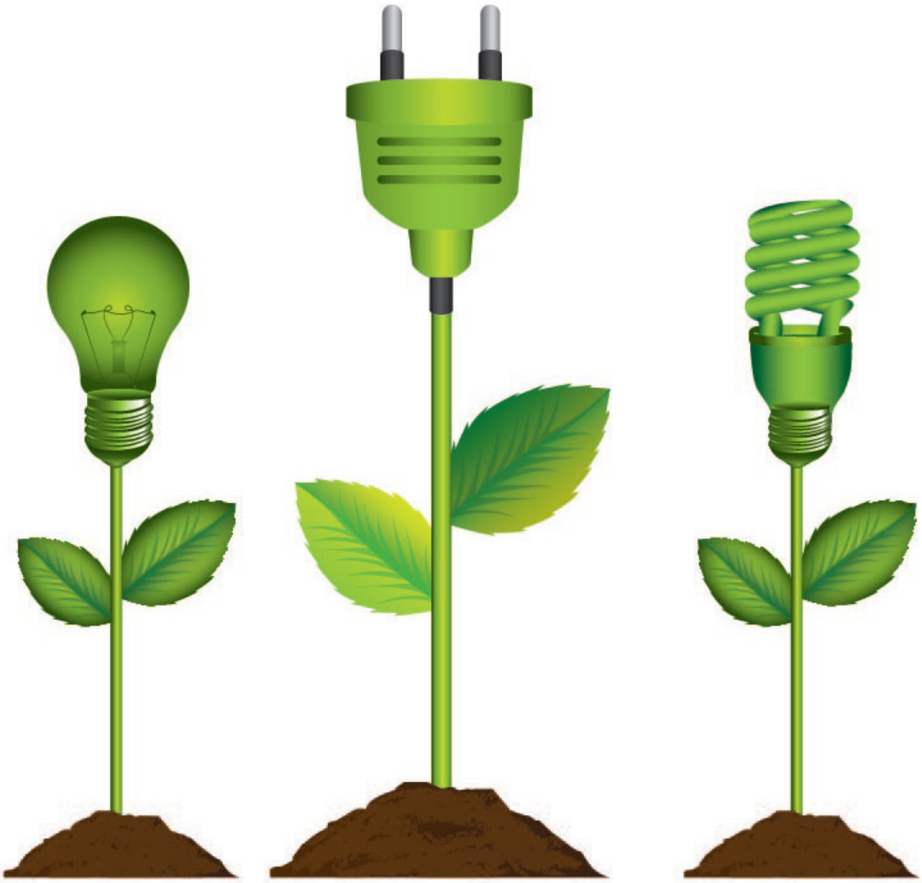
The findings and recommendation from the Energy Assurance Study will be combined with the findings of the assurance study into the final report of the Energy Resiliency Strategy that will be distributed throughout Florida. The EDDs and stakeholders will continue to implement the strategies into the Comprehensive Economic Development Strategies (CEDS), visioning efforts, Strategic Regional Policy Plans and other planning guides to help create a more energy resilient Florida. In addition to the FEAP, planning efforts like the Comprehensive Emergency Management Plans (CEMPs) (state and county) and the related Emergency Support Function 12 – Energy can utilize the study's findings and recommendations.

Interim Report

This interim report is being published to coincide with the project objectives and deliverables timeline of the FRCA agreement with the Florida Office of Energy. This report contains economic analyses and strategy recommendations for consideration for use in the Florida Energy Assurance Plan and other energy assurance planning processes. Due to the nature of an interim report and that as many as 15 different authors have participated, some sections may appear "to be in a different voice" or "out of flow." These issues will be addressed for the final report.

Next Steps

During the time period of April 2013 through August 2013, the FRCA Energy Assurance Planning Team will gather stakeholder input on the Interim Report. Additional work will be performed on Analyses and Strategy Recommendations as needed. The team will develop a Powerpoint presentation that will be scalable in length from executive briefings to conference presentations. The final Powerpoint(s) and final Energy Assurance Study will be published in September 2013.



Why We Need Energy Assurance

A steady stream of reliable energy provides the foundation for a functioning modern Florida, and residents of Florida have come to expect minimal interruptions in their supply of electricity, transportation fuels, and heating products. Energy supplies are not just a convenience, but have become an essential necessity for individuals, businesses, health services, tourism, public safety, modern agriculture, and law enforcement. Any interruption, especially a prolonged interruption of the supply of basic energy or fuel (petroleum products, electricity, or natural gas) would likely result in significant harm to Florida's public health, safety, economy, and security.

Although energy commodities are supplied by private firms, the State's interest in providing for the welfare of its citizens gives it a role to play in helping firms assure the continued provision of energy and fuel. The Florida Energy Assurance Plan is intended to help avoid, minimize and mitigate the impacts of an energy supply interruption and help the State return to normal conditions as quickly as possible.

Florida's electricity is expensive, and high energy prices can be expected well into the future, even without the added strain of climate change (Stanton and Ackerman 2007). The electricity sector in Florida includes 138 power plants, 24 of which represent over 56 gigawatts (GW) of capacity. (A gigawatt is a million kilowatts.) Florida's power plants are spread statewide, and the oldest date to the 1950s. The size of new plants increased dramatically through the early 1980s, with the addition of nuclear plants and natural gas plants. From the mid-1980s, new plants were primarily smaller natural gas generators (U.S. EPA 2006). Currently, the system relies heavily on power plants that burn natural gas (33%) and coal (21%); oil and nuclear power (10% each) make up the remainder. Twenty-five planned new plants will primarily burn natural gas, and it is expected that oil plants will be converted to burning gas or be phased out by 2015.

The transmission system reflects the location of power plants, with large lines extending down the center of eastern and western coastal counties. As coal plants have become less attractive politically, financially, and environmentally, the state has increased its reliance on natural gas plants, causing concern about the lack of diversity in Florida's energy portfolio (Platts 2007). Florida's electricity market has been affected by rising gas and oil prices, which have caused electricity prices to jump from 6.9 to 8.8 cents per kilowatt-hour (kWh) between 2000 and 2005. The U.S. Energy Information Administration (EIA) estimates that energy prices will stabilize at approximately 8.1 cents per kWh over the next two decades if oil prices settle at $60 a barrel. Floridians were projected to draw a peak demand of nearly 47 GW in 2007, 3% higher than the peak of 2006 (North American Electric Reliability Corporation 2006; Stanton and Ackerman 2007).

Why does Florida need a responsive Energy Assurance Plan (EAP)? Early power plants were built near the coastline, and now, numerous power plants and transmission lines remain close to the coastline, exposing significant energy infrastructure, and thus power system reliability, to storm damage, even without the more intense hurricanes that climate change may produce (Florida Public Service Commission 2006).

Florida's energy infrastructure is particularly vulnerable to sea level rise and storm impacts (Karl et al. 2009). Most of the petroleum products consumed in Florida are delivered by barge to three ports, two on the east coast and one on the west coast. The interdependencies of natural gas distribution, transportation fuel distribution and delivery, and electrical generation and distribution were found to be major issues in Florida's recovery from recent major hurricanes. (Bull et al. 2007).

Several thousand offshore drilling platforms, dozens of refineries, and thousands of miles of pipelines are vulnerable to damage and disruption due to sea level rise and the high winds and storm surge associated with hurricanes and other tropical storms. For example, Hurricane Ivan in 2004 destroyed seven platforms in the Gulf of Mexico, significantly damaged 24 platforms, and damaged 102 pipelines. Hurricanes Katrina and Rita in 2005 halted all oil and gas production from the Gulf, destroyed more than 100 platforms, damaged 558 pipelines, and disrupted nearly 20% of the nation's refinery capacity. Chevron's $250 million "Typhoon" platform was damaged beyond repair. Plans are now being made to sink its remains to the seafloor (Karl et al. 2009; CBO Testimony 2005).

Relative sea level rise in parts of the Gulf Coast region (Louisiana and East Texas) are projected to be as high as 2 to 4 feet by 2050 to 2100, due to the combination of global sea level rise caused by warming oceans and melting ice and local land sinking

(Potter et al. 2008). Combined with onshore and offshore storm activity, this would represent an increased threat to this regional energy infrastructure.

Infrastructure vulnerability to storm damage has already been 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 2006).

If an energy emergency is localized, it may relate only to the energy distribution system, or even more specifically, to just one asset or building. If it is regional or larger in scope, it may involve electricity transmission and/or generation. In any case, the energy provider is going to prioritize its response, in part, based on the scale and scope of the emergency. Because of this reality, all levels of government will have to take an active role in mitigating the effects of energy supply disruptions and their impacts on key assets and critical services. To fully grasp the concept of the EAP, it is necessary to examine its context, beginning with the providers and producers of energy supplies. Also important is the transportation or transmission of energy supplies and the subsequent distribution of supplies to end users. In addition, the EAP must account for the potential disruption of any of these activities, as disruptions can significantly impact the provision of critical services. Finally, the context for the EAP involves restoration or recovery—the return to normal operations. Even though other entities may be responsible for generating, transmitting, distributing, and delivering energy to local jurisdictions, most key activities and energy consumption fall within local boundaries. For that reason, local governments are a focal point for energy assurance. It is imperative that they understand their roles and responsibilities with regard to energy assurance and determine how these roles and responsibilities can most effectively be assumed. Florida's industries providing critical services, such as energy, communications, foodstuff and drink, and medical services; and government emergency managers, public safety and first responders; have a very important responsibility to the public to mitigate disruptions and maintain public order and control. This is only possible through a concerted effort by the many stakeholders in this endeavour.

Impacts on Economy

Q. Why do energy assurance 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).

Alternative energy or "'So-called "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 report commissioned by the American Solar Energy Society. And the burgeoning industry is claiming 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

Figure 3: Oil Prices And Economic Growth

Source: U.S. Bureau of Economic Analysis and electrificationcoalition.org 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.

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.
- Transportation vulnerability. Reducing the vulnerability of the transportation modes, terminals and users to intentional harm or disruption from natural events.

Petroleum and Diesel

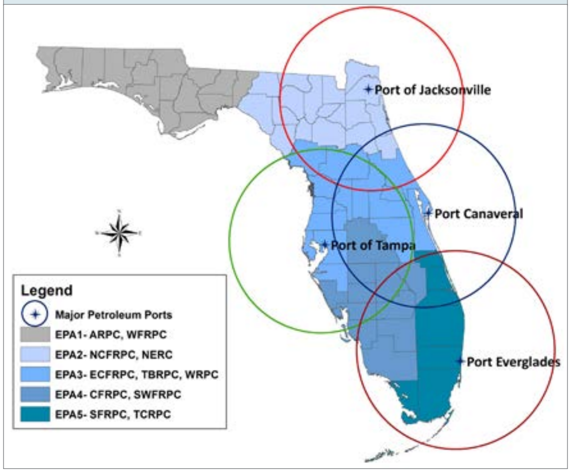
American consumers are supplied with the transportation fuels that they need every day through a complex yet extremely efficient system to transport gasoline and diesel fuel from the refineries where they are produced to their local gasoline station. The fuel that consumers use in their vehicles may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

Gasoline and diesel are produced at petroleum refineries and then typically transported to distribution terminals by pipelines. At the same time, biofuels are produced at bio-refineries and then generally 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. This happens perhaps 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.

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. 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.

Figure 4: Florida's Major Petroleum Ports

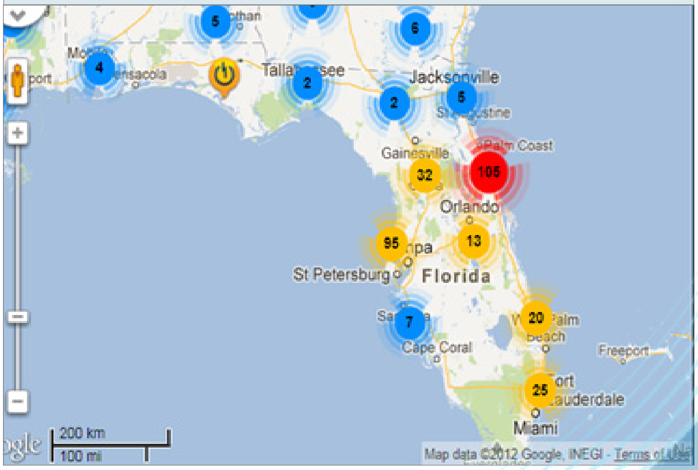


Electric Vehicles

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.

Figure 5: Florida's Charging Stations



Depending on where the EV is charged; its power will 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 is considered 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.

Impacts on Households

Energy assurance impacts households in Florida in their ability to pre-plan for their energy needs prior to a natural disaster or any other type of energy disruption and helps to address the household's post event impact. Immediately following a natural disaster, individual households are often left without electrical power. This electricity powers not only the lights and air conditioning at the residence, but it also powers the essential services such as water, sewer, and traffic signals as well as residential medical devices. Pre-event planning can help to mitigate energy disruptions for many households.

Some of these energy issues following a natural disaster or other event could be alleviated by the use of backup generators for the short term and by the installation of household photovoltaic solar systems for the long term. However, each of these solutions has their faults and inherent problems. Both of these systems are expensive and cost prohibitive for many households but depending on the scale of implementation, can be cost effective for short term use.

Backup generators come in many sizes, from small portable generators that can provide limited power for up to 6 hours on a tank of gas to whole home generators that can cost up to $20,000 with a run time that is only limited by the size of the fuel tank. Since most of the whole home generators run on natural gas, changes in price or post event supply can affect the household's ability to replenish their personal supply.

Residential solar power generation could be a bridge that would let households take advantage of the sun to satisfy their daytime energy needs. Residential solar installation is expensive and, although there are rebates and incentives in existence, is not financially feasible for every household. The results of the Energy Survey determined that most households either would not purchase solar systems or would expect a return on investment in between 1-5 years. Although there is no standardized return on investment timeline due to individual power usage, location, and size of solar system, the upper end of this expectation by households is attainable when generous incentives are factored in.

Although these backup generator and photovoltaic solar installations can be costly, the use of both backup generators for night time electrical power generation and photovoltaic solar for daytime electrical power generation, households could mitigate most of the post event impacts associated with natural disasters.

The most common form of post event disruption in Florida comes from natural disasters, specifically hurricanes. This is largely due to a vulnerable overhead power grid. The force of hurricanes often causes tree or other debris to impact the overhead power lines whereby causing the power lines to fail. By placing the overhead power lines underground, more of the electrical grid would be protected and could reduce recovery time, effort, and facilitate rapid restoration of power post event.

Impacts on Business Sectors

Stable and inexpensive energy prices are essential to a businesses production, both in a terms of goods transit and labor. In order to be able to produce a product or service, energy will be consumed. In order to manage the production of a product or service, energy will be used by the workers. To deliver such product or service, energy will be used to transport the good or service. These costs are all factors when deciding how much to charge a consumer for such good or service.

If these production costs increase, the good or service must in turn increase. If the products being sold are basic materials used to by other companies to produce more sophisticated products, then the production companies must also raise their prices of their products or reduce the wages of their employees. The end consumer would then be less able to buy the same goods and services as before and would in turn need additional income, which would repeat the cycle by raising the costs of labor, causing a higher inflation rate.

The basic inputs when determining the cost of doing business are the production costs or the factor input costs. The factor input costs can be broken down into three categories, Labor, Fuel, and Capital. A decrease or increase in any of these costs would alter the equilibrium. If capital prices were to decrease, a company could purchase more machines or buildings to produce more. Furthermore, the barriers to entry to engage in such business would decrease allowing new companies to develop, creating competition. Different industries will use different sources of energy and will attempt other means to solve this variable cost, but in order to produce, costs need to be stable, inexpensive and reliable. If these prices can't be certain, a company would need charge extra to save away or would decide against producing.

In order for businesses to invest and produce in the region, energy must be reliable, inexpensive, and stable. The more inexpensive it is, the cheaper it could sell its products or services. If energy becomes unreliable, unstable in terms of price, or expensive, businesses must charge more to offset the losses. Rising prices create a ripple effect that causes inflation. High periods of inflation, not due to growth, will create a recession or worse.

Transportation/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 (trade activity by country is shown below). 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 home to vibrant cruise industry, in which 13.3 million customers experienced in 2011.

Figure 6: Florida Ports

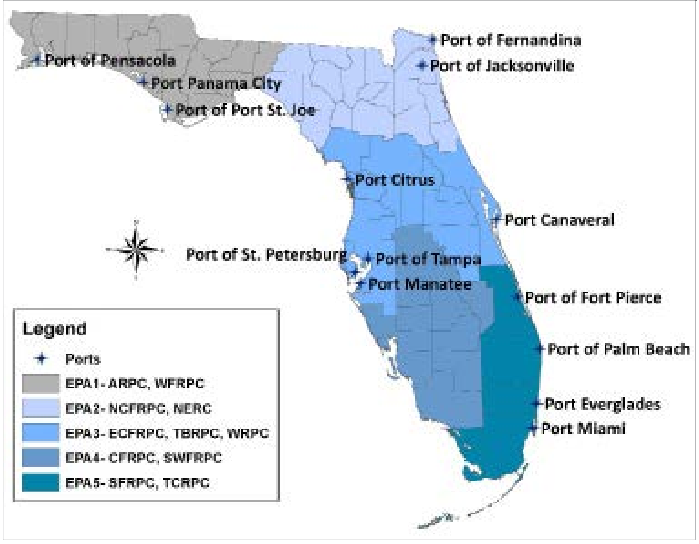


Table 1: Florida's International Trade By Global Region 2009 to 2011 (US$ 000,000)

Region	Value of Trade	Percent of Total	Value of Trade	Percent of Total	Value of Trade	Percent of Total	Percent Change 2011 over 2010
South America	$37,334.6	36.3%	$46,144.0	36.6%	$55,805.5	37.4%	20.9%
Asia and the Middle East	$18,592.8	18.1%	$24,924.3	19.7%	$28,056.0	18.8%	12.6%
Europe (Excl. Turkey)	$16,705.6	16.2%	$19,279.5	15.3%	$23,487.7	15.7%	21.8%
Central America	$13,105.5	12.7%	$16,495.8	13.1%	$18,870.8	12.7%	14.4%
Caribbean	$10,907.8	10.6%	$12,116.2	9.6%	$14,159.6	9.5%	16.9%
North America	$4,207.3	4.1%	$5,229.6	4.1%	$6,536.9	4.4%	25.0%
African Continent	$1,747.3	1.7%	$1,507.6	1.2%	$1,557.0	1.0%	3.3%
Australia and Oceania	$390.3	0.4%	$531.0	0.4%	$692.8	0.5%	30.5%
TOTAL	**$102,991.2**	**100%**	**$126,228.0**	**100%**	**$149,166.3**	**100%**	**18.2%**

Source: Enterprise Florida, based on U.S. Census Bureau

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. For instance the Orlando International Airport relies upon aviation fuel that is piped in through the Tampa Port. 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.

