



Florida Energy Conservation Assistance Program

Helping you Harness, Profit from and Protect the Free Power Provided to all of us by Mother Nature

Tampa Office (813) 545-5806
www.FLORIDAECAP.ORG



REPORT



Saving Energy Saves Everything



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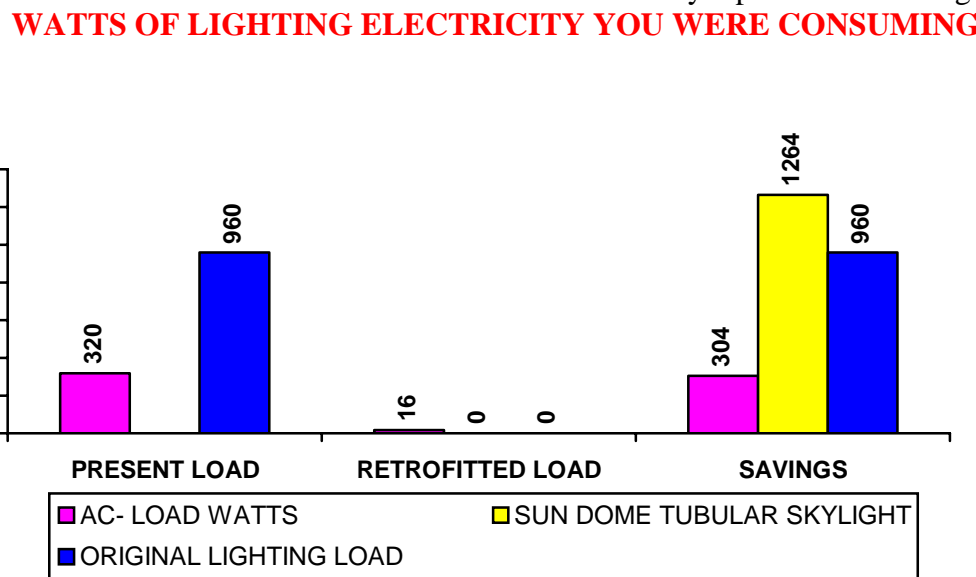
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Daylighting Retrofit Analysis *Gold Coast Invisible Fence* *West Palm Beach, Florida*

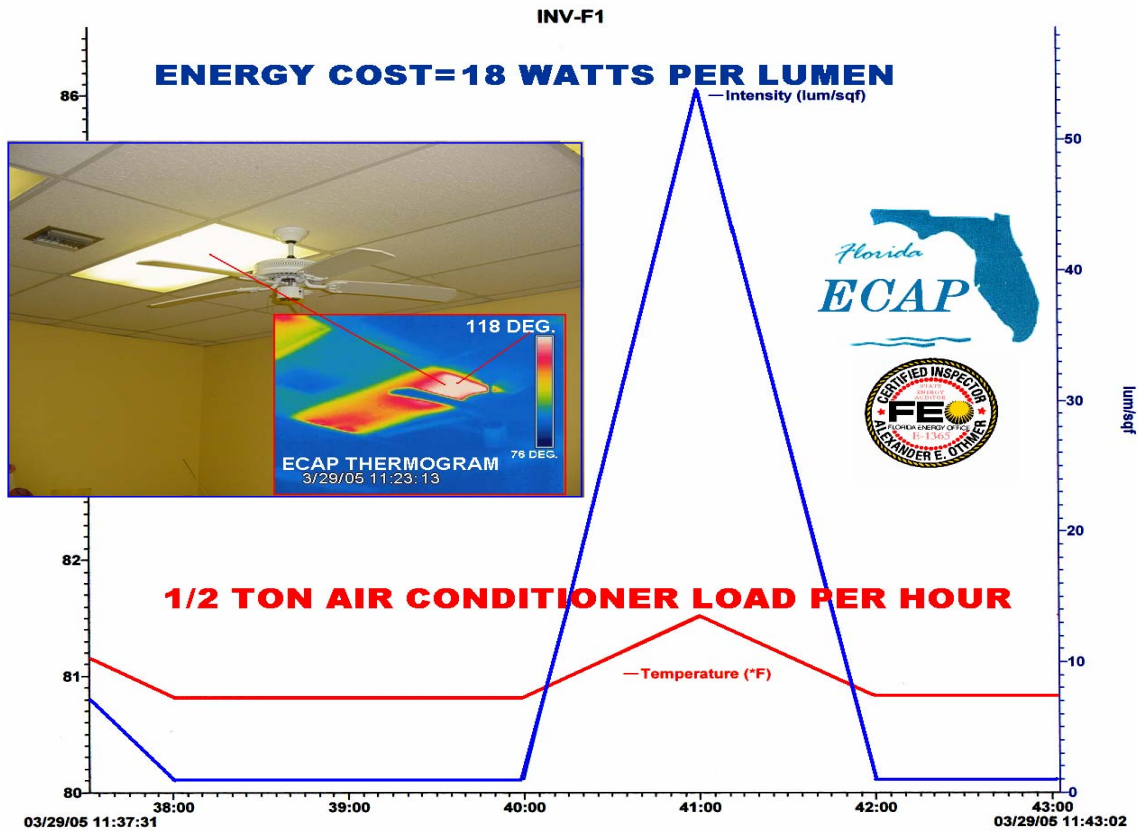
On May 20th, 2005 a survey was conducted at the above residences in accordance with the Florida ENERGY CONSERVATION ASSISTANCE PROGRAMS Designation: ECAP-CUL-1-99 Test Method for Comparing Utility Loads in Standard Constructed Buildings. The objective of this procedure is to determine the impact of the “As Built Conditions and As Installed Components / Equipment” on the utility loads in occupied residential, commercial and government buildings. The focus of this procedure is to provide a *comparison* to known standards for all parties interested in using *Alternative Energy Devices* to *displaced conventional utility loads*.

