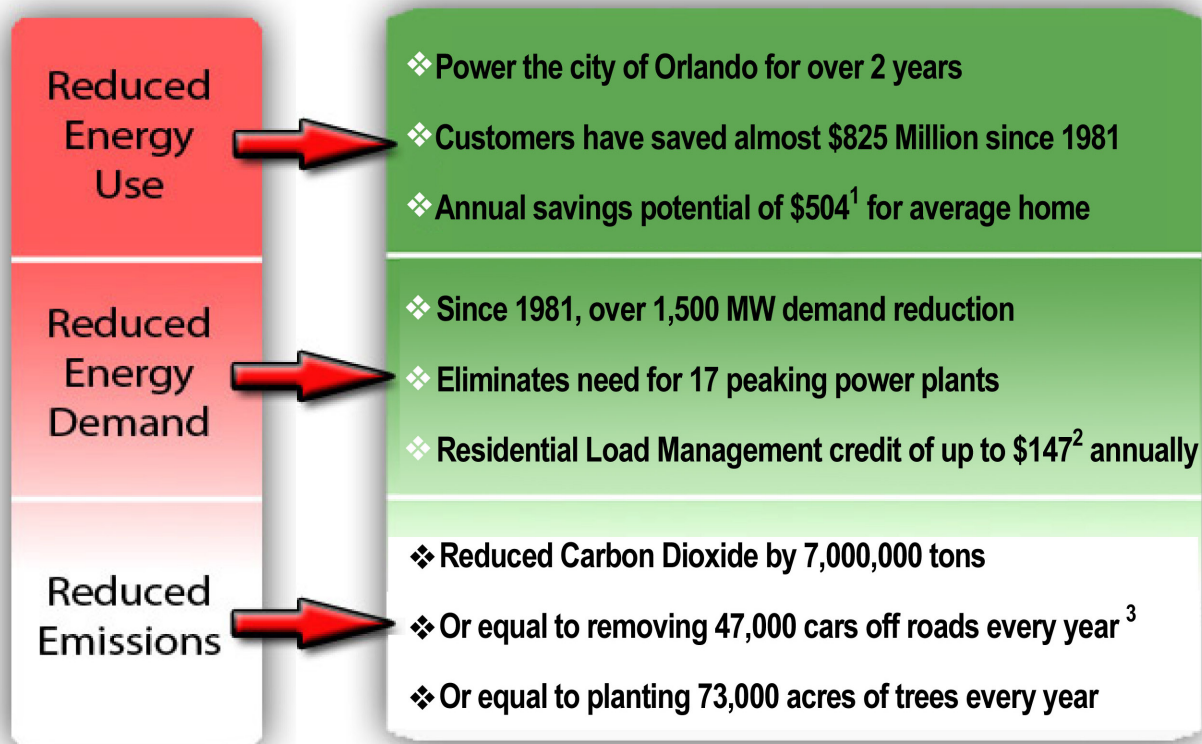


# Progress Energy 1981 to 2006 Energy Efficiency Impacts

Progress Energy has been helping consumers use energy more efficiently since 1981. Some of the highlights of Progress Energy and its customers' success with efficiency programs are:

- ❖ Energy Efficiency programs have achieved total reductions of over **10.7 billion KWH** of energy savings since 1981
- ❖ Our customers have saved almost **\$825 million** from their energy cost, since 1981, through our Energy Efficiency programs



- ❖ Customers implementing these Energy programs **can save \$504<sup>1</sup> annually**, plus up to \$147<sup>2</sup> if they sign up for Energy Management, **for a total of \$651<sup>1,2</sup>**:

PROGRAM	SAVINGS	PROGRAM	SAVINGS
Duct Repair	\$63	New Heat pump (SEER 15)	\$146
Insulate Ceiling R-30	\$63	Window replacement	\$108
Insulate Wall R-10	\$124		

- ❖ Energy Efficiency and Load Control programs have achieved total demand reductions of over **1,500 MW** since 1981
- ❖ Since 1981, our customers **eliminated almost 7 million tons of carbon dioxide** through energy savings with our Energy Efficiency programs

<sup>1</sup> Each car driven 12,000 miles annually. <sup>2</sup> Savings include new DSM offerings available 4/2007. <sup>3</sup> Res. L.M. savings based on Year Round program starting 6/2007.



