# **The New Energy Center**

The long, complex process of creating the New Energy Center plays a large role in FSEC's history. The process began in 1983 and was not completed until 1997 – 14 years later. The convoluted, complicated relocation process involved many individuals. FSEC Director Emeritus Dr. David Block names it the single most challenging activity of his many years with FSEC because of the complexity of the activities involved and the large "cast of players" involved in every part of the process.



David Block (August 1986)



Aerial view of old Cape Canaveral site

The story began in the 1980s, when the Center began to purchase trailers and construct experimental prototype facilities to satisfy a great variety of external contract obligations. By early 1984, FSEC had built 15 research, office and storage facilities on the Cape Canaveral site. Table 9-1 presents a listing of buildings on the site.



Building Name	Purpose	Year Completed	Net Assignable Area (ft²)
200 - R&D	Labs & Offices	1964	3,912
300 - T&O	Shop, Computer & Offices	1964	3,858
100 - Administration	Library & Offices	1964	3,792
400 - Auditorium	Auditorium	1964	4,370
PV House	Research and Graphics	1980	1,359
Test Building I	Solar Collector Testing	1976	105
Test Building II	Solar Systems Testing	1980	1,586
Daylighting Lab	Daylighting Research	1980	148
Passive Cooling Lab	Buildings Research	1981	1,551
Modular Office	Offices	1982	1,279
Flexible Test Facility	PV Testing & Research	1983	500
Trailer	Storage	1982	200
Trailer	Storage	1983	288
Trailer	Storage	1983	200
Trailer	Storage	1983	200
PV Prototype I	SERES Research	1983	747
PV Prototype II	SERES Research	1983	716
PV Prototype III	SERES Research	1983	635
Trailer (rented)	Offices	1983	640
		TOTAL:	26,086 ft <sup>2</sup>

 Table 9-1.
 FSEC Buildings as of 1984

At this time, FSEC's building space included 15,932 ft<sup>2</sup> in the original four buildings (the first four entries in Table 9-1) plus another 10,154 ft<sup>2</sup> in the 15 research, office and storage buildings, for a total of 26,086 ft<sup>2</sup>. The buildings had an estimated value of \$2.2 million.

Even with its non-permanent buildings, the Center's activities created a critical need for additional office and laboratory space. After an internal evaluation, on May 31, 1984, FSEC requested a review by UCF Director of Facilities Planning Robert Webb for a Fixed Capital Outlay Project. The request proposed construction of a Library-Laboratory-Learning (Three L) Complex. The Three L Complex concept would consist of a building for an expanded library, new laboratory facilities, and a visitor and public information center. The 32,000 gross ft<sup>2</sup> complex would be built on the Cape Canaveral site, at an estimated total cost of \$2.735 million. It was this request that initiated the new building process.

On August 31, 1984, UCF's first official action occurred when UCF Facilities Planning Director Richard Lavender submitted the Three L building request to Carl Blackwell of the Board of Regents (BOR) office. Lavender asked that the FSEC building be placed on the 1985-86 Legislative Public Education Capital Outlay (PECO) Project Priority List on an equal basis with UCF's list of requests. The request asked for \$4.771 million to construct a 38,000 ft<sup>2</sup> building.

On November 19, 1984, State University System (SUS) Chancellor Barbara Newell denied UCF's request to include the Three L Complex in the University System PECO list. The BOR annually submits its PECO list of construction projects to the Florida legislature. In her denial, she recommended that FSEC undergo a program review, which is the normal procedure before a construction project is added to the PECO list.

Following Chancellor Newell's letter, the SUS Council of Academic Vice Presidents, on December 6, 1984, scheduled an FSEC program review. The BOR review team consisted of three SUS Vice Presidents – Bob Bryan (UF), Les Ellis (UCF) and Ken Michels (FAU).

BOR Vice Chancellors Carl Blackwell and Roy McTarnaghan accompanied the Review Team to assess FSEC's programs and space needs during the site visit on March 12, 1985. Other participants included UCF Vice President for Research Louis Trefonas, Shirley Hayes (then Chairman of the FSEC Policy Advisory Board) and the FSEC Executive Committee.