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.

Renewable Power Sources

Florida is one of the largest energy consumers in the country, due to its large population, hot summers, land size along with its relatively low population density, and lack of mass transit options. Florida ranks third among states for its transportation fuel usage. Residential customers are the largest users of electricity in Florida and account for more than 52% of the electricity generated in Florida, due in no small part to the need for air conditioning. But the source of Florida's heat 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. However, only about 3% of the electricity generated in Florida is from renewable sources. Florida is in the minority of states that have yet to pass a Renewable Portfolio Standard, which would encourage the growth of clean energy by requiring utilities to generate a certain percentage of their power from renewable sources.

Solar Energy

The Solar energy capacity in Florida 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.

Florida Power & Light (FPL) deployed a number of solar arrays at their power plants to create energy during the peak demand time frame, ironically caused in part by customers needing electricity to run their air conditioners. Due to these expansions, in 2010 Florida became the second largest supplier of utility-scale solar power in the country. The Martin Next Generation Solar Plant became the first hybrid solar plant in the world. It's connected to a conventional power plant and directly offsets the burning of fossil fuels. The Martin plant is forecasted to reduce Florida's oil consumption by 600,000 barrels, saving customers over $175 million in fuel costs over its lifetime.

Biomass Energy and Cellulosic Ethanol

Florida is actively involved in the research and development of biofuels. Ethanol from corn is not ideal to grow in Florida, the University of Florida has begun biomass research that focuses primarily on traditional Florida agriculture sugarcane and sweet sorghum. Sugarcane is Florida's third-largest commercial crop, trailing only nursery and citrus.

Other alternatives include with fast-growing trees as a renewable fuel source for electric utilities, the project would cultivate special trees that can grow 20 feet a year, with an annual yield of 32 green tons and 16 dry tons of biomass per acre. A proposed 55 megawatt wood waste biomass power plant in Port St. Joe is in development plans and would sell most of its electricity to Progress Energy.

Wind Energy

Relative to the other places in the US, Florida doesn't have the best winds to make large commercial wind farms viable. However, it is important to take notices of the future developments as small-scale wind installations might make sense in windy areas. Additionally, offshore wind farms may become more feasible as more research is put into the process.

Biogas Energy

Methane emissions account for 7% of Florida's greenhouse-gas emissions and present a clear opportunity: every year, Florida livestock emit 19,000 tons of methane that could be captured to generate clean electricity. University of Florida has created lagoons and fixed-film digesters to suit Florida's farms. The state currently has two operating anaerobic digesters, including a fixed-film facility. 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.

Florida has passed a number of laws encouraging alternative energy uses, such as solar photovoltaic, solar thermal, and solar thermal pool heating systems through rebates or incentives and in 2008 the Energy and Economic Development Act established a myriad of requirements and goals for reducing pollution, increasing energy efficiency, and giving Florida a more secure energy future. Unfortunately, due to the lagging state economy, most of these new grants, loans and programs were not funded by the 2010 Legislature. Even existing programs, like the Solar Energy System Incentive Program, were not funded in 2010. With the help of a federal grant however, Florida created the Energy Star Appliance Rebate Program that handed out $17 million in rebates to offset the purchase price of new energy efficient appliances.

Businesses and investors are keenly interested in economic development related to green technologies. At the national level, venture capitalists sank $740 million into biofuel firms in 2006, compared to $111 million in 2005. The broader advanced energy technology sector attracted $2.9 billion in venture capital in 2006, outstripping even FY2008 federal appropriations of $2.7 billion. Investors in alternative energy sources have a unique opportunity as the industry develops in Florida. Mixed signals from recent legislative sessions will not provide necessary assurances to investors looking at Florida to develop these markets. State government must send clear signals to the marketplace that it is making a firm commitment to encouraging the development of these alternative and renewable energy sources and technologies.

Disaster 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 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.
- Florida Progress Energy
- 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

The ESF 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 have their own operations centers to direct their responses.

The Department of Agriculture and Consumer Services, FDACS Office of Energy provides staff for the fuels portion of ESF 12. Prior to a hurricane, this group will monitor fuel flow into Florida to ensure that there is sufficient fuel to allow for a potentially large scale evacuation. With a major hurricane approaching from the south, the evacuation can dramatically impact traffic in a large portion of the state. This group also monitors the flow of ships into Florida's ports which are the primary source of vehicle fuels. This section is critical to energy assurance since it must also be prepared to support emergency response operations which can lead to a quicker recovery.

In order to increase preparedness, there is an Annual Statewide Hurricane Exercise which is typically held in May of each year. This is prior to hurricane season which runs from June 1st through the end of November. In April 2012, the state also conducted a Statewide Geomagnetic Storm Exercise, which was precluded by smaller regional table top exercises.

While ESF 12 - Energy is primarily responsible for fuel and electricity assurance, ESF 10 - Hazardous Materials would also be involved if there was a spill or release of a fuel either during transport or at a fixed facility.

Hurricanes aren't the only threat to energy assurance. Tornados, floods and wildfires can also impact the normal flow of energy. Droughts can also impact fuel availability since ethanol in gasoline in the United States primarily comes from corn. Tsunamis and earthquakes are an extremely low probability in Florida.

Geomagnetic Storms, Solar Winds and Coronal Mass Ejections also have the potential to cause massive disruption to the electrical grid system. These solar events can induce currents in high voltage electrical distribution lines and cause damage to transformers and other systems. Another hazard is that global positioning satellites can be damaged or temporarily knocked out of service, which could impact the navigation of ships carrying fuels.

The impact from oils spills was apparent during the Deep Water Horizon spill. New drilling is being started off the coast of Cuba which presents additional threats to Florida coast.

Summary of Survey Results

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

Methodology

The population surveyed in each of the two survey samples were households and businesses within five Energy Planning Areas (EPA 1, EPA 2, EPA 3, EPA 4, and EPA 5). The sampling frame was taken from all working cellular and landline telephone numbers. Kerr & Downs Research's office conducted telephone interviews using CATI system from May 2012 to June 2012. The person most knowledgeable about energy in each household or business participated in the survey. All survey responses are anonymous and reported only in summary form.

A total of 750 residential surveys and 750 business surveys were collected. There were 150 residential and 150 business surveys completed in each of the 5 EPAs.

Given a 95% confidence interval there was a 3.6% points in the total study and 8.0% points for each Energy Planning Area.

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

The annual household income of those surveyed is lower than Florida's median household income of $46,136 and considerably lower than the U.S. median household income of $50,443 (2010 Census, U.S. Census Bureau).

Business profile:

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

General trends in the survey results include (Break out box):

- A plurality of support for domestic or renewable energy, especially if it will help enhance domestic energy security.
- A plurality of support for investing in energy conservation equipment, given appropriate payback periods.
- A majority of unwillingness 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.

Residential Energy Survey Findings

When considering payback periods for energy saving investments, pluralities of citizens would buy energy saving equipment depending on the payback periods. The survey found that 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. Homeowners are more willing to invest in all energy saving equipment than those who lease; individuals on long-term leases are slightly more likely to invest than individuals on short-term leases.

The attitude towards spending on energy saving equipment was that the "typical" individual would spend $2,000 on energy saving equipment. Among the individuals who would spend for energy saving equipment, the average expenditure was over $3,200. With savings from energy saving equipment the study found that 40% of individuals would add to their savings and investments and 24% would make improvements to their house or buy a new house.

An increase or decrease in a utility bill can have an impact on one'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.

The increase of gas prices also has an impact on consumer spending. With the typical resident surveyed spending $200 a month on gas, gas expenditures would have to increase $55 per month for the typical resident to have to cut back on entertainment expenses and increase $100 per month for them to make major lifestyles changes. It is significant to note that half of residents, 51%, do not have a plan for keeping total energy costs stable if energy costs were to increase sharply.

What motivates individuals to conserve energy is important to consider when coming up with statewide energy strategies and policies. This study concluded that 39% of individuals are motivated more by energy cost savings than by concern for the environment (8%) when purchasing energy conserving products. A plurality of individuals (47%) said that they are equally motivated by cost savings and by concern for the environment.

55% of residents support government requiring utility companies to match renewable or alternative energy sources to geographical suitability, but only 32% of residences are willing to pay higher utility rates for their utility company to use renewable or alternative energy sources. Of those willing to pay higher rates, the majority would be willing to pay 5-10% more.

Should Florida create an energy policy? 86% 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 domestic energy sources and less focus on foreign energy sources. The more proactive the State is when it comes to leading residents to conserve energy, the stronger the State can recover from a potential energy impact.

There was support for different methods of promoting energy conservation and use of alternative energy.

Business Energy Survey Findings

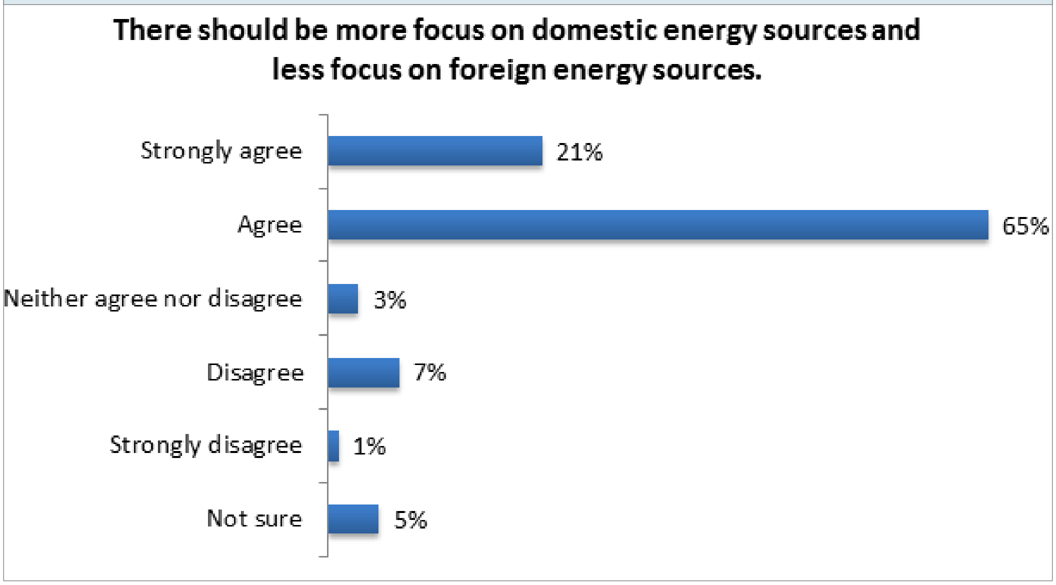
Unlike the residents surveyed, a plurality of businesses would not buy energy saving equipment regardless of the payment periods. 50% would not invest in $500 in window tinting, 45% would not invest in $5,000 energy efficient heating and air-conditioning systems, 52% would not invest in $10,000 in solar panels, and 50% would not invest $20,000 in energy saving equipment. Similarly to residents, businesses that owned their buildings are more likely to invest in energy saving equipment than business that lease; businesses with long-term leases are slightly more likely to invest than those with short-term leases. This is a significant finding when thinking about economic development post-disaster planning. In order for the State's economy to rebound quickly after an event or impact, businesses must participate in this effort and begin to adopt energy contingency plans or business continuity of operations plans.

The "typical" business would spend $100 on energy saving equipment and among the businesses that would spend for energy saving equipment; the average expenditure would be over $9,000. With savings from energy saving equipment, 49% would add to business savings and investments and 29% would make improvements to the building or operations.

What would you do with energy savings? (Multiple responses were permitted)

Business operations costs can affect the success or failure of that business. For the "typical" business, $500 per month is

Figure 7: Busines Survey Results - Energy Sources



spent on fuel for transportation. A significant increase in the price of products or services would have to be implemented if the price of fuel were $5 per gallon. The typical business would be forced to close if the price of fuel were $8 per gallon. It is significant to note that only 34% of businesses have a plan for keeping costs for producing and delivering their products or services stable if energy costs were to increase sharply. It is important for businesses within the state to consider creating and maintaining a Business Continuity of Operations Plan (COOP). This plan would identify internal and external threats and provide effective strategies for prevention and recovery. Plans would be established for provisions for alternate facilities, personnel, resources, communications, and vital records. The rise of gasoline prices are inevitable, thus the need for strategies to mitigate the negative impacts to businesses.

The relationship between business and energy providers is important to consider when creating new energy standards and when energy providers consider altering their renewable investments. 33% of businesses are willing to pay higher utility rates for their utility company to use renewable or alternative energy sources. Of those willing to pay more, the majority would be willing to pay 5-10% more.

56% of businesses agree that government buildings should be required to use renewable or alternative energy, 79% of businesses agree that the State of Florida should take a more active role in promoting energy conservation, and 86% of businesses agree that there should be more focus on domestic energy sources and less focus on foreign energy sources.

Online Survey

Questions were taken from the statistical survey and adapted to an online format. Two surveys, 1 residential and 1 business, were distributed throughout the entire state using different online platforms and emails.

The major disparities between the statistical and online residential survey were:

Question: How long would the payback period from energy savings have to be for you to invest $500 in window tinting?

- Statistical Survey – 54% would not purchase window tinting or were not sure
- Online Survey – 45% would need a payback period of one to two years or less than one year

Question: What is the most you would spend in a year on energy conservation equipment if it met your desired payback period?

- Statistical Survey – 24% were not sure and 13% would spend $0
- Online Survey – 21% would spend more than $5,000, 28% would spend $1,001 to $3,000, and only 2% felt they would spend $0

Question: How would your utility bill have to increase for you to make major lifestyle changes?

- Statistical Survey – 25% said $0
- Online Survey – 24% said $101 to $150

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

The differences may have been a result of the survey sample. The demographic characteristics between the statistical survey and online survey were vastly different. 51% of those surveyed

Figure 8: Business Survey Results - Energy Investments

	Add to business savings and investments	Improvements to buildings, operations, etc.	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%

online had an annual household income of over $80,000 as opposed to an average of $41,000 for the statistical survey. Additionally, 55% of those surveyed online had a master, professional, or doctorate degree with that majority of the statistical survey having an associate's degree or higher.

It is significant to note, that regardless of income and education levels, a majority of both online and statistical residential survey respondents do not have a plan in place for keeping total energy costs stable if energy costs were to increase sharply (51% from the statistical survey and 62% from online). Again, this is an important finding and underscores that we must work together to ensure that more residents are prepared for energy impacts or events, big or small.

The major disparities between the statistical and online business surveys were:

Question: How long would the payback period from energy savings have to be to invest $500 in window tinting?

- Statistical Survey – 75% would not purchase or were not sure
- Online Survey – 38% would invest for a payback of one to two years or less than one year

Question: What is the most your company would spend in a year on energy conservation equipment if it met your company's desired payback period?

- Statistical Survey – 40% would spend $0 and 28% would spend more than $5,000
- Online Survey – 53% would spend more than $5,000 and 14% would spend $4,001 to $5,000

Question: Motivation when purchasing energy conserving products?

- Statistical Survey – 42% were 50/50 on energy cost savings and concern for the environment
- Online Survey – Plurality concerned with energy and cost savings (31% were 100% by energy and costs savings) and 30% were 50/50 on energy cost savings and concern for the environment

There was a different between the demographic profiles of the online and statistical business survey takers.

Online survey profile:

35% employ 75 more
71% own or have a short term lease (more than 5 years) the building they are operating in
26% professional and technical services

Statistical survey profile:

Typical business had 4 employees
22% were office/professional
There seems to be a disconnect between the support for the idea that there should be more focus on domestic energy sources and less focus on foreign energy sources and the willingness to pay a higher utility rate for the utility company to use only energy produced in the United States.

The results of these surveys were used when creating the energy assurance strategies in this report as well as within some of the economic modeling assumptions. It was an important factor of this study to understand what Florida residents' and businesses' behaviors and attitudes towards energy were. How they felt about making specific energy investments and what they understood about energy helped guide the report findings and recommendations.

Florida Energy Assurance

Economic Analysis

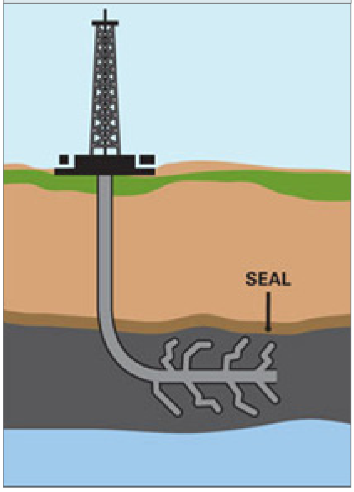
Several different scenarios were modeled for the State of Florida to investigate the impact that potential energy price changes, potential supply disruptions, or resiliency or assurance strategies might have on the economy. All the scenarios presented in this section of the report were modeled utilizing Regional Economic Models, Inc. (REMI) PI+ Software (ver. 1.3.13). The results will be presented depicting estimates on a statewide level comparing Energy Planning Areas (EPAs).

Natural Gas Price Increase or 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 (see figure). This has led to vast increases in supply of natural gas. Subsequently, the price per unit has dropped substantially.

Figure 9: Diagram of Natural Gas Fracking Technology



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 (see figure). 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 (see chart), and most estimates say that it will be responsible for closer to 60% within a decade if these trends continue.