**Progress Energy in Florida received approval in January 2007 to add 39 new measures to our existing programs and create two new programs to more than double our Energy Efficiency efforts.**

**Energy Efficiency Program information below summarizes statistics for 1994 through 2006:**

- ❖ Home energy audits conducted on almost 424,000 homes
- ❖ Construction of "airtight" duct systems in approximately 106,000 new homes
- ❖ Ducts repaired in over 60,000 existing homes
- ❖ Attics insulated in over 56,600 existing homes
- ❖ Over 46,400 high-efficiency heat pumps installed in existing homes
- ❖ Almost 700 participant homes have received efficiency improvements through the Low-Income Weatherization Program since program roll-out in 1999
- ❖ Almost 400 builders participate in Progress Energy Florida's new construction program
- ❖ Since 1999, almost 5,200 homes have been certified to Home Advantage Premium Energy Star criteria

Our Florida customer's commitment to energy efficiency is demonstrated through every duct repair, high-efficiency heat pump installed, attic insulated, audit completed with efficiency recommendations, window film or motor upgrades for business facilities.

## Residential Energy Efficiency Programs

**Home Energy Check:** Residential energy check program. Company representative examines home and makes recommendations on low-cost or no-cost energy-saving practices and measures. Home energy check types include: free walk-through, customer-completed (mail-in), customer-completed (online), phone-assisted customer survey, paid walk-through (\$15 cost), and home energy rating (BERS audit promoted by DCA).

**Home Energy Improvement:** Umbrella program for existing homes. This program combines thermal envelope efficiency improvements with upgraded equipment and appliances:

**Attic Insulation Upgrade:** Encourages customers to add ceiling insulation. Progress Energy pays a portion of the installed cost. The specific incentive amount is based on increasing the insulation amount above a maximum of R-15, with maximum incentive amount being \$100 per customer, plus up to 7¢ per square feet over 1,500 square feet.

**Duct Test and Repair:** Promotes energy efficiency through improved duct system sealing. Program helps identify and reduce energy loss by measuring air leakage rate through the central duct system. Customer must have electric heating and a centrally ducted cooling system to participate. PEF pays up to \$30 for the first unit for duct leakage test (\$20 for each additional unit at same address) and up to \$125 per unit for duct repair.

**High-Efficiency Electric Heat Pumps:** Pays financial incentive, not exceeding \$350 per unit, to replace existing electric-heating equipment with high-efficiency electric heat pumps. Specific incentive based on minimum heating and/or cooling efficiency levels. Indoor air handler and outdoor condenser must both be replaced with new equipment to qualify for this rebate.

**Spray-In Wall Insulation:** This incentive encourages customers to add insulation to the block-wall area by paying a portion of the installed cost. The incentive is 20¢ per square foot for the installation of wall insulation adjacent to conditioned space, with a maximum incentive of \$300 per residence.

**Proper Sizing of High-Efficiency Air Conditioners:** This encourages the contractor to properly size the air-conditioning unit using an approved sizing software. This incentive applies only for heating/cooling systems when installing a new air handler and condensing unit. The incentive for the proper sizing of high-efficiency heating/cooling systems is \$75 per system.

**HVAC Commissioning:** This encourages the evaluation and optimization of heating/cooling systems using approved technological software. To qualify for the \$50 incentive per system, the contractor must complete the specified recommendations.

**Supply and Return Plenum Duct Seal:** This measure encourages the contractor to entirely seal the supply and return portion of the plenum to the air handler. The incentive only applies to new heating and cooling systems with a minimum SEER 14. The incentive is \$50 per system.

**Reflective-Roof Manufactured Homes:** This measure will provide incentives to install an approved Energy Star roofing product. The residence must have whole-house electric cooling to be eligible for an incentive of \$40 per residence.

**Reflective-Roof Single-Family Homes:** This measure provides an incentive to install light colored roofs on the residence. The residence must have whole-house electric cooling to be eligible for this program. The incentive will be 15¢ per square foot, with a maximum incentive of \$150.

**Window Film and Window Screen:** This encourages customers to install qualifying film or screening on their windows facing east, west, and south. The residence must have whole-house electric cooling to be eligible for this program. The maximum incentive is half the cost up to \$100.

**Replacement Windows:** This measure encourages the installation of new high performance windows when replacing existing windows. The customer must have whole-house electric cooling and heating to be eligible for this program. The incentive for replacement windows is \$1.00 per square foot, with a maximum incentive of \$250 per residence.

**Residential New Construction (Home Advantage):** The Home Advantage Program promotes energy-efficient construction which exceeds the building code. Information, education, and consultation are provided to home builders and contractors on energy-related issues and efficiency measures. Mastic sealant on the home's duct system and energy-efficient electric heat pumps are required for participation.

**Low Income Weatherization Assistance (LIWAP):** This is an umbrella program to improve the energy efficiency of low-income family homes. Efficiency measures and incentives are identical to those offered in our Home Energy Improvement Program.