In April 1985, the Vice Presidential Review Team signed a Program Review Report that summarized FSEC's space and staff needs. The team agreed that a new building was a high priority. The report motioned several

innovative funding concepts, without specific recommendations. It encouraged at least partial funding from private sources and mentioned other SUS institutions that had received private funding, including the Florida State Museum and Shands Teaching Hospital. The team recommended that FSEC be permitted to approach the legislature for funds because it was created by and held a special relationship with the legislature. This recommendation contrasted with the normal procedure through inclusion on the PECO list before proceeding through legislative process.

The BOR did not want to place FSEC on the PECO list for a variety of reasons. It was this reluctance that led FSEC to approach the legislature outside the PECO process. Thus, the Review Team's comments were very important. In essence, the team gave FSEC the authority to go directly to the legislature for the building funds – a process that the BOR would later not allow.

The Review Team also pointed out that FSEC's long-term needs were inconsistent with its present site. Their report discussed the UCF Research Park and the Orlando area as longterm site options and recommended that the Central Florida Research Park be considered as a future FSEC location.

During the VP Review Team deliberations, discussions continued with the Facilities Planning group at UCF and the BOR. These discussions focused on the concept of constructing a new building at the Cape site. They determined that to build a state building on leased land would require a 40-year lease. The Cape Canaveral site's lease began June 1, 1964, and would end in 2014. So, in 1984, the remaining lease duration of 30 years did not meet the 40-year requirement.

On December 6, 1984, FSEC Director David Block sent a letter to the U.S. Air Force requesting

an extension of the lease to cover the 40-year state requirement. On May 15, 1985, Patrick Air Force Base Commander Colonel Nathan Lindsay responded by denying the leaseextension request. Lindsay based his denial on continued exposure of FSEC personnel to missile explosive handling operations at the Trident and Polaris-Poseidon wharves to the east and south of the site. The accompanying photo shows the FSEC site and its relation to the "blast zone" restriction.



Port Canaveral aerial showing FSEC's location and missile blast zones

#### Actions

From this point on, FSEC's planning process took five paths of action:

- (1) Select a new site
- (2) Conduct planning activities
- (3) Obtain relocation and construction funding from the Legislature
- (4) Negotiate a funding settlement for breaking the lease with the Air Force
- (5) Work with UCF and BOR Facilities Planning on design and construction of the new facilities.

Table 9-2 provides perspective on the dates, actions and activities that took place during the 14-year relocation process.

Date	Action	
August 1984	UCF sends a letter to BOR requesting new building.	
May 1985	Air Force denies request to extend lease.	
March 1986	Lease negotiations begin with Air Force.	
June 1986	Legislature appropriates \$350,000 for relocation funds.	
October 1986	Study determines potential Brevard County sites (Gateway Center, Brevard Community College) and auxiliary site.	
February 1987	Presentation made to BCC Board of Trustees, who approve BCC site.	
April 1987	BOR approves sites and relocation plan.	
June 1987	Legislature appropriates \$600,000 for planning.	
September 1987	Architects Design Group, Inc., selected as architectural firm.	
November 1987	1986 relocation funds converted to construction funds; 10-acre auxiliary site purchased.	
June 1988	Legislature appropriates \$3.4 million, with restrictive language requiring that the Air Force must supply \$7.0 million.	
April 1989	SUS reaches agreement with Air Force on lease dispute (\$2.7 million, plus moving expenses).	
June 1989	Legislature re-appropriates \$3.4 million and removes Air Force restrictive language.	
October 1990	Congress authorizes Air Force to purchase FSEC lease for \$2.953 million.	
September 1991	Chancellor and Air Force sign amended lease.	
January 1992	SUS receives \$2.43 million lease settlement from Air Force.	
January 1992	H. George Carrison donates 40 acres of land in South Carolina.	
May 1992	FSEC receives \$560,000 from Florida Energy Office for energy-efficiency measures.	
February 1994	H. J. High Construction Company selected to build office and laboratory buildings	
April 1994	Ground breaking ceremony at BCC site.	
September 1994	South Carolina land sold for \$550,000.	
August 1995	Offices and laboratory buildings completed and ready for occupancy. Move completed.	
July 1995	Florida Legislature matches Carrison gift with \$550,000.	
September 1995	Dedication of new Center.	
December 1995	H. J. High Construction begins construction of Carrison Auditorium.	
October 1996	Auditorium dedicated.	
December 1999	Building Science Research and Training Laboratory completed.	