Figure 10: Natural Gas Utilities and Pipelines

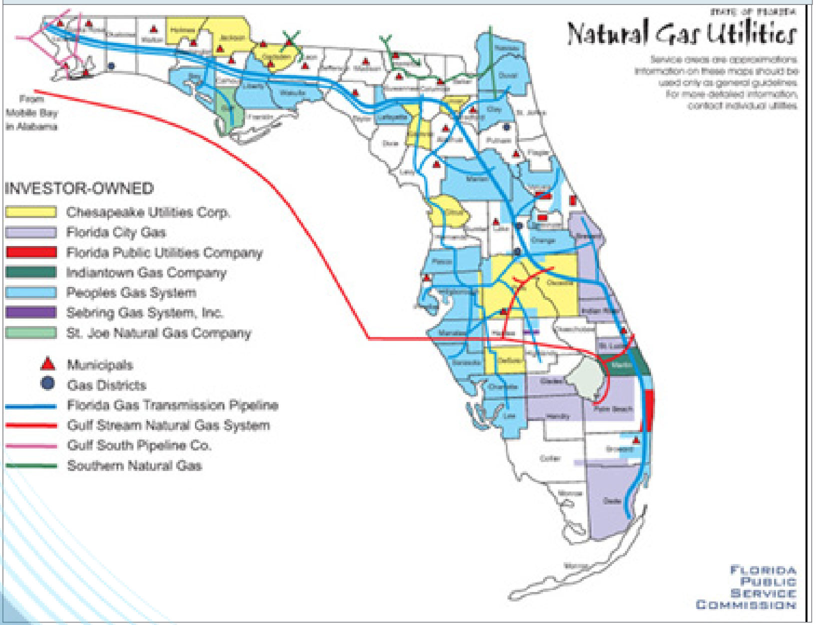
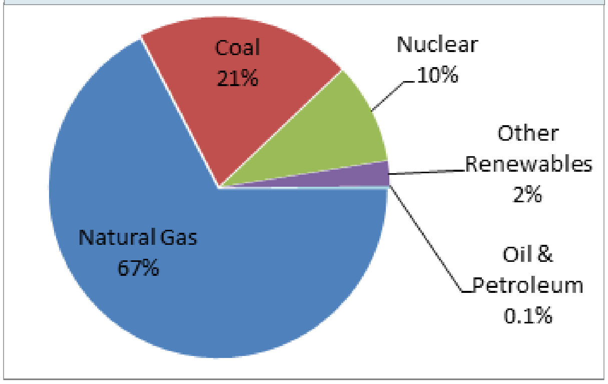


Figure 11: Florida Net Electricity Generation by Fuel



Source (U.S. EIA, Nov. 2012) (GWh)

Some other reasons that natural gas has been 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."

Figure 12: Natural Gas Historical and Forward Prices

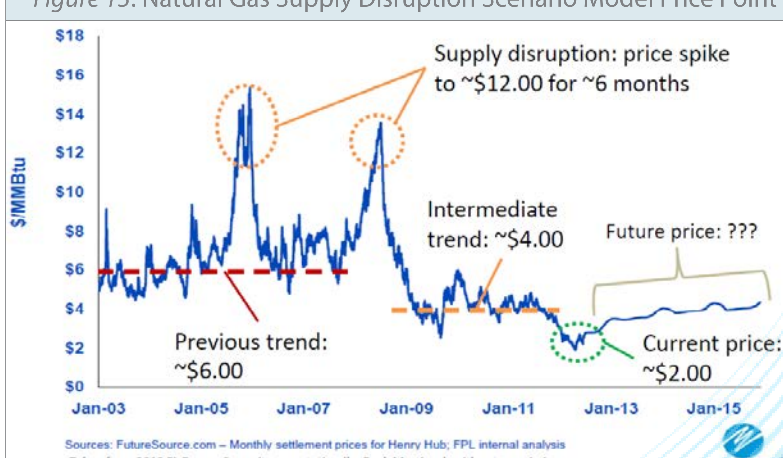
There are also no significant natural gas wells or nuclear material extraction areas in Florida to date. This means that Florida is extremely reliant upon external sources, including other states and nations, for its power supply. In addition, these fuels must be transported into the state, which means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

Since natural gas plays a majority 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 the following chart. 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.

Figure 13: Natural Gas Supply Disruption Scenario Model Price Point



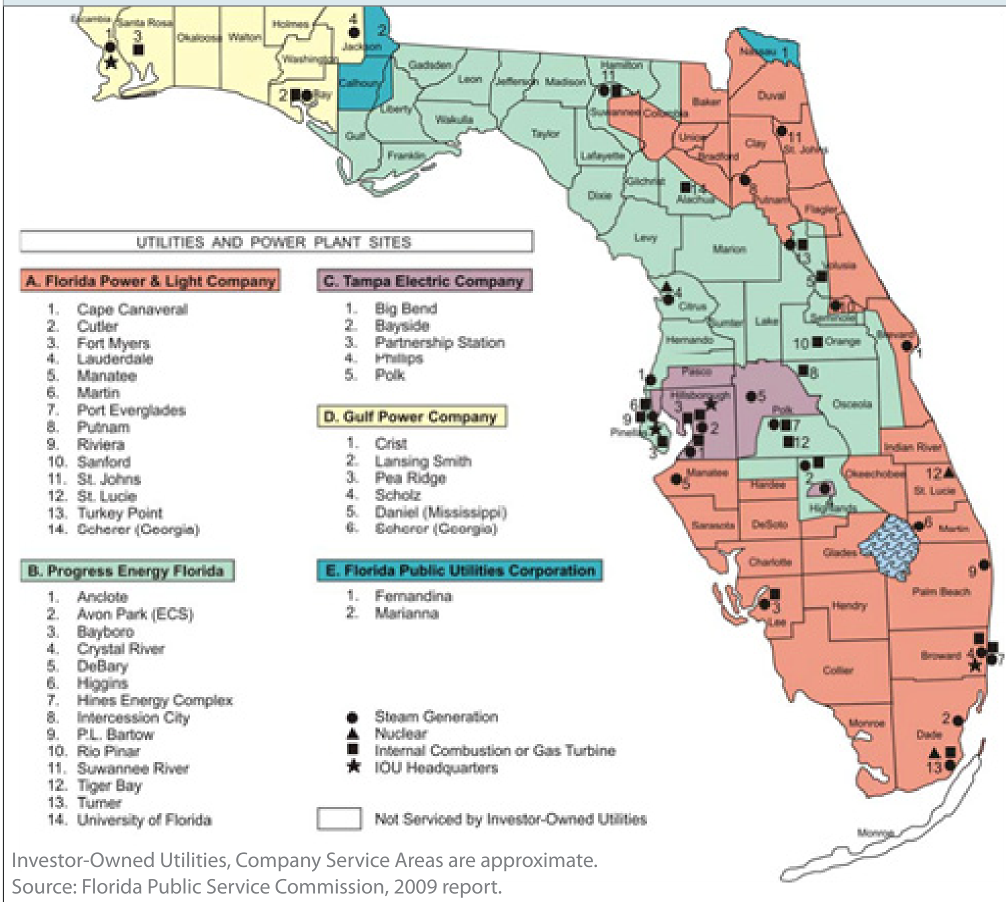
Potential Impacts of higher Natural Gas Prices or supply disruptions:

- 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 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.

Figure 14: Utilities and Power Plant Sites



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

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

1. 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.

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 became formed the basis for a supply disruption scenario.

Part of the development of this scenario involved determining what proportion of electricity was generated using natural gas as a fuel, for each county. The following map displays the service boundaries for the five major Investor-Owned Utilities in Florida. For the purposes of this project, the use of natural gas was estimated for the largest four service provision areas only. No attempt was made to determine individual county consumption of natural gas either directly or via electrical generation, but estimates were made using rates determined from each utility's ten-year site plan, located here: http://www.psc.state.fl.us/utilities/electricgas/10yrsiteplans.aspx. These amounts are summarized in two tables herein.

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, 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.

Table 2: Analysis of Natural Gas as a Component of Electricity Production

Analysis of Natural Gas as a component cost of electricity production.					
		GWh generated		**% GWh from Natural Gas**	
Company		**year 2010**	**year 2011**		
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%**	**average**
	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%**	**average**
	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%**	**average**
	Source: http://www.psc.state.fl.us/library/filings/12/01935-12/01935-12.pdf page 38				

Table 3: Percentage of Electricity Costs Affected by Changes in Natural Gas Prices

Percentage of electricity costs that will be affected by an increase in natural gas prices.				
	% revenue spent on fuel (i.e.- this is the non-infrastructure costs of natural gas electricity)			
Company	**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.				

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 below. 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 chart displays the graphical differences between EPAs with respect to the barometer indicators, for comparative purposes.

The following chart compares the impacts to regional GDP of the two scenarios modeled by Regional Planning Council (RPC). This level of detail reveals differences between the RPCs that are probably primarily driven by differences in the dominance of different natural gas-reliant industries or by differences in fuel source composition of electricity providers that serve each RPC.

Table 4: 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 five 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.

Statewide Value Added and Existing Infrastructure

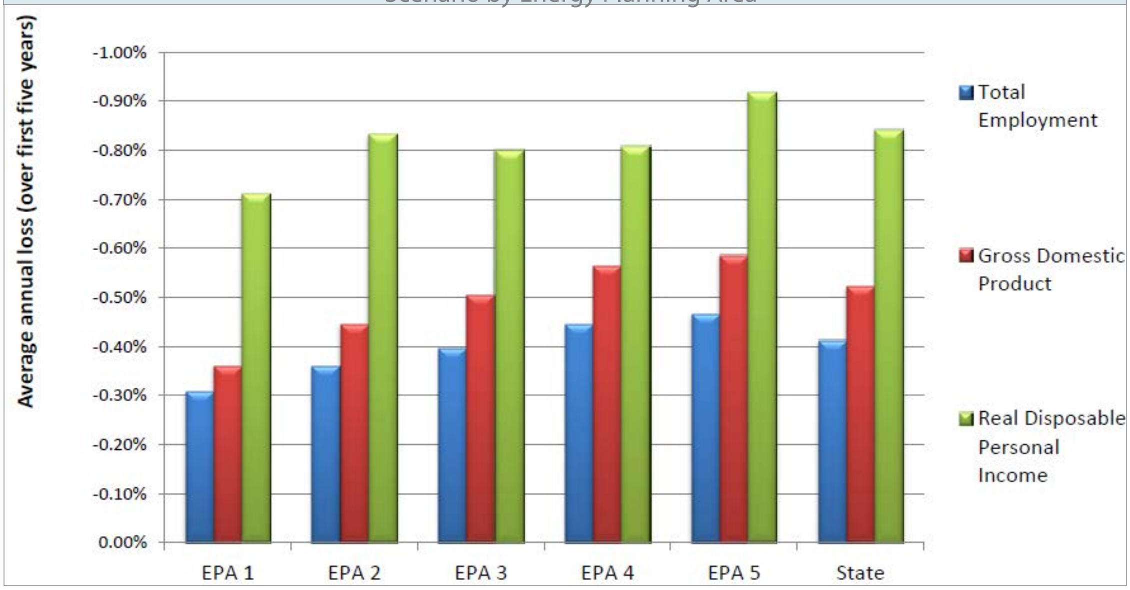
There are some readily apparent alternatives to the existing infrastructure and reliance on natural gas as a primary fuel source for electricity. Using the existing infrastructure, but expanding to a more diverse fuel portfolio would reduce dependence on natural gas. However, the costs associated with 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 vsources, so further investigation would be necessary to determine the potential advantages and disadvantages and weigh those against the current mode. Obviously with natural gas's 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

Table 5: 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 loss over first five years					
	Total Employment	**Total Employment**	**Gross Domestic Product**	**Gross Domestic Product**	**Real Disposable Personal Income**	**Real Disposable Personal Income**
Energy Planning Area	**jobs**	**percentage**	**billions of 2005 dollars**	**percentage**	**billions of 2005 dollars**	**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.

Figure 15: Comparison of Statewide Six-month Natural Gas Shortage Scenario by Energy Planning Area



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.

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.

Conclusion
It is important to fully understand the limitations of the scenario modeled and the assumptions present in the modeling software when drawing conclusions about the economic impacts modeled. Room for improvement exists within this scenario modeling for further refinement of the exact fuel mix for each electricity generation facility within the state and the exact population that 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:

- 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.

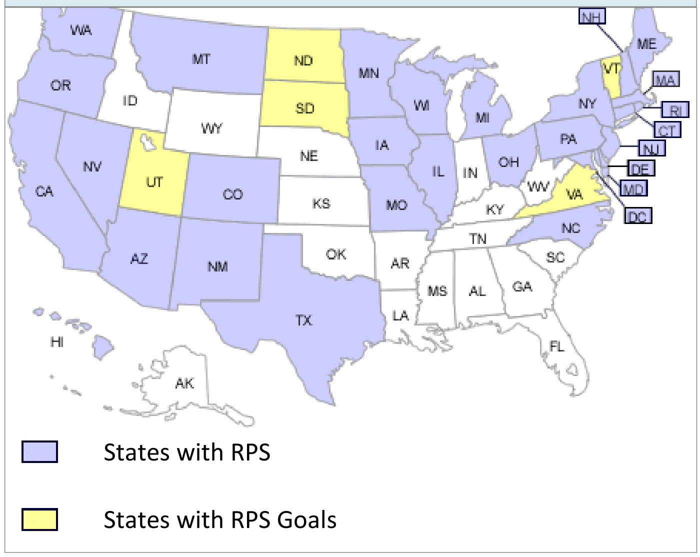
When compared with the outcomes predicted by the gasoline price increase scenario due to supply disruption, it becomes apparent that the economy of Florida is more affected by price increases in gasoline than natural gas. This is likely because gasoline affects not only direct consumption, but is also 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.

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.

Figure 16: States With RPS Requirements, 2009



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

As of March 2009, RPS requirements or goals have been established in 33 states plus the District of Columbia (Figure 1). 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 (FPSC) to establish appropriate "goals" for renewable energy generation in the state. In 2009, the FPSC 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 Florida Renewable Energy Portfolio Standard (RPS) from the Florida Statutes.

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

Florida Statues Section 366.91(2)(d) 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."

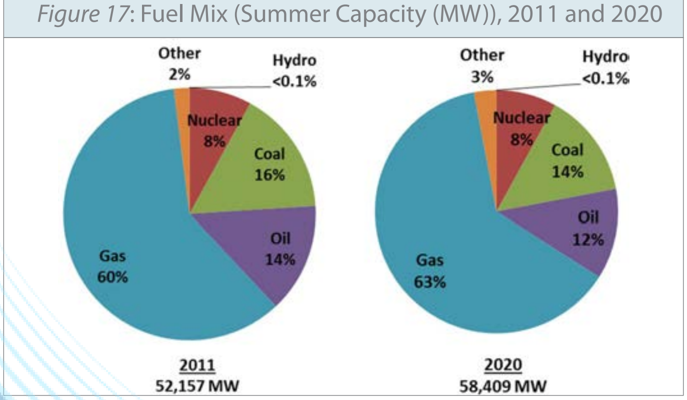
Florida utilities purchase 384.3 megawatts (MW) of firm renewable energy and 732 MW of non-firm (sporadically available) renewable energy (2011 FRCC cite). Florida utilities currently own 83.5 MW of renewable energy.

- 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

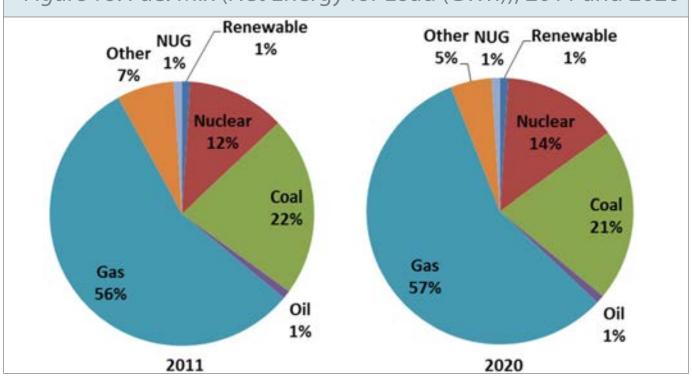
Florida RPS Assumptions

Figure 17: Fuel Mix (Summer Capacity (MW)), 2011 and 2020



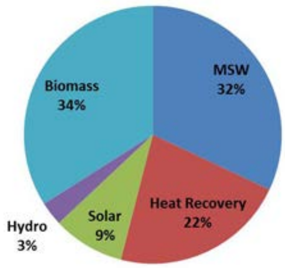
Source: Florida Reliability Coordinating Council

Figure 18: Fuel Mix (Net Energy for Load (GWh)), 2011 and 2020



Source: Florida Reliability Coordinating Council

Figure 19: Renewable Resource Capacity (of 1,282 MW), 2011



Source: Florida Reliability Coordinating Council

Figure 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

- 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 are listed in Table 6.

Table 6: Capital Investment and Relative Costs/Prices

	Biomass	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/)

Based on the assumptions, we develop an alternative summer capacity and actual energy generation. The differences are shown in Table 7 and Table 8.

Table 7: Added Summer Capacity (MW) Through 2020

	Biomass	Solar PV	Natural Gas	Coal
Baseline	+308	+325	+5,503	+791
Alterna-tive	+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 8: Added Net Energy for Load (GWh) Through 2020

	Biomass	Solar PV	Natural Gas	Coal
Baseline	+2,266	+797	+22,394	+5,167
Alterna-tive	+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.

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 9: 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 will undoubtedly reduce the dependence on fossil fuel as well as stimulate job growth in the State of Florida.

Biofuel Development

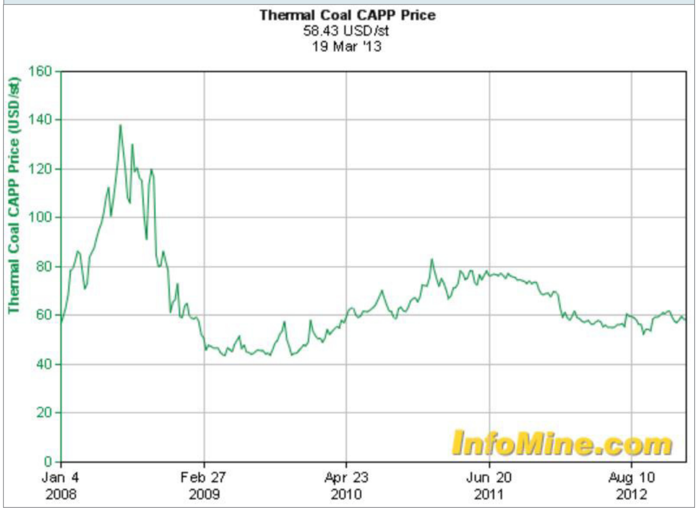
Introduction

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 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

Figure 21: Thermal Coal CAPP Price (of 1,282 MW), 2008-2012



Source: InfoMine.com

product will be the 'energy cane' cultivated under continuing development at the IFAS research stations across Florida.

