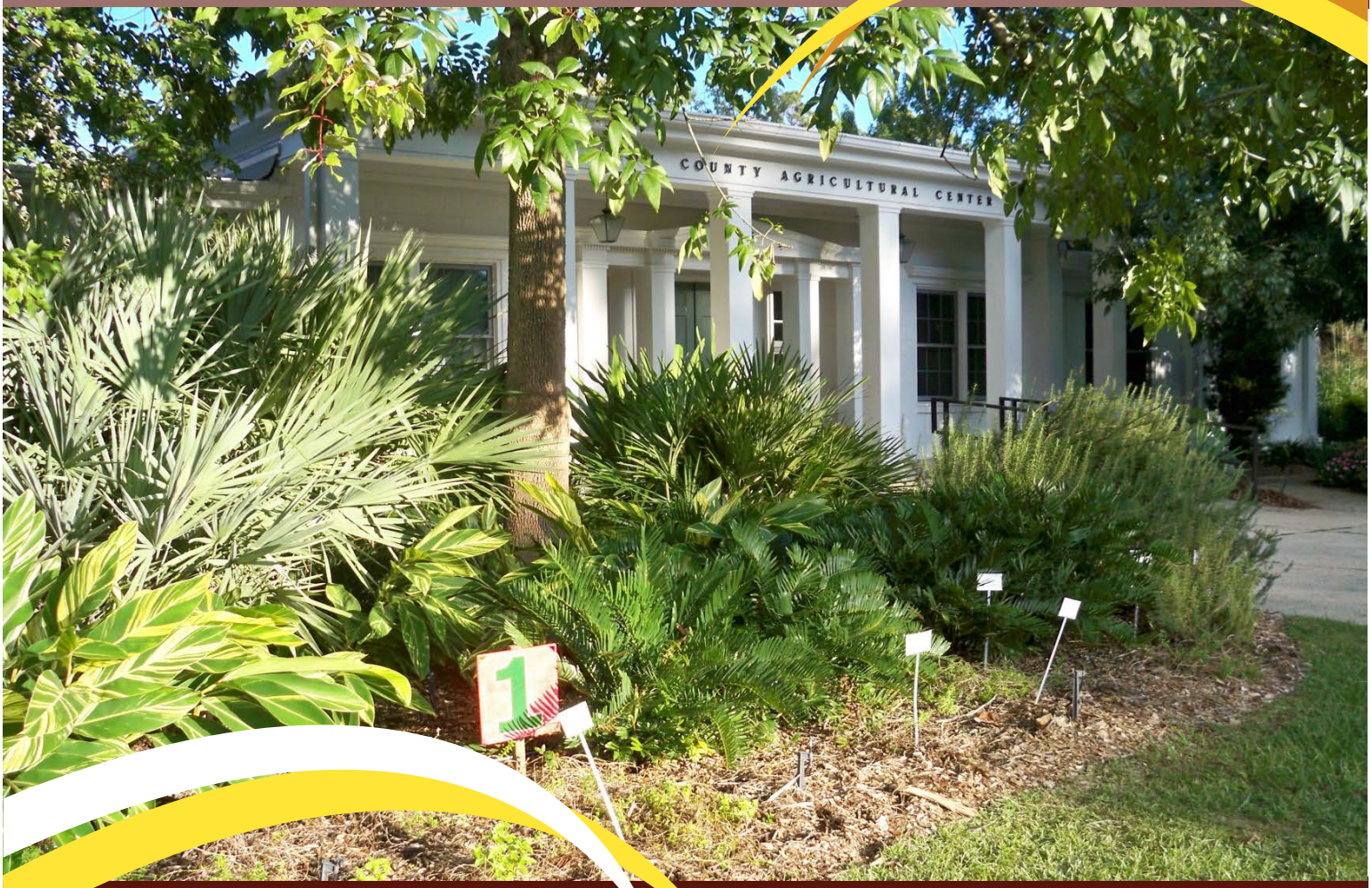
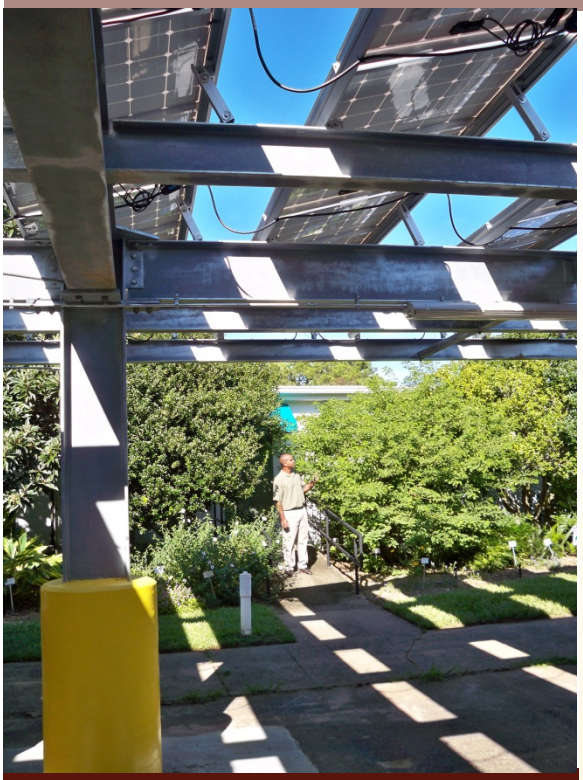
Leon County Sustainable Building "NET-ZERO" Demonstration – at the Leon County Extension Center