- Our survey indicated that your existing daytime lighting loads have been reduced by **95%** during daylight hours with your installation of a *Sun Dome Tubular Skylight Systems from Daylighting Technologies Inc.* As can be seen in the chart below, under your conditions the Sun Dome Tubular Skylight System obviously would qualify as an *A Renewable Energy (solar) Device* in accordance with **F.S. 1995 704.07 Solar easements; creation; remedies.-163.04 Energy devices based on renewable resources. Properly installed your Sun Dome installation is having no negative effect on the roofing systems water tight integrity or Architectural Aesthetics.** The chart below shows a synopsis of our findings.

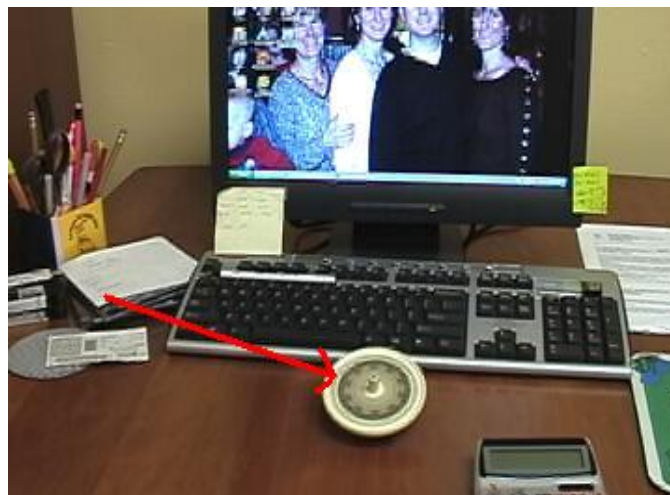


SURVEY RESULTS

As can be seen in the chart and the photos below, the amount of light that was available during daytime hours prior to the retrofit *was adequate but delivering minimal visual perception and creating excess heat loads and negative photobiological effects, a likely cause of your employees continual complaints concerning headaches when working in this office.*



Typical negative photobiological effects, Flicker & Strobe Frequencies recorded;



The both the Color Rendering Index (CRI) and the Photopic Ratio (the amount of light perceived by the human eye) of the existing **COOL WHITE** fluorescent fixtures were likely contributors to the uncomfortable working conditions being reported by the employees. The charts below show the relationship between these variables. All of the lighting sources in red produce some type of *negative photobiological effect* (flicker) and in some cases are a source of undesirable ultraviolet rays that can cause premature fabric fading and deterioration of furniture protective coatings.