**The Neighborhood Energy Saver Program (NES):** This is a new program designed to assist low-income families with escalating energy costs. The goal of the NES program is to implement a comprehensive package of electric conservation measures at no cost to the customer. In addition to the installation of the conservation measures, an important component of this program is educating families on energy efficiency techniques and the promotion of behavioral changes to help customers control their energy usage. Additionally, the NES program uses a unique canvassing technique that employs a door to door implementation strategy. Another important component is the informational and educational communications campaign. The comprehensive package of electric conservation measures will consist of the following items: Compact Fluorescent Bulb, Water Heater Wrap and Insulation for Water Pipes, Water Heater Temperature Check and Adjustment, Low Flow Faucet Aerator, Low Flow Showerhead, Refrigerator Coil Brush, Refrigerator Thermometer, Wall Plate Thermometer, HVAC Winterization Kit, HVAC Filters, Change Filter Calendar, and Weatherization Measures.

**The Renewable Energy Program:** This is a new program designed to provide an incentive for renewable energy technology used in conjunction with Energy Management. Renewable energy technology supplements a portion of consumer demand, while peak demand is reduced by interrupting service to selected electrical equipment with radio controlled switches installed on the customers' premises.

**Solar Water Heater with Energy Management:** This measure encourages residential customers to install a solar thermal water heating system. In order to qualify for this incentive, the heating, air-conditioning, and water heating systems must be on the Energy Management program. The proposed incentive is \$450 per residence, plus an associated Energy Management program credit.

**Solar Photovoltaics with Energy Management:** This measure promotes environmental stewardship and renewable energy education through the installation of solar energy systems at schools within Progress Energy Florida's service territory. Customers participating in the Winter-Only Energy Management or Year Round Energy Management plan can elect to donate their monthly credit toward the Solar Photovoltaics with Energy Management Fund. The fund will accumulate associated participant credits for a period of 2 years, at which time the customer may elect to renew for an additional 2 years.

All proceeds collected from participating customers, and their associated monthly credits, will be used to promote photovoltaics and renewable energy educational opportunities.

**Residential Energy Management:** Voluntary load control program in which PEF reduces winter and summer peak demand by interrupting electric service to water heaters, central electric cooling and heating units, and pool pumps. Program is offered during winter months (November through March) and during summer months (April through October). Maximum annual bill credit for cooling, heating and water heating is \$117.00 but the credit is reduced when customer usage is less than 600 kWh per month.

## Commercial Energy Efficiency Programs

**Business Energy Check:** A company representative will survey your facility and make recommendations on low-cost or no-cost energy-saving practices and measures. Business Energy Check types include free walk-through, customer-completed (online), and paid energy analysis (\$35 to \$4,000 cap).

**Better Business:** This is an umbrella efficiency program for existing business buildings. The Business Energy Check provides customers information and makes recommendations on energy-related issues and efficiency measures that are available for a Progress Energy rebate in Florida. Like the following measures:

**HVAC Equipment:** Pays financial incentive, of up to \$150 per kW reduced, for the purchase of high-efficiency HVAC equipment such as packaged terminal heat pumps, packaged rooftop units, water-cooled and air-cooled chillers, and unitary heat pumps and air conditioners.

**Energy Recovery Ventilation:** Pays financial incentive of up to \$15,000 for the installation of high-efficiency energy recovery ventilation units that remove heat and humidity from conditioned space. Customer must have electric heating and cooling system to participate.

**Duct Leakage Test and Repair:** Program helps identify and reduce energy loss by measuring air-leakage rate through the central-duct system. Customer must have electric heating and centrally ducted cooling system to participate. Progress Energy pays up to \$30 per unit for duct leakage test and up to \$125 per unit for duct repair.

**Ceiling Insulation Upgrade:** Encourages customers who have electric space heat to add ceiling insulation. Specific incentive amount is based on increase in insulation amount above a maximum of R-12, with maximum incentive amount of \$100 per customer, plus up to 7¢ per square feet over 1,500 square feet.

**Cool Roof:** Promotes the installation of “cool roof” coating or membrane that reflects heat from the sun. Customer must have electric-cooling system to participate. Progress Energy pays 10¢ per square foot of cool roof coating or membrane installed up to a maximum of \$15,000 per building.

**Roof Insulation Upgrade:** This measure encourages customers who have electric space heat to add insulation to the roof area by paying for a portion of the installed cost. The facility must have an existing roof insulation level less than R-12 to participate and upgrade to a minimum value of R19 to receive the incentive. The incentive amount will be 7¢ per square foot with a maximum of \$15,000 per building.

**Thermal Energy Storage w/ Time-of-Use Rate:** This measure will provide an incentive to encourage existing business customers to utilize thermal energy storage (TES) systems to reduce the size and cost of replacement chillers and lower energy costs. To generate maximum cost savings for customers, they will be required to enter into the Time-of-Use Rate. The proposed incentive for the new measure will be up to \$300 per kW of reduced cooling load at peak times.

**Green Roof:** This measure is designed to encourage business customers to increase the thermal efficiency of their buildings roof, utilizing green roof designs. The effect of these applications will result in reduced peak kW. The proposed incentive will be \$.25 per square foot for the installation of an approved green roof.