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

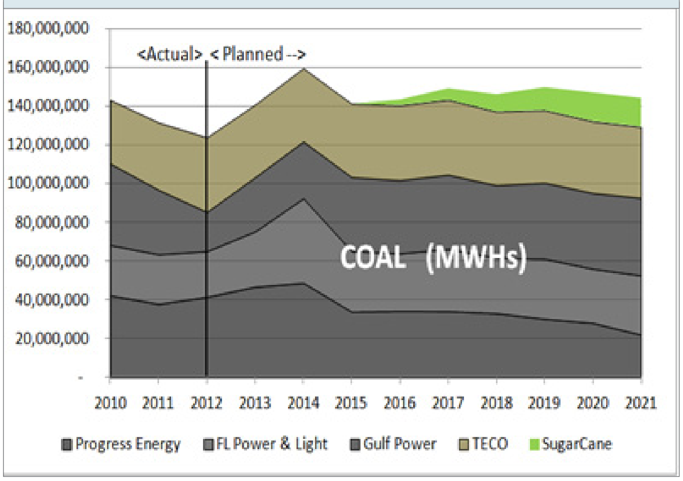
Three policy changes were made to the standard forecast in the REMI model that were run simultaneously. The first model the costs of production as an economic stimulus in Florida's three Regional Area of Critical Economic Concern. Economic assistance might be available as a value added agricultural stimulus, but would require a policy change from current DEO 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 South Florida's FHREDI region to 200,000 total acres proposed for the Opportunity Florida and the North Florida Economic Development Partnership. The increased acreage compensates for reduced growth potential and nets the same yield per RACEC.

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 econometric staff, 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. The southern region, FHREDI becomes profitable in the fifth year while the two northern regions do not turn a profit until year six.

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. The graphic 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.

Figure 22: Coal Use of Florida's Coal Burning Utilities



Source:

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 presents the effect on employment in the three regions.

Table 10: Total Employment

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	466	3,409	3,163	2,925
N. Fl. Economic Dev. 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 11: Population

RACEC Region	2015	2020	2025	2030
Opportunity Florida	213	12,746	29,253	36,502
N. Fl. Economic Dev. 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. The following chart shows the impact to the regions' Gross Domestic Product measured in Millions of dollars annually.

Table 12: Gross Domestic Product $Millions

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	31	116	115	115
N. Fl. Ecomomic Dev. 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 13: Personal Income ($Millions)

RACEC Region	2015	2020	2025	2030
Opportunity Florida*	22	111	162	203
N. Fl. Ecomomic Dev. 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.

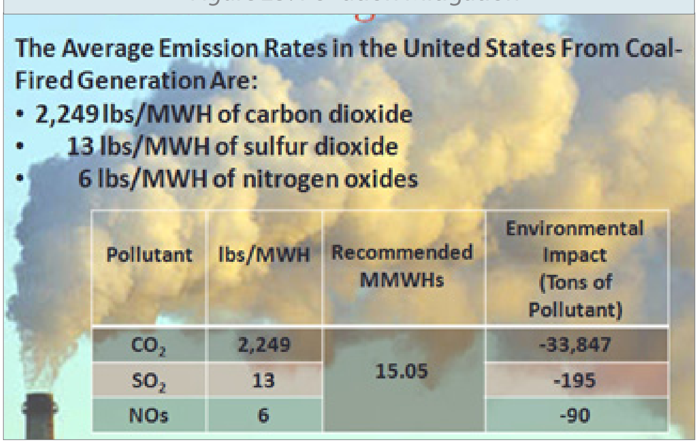
Statewide Value Added and Existing Infrastructure

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 retro fitting 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 while growing, 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. Reduction the relatively minor 11% consumption would have beneficial environmental effect 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 23: Pollution Mitigation


The Average Emission Rates in the United States From Coal-Fired Generation Are:

- 2,249 lbs/MWH of carbon dioxide
- 13 lbs/MWH of sulfur dioxide
- 6 lbs/MWH of nitrogen oxides

Pollutant	lbs/MWH	Recommended MMWHs	Environmental Impact (Tons of Pollutant)
CO_2	2,249	15.05	-33,847
SO_2	13		-195
NOs	6		-90

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 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, tax rebates for equipment, and 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 Cars Integration

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

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

The Nissan Leaf and Chevy Volt are current examples of 100% or hybrid electric mix vehicles. These typically cost around $32,700 and can travel a distance of 100 miles per charge. A power consumption of 34 kWh is typical for a 73 mile round trip. 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 2031 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 2031.

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 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 2031. 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 2031.

An average fuel cost per vehicle were 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.

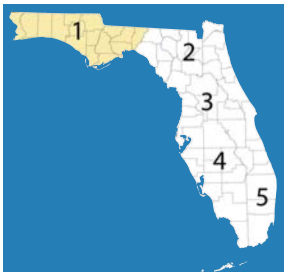
Results:

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. There was a statewide increase in jobs of 652 modeled statewide with a net increase of gross domestic of $37 million.

Case Studies

Florida Regional Planning Councils have identified different ways to encourage assurance from a bottom up supply. Through specific case studies, RPCs utilized 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 sources of energy will be explored. Also examined is why the specific alternative was chosen, what obstacles were overcome, if any, and what could be improved.

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



STEWART PARSONS NEAR ZERO RETRO-FIT

Description: Residential photo-voltaic solar electric systems can be sized to provide full electric power required for sustained usage. Installation costs still present the primary obstacle to wide spread adoption. The Parsons residence, near Chattahoochee, Florida, is a 2,400SF 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- 3x5 ground mounted photo-voltaic 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. 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 as the residence is served by a septic system, the entire utility bill is for power.

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.

Figure 1 Panel installation with home in background. Ground mount provides easy access for twice a year squeegee cleaning of panels.

Installed Costs for the Photovoltaic system:

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 2. Energy usage records prior to PV installation in summer 2009, 2007

Figure 24: KWh Usage Prior to Solar Installation

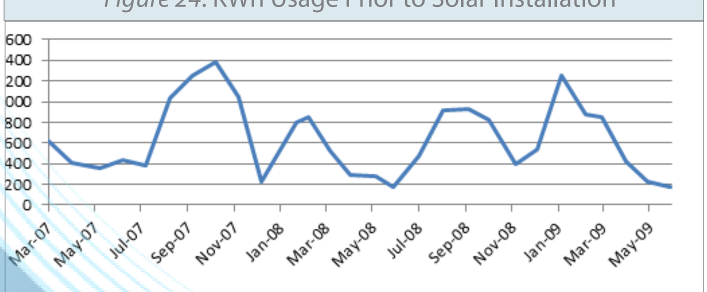


Figure 3. Energy Used vs. Energy Generated

Figure 25: KWh Used and Generated 2011-12

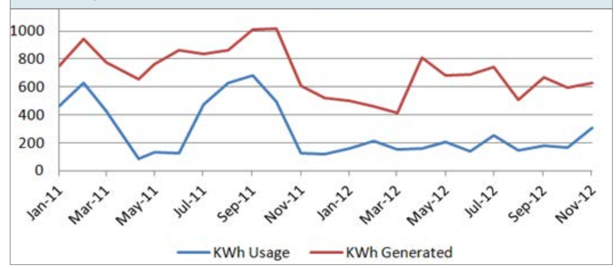
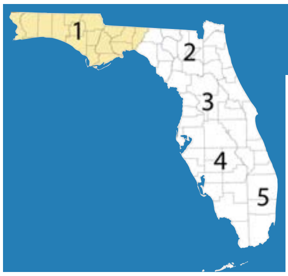


Figure 2 represents full occupancy (2 Adults) and normal energy usage. 2008-9 mark the beginning of energy reduction strategies. Records stop in this chart just prior to installation of 5KW Photovoltaic system.

In Figure 3 we see 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 put into the utility provider's system. The system was struck by lightning shortly after installation resulting in a loss of good record immediately after start-up. 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 .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 at home children. 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.

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 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 PB systems at this time.



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 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 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.

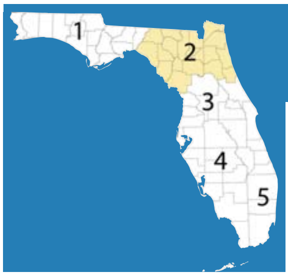
It is anticipated that there might twenty events annually. At this writing, the City of Tallahassee has 5MW of peak shaving capacity enrolled in the program and plans on twelve more for a total of 17MW by end of August 2013.

Case Studied PUBLIX Supermarkets:
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 the participation in the study, the participants are charged a lower rate year-round and get a fuel cost rebate for cost of 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.

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 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 Invetment: 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 Contact when questioned.



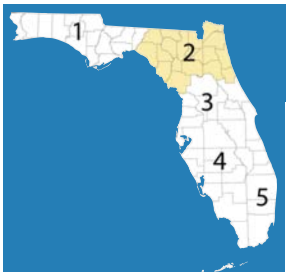
GAINSVILLE SOLAR VOLTAIC PANELS

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.

Total Costs: The system cost an initial $22,000 before the 30% tax credit. Any excess energy is sold back to Gainesville Regional Utilities using a net metering agreement. Purchased energy consumption dropped from 10,276 KWh to 4, 472 KWh. This resulted in an annual savings of $1122 in monthly electrical expense. This project enhances energy assurance since it can supply electricity during a disaster when the electrical grid may be down.

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 is used for heating. The solar system has encouraged the home owners to look at 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.



BIODIESEL FUEL PROGRAM USES RECYCLE COOKING OIL TO HELP POWER ST. JOHNS COUNTY VEHICLES

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.

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."

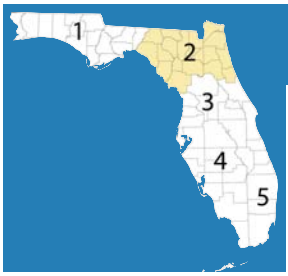
This project enhances energy assurance since it can supply a motor vehicle fuel during a disaster when there are often shortages of fuel. Joe Stephenson, Public Works Director says that, "Of all the things I've tried to do to make public works green, this is the most win, win, win situation that I have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

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

Payback period: 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: St. Johns County Website

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



TREE HILL NATURE CENTER ENERGY EFFICIENCY DEMONSTRATION PROJECT: GEOTHERMAL HEATING AND COOLING SYSTEM

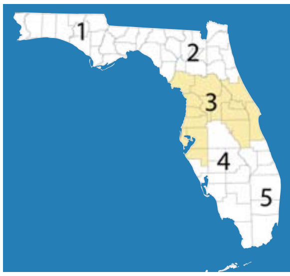
Description: Tree Hill Nature Center in Jacksonville Florida installed a Modern Energy Efficient Geothermal heating and cooling system in 2012 by using the IAS (Hawthorn Group) as the heat transfer medium instead of the underlying Floridan Aquifer System that is the primary source of drinking water for 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 Intermediate Aquifer System (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 is 25 or more years, the last five to seven years should provide a return on the investment. In the event of 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.



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 a 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. Pete's 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, 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."

Photo: Roundhouse Creative

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."

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 either, 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

Image: Roundhouse Creative

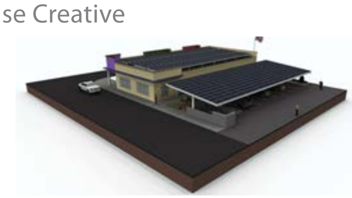
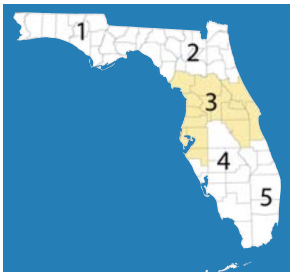


Photo: Roundhouse Creative

Florida Energy Assurance



DARDEN HEADQUARTERS SOLAR PHOTOVOLTAIC ARRAYS

Darden's Restaurant Support Center (RSC) Solar Array

Description: Darden's new 489,000 square foot Restaurant Support Center (RSC) opened in Orlando, Florida in 2009 and is home to 1,500 employees. 13 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 a 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 saved almost 40 million gallons of water since September 2009. They also diverted over 90% of all construction debris away from landfill changing the operational landfill diversion rate from 28% to 42% since 2009.

Overall, the new RSC 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.

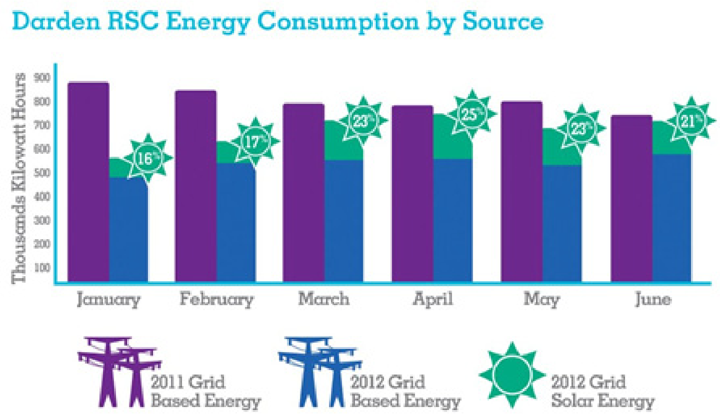
Darden received the Energy Star rating for Top Quartile Energy Performance.

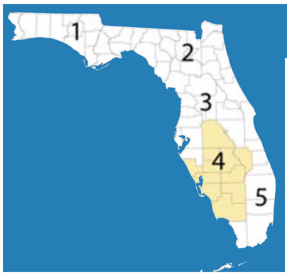
Total Costs: (materials plus installation)
A $5.6 million construction project with a conservation rebate of $260,000 from Progress Energy, the utility that serves Darden's headquarters.

A Jacksonville based contractor, Kenyon Energy, installed 4,404 Solar World mono crystalline panels covering both the garage and part of the main building.

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 after 10 to 12 years.





FLORIDA GULF COAST UNIVERSITY SOLAR INSTALLS

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 system, that is the second largest system located on a University campus in the U.S. and a cost-effective solar energy plan that would allow the University to continue expanding 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.

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. FGCU's 2 MW solar system is the second largest system located on a University campus in the US. Arizona State also has a 2 MW solar system. 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.

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 like 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 current estimate is $5.60 per KWh for a total of $11.2 million.

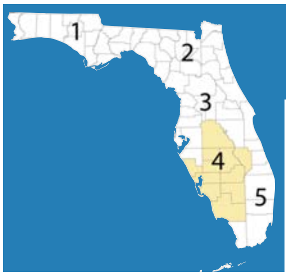
Two federal incentives were available to the university if the solar field went on line before the end of 2010, including a treasury grant that once took the form of a tax credit. About half of the project's total cost has been funded with a state grant, and the field is expected to save the university $700,000 to $800,000 a year in energy costs.

Payback period: The field is expected 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 $11.2 million then the project recoups cost 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.

Economic impacts: Extrapolating the project savings to all 12 State Universities would save the state $9 million in energy costs. 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 of solar in that case then the statewide savings to the university system would be $60 million.

Source: http://fgcusolar.com/the_project_installation



SADDLE CREEK LOGISTICS SERVICES COMPRESSED NATURAL GAS FLEET CONVERSION

Description: Saddle Creek Logistics Services is a third party provider of warehousing, transportation, packaging and fulfilment services. The transportation arm of Saddle Creek operates fleets of tractor trailers in markets across the country. In 2012, Saddle Creek replaced 40 of their diesel tractors with new ones that run on Compressed Natural Gas (CNG). This 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.

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. At current prices, Saddle Creek estimates that natural gas costs approximately 50% of the diesel gallon equivalent (dge).

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.

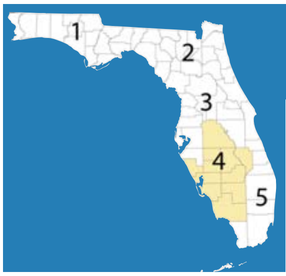
However, the conversion of a fleet to natural gas is not without tradeoffs. For instance, the construction of the CNG fueling station is a large purchase that many companies cannot justify, and may require many years to fully recoup costs. The on-going maintenance and operations of the fueling station 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.

Another large, upfront cost is the new tractors themselves; they cost around 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.

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. Both diesel and CNG trucks have an expected operational lifespan of 10 years, or about one million miles. Saddle Creek estimates that maintenance costs per mile for CNG trucks are about twice that of a regular diesel rig.

Finally, 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.

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.



SUSTAINABLE BUILDINGS PROGRAM

Description: Miami-Dade County West Lot Parking Garage and Office Building

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 (LEED) 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 (SF) structure includes 266,867 SF of parking throughout the six levels; 52,260 SF of office and storage space in four levels; and 1,000 SF of retail area. The garage and office building occupies 1.67, which was previously a surface parking lot.

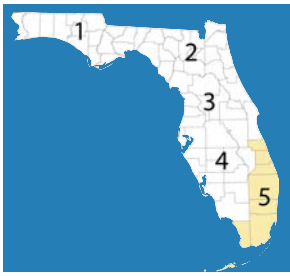
The parking garage is an initiative of the Miami-Dade County Sustainable Buildings Program which was adopted in 2005 to incorporate sustainable development measures into the design, construction, renovation, and maintenance of county-owned, financed, and operated buildings. Similar measures have been implemented nationally and were intended to conserve resources, reduce construction waste, and increase facility energy efficiency.

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 and 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. 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, we have walls 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.

Return on investment: It has been estimated that the annual savings are approx $15,500/year, when considering energy and water savings. ROI will be contingent to the term and future value of the investment, information that is not currently available.



THOMAS COOPER 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.

The core concept of the energy efficient design for this residence is the use of principles derived from the traditional mid-Florida vernacular architectural examples. 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 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.

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 (SF) of air conditioned space; 2,880 SF non-air conditioned space; and 1,200 SF of decks, terraces, and porches. Considering the interior square footage of the house (5780 SF), 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.

Assurance Strategy Recommendations

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

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 a first-glance compatibility or applicability. The dashboard consists of three key criteria for organizing the strategies: Category, Level of Implementation, and Ease of Implementation.

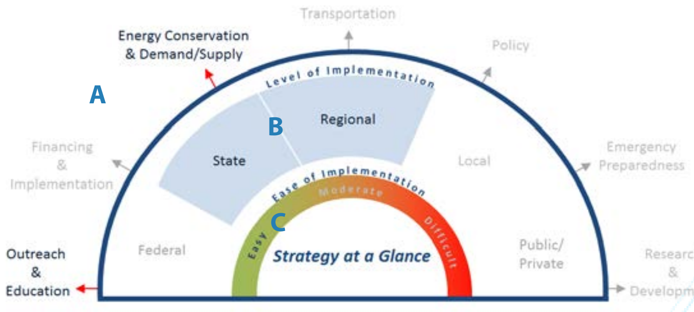
A: The Category(ies) that best describe each strategy is indicated on the outside ring of the dashboard. The seven categories are Outreach & Education, Financing & Implementation, Energy Conservation & Demand/Supply Management, Transportation, Policy, Emergency Preparedness, and Research & Development. 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.

B: 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.

C: The "Ease of Implementation" bar indicates the potential relative ease of executing a particular strategy. Each dashboard will display a bolded word of "Easy", "Moderate" or "Difficult" to indicate the ease of implementation. Some strategies represent low-hanging fruit and may be essentially effortless to implement; others may be very difficult to implement. 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, and critical evaluation is necessary to estimate the risks and gains that might be associated with the implementation of any particular strategy.