Built 1960-61
Renovated 2000-01
Retrofitted 2009-12

615 Paul Russell Rd • Tallahassee, Florida

WL Sheftall, Extension Agent IV, University of Florida Extension – Leon County



SUSTAINABLE DEMONSTRATIONS

- Solar Photovoltaic Renewable Energy Production System
- Closed-loop Geothermal HVAC System
- Heat Recovery Hot Water Heater
- T8 Lamp/Electronic Ballast Interior Lighting
- "Florida Friendly" Demonstration Gardens
- Rainwater Harvesting/Cistern Storage
- Micro-jet Irrigation System
- High Efficiency Toilets and Low Flow Faucets
- Material Reuse and Waste Reduction
- Material Recycling
- Green Cleaning

"Net-zero": Beyond Pay-back Calculations and Cost Savings to Resource Stewardship

STEWARDSHIP GOALS

The Leon County Board of County Commissioners decided in 2007 to place high priority on reducing greenhouse gas (GHG) emissions from county buildings. The purpose was to reduce county government's contribution to global warming, amplified climate variability, and accelerated climate change.

The Leon County Extension Center was selected as the Board's retro-fit demonstration building. Through a mix of in-house and contracted work, the Department of Facilities Management has designed and constructed the retrofit to demonstrate how a "net-zero" energy-use building operates, while saving the County money on the building's electric bill. A complementary goal was to demonstrate how to reduce the use of potable water for landscape irrigation, by first capturing from the roof (intercepting and storing) a portion of the rainwater previously leaving the site as stormwater runoff, and then infiltrating this water into the demonstration gardens. And saving money on the landscape's water bill.

LEADERSHIP FOR FUTURE QUALITY OF LIFE IN LEON COUNTY

Choosing to set a goal of net-zero is a win-win for both stewardship of natural resources and taxpayers' money. Leon County's investment in this project is a mitigation strategy to reduce its GHG footprint on the earth. It is also an adaptation strategy to hedge against projected future energy price increases for fossil fuel-based electricity needed to power the building. Getting off municipal potable water for irrigation also reduces the building's GHG footprint since there is an energy component to potable water. Transitioning to rainwater irrigation also conserves the region's aquifer, springflow, and useable life of private wells.

global trends affect our energy costs here

A growing world population and energy-intensive industrialization in Brazil, Russia, India and China will increasingly strain energy production from non-renewable fossil fuels. This increasing demand is colliding with decreasing net energy production from oil reserves whose production has peaked, and from lesser-quality coal deposits as mining depletes the more energy-dense coal.

We're also seeing a trend of increased costs for exploring, developing and producing energy as we deal with more challenging environments. More energy is required to produce a given unit (such as a barrel of crude oil) when drilling in deep ocean deposits, or extracting oil from tar sands. This input-to-output ratio results in the production of lesser amounts of ***net*** energy for global societal use.