**Efficient Compressed Air System:** This measure will provide an incentive to encourage business customers to utilize a proactive approach to increase the efficiency of compressed air systems. Proposed incentives will be calculated based on \$50 per kW reduction.

**Roof Top Unit Recommission:** This measure will provide an incentive to encourage existing business customers to perform recommissioning of rooftop air-conditioning units (RTU). Recommissioning will consist of performing maintenance to assure that the unit is operating at optimal efficiency with the proper freon charge, as well as, adjustment, cleaning, and replacement or repair of all parts of the unit that affect efficiency. The proposed incentive for the new measure will be \$15 per ton of RTU.

**HVAC Steam Cleaning:** This measure will provide an incentive to encourage existing business customers who utilize packaged terminal air-conditioning (PTAC) and packaged terminal heat pump (PTHP) units to have the coils steam cleaned. This steam cleaning process will improve the efficiency of the HVAC equipment as well as eliminate any mold, fungus, or mildew. The proposed incentive is \$15 per unit one time.

**Efficient Indoor Lighting:** This measure is intended to improve energy efficiency through the retrofit of inefficient lamp and ballasts in indoor lighting fixtures with high-efficiency technologies. The proposed incentives will be \$50 per kW reduced.

**Occupancy Sensors:** This measure will provide an incentive to encourage business customers to install occupancy sensors in any areas where lights are not likely to be turned off. The proposed incentive will be \$50 per KW of lighting load controlled with approved controls.

**Demand Control Ventilation:** This measure will provide incentives for the installation of demand control ventilation (DCV) using Co<sup>2</sup> sensors. DCV saves energy by automatically adjusting building ventilation rates in real time based on

occupancy. This measure provides incentives of \$50 per ton with properly designed and installed DCV control programming.

**Efficient Motors:** This measure promotes the installation of high-efficiency polyphase motors, through a simple incentive structure, based on the motor size and a specified \$/hp. The maximum incentive amount will range from \$1.75 to \$2.75 per hp. The specific incentive amount will be a function of the motor size and efficiency.

**Window Treatment:** Progress Energy Florida will provide customers with an incentive to install window film or solar screen on existing windows having east, west, and south exposures. The maximum incentive will be \$.75 per square feet of window treatment installed. The total incentive per customer can not exceed \$5,000 per building. An exception to this limitation will be made for facilities with multiple guest rooms, such as hotels, motels, hospitals, and assisted-care living facilities -- all of which may receive incentives up to a maximum of \$55 per room.

**Business New Construction:** This is an umbrella efficiency program for new business buildings. This program provides information, education, and advice on energy-related issues and efficiency measures by involvement early in the building's design process. Also provides incentives for energy-efficient equipment, such as HVAC equipment, energy recovery ventilation, and cool roof coating. Incentive levels are identical to those offered in the Better Business program for existing buildings.

**Innovation Incentive:** Provides incentives for customer-specific demand and energy efficiency projects, for measures not currently available as a rebate, on a case-by-case basis. Like all of our programs, the project must pass the Rate Impact Measure economic test proving it is cost-effective to participating and non-participating customers. To be eligible, projects must reduce or shift a minimum of 10 kW of peak demand. Rebates will be limited to \$150 per kW reduced or shifted. Focuses on measures not offered in PEF's other DSM programs. Examples include refrigeration equipment replacement, thermal energy storage, microwave drying systems and inductive heating (to replace resistance heat).

**Standby Generation:** Voluntary demand control program available to all C/I customers having on-site generation capability. Customer controls the equipment but operates it when needed by PEF. Incentive is based on the load served by the customer's generator and on our GSLM-2 rate schedule.