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

- Outreach & Education- involves some type of public or professional education or certification.
- Financing & Implementation- more of 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- involves the non-electric side of energy consumption, namely the movement of goods and people that relies on petroleum fuels (gasoline and diesel, mostly).
- Policy- involves some 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.

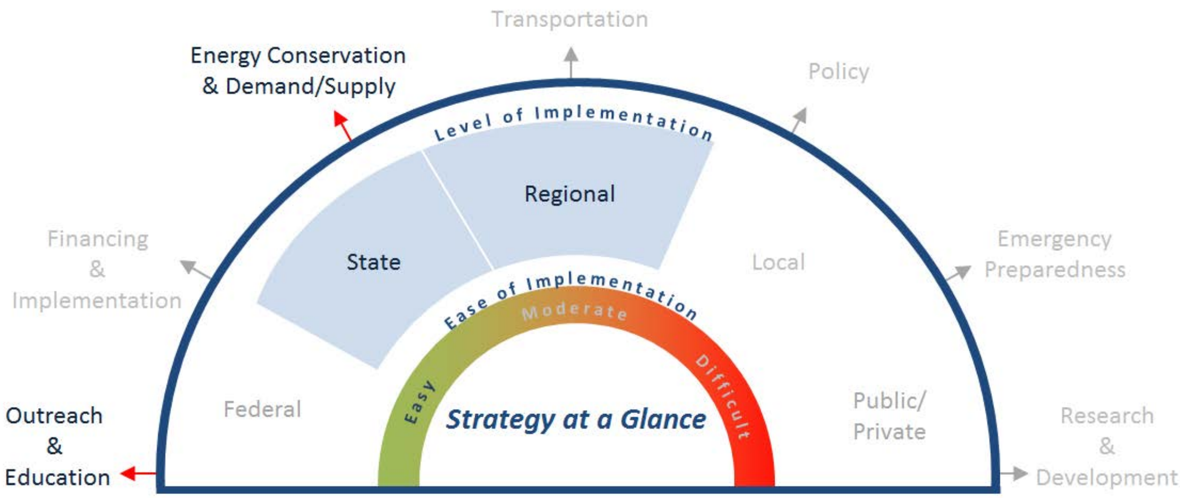


Example Strategy Wheel

Assurance Strategies

Strategy

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 HERS rating tells customers what they can expect their annual energy consumption (in kWh and dollars) to be in any particular building. This allows for comparisons to be made between buildings based on a standardized set of measurements.

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 great 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.

Strategy

Promote the accelerated development of renewable energy technologies.

The expanded use of renewable energy for electrical power generation in Florida is critical for enhancing assurance during supply interruptions. As of October 2012, renewable energy accounted for only 2.1% 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, 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 Navigant 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 a large technical 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 the only 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 (FSEC), a research institute of the University of Central Florida, has been researching, testing and evaluating solar and renewable energy technologies since 1975. The FSEC 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 (FAU), 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. North Florida is prime to engage in advances in biomass energy production, because of their vast timber industry, while Central Florida can tap into equivalent resources in non-woody crops.

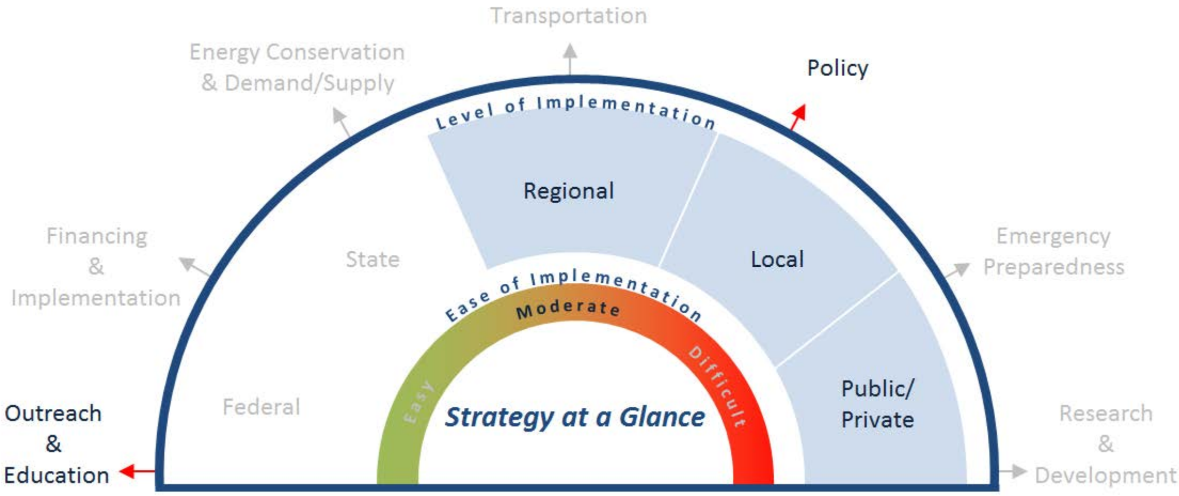
Partnerships with existing electric utilities are important to promoting the development of renewable energy technologies.

For example, Florida Power and Light Company (FPL), the state's largest electric utility, has developed alliances with several Florida universities to promote development of emerging technologies. FPL has taken the lead in assisting FAU with discussions being held with the U.S. Department of the Interior's Minerals Bureau of Ocean Energy Management Regulation and Enforcement to establish the permitting process for ocean energy development on the outer continental shelf. FPL has also developed an alliance with the University of Florida to perform wind studies within the state. In addition, FPL has partnered with the Florida Institute of Technology on fuel cell technology and with the Florida State University Center for Applied Power System in regard to grid integration of ocean energy and other renewable energy. Continued support of existing and future research and development programs by Florida universities, private industry, and partnerships with existing utilities is critical to accelerating the development of renewable energy in Florida.

The potential for renewable energy technologies to hasten recovery following a disaster event is promising because the fuels for these technologies do not have to be shipped into the state; they are often ubiquitous and plentiful. Accelerating development of these technologies would help bring them to market more quickly. This type of broad-based research acceleration strategy is best implemented at the federal, state, or regional level, and through public-private partnerships. Public universities will likely continue to play a large role in the advancement of these technologies.

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.

Strategy



The intent of this strategy is to partner with programs that can be undertaken at the Regional Planning Council (RPC) level, and the RPC need not wait for state or federal goals or requirements to address energy. Each RPC would identify these programs and implement them voluntarily through partnerships. Efficiency, conservation, cost savings, and resiliency are all desired outcomes, but the focus can be on assurance. Imagine, for example, if all 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 doable in the event of disruption of gasoline.

The regional scale of this strategy means limited initial impacts, but should result in strategies right for each RPC. When combined this can maximize impacts and result in cumulative positive impacts on a statewide scale. The scope works well, because it includes only partners willing and able to collaborate.

When stakeholders were gathered in Florida regions, they came up with this overarching idea and suggested using this approach rather than waiting for state or federal guidance. Strengths in Florida include acreage in silviculture and access to and interest in biomass, as well as interest in natural gas as fuel for transportation. All other strategies benefit from this approach, and from the ability of the region to implement it without outside approvals.

Forest owners partner with utilities looking at or planning to use biomass are possible implementation partners. Local governments and commercial fleets have a potential to take advantage of inexpensive natural gas to fuel vehicles. This would require working with engine conversion companies for additional local benefits. There are existing examples of fleet conversions that show this is a viable strategy. Regional and Local success is likely without any legislation or policy changes.

Strategy

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

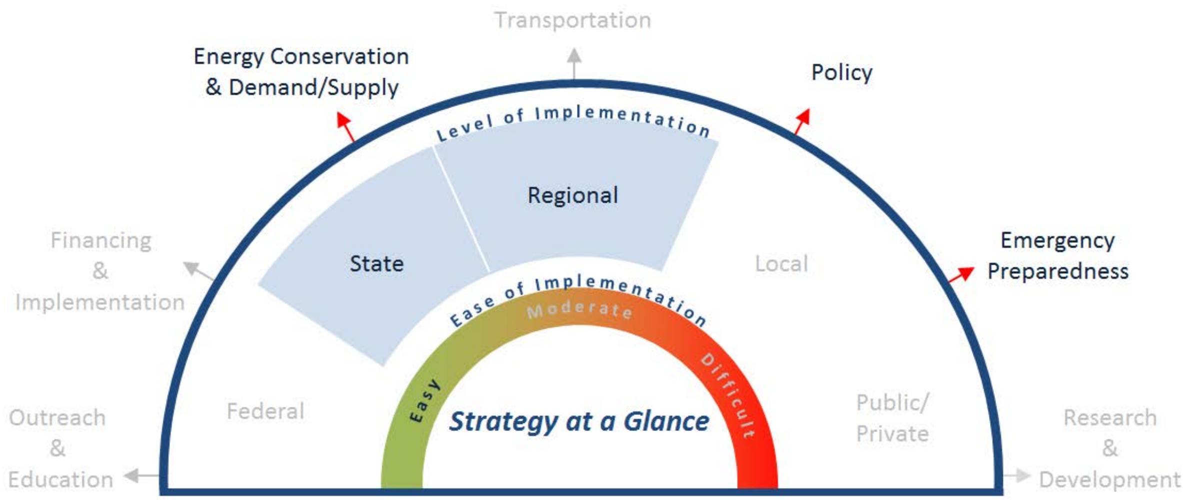
Innovative energy project development requires widespread collaboration to be effective on regional and statewide scales. This is especially true where little has been previously done to encourage collaboration on energy projects. One desired outcome of this strategy is to align efforts to maximize grant funding potential and cultivate innovation. Another desired outcome is to use student power as an available resource to identify and move innovative energy projects forward. For example, in North Florida, expanding collaborations 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 the ideas and research is important to implementing this strategy.

Strengths in Florida include existing talent in the energy field, universities and the research they are conducting. This encourages the initiation of high tech companies that could play a significant role in innovative energy project development.

The state university system is already making this strategy viable. Areas without research institutes need to develop their own collaborations or reach out further to research universities. Potential implementation of this strategy would include identifying lead agencies and public and private partners. In addition to academic partners, other potential partners include small business incubators and chambers of commerce. Possible methods for implementation include integration with existing policies, programs, and structures, perhaps using the existing regional councils. Incubators exist across the state, including the new Florida Innovation Hub at UF located in Gainesville. There is a need to develop a collaborative mechanism, through universities with chambers of commerce to initiate a conversation about the need for innovative energy projects.

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

Strategy



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 other 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 TPDE 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. Of course, the best way to achieve the most benefit from a TPDE program is for the utility to implement a "smart grid". 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 resiliency strategy. In addition, stronger interties (connections between utilities) and agreements between national electricity grids may be beneficial to cultivate to ensure continuous supply delivery.

Incidentally, consideration has been given recently to legislation that would increase the temporal energy supply certainty to utilities from renewable energy sources. The legislation states that 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 properly realized.

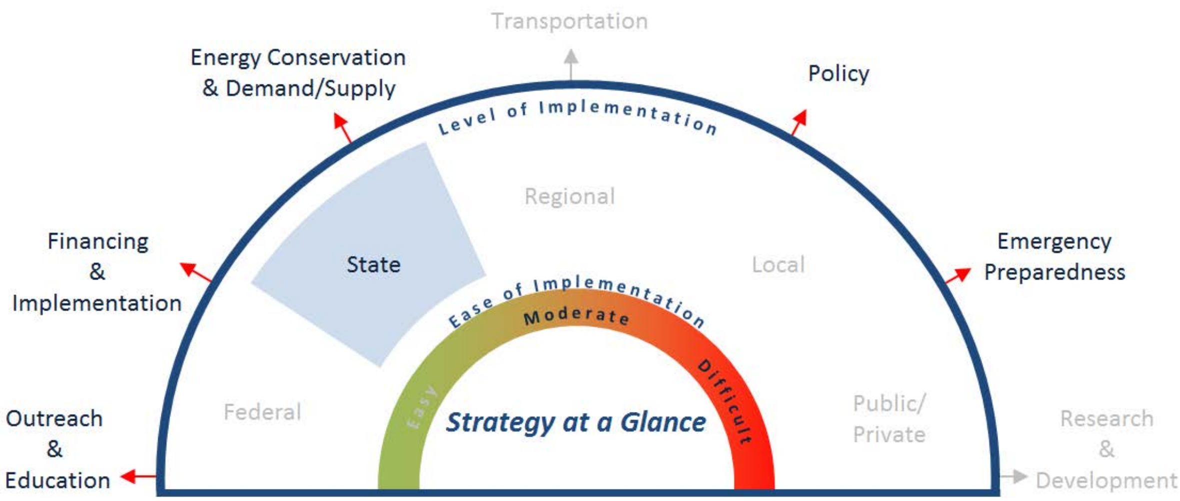
If utilities and regions move toward TPDE, then distributed energy storage becomes an appropriately complimentary resiliency and assurance strategy. Distributed energy storage will allow increased assurance during supply shortages, and also will help facilitate energy supply management with increased intermittent renewable energy generation, especially if smart grid technology can also access and manage the distributed energy storage network.

Economic benefits from TPDE involve increased local economic activity. Distributed installations and sales would generate local jobs and economic growth. The potential of residents and businesses selling energy via a feed-in of some sort could also generate local economic gains. At the very least, 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.

TPDE is probably best implemented at the state level, through the Public Services Commission (PSC). It is possible to implement this strategy regionally at the utility service area level, but this route might prove very difficult especially without explicit cooperation from the PSC. Local implementation by local governments is most likely unachievable, unless the locality owns its own utility. In any case, PSC approval and support would be needed.

Strategy

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



Third-party energy sales and power purchase agreements are directly between private entities, and often bypass utilities entirely. One example is a building owner offering to sell rooftop solar photovoltaic electricity generated on site to tenants in the building. Another business model involves one company renting rooftop space from another company, to install and manage solar PV panels on top of the roof, with an agreement that the building owner will purchase electricity from the PV provider for a length of time at an agreed upon rate. 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, at least partially, if not wholly. This will increase energy assurance by shifting responsibility for 100% energy supply provision partly to the private sector, and away from utilities. Furthermore, third-party systems can use whatever technologies are available to generate the power. Often this will be renewable energy technologies, which will reduce reliance on non-Florida fuel sources. During supply disruption events, energy assurance will be enhanced because, if implemented with proper interconnection and reliability protocols, this strategy can reduce the effect of wide-scale energy disruption, since more energy will be generated and consumed locally. This would put utilities more into the business of energy supply coordination, facilitation, and distribution on a larger scale (for instance, if the power purchase site and power generation site were not proximate to each other), and less focused on energy generation and sales. Currently, third-party energy sales are prohibited in Florida, although they are allowed in some form or another in over 30 states nationwide.

Although this may not be ideal for some utilities, it can increase energy assurance by allowing private companies to contract with each other to produce and provide electricity for each other. Utility infrastructure costs can be recouped via infrastructure and supply management fees or some other such mechanism. Potential synergistic economic benefit of the implementation of third-party energy sales and power purchase agreements include the local installation and operation of these energy generation sites. Additionally, some utilization of contract specialists will be necessary for the negotiations between purchasers and suppliers. Depending on the scope of implementation of this strategy, utility companies may still be integral as power managers and stewards of transmission infrastructure.

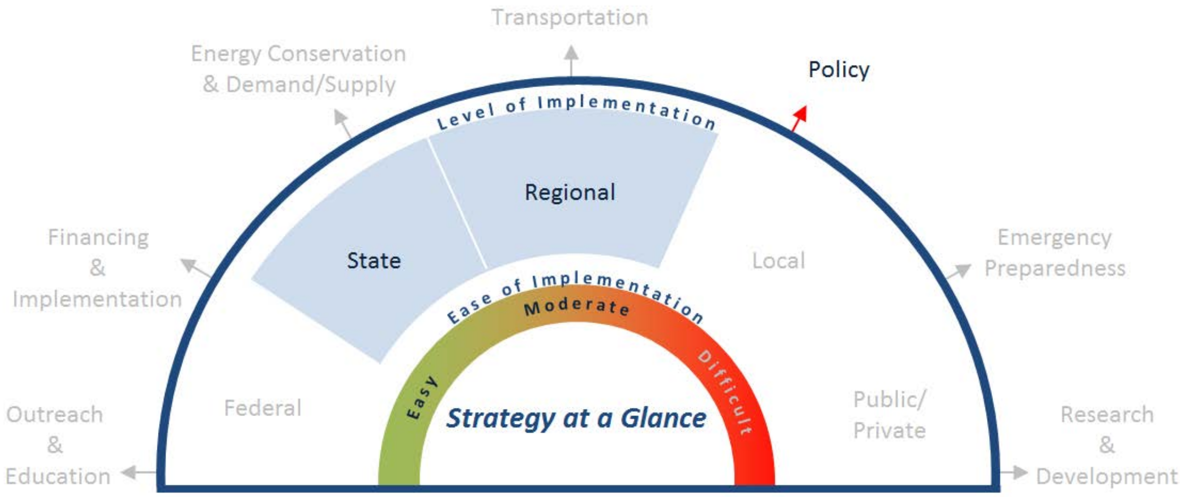
The full, logical extension of a third-party energy sales strategy is the complete replacement of large-scale power generation facilities, with utilities relegated to managing supply and distribution. This is not likely to occur in any timeframe relevant to this study. However, allowing third-party energy sales and power purchase agreements would facilitate a distributed energy generation and consumption network. It would be difficult for any one event (such as a natural disaster) to entirely disrupt power over a vast area. This type of strategy would be complimented by other strategies, such as enhanced interconnection protocols that allow for localized power generation during outage events and integration with smart grid technology. Third-party energy power purchase agreements would also allow individuals to purchase energy at whatever price they desire, as generated by whatever technology they favor.

If utilities move toward third-party energy sales regionally, distributed energy storage can also be part of this assurance strategy. Distributed energy storage will allow increased energy assurance during supply shortages, and also will help facilitate energy supply management with increased intermittent renewable energy generation.

The strategic implementation of third-party energy sales will necessarily involve smart grid technologies for the real-time management of consumption, supply, and distribution. In addition, it may 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 can be a private market alternative to centralized, wholesale power generation and sale. This type of strategy can probably only be implemented on a state level. More research may be necessary as to the available implementation and management strategies for fully realizing this type of strategy.

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

Strategy



A Renewable Portfolio Standard (RPS) is a requirement, often at the state level, that requires utilities to generate (or purchase) a certain amount of their energy from renewable sources. Although this is often a state mandate, and in the case of Florida would have to come from the state legislature to the Florida 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. For instance, Lakeland Electric, which primarily serves the City of Lakeland, has already partnered with a waste-to-energy facility and associated solar photovoltaic field. Both of these facilities use indigenous fuels (in this case trash and sunshine, respectively), which reduces reliance on non-Florida fuel sources.