PROJECT FUNDING

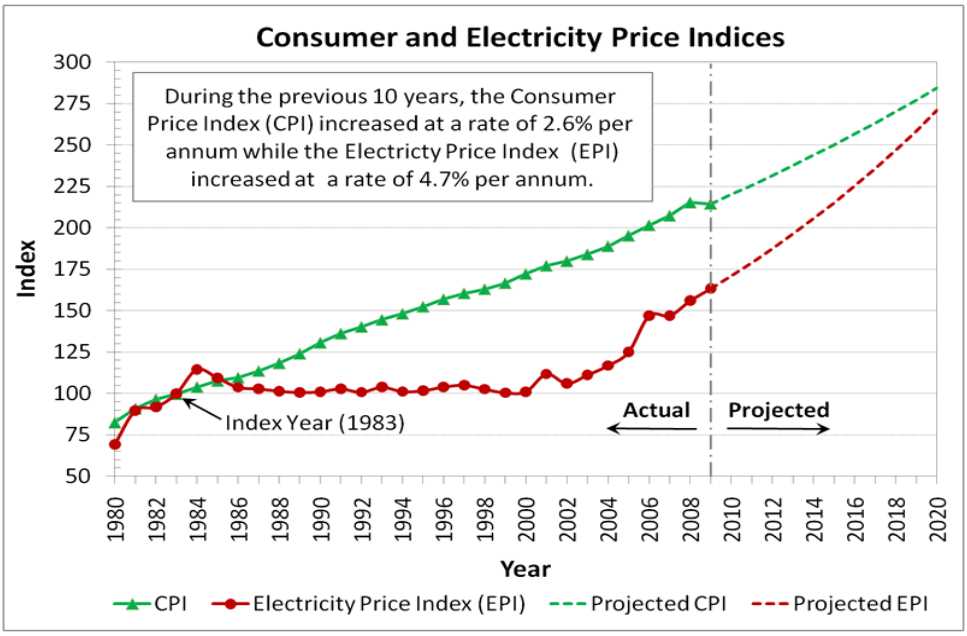
The net-zero energy demonstration project was funded largely by a US Department of Energy grant having these purposes:

- reducing US reliance on foreign oil;
- reducing US dependence on fossil fuels;
- boosting the renewable energy market by helping solar, wind and geothermal industries achieve price efficiency through scale;
- reducing the GHG footprint of the US; and
- creating jobs in the renewable energy sector.

Source of Graph to right: James Fenton, Director, University of Central Florida's Florida Solar Energy Center, in an oral presentation, *Reasons for Renewables in Florida – Florida's Energy: Where does it come from and where is it going?* FARE 2010 Renewable Energy Conference: "The Next Decade of Renewable Energy," Kissimmee FL, 26 March 2010

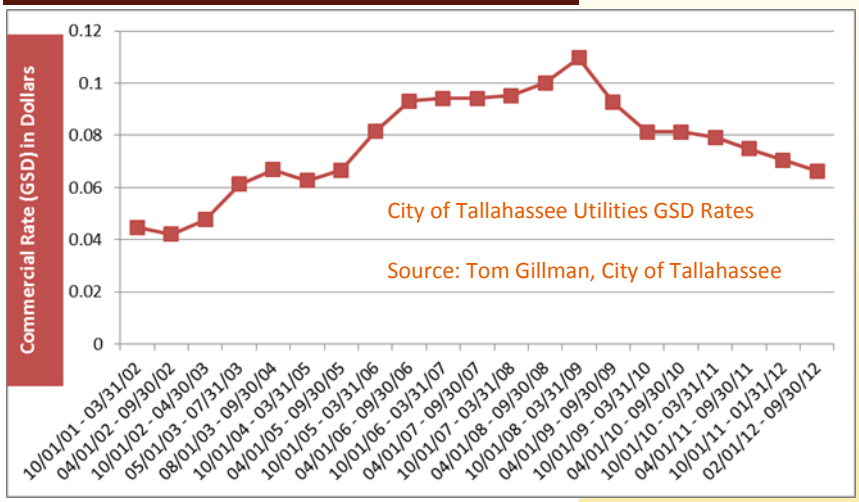
Graph below: 10-yr Rate History, City of Tallahassee Utilities General Service Demand (GSD) billed rate, which is cost of (kWh + Fuel) in US Dollars

City of Tallahassee Utilities generates electricity primarily from natural gas, which has dropped in price since 2008. An eventual upward trend in price for natural gas is likely as US utility and transport industries convert to this cleaner-burning fossil fuel, to avoid the more rapidly rising prices for oil and coal. As demand rises, competition for natural gas *vs.* supply will put upward pressure on price.



reducing the building's carbon footprint

Electricity distributed by the City of Tallahassee Utilities has an average carbon footprint of 1.020 lbs of CO_2 per kWh. It is one of the lowest CO_2 per kWh ratios in the industry. This is a result of the City's mix of power plants, which use natural gas, and to a much lesser degree the Lake Talquin hydroelectric dam.