## Table 9-2. Critical relocation dates and actions

## Site Selection, Relocation Study

Selecting the new site reguired a consequential set of actions. The first significant action took place during the 1986 Florida legislative session, when Brevard Representative Bud Gardner initiated language for a state budget allocation of \$350,000 to be used to study FSEC's relocation. The primary purpose of this study was to evaluate relocation sites within Brevard County. Consequently, the UCF Research Park in Orlando was no longer an option.



Jim Roland began the relocation study in August 1986. From this point on, Roland would play a very large and critical part in the entire relocation and construction process. He contacted countless realtors and visited more than 40 potential sites within Brevard County. After four months of concerted effort, three sites were determined as potential candidates: Brevard Community College, the Gateway Center in Titusville, and an undeveloped site proposed as a research park at the south end of the Kennedy Space Center (KSC).

With its proximity to KSC, the KSC site was the initial favorite. Roland and Block approached KSC personnel with the idea, and KSC staff took the concept of KSC leasing the land to FSEC to the Reagan Administration for approval. Word came back from Washington that the KSC Administration could instead sell the land and give the money to the U.S. Treasurer. Consequently, both FSEC and KSC dropped the KSC site concept. Interestingly, KSC is now developing a Space Commerce Park at the very location FSEC would have occupied. If not for Washington's decision, NASA's new Space Commerce Park could have had FSEC as its first tenant with development occurring 10 years earlier.

Jim Roland (August 1999)

In October 1986, the two other sites were under final consideration. In early February 1987, the Brevard Community College (BCC) site was selected for the following reasons:

- (1) Close ties with the academic community
- (2) Strong support from BCC and from the local community
- (3) Available support services from UCF and BCC (students, library, cafeteria, computers)
- (4) Proximity to FSEC's Cape site, which would ease transition
- (5) UCF and BCC support for FSEC research projects.

While the Gateway site offered a larger amount of available land (40 acres compared with 20), BCC's other positives outweighed this one item.

In February 1987, David Block presented FSEC's proposal to relocate to the BCC campus site to BCC's president Dr. Maxwell King and the BCC Board of Trustees. The BCC Board approved the proposal and requested that a lease be drawn up. On June 10, 1987, BOR Chancellor Reed and BCC Trustee Irena Burnett signed a 50-year site lease. The BCC lease also allowed for an additional 49-year option.



Aerial view of new FSEC site at BCC before construction (1992)

The original lease was modified on September 25, 1992, to reduce the site by five acres, allowing for construction of the BCC/UCF/FSEC Joint-Use Library. The Joint-Use Library opened approximately one year before FSEC occupied its new facilities.

Because FSEC would not have to purchase land, the 1986 legislative relocation study appropriation could be used for other purposes, one of which was to purchase an auxiliary site to be used for experiments and purposes not compatible with the BCC campus site. Jim Roland examined options and recommended that FSEC purchase 10 acres in the Cocoa Industrial Park on Grissom Parkway (north of the BeeLine Expressway). This auxiliary site was selected because it would:

- Provide land for future experi-٠ ments that may be too large for the permanent site or that may be aesthetically unattractive
- Allow for rapid and unrestrict-• ed experimental development
- Ease transition through its proximity to BCC
- Satisfy FSEC's immediate ٠ contractual needs for a Radiant Barrier Test Facility (constructed in 1988) and trailers in which to operate an appliance efficiency laboratory and thermal storage testing facility (constructed in 1988).





at auxiliary site (June 1988)

In April 1987, the BOR approved both the BCC and the auxiliary site and an accompanying relocation plan. In November 1987, the State's Division of Natural Resources purchased the auxiliary site and gave it to FSEC for the Center's long-term use. Construction of the Radiant Barrier Test Facility began in December 1987.

With the remaining funds from the \$350,000 appropriation, FSEC hired the architectural firm of Rand Soellner Associates, of Casselberry, FL, to undertake site planning and develop an architectural concept design for the BCC site. Soellner completed the architectural design, shown below, in April 1987. The actual design of the new facilities followed this conceptual design, with the office building on the north, and testing areas on the south areas of the site. Soellner's conceptual design shows the site before the BCC Joint-Use Library was envisioned. The fountain in the lake is now behind the Joint-Use Library.