Scotopic/Photopic Ratios for Various Light Sources

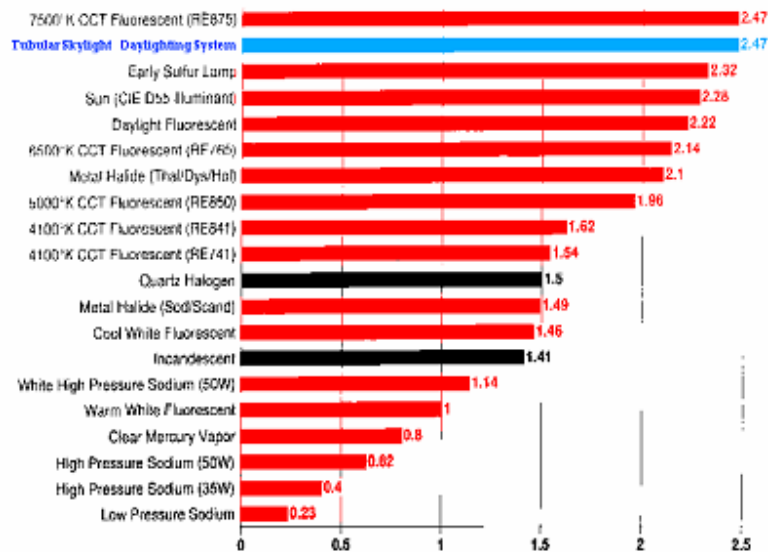
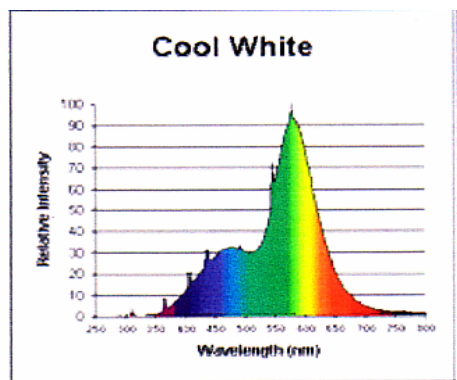
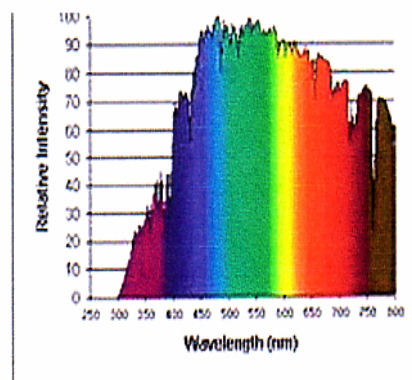


Figure 3



Three observations. 1. Notice how the yellow and green peaks. This is what you see. 2. Notice the lack of color spectra, in comparison to the other lights. 3. The blacks are flat lining on the right, contrast and form visibility is decreased.



The retrofit replaced these conventional electric lights with a *Sun Dome Daylighting System* that has a minimum CRI of 98 (Blue Line, chart above) *and produces no negative photobiological effects.*

As noted in the photo below, the original lighting system, *being high in the yellow spectrum*, along with the fact that the walls of this office were also painted yellow was creating a very dull looking work environment even though the 225 square foot room was being lit by six fluorescent fixtures *consuming over 960 watts of electricity*.



All of these factors, combined with other historical data on similar lighting systems (see publication below) were causing lost productivity, additional air-conditioning costs and employee complaints for the business owner prior to the retrofit.

Health Hazards of Fluorescent Lighting

Known effects and their likely causes

The following is a list of symptoms and diseases known to be linked to exposure to fluorescent lighting:

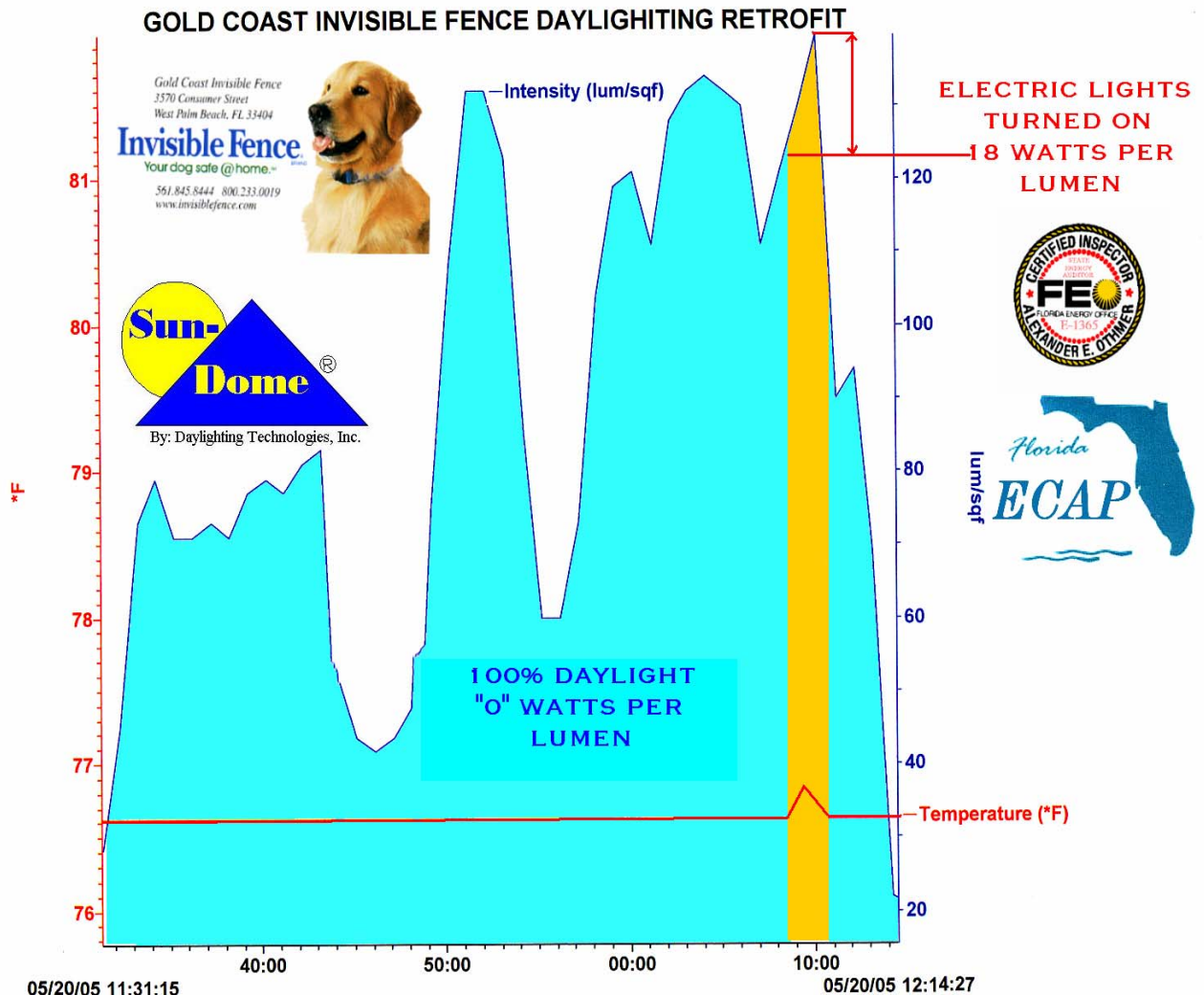
- Headache, eyestrain, eye irritation, fatigue, difficulty in concentration, increased rate of 'misjudgments' and accidents, malaise and irritability can be caused by noise, glare and flicker from fluorescent lighting.
- Increased stress (which may in turn lead to heart disease) can arise from increasing the intensity of artificial light with fluorescent tubes. It has been shown that increased use of artificial light (rather than natural light) affects the levels of hormones in the body, particularly the hormones associated with stress, such as cortisol.
- Variation in brightness, as provided by daylight, is necessary for the normal functioning of the body's rhythm. The monotonous illumination of fluorescent lighting may also add to the changes in hormone production.
- Allergic skin reactions and dermatitis can be caused by exposure to fluorescent lights. An unknown number of people suffer from 'cutaneous light sensitivity' due to fluorescent lights. This means that not only can they become allergic to fluorescent lighting but they can become more sensitive to ordinary sunlight.
- Certain long-term, mild skin diseases can become worse if the sufferer is exposed to fluorescent light. Some medical drugs (including some tranquilizers, antibiotics, heart drugs and diuretics) can make you particularly sensitive to UV radiation (photosensitivity). Skin eruptions then occur even with the small doses of UV (in the 300-320nm wavelength range) emitted by white fluorescent lights.
- Hyperactivity has been linked to the flickering produced by fluorescent lighting. Microwave emissions from fluorescent lighting are also suspected of contributing to these behavioral disorders. Other mild behavioral disorders in children may be made worse by working at school under fluorescent lighting.