Thus, as a City customer, every kWh of electric power produced by solar PV here and consumed on-site by the retrofitted Extension Center avoids emitting 1.020 lbs of CO_2. The retro-fitted building is projected to avoid using conventional carbon-based fuel sources that would emit 80,417 lbs of CO_2, or 39.5 metric tons/year. Over the projected 30-year life of the solar and geothermal systems, emission of 1185 metric tons of CO_2 potentially will be avoided. Computing the equivalence of planted trees as an offset for this volume of CO_2 emissions, it would take a forest of 6.4 acres growing for 55 years to turn this volume of CO_2 into biomass. [*]

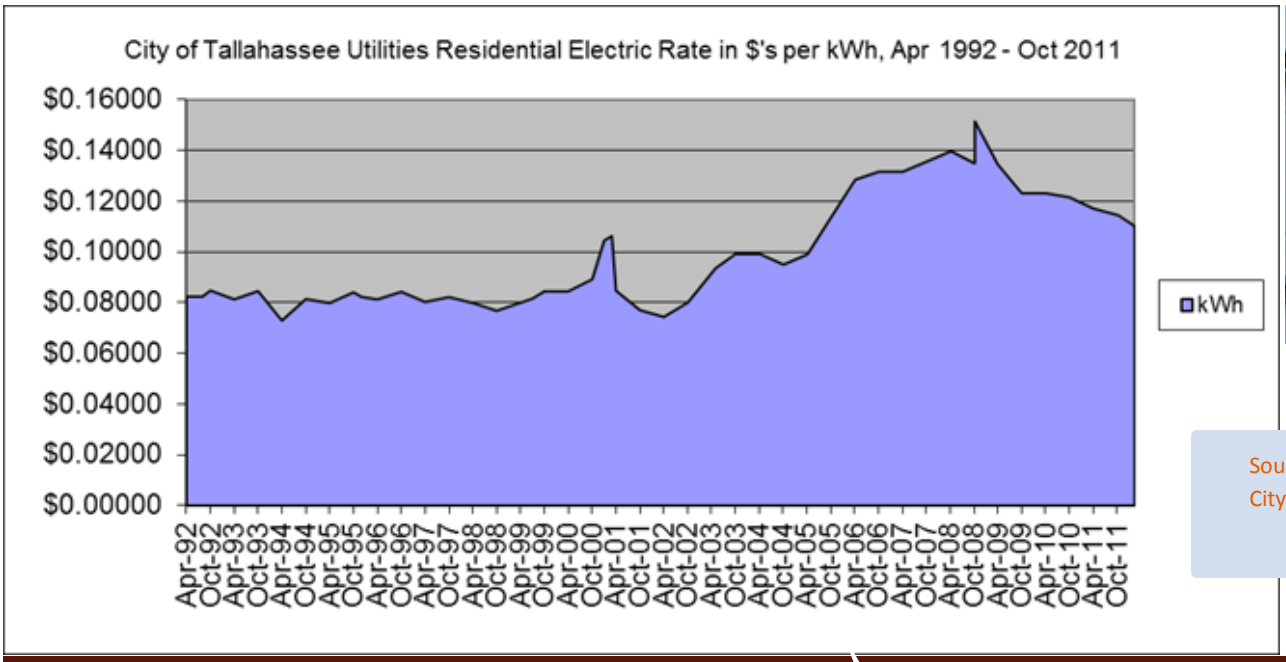
[We can use the factor of 185 metric tons of CO_2 stored *per acre of trees, planted at 450 trees/acre and grown* for 55 years, to compute 6.4 acres as the alternative offset equivalent to the retrofit. The factor was derived by American Forests from US Forest Service data.]

calculating payback for becoming a distributed energy generator and user

A retro-fit installation of solar photovoltaic (PV) panels allows the building to generate 78,840 kWh of AC electricity annually, which is projected to be roughly as much energy as it consumes on an annual basis. The dollar value of energy produced eliminates purchase of ~$5226.00's worth of electricity annually from the City of Tallahassee Utilities. This figure is based on the "General Service Demand" (GSD) rate of $0.06628/kWh for commercial customers since February 2012. The GSD is comprised of a commercial base rate currently at $0.01745/kWh, plus the charge for fuel and purchased power at $0.04883/kWh. The GSD will be subject to a periodic adjustment again in October 2012.

The projected payback period for this integrated system at the 2012 price of electricity -- calculated for the County's grant match investment of $91,000 (direct cost to Leon County taxpayers), comes to 15.6 years or ~½ the projected 30-year life expectancy of the infrastructure. This payback period will shorten if fuel charges or rates increase over the next 30 years, which is more likely than not.

Let's say, hypothetically, that the Leon County Extension Center's 13,289 square foot building were a residential building/customer served by City of Tallahassee Utilities instead of being a commercial customer. In such a case, the May 2012 rate of $0.11020/kWh for residential customers would translate into a potential electric energy savings of ~$8688 per year through solar PV net metering.



Source: Tom Gillman, City of Tallahassee

LEON COUNTY EXTENSION

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