Radiant Barrier Test Facility and Weather Data Tower at auxiliary site (October 1992)



Rand Soellner conceptual design (April 1987)

## Winston (Bud) Gardner, Jr., PE and Dr. Maxwell King



Winston "Bud" Gardner has given more than 20 years of dedicated service to FSEC in his roles as Florida House and Senate member from Brevard County. In particular, Gardner was the key individual who worked to obtain state funding from the Florida Senate, which was used to plan and construct the new buildings in Cocoa. FSEC thanks him for his unwavering and continuing support of FSEC programs in the Florida legislature and for his 21 years as a key Policy Advisory Board member.

Dr. Maxwell King, former District President of Brevard Community College, provided consistent support for the Florida Solar Energy Center from its beginnings. King's creative thinking and dedicated efforts were key to FSEC's relocation to property on the BCC Campus. His persistence resulted in selection of the property, and his diligence resulted in execution of the lease. King also worked with the Brevard legislative delegation to obtain construction funding for the new Energy Center.

Chapter 9

## **Planning** Activities

At this point in the process, plans and actions by the university system, the legislature and the Air Force became entangled. During its 1987 session, the legislature appropriated \$600,000 for planning the new facilities. These funds were to be used to hire an architectural firm and pay for such pre-construction incidental costs as permits, surveys and soil tests. This appropriation signaled that construction of the new facilities would go forward, but many hurdles remained.

Before advertising for an architectural firm, FSEC needed to produce a planning document [Reference 148]. FSEC and UCF prepared the planning document, which was approved by UCF Provost Richard Astro, UCF Vice President for Administration John R. Bolte and FSEC Director David Block in the late summer of 1987.

In October of that year, UCF issued a request for submittals from architectural firms. The architectural selection committee, consisting of the BOR's Murdoch Shaw, UCF Facilities Planning Director Jerry Osterhaus and FSEC Director David Block, met in early October 1987 to review the submittals. They selected four architectural firms out of 20 to make oral presentations in late October. The committee selected Architects Design Group, Inc. (ADG), of Winter Park, FL, in part based on the firm's use of

bold colors in its previous work. A contract was then written to formally begin the architectural design process.

The architectural design process was very lengthy due to many factors, but principally because of the time required to obtain settlement funds from the Air Force. FSEC developed and proposed phased-design and construction processes to accommodate the phased flow of funds, but the BOR determined that all construction dollars must be "in the bank" before any construction bidding could take place.

ADG began work in late 1987, and FSEC accepted the completed conceptual schematic design on December 29, 1988. From this point forward, the design process slowed but never completely stopped. FSEC staff committed countless hours to the design process. The FSEC architectural design committee, made up of Philip Fairey, Danny Parker, Tim Merrigan and Jim Roland, met at least monthly, reviewing and resolving numerous design issues. ADG relied on FSEC staff for many critical decisions during the design period.

Actual design and construction of the new Energy Center followed four distinct funding phases to complete the total funding package. Each of the phases were very important. They were, state dollars, federal dollars, Florida Energy Office dollars and Carrison dollars.

## State Dollars

State dollars made up the largest and most critical piece of the funding picture. The normal state funding process begins with planning funds, followed by construction funds and ending with equipment funds.

FSEC's planning dollars had been appropriated in June 1987. In June 1988, the legislature appropriated \$3.4 million for construction. However, this appropriation included contingency language, which required that the Air Force supply \$7 million to the project. FSEC was of the opinion that the Air Force would not settle for an amount as high as \$7 million. Knowing that the state construction appropriation had no chance of being implemented, it was back to the Legislature for re-appropriation the next session.

Efforts during the 1989 legislative session resulted in re-appropriation of the \$3.4 million and removal of language stating the Air Force contingency amount. While FSEC would still need to get dollars from the Air Force before the BOR would let construction proceed, the Air Force dollar amount was now unspecified.