Suspected effects

There is also some evidence that the following effects may be caused by exposure to fluorescent lights:

- Increased risk of seizure in epilepsy sufferers
- Higher incidence of miscarriage
- Speeding up the aging of the retina.

After the installation of the *Sun Dome Daylighting System* conditions changed dramatically and *within one week all complaints concerning headaches had been eliminated*. The chart below shows a synopsis of some of the data collected at this facility. *Air Conditioning Loads were reduced, negative photobiological effects were eliminated and the system was delivering more usable light at a cost of "0" dollars per lumen.*

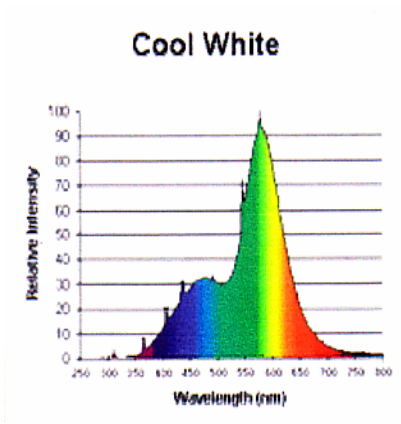


You will note, in the chart above, that even when clouds passed by, the daylighting system was still delivering more light than the conventional fluorescent system. Also note that when **we turned on the conventional system** (yellow area in the chart) that **added over 960 watts** of electric lighting load to the room we only gained **10 Lumens** of additional light and **the room temperature**, at work level, (thermal loads the air conditioner now had to contend with) **immediately increased**.

Side by Side data;

BEFORE

AFTER

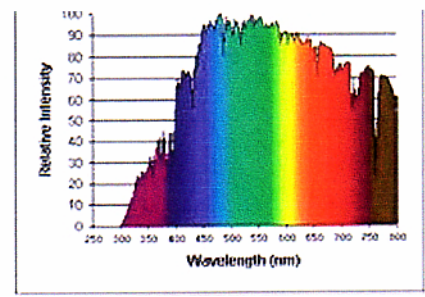


SunDome
By: Pro Lighting Technology, Inc.

Florida ECAP

Sunlight

With sunlight, you get a full array of the color spectrum.



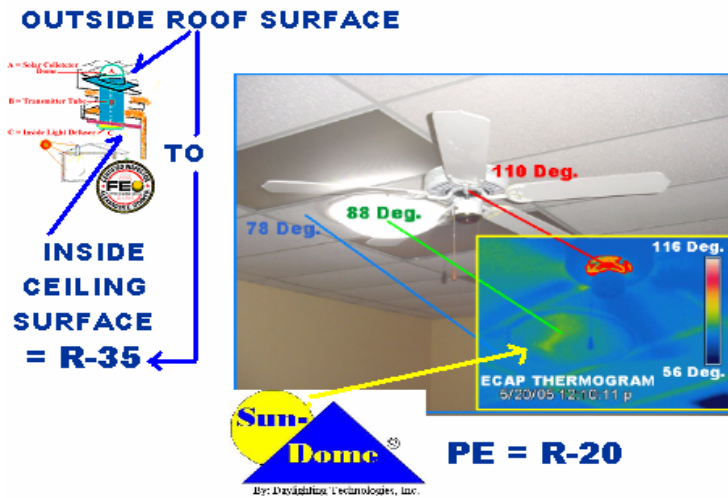
**960 WATTS , FLICKER
and employees with headaches.**