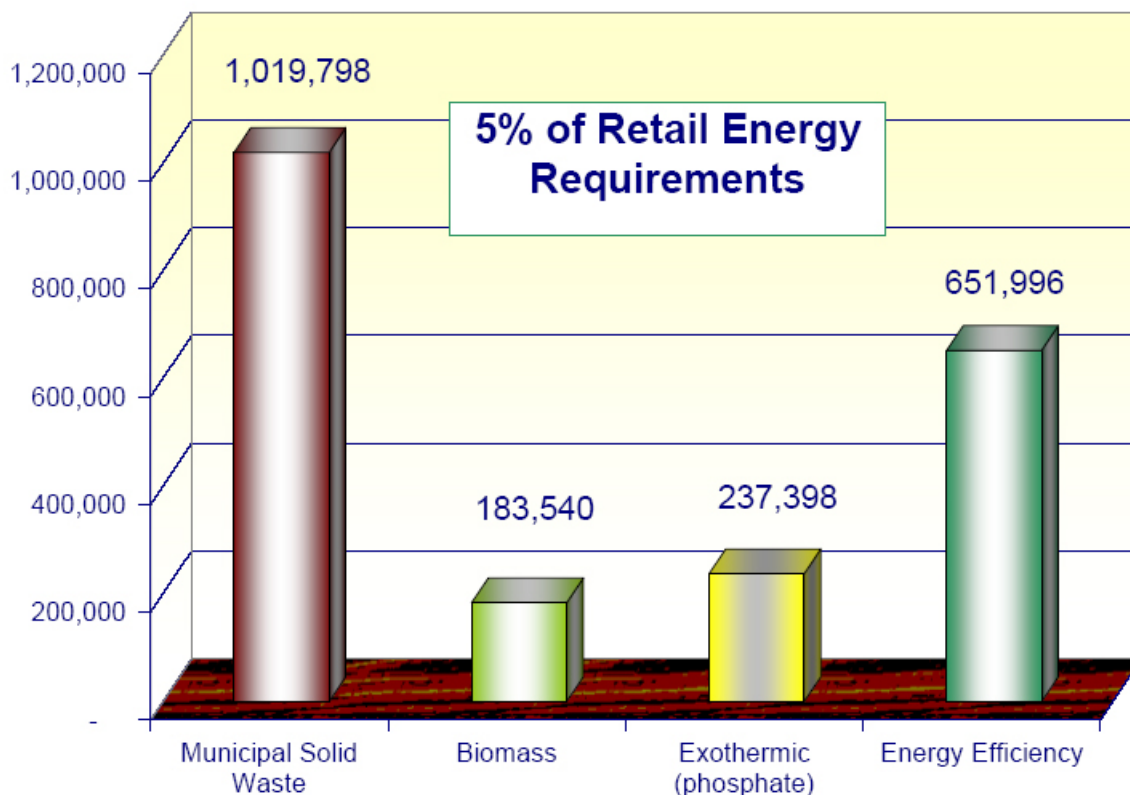
**Interruptible Service:** Progress Energy interrupts power by disconnecting electric service at the breaker during peak or emergency conditions. This program is offered under PEF's IS-2 and IST-2 tariffs. This service is available to any non-residential customer with an average billing demand of at least 500 kW. Monthly credit paid based on level of billing demand and load factor.

**Curtable Service:** Similar to interruptible service, only the customer's entire load is not shed. This program is offered under the CS-2 and CST-2 tariffs and is available to any non-residential customer with an average billing demand of at least 500 kW. Customer must be willing to reduce 25% of the average monthly billing demand upon request by PEF. Monthly credit paid to customer based on level of curtable demand.

## Progress Energy Florida's Alternative Energy Production

The amount of energy produced by alternative energy power plants under contract and energy conserved through customer participation in our energy efficiency programs, in 2006, was 2,092,732 mega-Watt hours (MWH). This was five percent of our total retail customer energy requirements of 41,796,100 mega-Watt hours (MWH). As the graph below illustrates, this production came from four alternative energy sources:

❖ Municipal Solid Waste	1,019,798 MWH
❖ Energy efficiency programs	651,996 MWH
❖ Exothermic (phosphate) heat recovery	237,398 MWH
❖ Ridge Biomass plant	183,540 MWH





# Alternative Energy Projects: Solar

The following projects and initiatives represent over 420 kW and 610,000 kWh of present and future photovoltaic generation located throughout Progress Energy's service area:

## **1. Manufactured Housing Photovoltaic (PV) Pilot Project**

(8 kW Demand / 11,680 kWh Energy per year)

This project was nationally recognized with the Interstate Renewable Energy Council's (IREC) 2002 Innovation Award. Additionally, this project received the 2003 Florida Sustainable Energy Award and was recognized by Governor Jeb Bush and his Cabinet with a Resolution Ceremony at the Capitol in Tallahassee on September 30, 2003.

## **2. British Petroleum Amoco "BP"**

(290kW Demand / 423,400 kWh Energy per year)

British Petroleum Amoco (BP) has worked with Progress Energy to interconnect 16 stores with gas-pump canopies outfitted with power generating photovoltaic systems throughout Progress Energy's service area. Progress Energy partnered with BP to monitor and evaluate the photovoltaic (PV) production from a sampling of the sites.

## **3. Progress Energy's Econolochatchee Photovoltaic (PV) Array**

(10.5 kW Demand / 15,330 kWh Energy per year)

The Econolochatchee Photovoltaic Array was originally commissioned in August 1988 at the Econolochatchee (Econ) substation in Orlando, Florida. The PV array consisted of 640 Siemens G4000 thin-film amorphous silicon modules and was nominally rated at 15-peak kilowatt (kWp). The PV system was designed to research power generating technologies that could generate electric power that would then be delivered directly into the electric grid. In 2006, two new PV technologies were added. The three technologies have identical interconnections and will be used to compare and evaluate the most efficient and cost effective performance.