Regardless, a comprehensive state-mandated RPS should also include some revision of the PSCs regulatory restrictions that inhibit fuel source diversification. Currently, about 30 other states have some type of legislation resembling an RPS, but Florida does not. This is a severe impediment to energy resiliency because a RPS encourages fuel source diversification through locally available, non-fossil fuel-based fuels.

One of the purposes of a RPS is to diversify the fuels used by the utility companies, preferably to local fuels. For instance, a RPS might suggest shifting some portion of power generation from the currently dominant fuels (fossil-fuels and nuclear) to solar photovoltaic, wind power, hydroelectric, biomass, and/or waste-to-energy. Waste-to-energy facilities, while not exactly "green" do provide a motivating alternative to importing fossil-fuels or nuclear material, in that garbage is a somewhat "renewable" resource that utilizes a local fuel source. Waste-to-energy can play a vital role in efforts to increase energy resiliency and energy assurance, as the fuel source is less subject to supply disruption than traditional fuels.

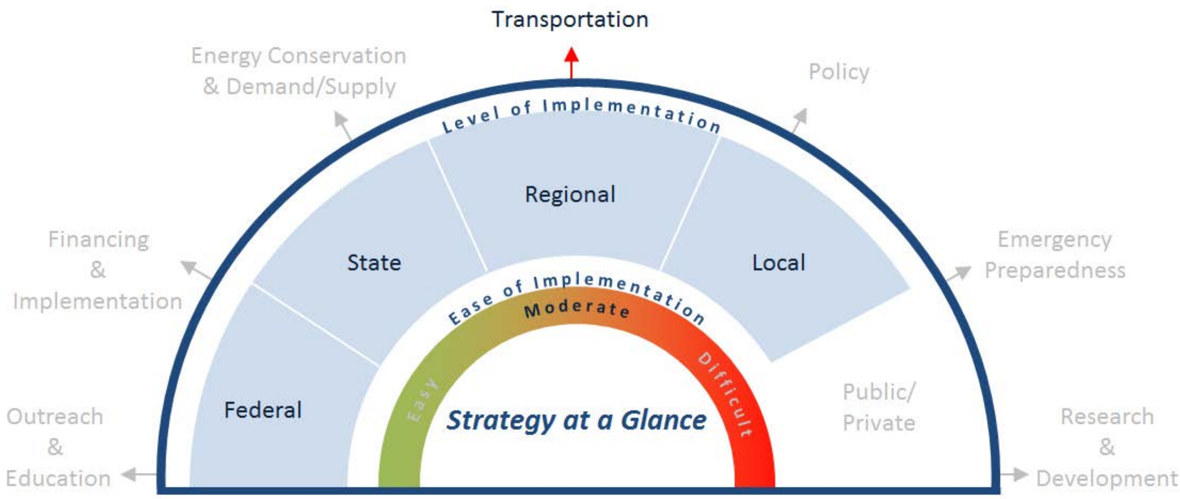
While an RPS can be written to be "fuel source blind", to maximize the effect that it has on energy resiliency it should incorporate some measures to promote a diversification of fuels, with a particular focus on reducing dependence on non-Florida fuels. Accordingly, this diversification should be away from non-renewable, fossil fuels and toward renewable energy technologies and fuels. The shift away from non-renewable fossil fuels to locally available fuels will shorten supply chains and increase Florida's energy resiliency because Florida primarily imports all fossil fuels and nuclear material.

An associated benefit to reducing the amount of money that Floridians send to other states and nations when purchasing fossil fuels is increased local economic activity. If Florida creates the industries locally to supply the technology and materials that will provide the renewable energy, it creates more jobs and local economic activity. Regionally, this is especially true for ethanol and biofuels industries, which central Florida is particularly well-suited to developing. An RPS can be an economic boon for local, high-technology 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 level or local level (i.e. - by a particular utility), but it is less likely due to statewide regulations on utilities. Regardless, further research into an aspirational and achievable RPS would serve to create a platform for enhanced energy resiliency and energy assurance in Florida.

Increase fleet adoption of alternative and blended fuels (such as full electric or electric hybrid, pure ethanol or biodiesel, E-85, B-20, etc.), especially in government and publicly-funded fleets (like school buses or public transit).

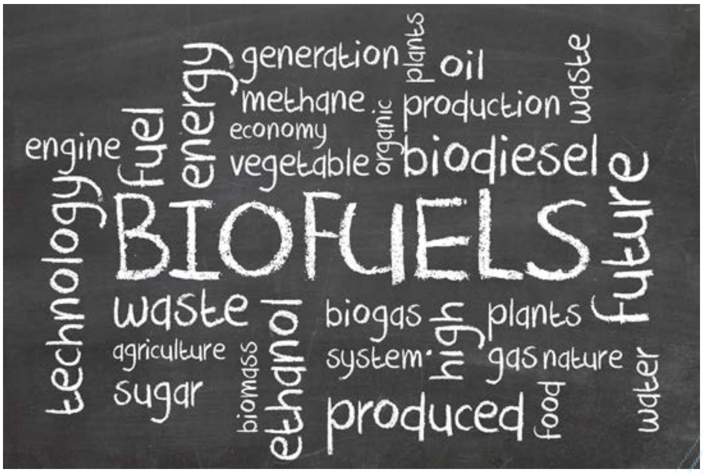
Strategy



Vehicle fleets present an excellent opportunity to implement energy resiliency. Fleets often are operated by one entity and utilize a small number of maintenance and/or refueling facilities. Examples of fleets include school buses, government fleets such as county vehicles, trash pickup, or property appraiser vehicles, transit, or large commercial operations that may include on-road vehicles like semi-trailers or off-road vehicles like forklifts or tractors.

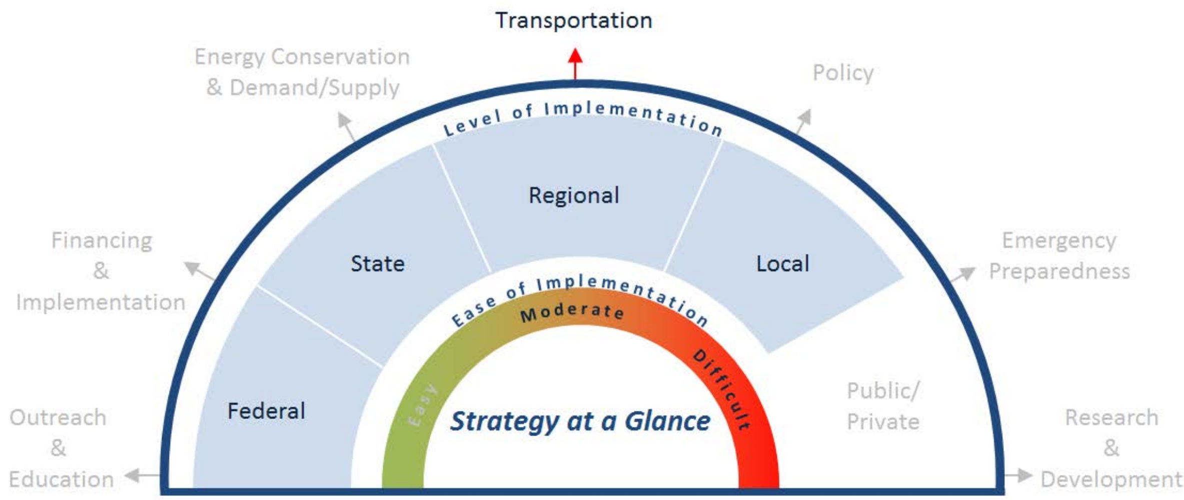
Because of the centralized ownership and often-fixed routes of operation, an entire fleet can be converted to an alternative fuel relatively easily, and utilize one (or a few) common fueling station and maintenance facility. This can decrease the operating costs of the particular fleet if the conversion and new operating procedures are thoughtfully planned and executed, and the new fuels are lower in cost than traditional petroleum fuels. In addition, it would provide a bulk demand for the alternative fuel and 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. This would potentially create demand for new skill sets in the region that the fleet operates.

This strategy would be best implemented at the state or local level, through government mandates regarding fleet operation. Regional implementation would be feasible also, depending on the fleets targeted. For this type of strategy to realize synergistic economic benefits in the state, the alternative fuels targeted should be carefully selected so that can be produced in the state from local resources.



Strategy

Increase fueling infrastructure and accessibility for alternative and blended fuels (such as full electric or electric hybrid, pure ethanol or biodiesel, E-85, B-20, etc.), especially in government and publicly-funded fleets (like school buses and public transit)



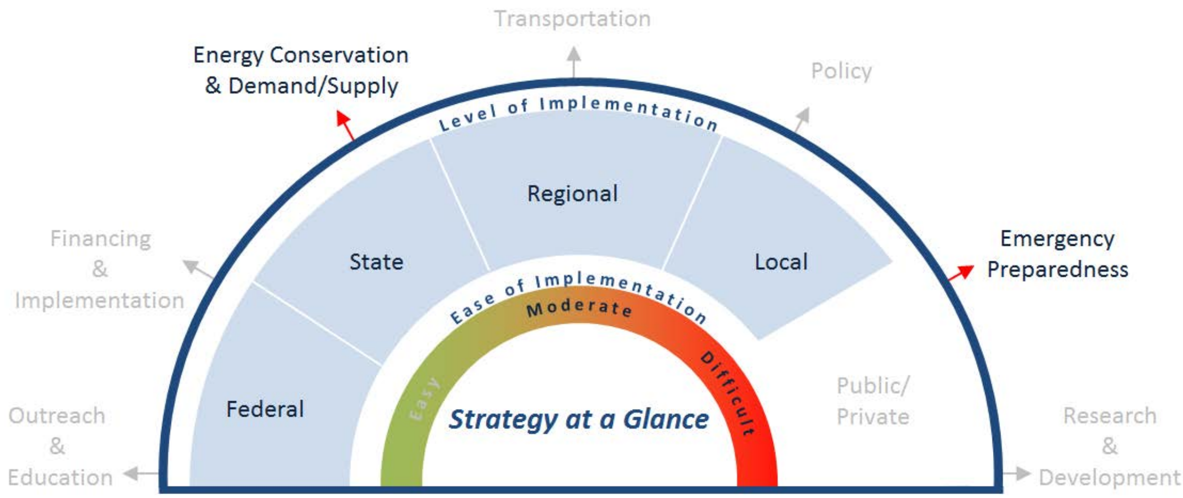
One impediment to vehicle fuel resiliency is the lack of publicly-accessible fueling infrastructure for alternative fuel vehicles. This includes fuels like electricity, pure ethanol and blends like E-85, pure biodiesel and blends like B-20, and even Compressed Natural Gas (CNG). Most publicly-accessible fueling stations serve only petroleum products like gasoline or diesel. This fueling infrastructure has taken lots of time to develop, and is now fully imbedded in the landscape. The introduction of alternative fuel vehicles increases the need to have fueling infrastructure to support those alternative technologies in vehicles. Having alternative fuels or blends as a viable option to traditional gasoline or diesel will reduce reliance on these fuels. If possible, public or private fleets implementing alternative fuel technologies should be encouraged to make their fueling infrastructure available for public usage. This would enhance the provision of public fueling stations for alternative fuels. There are currently many physical, litigious, 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. The state has extensive agricultural resources that can be used as feedstock for developing biofuels. There are also two existing pipelines (with one under construction) that can provide access to natural gas. One or more of these pipelines may have capacity for the transport of biofuels. In addition, the I-75 Green Corridor Project (http://eerc.ra.utk.edu/etcfc/cleanfuelscorridor/project.html) can provide a national connection to the biofuels movement. Existing electrical utility infrastructure can be easily accessed to provide electrical vehicle fueling.

A strategy such as this would be best implemented in parallel with the conversion of fleet vehicles to alternative fuels. Government and publicly-funded fleets, such as school buses and transit, are particularly viable options for conversion. These fueling stations could be designed to provide access for public consumers without compromising the security of the public facilities. It may be difficult to convince or require private businesses with alternative fueling infrastructure to allow public access, but perhaps incentive programs can be created to further access to these fuels.

Implementation of this type of strategy would probably best be realized as a state or local government initiative combined with conversion of government and publicly-owned fleets to alternative fuels. 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 provide access to their fueling infrastructure.

Strategy

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 near to where the electricity is used. Distributed energy storage, when coupled with smart grid technology for real-time communication and coordination, can be used as a way to efficiently, effectively, and safely increase energy assurance following an energy supply disruption event. The integration of a dispersed energy generation infrastructure can also enhance this strategy's effectiveness.

The "power block", also known as a micro-grid, is a concept that fits well with energy assurance. In much the same way some resistance organizations of World War II functioned, with many semi-autonomous cells acting in coordination, 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 assurance during outage events, while also allowing operation and power provision during non-emergency times. This semi-autonomous cell structure allows for at least partial operationally 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.

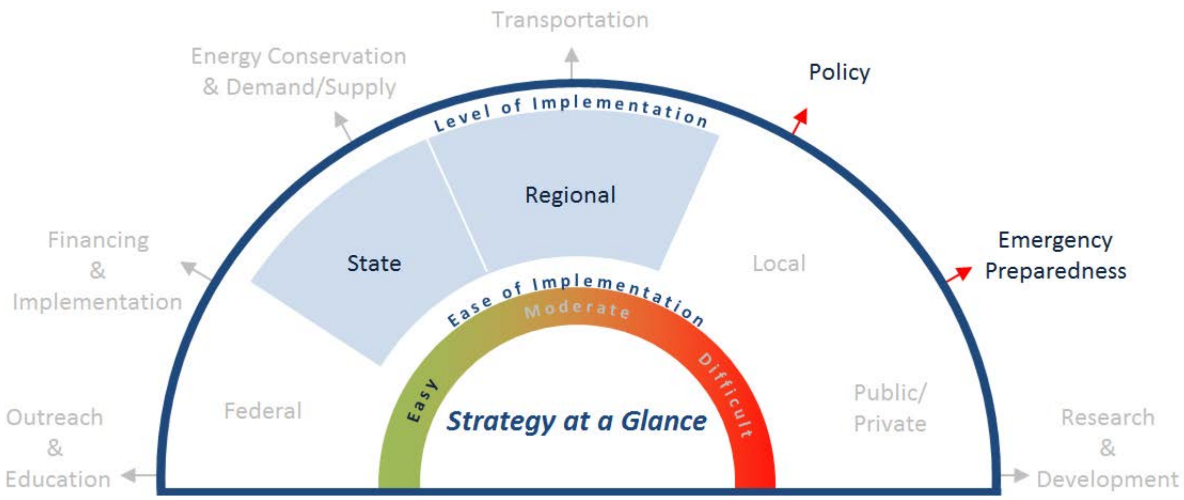
The autonomous energy generating unit(s) do not necessarily have to generate the entirety of the power used by the area covered by the power block. Their primary function, when combined with the power storage system, would be to provide enough power to sustain critical infrastructure during disaster-type 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 assurance, regardless of weather conditions. They could easily be part of a larger third-party distributed energy (TPDE) 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 may find that peak hour energy demands can 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 (*http://blog.floridaenergycenter.org/echronicle/2011/07/sunsmart-e-shelter-installations/*).

The power block could best be implemented as a state wide strategy to increase energy assurance, although it can also be implemented by utilities across their service areas. It is probably less well implemented 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 should be coordinated with local utilities so that the infrastructure does not sit idle during times of non-emergency energy provision.

Strategy

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 instance, 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 paradigm, but can be mitigated to provide increased energy assurance in the future. Buildings with their own power generation infrastructure and equipment should be less vulnerable because they should be producing electricity for themselves during outage events.

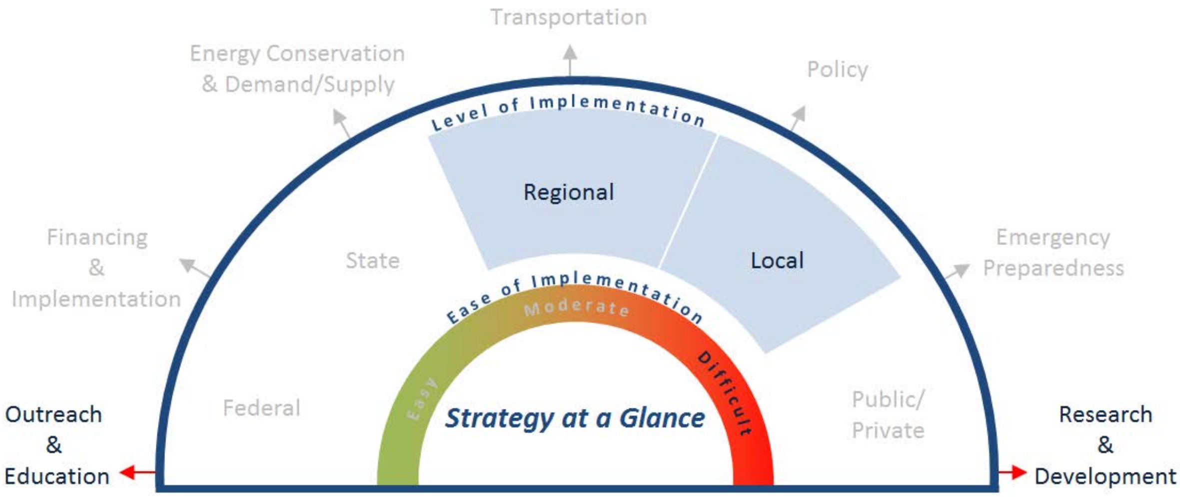
Interconnection protocols should be developed for energy generating buildings that allow for off-grid operation during and/or after disruption events. This will allow local energy generation and consumption from these technologies regardless of overall grid integrity. This will reduce damage and impacts from outage events by allowing local energy generating systems to continue generating. Whether this is achieved physically, like by using a separate breaker box with physical disconnection from the grid, or organizationally, via a smart grid or remote control, can be left up to each region, utility, or other entity, although it is possible it will need to be coordinated across state lines. Care needs 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 is likely to increase energy assurance 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. Naturally, this type of strategy would also be bolstered by any facilitating strategies that increased adoption of distributed energy generation technologies.