**“0” WATTS, NO FLICKER
and no more headaches.**

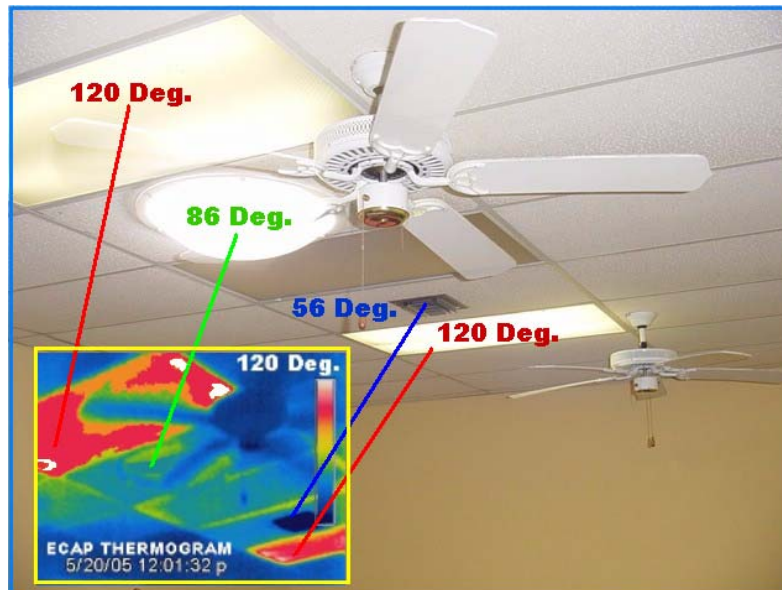
THERMOGRAPHIC ANALYSIS;

Both Thermographic and contact heat analysis were performed using the existing building envelope and the Sun as a *modified climatic chamber* to approximately the R-value of the system as installed.

As can be seen in the photos and Thermograms below with a known, built-up outside roof to inside ceiling building material total R-value of R-35, the heat Flux and Thermographic performance equivalent analysis indicated that the *Sun Dome Daylighting System* was performing at an approximate R-20 resistance level at the time of this analysis.



You will note in the Thermogram above, that the fan motor was actually producing more heat and than *the luminaire of the Sun Dome tubular skylight*. In the photo and Thermograms below you'll see the obvious *negative thermal loads* being produced when we turned on the conventional fluorescent lighting fixture in this office.



"Saving Energy Saves Everything"

Closing Comments

As can be seen in the chart on page 2 of this report your installation of the *Sun Dome Daylighting System* is obviously going to *save you Energy Dollars*. Predicated on your hours of operation the simple pay back on this retrofit should be *less than 3 years* at present day electric rates.

Aside from the **obvious Dollar Savings**, the annual **Reduced Environmental Impacts**, or the pollution created at the power plant to produce the electricity delivered to your business would equate to approximately;

- **49,640 Pounds of Reduced Power Plant Emissions** (greenhouse effect gases).
- **43,800 Gallons of Water Saved** used to produce the electricity generated.

This type of Tubular Skylight, when properly installed as was yours, create no negative effects on the buildings **Architectural Aesthetics** as can be seen in the photo below;





The *Sun Dome Daylighting System* you have installed also meets all of the **FLORIDA BUILDING CODES for MAXIMUM HURRICANE PROTECTION.**

The unit in the photo below was still in place and **LEAK FREE** after being exposed to **3 HURRICANES** that hit this Florida building in 2004.

The Roof was gone, the Shingles were gone but the *Sun Dome was still standing and 100% operational.*





On behalf of your ***Florida Energy Conservation Assistance Program***, let me thank you for your efforts to Conserve Energy and reduce it's related Pollution in your community.

We hope you will continue to consider ***Florida Manufactured ENERGY STAR & REBUILD AMERICA BUSINESS PARTNERS products*** to assist you in meeting your conservation goals.



Homeland Security

We also urge you to ***protect your business against possible vandalism, storm and fire damage.***

Please feel free to contact our office if we can be of any assistance in helping you meet your future conservation goals. ***We hope you will share your experiences using Daylighting Systems with other Business owners. Your ECAP program would be more than happy to meet with your owners association to clarify any questions that may arise concerning the products outlined in this report and assist them in developing a more efficient energy management strategy of their own.***



A handwritten signature in blue ink, which appears to read "Alex Othmer".

CEA/CBA/NEIII

Alexander E. Othmer
Certified Energy Auditor / Certified Business Analyst / Registered Expert Solar Law Witness
Director, Florida Energy Conservation Assistance Program