## **4. The Nature Conservancy at the Disney Wilderness Preserve**

(13 kW Demand / 18,980 kWh Energy per year)

The Nature Conservancy at the Disney Wilderness Preserve features two grid connected PV systems. The two 6.5 kW systems were installed to promote renewable energy technologies at the Disney Nature Conservancy conservation and learning center located in Kissimmee, Florida. The buildings were officially opened to the public in October 1999.

## **5. The SunSmart School Program**

(26 kW Demand / 37,960 kWh Energy per year)

Progress Energy Florida partnered with the Florida Department of Environmental

Protection (FDEP) and the Florida Solar Energy Center (FSEC) to demonstrate PV systems at eight schools throughout the company's service territory.

This demonstration is part of the SunSmart Schools program, which is a collaborative initiative that provides students with interactive learning opportunities to explore alternative energy sources. The five-year project was launched in 2003 with the installation of 4-kilowatt (kW) PV systems at five schools. An additional school with a 2kW system was added in 2005, and two more 2kW systems in 2006.

Students can track energy production from the PV system mounted on a school's roof, even if they do not attend that school. Students work within their individual classrooms to conduct scientific experiments and mathematical computations based upon the PV system's energy production.

## **6. The Solar Energy Education Program**

The Solar Energy Education program was implemented in 2001, and it is estimated that this initiative benefited 7,500 students, equipped thirty schools with solar energy education kits, curriculum materials, and an interactive energy focused web site. Progress Energy recognizes the benefits of educational programs that promote science, mathematics and critical thinking skills.

## **7. Additional Customer Owned And Operated Interconnected Photovoltaic (PV) Systems**

(58 kW Demand / 84,680 kWh Energy per year)

Progress Energy has worked with several residential/commercial customers to interconnect PV systems to our electrical grid, accounting for 58 kW.

## **8. Homosassa Springs State Wildlife Park — demonstration hydrogen production and fuel cell project**

(5 kW Demand / 7,300 kWh Energy per year)

Progress Energy Florida and the FDEP have teamed up to develop a sustainable hydrogen generator and fuel cell for the wildlife park in Citrus County, Florida. The hydrogen fuel cell and 5-kilowatt PV system demonstrate sustainable energy, requiring only sunlight and water as a fuel source.

The PV cells convert sunlight into electricity, which operates an electrolyzer to produce hydrogen and oxygen from



water. The oxygen is released harmlessly into the atmosphere, while the hydrogen is used inside a fuel cell, which is similar to a battery, to generate electricity for the park's Wildlife Encounter Pavilion.

### **9. Jamestown Solar Thermal Water Heating Pilot**

This project involves installation of six solar thermal water heating systems in a community east of Orlando, FL. These systems are being monitored to determine the impact of the solar thermal systems on Progress Energy Florida's system peak.

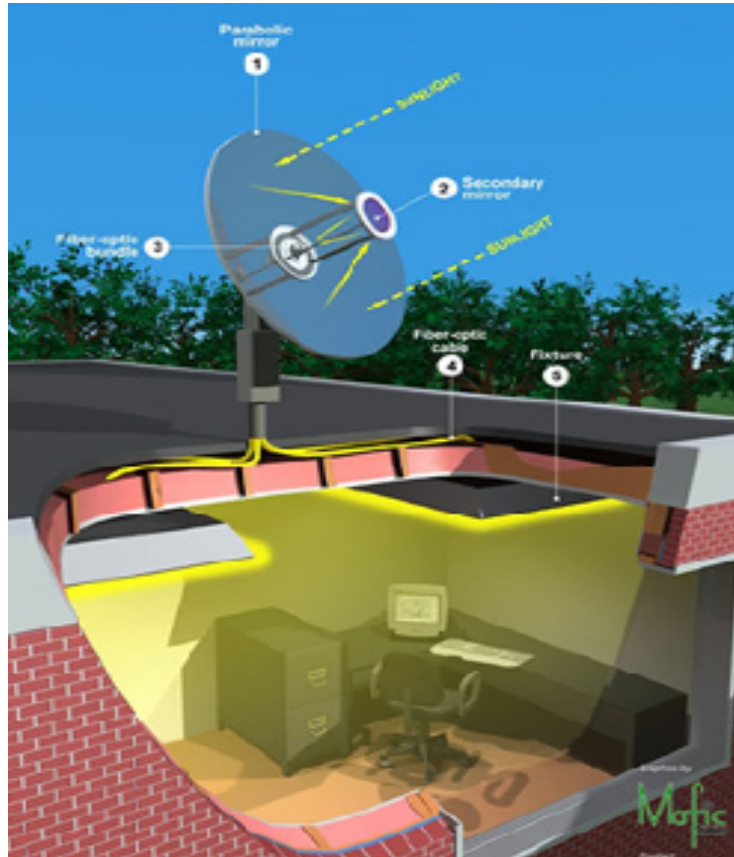
### **10. Renewable Distributed Generation and Storage System with Demand Side Management (DSM)**

(10 kW Demand / 14,600 kWh Energy per year)

In partnership with Dr. Alex Domijan, University of South Florida (USF), Professor and Director, Power Center for Utility Exploration, this project will install a 10 kW solar array on the USF, St. Petersburg campus. The output of this array will be stored in an advanced battery system known as a Vanadium flow battery. The stored energy will add to the solar output to reduce the power system summer peak. During the winter peak, the battery will allow the intermittent solar energy to reduce the power system winter peak.