The development of interconnection protocols that allow for off-grid operation of distributed, local energy generation is probably best 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

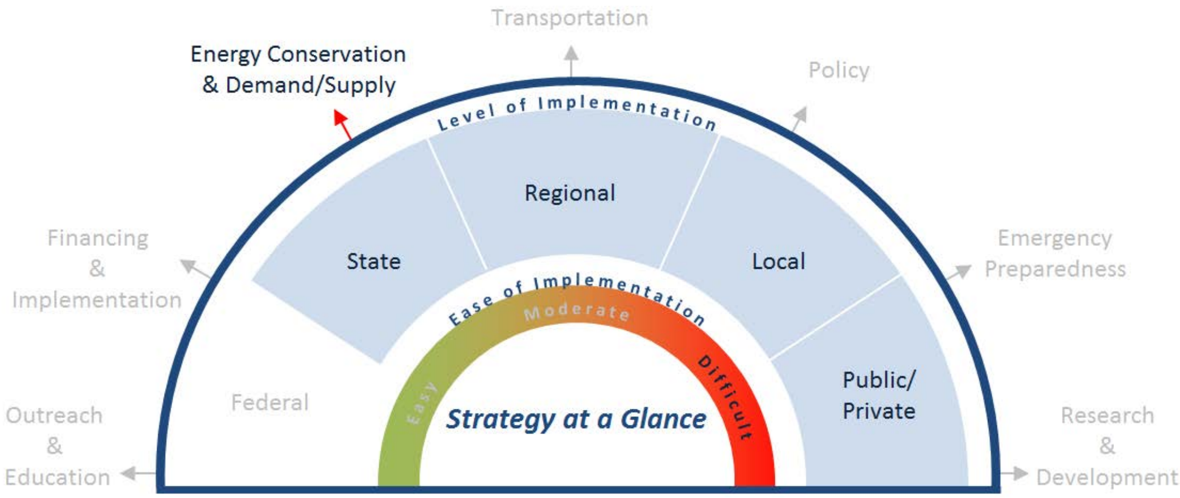
Create and maintain a database of building stock data relating to energy efficiency and building condition to assist with future retrofit opportunities.



The intent of this strategy is to identify sources and start collecting baseline data on building stock relating to energy efficiency and building condition. This information could be helpful in determining what the needs are for future retrofit opportunities. This will help achieve the desired impacts of increasing energy conservation, energy cost savings and creating retrofit construction jobs. For example, regional planning councils could gather data from property appraisers and other sources, map it using existing geographic information systems, and recommend strategies to local governments. Local governments could then pool resources to support collaboration with other programs, and aligned programs to prioritize funding to incentivize retrofits.

Given the large stock of sound, but energy inefficient housing that is not near the end of its lifespan, retrofit has a huge potential return on investment. This can save homeowners money as well as creating additional jobs in the communities. These jobs would be in the construction sector where there is an excess of skilled but underemployed or unemployed workers. Regional Planning Councils, Counties, Municipalities, other local government agencies, and utilities could be included as implementation partners and lead agencies. Potential applicable methods for implementation include integration with existing local and state government programs, as well as nongovernmental organizations involved with housing improvements. Regional and local levels of implementation would be based on availability of funding to compile data and local governments or utilities to incentivize or fund retrofits. Local ordinances and possible legislation would be required if HERS or retrofit were to be required, or incentivized. However, this would not be required to start the collection of data that forms the basis for this strategy.

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



Currently, there is very little penetration of natural gas for direct usage in the residential market in Florida. Greater direct consumption of natural gas in residential and commercial applications will provide some redundancy of energy supplies, potentially reduce overall energy costs via increased competition, and potentially reduce related CO2 emissions. A more effective and expansive network of natural gas infrastructure would minimize the extent of areas isolated from energy infrastructure, thus decreasing the vulnerability of disaster or electrical supply disruption events.

Natural gas represents a larger portion of Florida's energy consumption. However, the majority of Florida's natural gas supply comes from only 2 major pipelines, serving 59 of 67 counties, with local distribution systems that will need improvement for greater accessibility. As Florida's population continues to grow, energy demand will also grow. While greater diversity in energy mix will increase assurance, strengthening the infrastructure of natural gas, a large contributor to the energy mix, will also increase assurance.

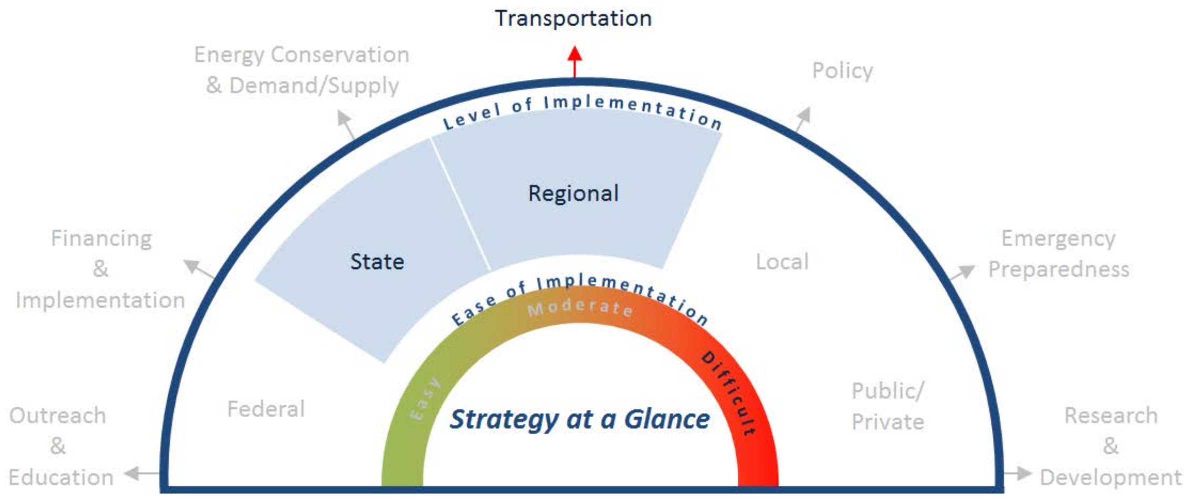
An expansion of Florida's natural gas infrastructure to accommodate direct residential consumption would temporarily stimulate the economy by creating construction jobs and potentially attracting energy industry businesses with specialized technological knowledge and skills, while also potentially creating opportunities for growth and new technical training for current workforce. Other, longer-term economic impacts include potential increase in employment related to operations and maintenance of improved local distribution systems, and a potential decrease in energy cost.

Implementing this type of assurance strategy would take integrated coordination among many agencies. 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 the Department of Economic Opportunity. Partnerships between private utility providers and local governments would be optimal, especially when seeking grant awards. Other funding opportunities could 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. Change in legislation and revision of local regulations may be advantageous, but not necessary, in order to encourage participation in incentive programs and submit stronger grant applications.

Florida Energy Assurance

Strategy

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

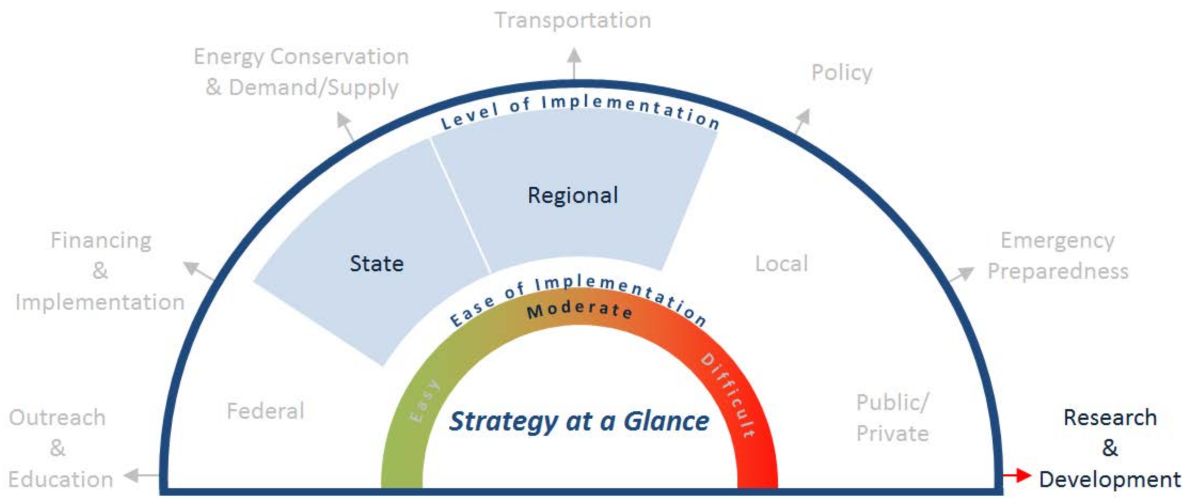


The intent of this strategy is to encourage increased interest in and accessibility of alternative energy sources, such as natural gas (CNG), biofuels, as well as electric vehicles (EV), for transportation. Greater use of alternative energy sources for transportation will increase diversity of the fuel mix, thus decreasing dependence on foreign sources. Other impacts include the opportunity to enter a newer market for research, manufacturing, and installation of alternative energy innovation and technology; reduction of CO2 emissions; and greater productivity of available energy supplies.

Florida is heavily reliant on personal vehicles for travel, however, use of and access to alternative fuels remains minimal. Of the 24 existing CNG fuel stations in Florida, only 8 are public. Of the 15 existing biodiesel fuel stations in Florida, only 4 are public. Of the 51 existing E85 fuel (ethanol fuel blend) stations in Florida, 44 are public. One advantage is that, as previously mentioned, Florida has five natural gas pipelines that serve 59 of 67 counties, creating opportunity for expansion of this infrastructure. Also, the strong agriculture sector in Florida may be conducive to biofuel production.

Greater use of alternative energy sources and development of an alternative energy infrastructure for transportation in Florida would stimulate the economy in the immediate term, creating jobs and potentially attracting energy industry businesses with specialized technological knowledge and skills, while also creating opportunities for growth and new technical training for current workforce. Other, longer-term economic impacts include overall increase in employment and a potential decrease in fuel cost. Lead agencies and implementation partners include the private sector, 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 the private sector and local governments would be optimal, especially in seeking grant awards. Other funding opportunities may include incentive programs from local governments. Local 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 may be advantageous, but not necessary, in order to encourage participation in incentive programs and submit stronger grant applications.

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. This assessment will allow regions to determine energy infrastructure strengths and needs. Identifying energy infrastructure strengths, weaknesses, opportunities, and threats will 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 this assessment.

Some of the data regarding energy infrastructure is current and available. However, because there are so many providers, especially cooperatives and local government providers, and because service area boundaries are always changing, coordination among all of the players, as well as compilation of consistent data may be cumbersome. This will need to be a State wide effort with a great deal of cooperation.

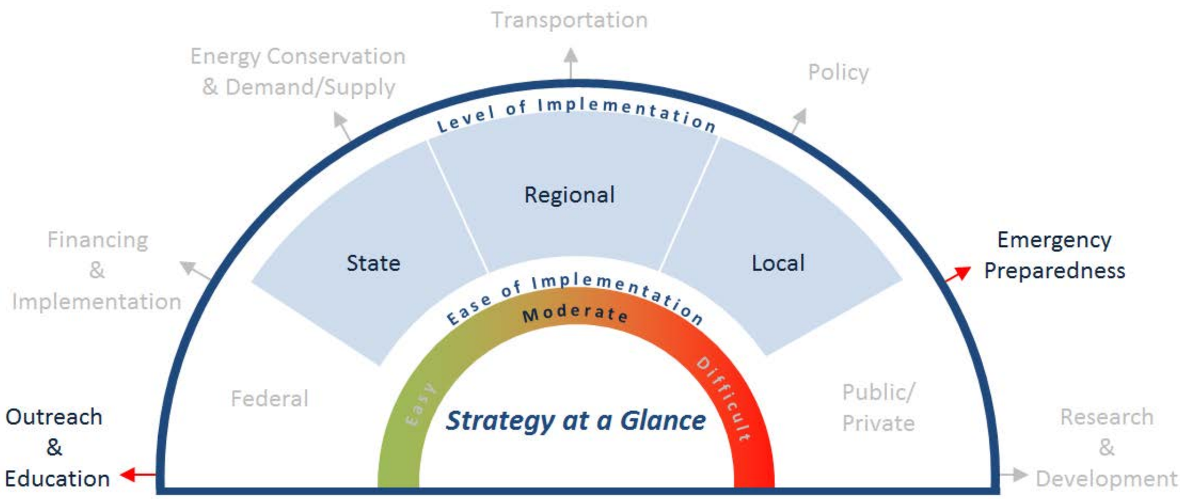
A better understanding of energy infrastructure in Florida may also reveal in which alternative energy industries investment would be most beneficial, creating a more cost effective plan for energy investments. Another economic impact is a reduction in recovery costs and time after a disruption, as local governments will be better able to allocate assistance. Also, knowledge of the state of energy infrastructure in Florida will result in stronger grant applications for emergency management, as well as alternative energy innovation and development.

Lead agencies and implementation partners include Regional Planning Councils, utility and fuel providers, 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 among all lead agencies and implementation partners would be optimal, especially in seeking grant awards. Local and regional implementation would be viable, however 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 ne

Florida Energy Assurance

Strategy

Support a Rapid Action Utility Workgroup as part of Emergency Management Plans and add Energy Response to CEMP ESF12.



The intent of this strategy is to coordinate with local emergency management agencies for improved recovery of energy disruptions, especially disasters to which Florida is vulnerable, like tropical storms and hurricanes. A rapid action utility workgroup may 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 include faster, more efficient recovery, and more effective use of local government resources expended on recovery.

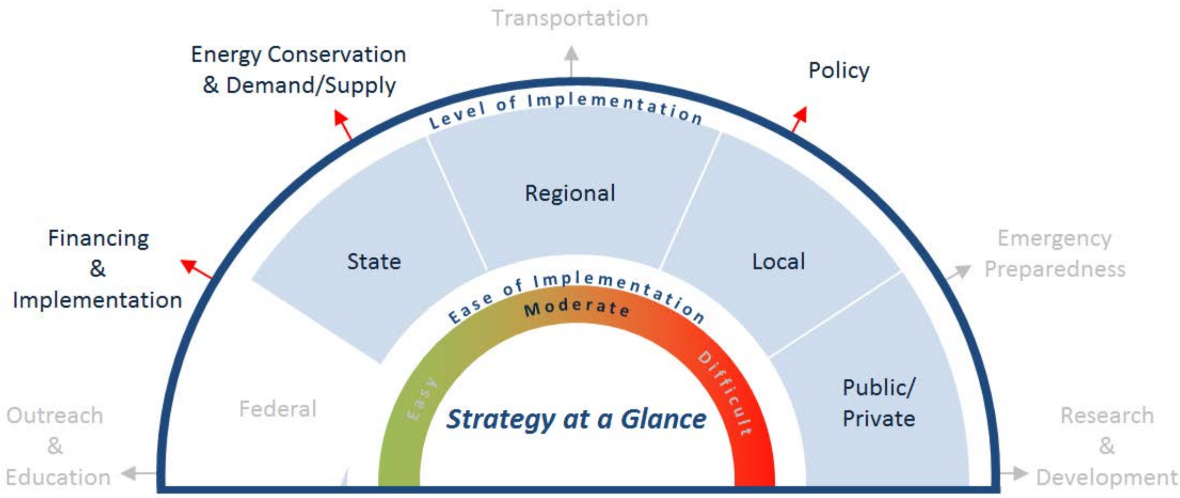
One advantage is that Florida boasts a strong, coordinated emergency management community, especially since it has been exercised at the local and state level more frequently than most states. Adding Energy Response to Comprehensive Emergency Management Plans (CEMPs) may not be too difficult, as local emergency management departments are encouraged to add Emergency Support Function (ESF) categories that are relevant to their locations and populations.

More efficient recovery efforts will reduce recovery time after energy disruptions, thus restoring utilities quickly to communities, and decreasing the heavy reliance on government programs and costs associated with post-disaster recovery. Another economic impact is that businesses will be able to return to regular operations more quickly, thus saving potential loss of income. Also, addition to the local CEMP may benefit communities by strengthening 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, Counties, Municipalities, and other local governments, as well as state agencies, such as the Division of Emergency Management, Public Service Commission, and 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 would be required, as well as submission for review by the state Division of Emergency Management.

Strategy

Encourage incentives and/or rebates for energy conservation, innovation and/or renewable energy at the state level.



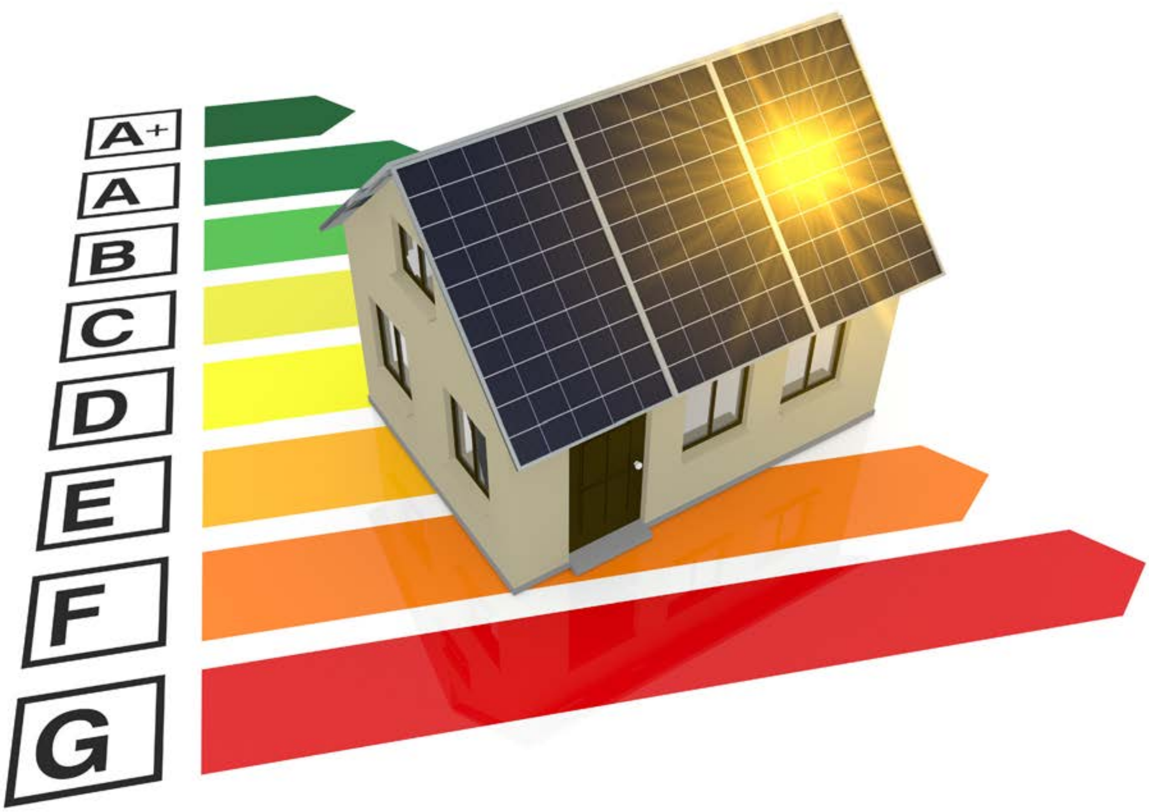
The intent of this strategy is to support the creation of state energy conservation and innovation programs, such as incentives and rebates, and to promote participation in these programs. By encouraging conservation and the integration of renewable energy technologies, local energy mix would be more diverse and potentially less vulnerable to disaster events or disruptions. The success of these incentive and rebate programs will result in decreased energy consumption, or 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 potential improvement of environmental quality.