With state dollars in hand, FSEC's next goal was to settle with the Air Force to obtain sufficient funds to construct the building. Because Air Force dollars were not yet available, the architectural design was at a standstill. In 1993, because Air Force funds were not in hand, the state dollars lapsed with lack of a construction contract. This meant the \$3.4 million would have to be re-appropriated yet again – a process that was accomplished without problems.

As previously stated, the normal SUS procedure for funding new buildings includes provision of 10 percent of the construction cost for new equipment. FSEC made numerous requests for these equipment dollars over the years with a final request in May 1994. While supporting data showed that only three out of 134 SUS projects did not receive equipment funds, FSEC's new building never received any equipment dollars. From the beginning to the end of the process, Vice Chancellor Carl Blackwell was adamant that FSEC generate its own equipment dollars.

## **Federal Dollars**

Obtaining the needed federal funds entailed a much more difficult process than acquiring state dollars. As previously mentioned, the Air Force refused to extend the Cape Canaveral site lease beyond 2014 because of the combined exposure of FSEC staff and facilities to risks of missile and explosives handling at wharves to the south and east.

In addition, all FSEC construction on the Cape Canaveral site had to be pre-approved by the Air Force. The Air Force had previously approved construction of test facilities, but no personnel or offices were located in these facilities.

On October 3, 1985, and again on December 5, 1985, Jim Roland sent requests for approval to expand the solar collector test facilities. Finally, on March 7, 1986, FSEC received a letter from Colonel Lindsay denying further expansion, stating it would be incompatible with Air Force projections of Trident-related activities. The letter contained a detailed two-page paper on incompatibility issues. Internally, FSEC staff speculated that the Trident blast area had expanded and would now cover the entire FSEC facility, but this speculation was never proven.

The Shuttle Challenger accident in January 1986 apparently had added to the Air Force concerns. The Challenger accident, combined with the Trident expansion, appears to have motivated the Air Force to reevaluate its position with regard to the leased property, providing the impetus to begin activities to break the lease.

In October 1986 BOR General Counsel Gregg Gleason and UCF General Council Ash Brown wrote a four-page letter to the Army Corps of Engineers (owners of Air Force property) in Mobile, Alabama, discussing the lease issues. The letter ended with the following statement: "Our intentions under the lease have not changed. However, it appears that the needs of the Air Force have been altered significantly to the extent that they now require the full use of the property conveyed in the lease. The Air Force has ample authority to remove FSEC from the property in a legitimate manner with due compensation. It appears the time has come to exercise those options."

To begin to establish the value of the Cape Canaveral property, FSEC contracted Briel, Rhame, Poynter & Houser A/E, Inc. (BRPH) of Melbourne, FL, to evaluate the cost of replacing its existing Cape facilities. BRPH produced a "Budget Cost Estimate for Proposed Florida Solar Energy Center Relocation" on November 29, 1987. The report showed the total replacement value of the Cape facilities to be \$4,997,176. Much of this cost was contained in the underground communication and data infrastructure FSEC developed at the Cape site to support the Center's externally funded research.

The Air Force then hired local commercial real estate appraiser Robert Houha to evaluate the commercial value of the FSEC property as office space. The appraiser conducted a site evaluation inspection and submitted a report as to the commercial value of the FSEC site. This report showed an appraised value of \$1.2 million, a valuation FSEC would not accept.

At this time, SUS Chancellor Charlie Reed brought the Air Force problem to the attention of Senator Bob Graham. Reed had been Senator Graham's Chief of Staff. Through Senator Graham, Chancellor Reed gained an audience with the Air Force in Washington, after which the Air Force agreed to conduct another appraisal of the property, and this appraisal would include the actual value of the property itself. Robert Houha also conducted this appraisal audit, which was completed in late 1988. It placed a commercial value on the property at \$2.7 million.

In April 1989, the Chancellor and the Air Force agreed to dissolve the lease for a value of \$2.93 million, which included slightly more than \$200,000 for moving expenses. This action established the Air Force's dollar value on the property.

The next problem involved getting the Air Force to expend its federally appropriated dollars to buy out the lease. The Air Force had numerous projects on its construction list, and the FSEC lease had no priority. Chancellor Reed again acted through Senator Graham to elevate FSEC to a priority level. In October 1990, Congress authorized the Air Force to purchase the FSEC lease for \$2.953 million. In September 1991, the Chancellor and the Air Force signed an amended lease, releasing FSEC and providing the Center with the needed federal funds for construction of the New Energy Center.