### **11. Solar Hybrid Lighting**

Sunlight Direct, a DOE startup, and two commercial customers are partnering with Progress Energy Florida to determine the cost effectiveness of Solar Hybrid Lighting. This new technology uses a solar collector on the roof to concentrate the sun's energy into a bundle of fiber optic cables that distribute the solar light into the business building. The system also has the ability to dim or shut off the normal incandescent or fluorescent lighting system when there is enough day lighting. This system is eligible for a 30% tax credit. Progress Energy Florida will monitor the energy and demand saved to determine if this can become a DSM offering with participant incentives.



# Alternative Energy Projects: Hydrogen

## 1. Hydrogen Fuel Cell Vehicles and Hydrogen Production

Progress Energy is piloting fuel cell vehicles (FCV) and will use hydrogen-fueled Ford Focus FCVs in Florida. The vehicles will be driven by energy counselors who make home visits to advise customers in energy-efficiency methods. Progress Energy Florida (PEF) and the Florida Department of Environmental Protection (FDEP) have created the first hydrogen car support facility in Central Florida. Ford Motor Company has delivered six hydrogen vehicles for a three year field test. The hydrogen fueling station is currently under construction at the PE Jamestown Operating Center. The partnership is between PEF, FDEP, Ford and British Petroleum.



## 2. Hydrogen ICE Bus's and Hydrogen Fueling Station

Progress Energy Florida and the Florida Department of Environmental Protection (FDEP) have teamed up for this H<sub>2</sub> fueling station to be located on property owned by Progress Energy near the Orlando International Airport. The station is intended to fuel eight state owned Ford V-10, E-450 hydrogen-powered shuttle buses transporting visitors. With a range of up to 150 miles and near-zero emissions, including carbon dioxide, the Ford hydrogen shuttle bus uses an internal combustion engine designed to run on hydrogen fuel instead of gasoline.



The station will provide a test platform for showcasing the safe and cost-effective production, storage and dispensing of hydrogen as a transportation fuel. Worldwide, energy companies, automakers and petroleum companies are investing more than \$2 billion

annually to develop the hydrogen industry and diversify with new, sustainable sources of energy.

### **3. Hydrogen: The Power and the Potential Student Curriculum**

Our goal was to develop a curriculum that motivated students to envision a world that utilizes a variety of energy sources, such as renewable energy, energy conservation and, in particular, hydrogen. The Hydrogen: The Power and the Potential program is an opportunity for students, guided by teachers and supported by the partnership of Progress Energy and the Florida Solar Energy Center to step confidently forward into a new energy era. The program was initiated with the following eight Florida schools:

- ❖ Nature Coast Technical High School -- Brooksville
- ❖ Polk Avenue Elementary School -- Lake Wales
- ❖ J.W. Mitchell High School -- New Port Richey
- ❖ Lakewood High School -- St. Petersburg
- ❖ Lake Howell High School -- Winter Park
- ❖ Durance Elementary School -- Orlando
- ❖ Tusawilla Middle School -- Oviedo
- ❖ Oak Ridge High School -- Orlando

These interdisciplinary teams of teachers from the schools listed above, participated in training facilitated by the Florida Solar Energy Center education staff. The teachers reviewed current curriculum and other information available on hydrogen to develop a unique curriculum that was aligned with the Sunshine State Standards and their individual classes.

As the population of Florida continues to increase, so does the need for resources, infrastructure and energy. The Hydrogen: The Power and the Potential student curriculum will serve as a model that could expand to other schools in the future. The goal is to help transition Florida to an economy that utilizes a variety of energy sources and technologies, including hydrogen.

### **4. Uninterrupted Power Source Powered By a Hydrogen Fuel Cell**

Progress Energy Florida researched the feasibility of an alternative energy Uninterrupted Power Source (UPS) with a 5 kW hydrogen fuel cell. This demonstration project was conducted at the Palm Garden Assisted Living Facility on the west coast of Florida. The UPS hydrogen fuel cell provided the power to essential lighting during power outages caused by weather or other emergencies that can cause interruptions in grid power.

The UPS hydrogen fuel cell project furthers the research and development of this technology for the future. This was a joint project funded by Progress Energy and Plug Power.