Incentives such as Property-Assessed Clean Energy (PACE) financing 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. Rebate programs, might offer participants rebates per watt or for installation of energy efficient appliances. Individuals and businesses seeking grants for innovation research and business incubator programs for renewable energy or energy conservation businesses should be encouraged and assisted.

Currently, Florida universities and institutions are contributing to innovative research in alternative energy and conservation. That combined with the technically capable Space Coast workforce provides a distinctive advantage to Florida (relative to other states) when pursuing innovation in energy conservation and renewable energy technologies. These advantages may entice alternative energy enterprises to seek opportunities in Florida. Florida could also synergistically capture talent and capital by supporting a culture of innovation, research, and venture businesses.

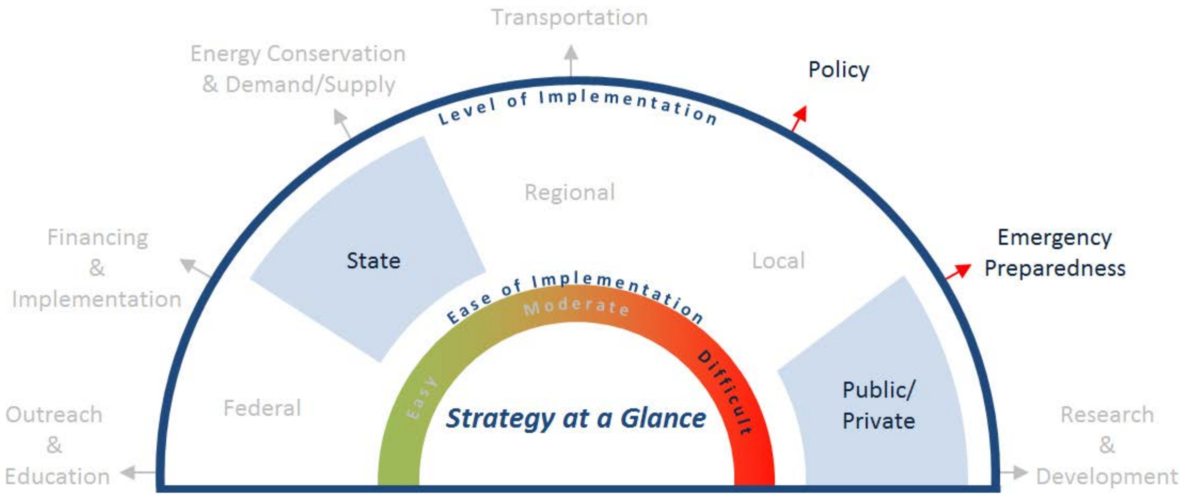
Participation in energy incentive and rebate programs would stimulate the economy in the immediate term, creating jobs and potentially attracting energy industry businesses with specialized technological knowledge and skills, while also creating opportunities for growth and new technical training for current workforce. Over the long-term, economic impacts would potentially include overall 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 governments, 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. Other funding opportunities may include leveraging incentive programs from local governments. Change in legislation and revision of local regulations may be advantageous, but not necessary, in order to encourage participation in incentive programs and submit stronger grant applications.



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 represent the least-cost alternative.

Strategy

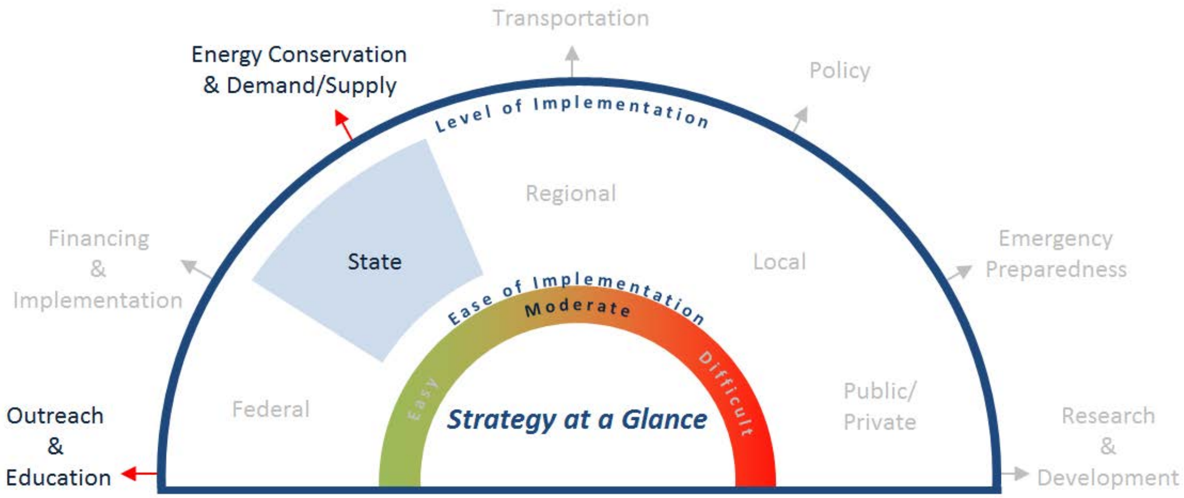


The intent of this strategy is to create a flexible and supportive environment for supplementing conventional utility supply plans with renewable energy options. Diversity of energy sources may potentially result in decreased vulnerability to and easier recovery after disaster and supply disruption events. 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 allowing utilities to incorporate more 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%. Utility providers and Florida universities and institutions are contributing to research and pilot programs for innovation in renewable energy technologies.

Inclusion of renewable energy in utility plans would stimulate the economy in the immediate term, creating jobs and potentially attracting renewable energy industry businesses with specialized technological knowledge and skills, while also creating opportunities for growth and new technical training for current workforce. Other, longer-term economic impacts 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 businesses' functional losses may be subdued. 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% of businesses do not reopen and another 25% fail within one year after a disaster. Similar statistics from the United States Small Business Administration indicate that over 90% of businesses fail within two years after being struck by a disaster. Considering these figures, in addition to this project's business survey responses (which indicate that more than half of all businesses do not have a plan to keep cost of products and services stable in the event of a sharp increase in energy costs), assurance is especially important to the business community. By supporting policies, as well as incentives and/or rebates for renewable energy innovations, the energy mix will be more diverse and local, possibly less vulnerable energy sources will be utilized, facilitating greater assurance.

Lead agencies and implementation partners primarily include utility providers, the Florida Legislature, and the Public Service Commission. These agencies play key roles in restructuring policy and process to enhance energy assurance through this strategy. Other private sector businesses, universities and research centers, Regional Planning Councils, Counties, Municipalities, and other local governments, as well as other state agencies might also play a support role in implementation. Leveraging partnerships between state and utility providers might enhance opportunities in seeking federal grant awards. Change in legislation and revision of local regulations may also be advantageous in implementing this type of assurance strategy.

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 basic programmatic guidelines as the now defunct My Safe Florida Home program. However, unlike the My Safe Florida Home program, energy audits would be available to modular and mobile home owners as well as site built home owners. The program would help Floridians identify and make improvements to strengthen their homes against energy loss through free energy audits and grant funds. This program would be a phased in project that could start with the most economically challenged residents where the bulk of the funding would be spent. These audits would not only consist of appliance and infrastructure upgrades and specific recommendations for retrofit or replacement credits but also education to ensure the residents know 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 would 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.

There would be many advantages to this program at both the state and regional level. The first significant advantage would be that there would be a large 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 given to the public will provide the stimuli needed to affect residential energy conservation.

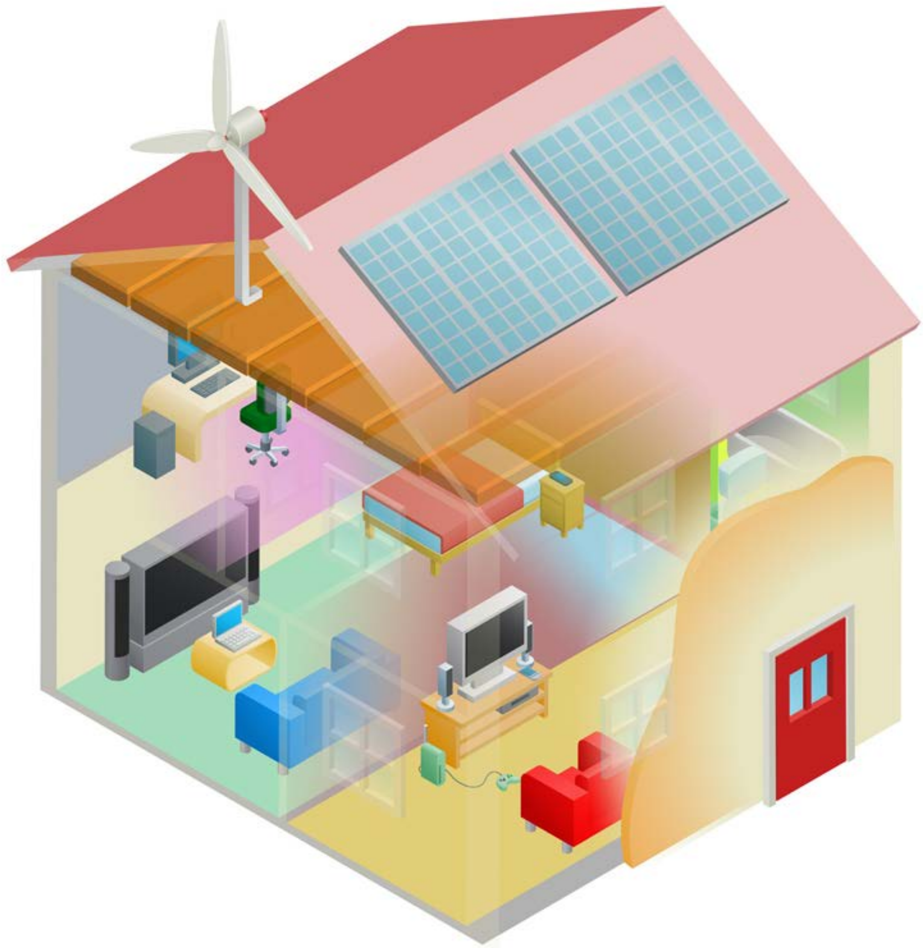
Should this program be started in Rural Area of Critical Economic Concern (RACEC) counties and would be easily portable to all counties within the state. This program would allow homeowners to realize an immediate energy savings which in turn would allow its residents to possibly re-invest their savings into other infrastructure items or other items that would improve their quality of life. This program would also allow the energy producers to scale back the production of electricity and would place less stress on the electrical grid. This strategy when coupled with strategy six will allow for the realization of a significant cost avoidance during times of peak demand whereby affecting a state-wide cost savings and a reduction in the overall greenhouse gas production.

The lead agencies would be the Florida Department of Financial Services and the Florida Department of Agriculture and

Consumer Services, FDACS Office of Energy with the Regional Planning Councils being charged as the Regional Coordinators. The local electric utility companies would be the implementation partners.

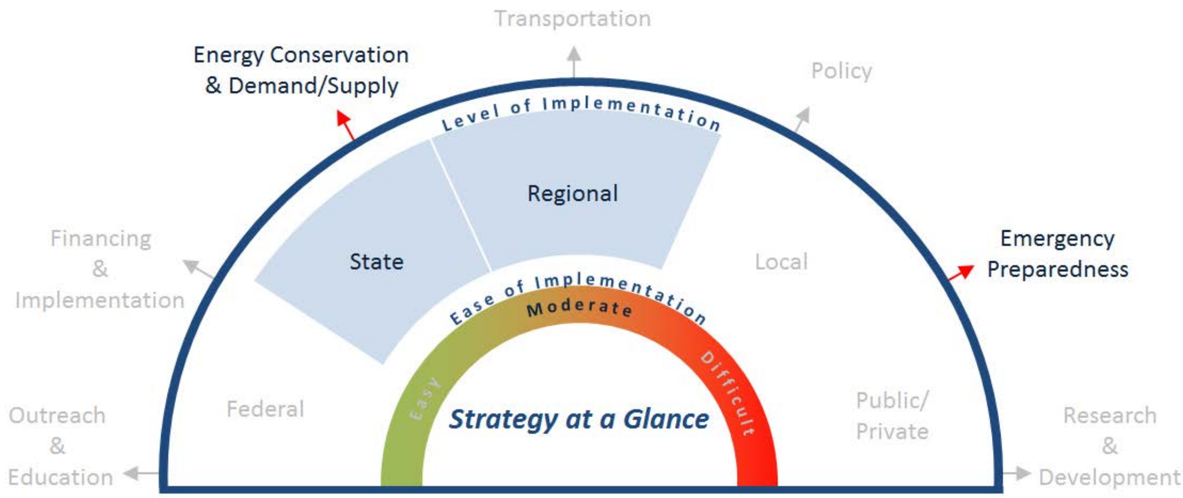
There are numerous utility sponsored examples in the Florida already that can serve as models. Examples of these include; City of Tallahassee Utilities, TECO, Talquin Electric, and West Florida Electric. Best practices would be culled from these to serve as a service model for all regions not currently benefiting from an aggressive energy audit program.

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



Strategy

Facilitate and encourage distributed energy storage capacity.



Encouraging and facilitating distributed energy storage will 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 extremely useful in terms of energy assurance, this strategy could also potentially increase energy resiliency during non-emergency conditions. For instance, smart grid technology allows these 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.

This strategy would be particularly effective if paired with smart grid technology, allowing utilities to control, at least partially, the operation of the distributed energy storage equipment. If strategies encouraging local energy generation, particularly through renewable energy technologies, interconnection and tie-in protocols, and tiered energy pricing are also involved, then the utility of distributed energy storage is greatly enhanced. A scenario such as this could lead to significant financial incentives to the consumer, and possibly to utilities as well.

Distributed energy storage could also be facilitated by strategies such as a Property Assessed Clean Energy (PACE) program or other incentive programs. It would also be important to get the utility providers' support for such a strategy. Mutually beneficial terms would provide the best incentive for both parties.

This type of strategy would be best implemented on a statewide level. Regional implementation may be effective, provided utility cooperation exists, and regulatory barriers are minimized. As technologies and industries develop, distributed energy storage will become an increasingly effective way for managing the intermittent nature of renewable energy technologies and the relatively predictable nature of power consumption.

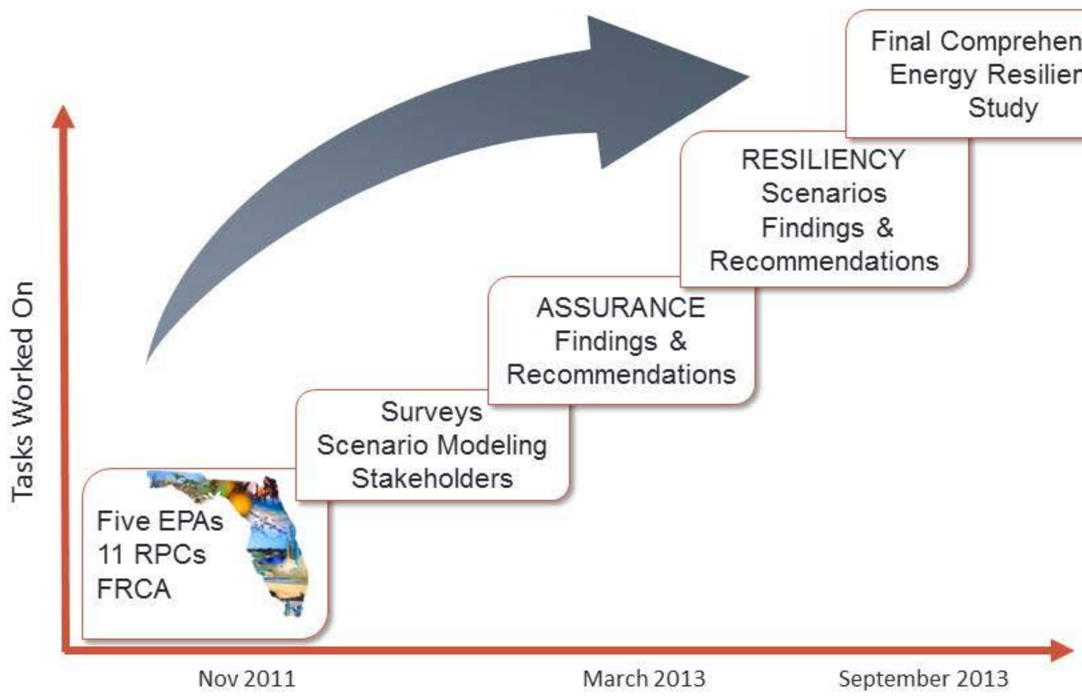
As key industry stakeholders and electric utilities are positioned to support energy storage applications because they can test, evaluate, and deploy resources in different sections of the electricity value and supply chain, and enable the monetization of benefits in different ways than other stakeholders. The wide range of potential applications dictate 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. Governments can 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 can 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.

Next Steps

This interim report is being published to coincide with the project objectives and deliverables timeline of the FRCA agreement with the Florida Office of Energy. This report contains economic analyses and strategy recommendations for consideration for use in the Florida Energy Assurance Plan and other energy assurance planning processes. Due to the nature of an interim report, approximately 15 different authors have collaborated on this process. The items and issues addressed in this report are generally technical in nature and stand alone. The final Energy Resiliency Strategy will be more cohesive and intended more for general public and policy maker education.

During the time period of April 2013 through August 2013, the FRCA Energy Assurance Planning Team will gather stakeholder input on the Interim Report. Additional Scenarios and Case Studies will be performed as needed. As more analysis are performed and more feedback is gathered, supplementary findings and recommendations will be created.

The team will finalize the Energy Assurance Study into the comprehensive Energy Resiliency Study. The team will develop a master presentation that will be scalable in length from executive briefings to conference presentations. The final presentation and final Energy Assurance Study will be part of the Energy Resiliency Study to be published in September 2013, as shown in the timeline below.



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