Following the signing of the amended lease, the Air Force supplied a check in the amount of \$2.43 million to FSEC in January 1992.



Presentation of check from Air Force officials with Philip Fairey, Maxwell King (BCC), Mike Bass (UCF) and Jim Roland (January 1992)

FSEC Director David Block transmitted the check to UCF's John Bolte for deposit. In the settlement, the Air Force held back \$500,000 for contingencies until the site was vacated. This holdback caused further delay in release of the construction funds, so negotiations with the Air Force continued. Almost two years later, in December 1993, FSEC received another \$250,000 from James F. Boatright, Deputy Assistant Secretary of the Air Force. FSEC did not receive the final \$250,000 until the Cape site was officially turned over to the Air Force in November 1995 after FSEC had moved to Cocoa and spent more than \$25,000 to remodel the Cape site.

Ironically, when FSEC finally vacated the site in 1995, the Air Force gave the site to Spaceport Florida, which has since refurbished and occupied the original four buildings. So, again, the Air Force did not assume the site for its own use.



Jim Tait, former Director of Florida Energy Office

## Other Construction Dollars

Two more sources of funds were critical to construction of the new facilities. These monies came from the Florida Energy Office and H. George Carrison in late 1991, and both sources were motivated to provide these funds to make the new facilities a model of solar energy and energy efficiency.

## New Energy Center Energy-Efficiency Design

In the fall of 1991, on a visit to the Florida Energy Office (FEO) in Tallahassee, David Block began discussions with FEO Director Jim Tait regarding a proposal for the new facilities. The proposal entailed that the Energy Office supply approximately 10 percent of the construction costs to make the new facilities a showcase of energy efficiency. In May 1992, FSEC received an FEO grant of \$560,000 for the purpose of making the new facilities as energy efficient as possible. Because energy efficiency was not a part of the original design and most likely would not have been included in the building's design because of cost considerations, this grant was critical to making the New Energy Center a model of energy efficiency. FSEC offers very special thanks to Jim Tait for his foresight in this area.

To satisfy the FEO grant's goal of a highly visible demonstration of energy-efficient design solutions, FSEC staff, ADG architects and the project's mechanical engineer, Brian Cumming of R. Douglas Stone and Associates designed a state-of-the-art energy-efficient office complex. The design objective was: within the limits of Florida's climate, design and construct the most energyefficient office building possible. The result was a highly energyefficient building using one-third the energy of a conventional building of the same size.

Following are special features of the energy-efficient design:

- The building design is long and narrow, with the longest walls facing north and south. This orientation cuts down on direct morning and evening sunlight beaming through windows and provides natural light for all the offices.
- Daylighting is maximized by use of sensors in the ceiling of perimeter offices that react to dark, cloudy or sunny skies, and brighten or dim the lights accordingly. Occupancy sensors in each room detect movement, turning lights on or off as people enter or leave.
- The double-pane, advanced technology windows are treated with a spectrally selective micro-thin metallic oating that blocks 70 percent of summer heat, while still letting in 60 percent of visible light. The windows on the long, south-

facing wall are protected by exterior shades during spring, summer and fall. Only in winter are they exposed to low-angle sunlight – when heat is needed.

- Special daylight monitors that eliminate overheating and local hot spots are used, rather than traditional flat or low-angled skylights.
   FSEC's monitors use vertical north-facing windows, and sunlight reflects off curved monitor walls, radiating down into the building's interior spaces.
- The air conditioning and ventilation system is a highefficiency system that reduces wasteful reheat by using heat pipes. The heat pipes pre-treat the outdoor ventilation air and remove the outdoor humidity before circulating air to the interior. They are also coupled with carbon dioxide monitors that sense the number of

people inside the building in order to appropriately adjust ventilation levels.

- Instead of zoning air conditioners for upstairs and downstairs, as in most buildings, FSEC's building is zoned for the south wall and north wall. This means that workers in south-facing offices are not too warm, while those on the north side are too cold, or vice versa.
- A white roof reflects 80 percent of the sun's heat to control peak-day cooling loads.
- Landscaping uses native live oaks, sweet gums, bald cypress and slash pines to improve aesthetics and cooling potential. Reclaimed water nurtures them.
- The building's total energy system is extensively monitored and controlled to prove the efficiency of the energy measures employed.