Hydrogen is the third most abundant element on earth and can be extracted from many sources including biomass, water or in this case, natural gas. Hydrogen, therefore, is a renewable or sustainable energy carrier and will never run out. The challenge is developing an economical way to extract hydrogen to justify replacing existing fuels.



"These projects give us research opportunities and experience with this technology," said John Masiello, Progress Energy's manager of Demand Side Management and Alternative Energy Strategy. "Learning to use hydrogen effectively and safely is a key step in making hydrogen fuel potentially viable in the future."

## Alternative Energy Projects: Biomass

### 1. Biomass 130MW Power Plant

Progress Energy has signed a contract with Biomass Investment Group (BIG) to build a 130MW biomass power plant in Central Florida. BIG says once it is constructed, the plant will be the world's first commercial-scale, closed-loop (no carbon emissions) biomass facility using crops grown on site. The crop will be a giant reed resembling bamboo and trademarked as e-Grass, the scientific name is *Arundo Donax*.

### 2. Landfill Methane Gas 14MW Power Plant

Progress Energy has signed a contract to purchase 14MW of electricity generated from landfill gas in Central Florida, beginning in 2008.

### 3. Biomass Inventory and Potential

The Florida Energy Office has awarded University of South Florida's Power Center for Utility Explorations and Progress Energy a \$70,000 grant with three goals:

- 1) Review the overall feasibility of generating electric power using biomass.
- 2) Develop an understanding of the various issues in the entire process of collection and use of biomass for electric power generation.
- 3) Assess the biomass potential in Progress Energy's service area.

Two types of systems will be studied namely "biomass only" and "co-firing" systems. The economic feasibility of using the syngas generated from the gasification process for charging fuel cells and using in combustion turbines will also be studied.

# Alternative Energy Projects: State Grants Submitted

**Progress Energy Florida (PEF) has partnered with a number of universities for a total of nearly \$17 million in alternative energy projects submitted to the Florida Renewable Energy Technologies Grant Program.**

## **1. Grid Optimization**

USF: Dr. Domijan-Professor, UTCP: Marcus Rothstein, Proton Energy Systems. Grid Optimization is a renewable energy demonstration project that will use hydrogen as an energy carrier to store energy generated by solar PV panels and "off-peak" utility grid energy for use at the optimum time. This project will use an electrolyzer to generate hydrogen which will be compressed and stored for use by fuel cell to power a UPS system that will optimize delivery of power to residences in order to accomplish specific objectives including Demand Side Management, Power System Hardening, Power System Reliability Improvement, and Addition of Hydrogen Fueling Infrastructure.

## **2. Renewable Energy Display**

The Mary Brogan Museum and PEF are partnering to develop an interactive, educational experience for diverse audiences with a focus on renewable energy and energy conservation. The innovative exhibit will feature emerging energy technologies including solar, hydrogen, and biomass while providing an examination of and comparisons with existing technologies such as oil, natural gas, nuclear and hydroelectric. It will also promote an emphasis on energy efficiency.

## **3. Distilled Water Production using waste heat from thermoelectric power plant**

James F. Klausner, Phd., Professor, University of FL Department of Mechanical and Aerospace Engineering. This project will build a pilot scale plant to produce 10,000 gallons per day of distilled water for use at the Progress Energy UF Cogeneration Plant in lieu of potable water used currently. Waste heat from the condensate system of the cogeneration plant will supply some of the energy used by this system.

## **4. Plasma Gasification Power Project**

Dr. Jacob Chung, Professor in the Department of Mechanical Engineering at the University of Florida. This project will design and build a plasma enhanced biomass gasification system for continuous generation of syngas. The plasma enhanced gasification system will use various kinds of locally available biomass fuel including campus waste, medical waste, forestry and agricultural waste. The syngas will be used to power a fuel cell, combustion turbine and boiler

for steam generation. Progress Energy will assist in the interconnection of the output of this system with the power system at a site to be determined. (250kW - estimated output)

### **5. Biomass Anaerobic Digester DSM Power System**

Dr. William Sheehan, Environmental Systems Commercial Space Technology Center, University of Florida. This project will use the diverse waste generated on campus to feed an anaerobic digester. The waste will include cafeteria waste, green waste, bio-solids, glycerol derived from bio-diesel production, and others. The syngas will be cleaned and stored for use during Progress Energy's peak demand periods utilizing a gas turbine generator and/or a fuel cell. Progress Energy will assist with the interconnection of this generator with the power system at the UF's Energy Center. (100-200KW - estimated output).

### **6. Solar Thermal Organic Rankine Cycle (ORC) Energy Project**

Mr. John Lenhart, United Technologies Research Center (UTRC), in partnership with Progress Energy of Florida, proposes to demonstrate a solar thermal and waste heat driven organic Rankine cycle (ORC) DG power plant, capable of providing 220 kW of electrical power to accomplish demand side management.