Daylight monitors under construction (October 1994)

The final building design was predicted to reduce energy use and associated operating costs by more than 62 percent over the original design and to reduce the peak load by 60 percent. Lighting-related measures accounted for 58 percent of the identified savings in the package. The annual energy use index for the base-case building dropped from 71 kBtu/ft<sup>2</sup> (224 kWh/m<sup>2</sup>) to 27 kBtu/ft2 (85 kWh/m2) for the optimized building, and the peak electrical load was reduced from 320 kW to 125 kW. A detailed technical article on the building's energy-efficient features was presented in the ASHRAE Journal, April 1997, by FSEC's Danny Parker, Philip Fairey and Janet McIlvaine. [Reference 149]

## H. George Carrison

The story of H. George Carrison's very generous gift to the Solar Center began in the fall of 1991, when Griff Carrison, founder and owner of Thermal Conversion Technology, Inc., a solar collector manufacturer in Sarasota, FL, contacted Center Director David Block, Carrison told Block that his father, H. George Carrison, was considering giving 40 acres of property to a small Tennessee college called the University of the South at Sewanee, TN, to endow a chair in solar energy. He asked Block to look at the school. After a literature review, Block determined that the University of the South was a small liberal arts college, with no engineering program and no master's or Ph.D. programs in

physics. Block communicated to Griff Carrison that the Tennessee college would most likely not be the best choice for solar energyrelated research. He further proposed that Carrison's father may want to consider making the gift to FSEC for the same purpose, or to support building a portion of the New Energy Center, which could be named after him.

After initial discussions, Griff Carrison and Block traveled to H. George Carrison's home in Camden, SC. On one of three such trips, Block was accompanied by FSEC's Ingrid (Melody) Norberg and UCF Provost Richard Astro. The Solar Center's new facilities were the main topic of discussion, and the end result was that Mr. Carrison changed his will deeding 40 acres of South Carolina land to the UCF Foundation for use by FSEC. Mr. H. George Carrison called David Block on December 13, 1991, and stated that all documents were completed to deed the Charleston property to the UCF Foundation. He signed the new will on December 23, 1991, and passed away two months later, on February 28, 1992.

The following quotes are taken from an FSEC general news release on April 23, 1992:

"The Carrison family has enthusiastically supported solar technology development for a long time," said Griff Carrison, George's son. "It's our pleasure to make this donation to the Solar Center." In accepting the deed to the property, UCF President Hitt noted that the gift is in keeping with Carrison's history of activities to benefit Florida. "Mr. Carrison's financial acumen played a big part in responsible development of this State's infrastructure," Hitt said. "He had the vision to see the role solar energy technologies will play in Florida's future."

FSEC Director Dr. David Block noted that the gift will have a big impact on the new facility. "We have sufficient government support to construct the new center, but not to make it the solar and energy-efficiency showcase it needs to be," he said. "Mr. Carrison's generosity will go a long way toward helping us reach our goal and making his vision a reality."

The next task was to develop a plan for exchanging the land for construction dollars. The value of the 40 acres on the Intracoastal Waterway, about 20 miles north of Charleston, SC, was estimated at more than \$1 million if fully developed for residences. Because the property was in South Carolina, and UCF had no development experience, the decision was made to sell the land.

A Charleston realtor, Donald Bailey, contracted the land for sale. After approximately one year had elapsed and the realty contract was about to expire, Bailey received a contract for sale for \$600,000. FSEC determined it would need to net \$550,000 from the sale. UCF Foundation Officer Roberta Byrum conducted significant formal negotiations with Bailey. She conveyed the \$550,000 number to Bailey and, on September 2, 1994, the South Carolina property sold for \$600,000, with FSEC receiving \$550,000. With the sale of the property, FSEC next began the process to seek Florida legislature matching funds that would double the gift and allow the Center to name the building facility in honor of *M*r. Carrison and his gift.

## New Building Construction

The pieces that would allow construction of the New Energy Center were coming together, but still at different times. While Architects Design Group (ADG) had been on the job since 1988, their work began in earnest in the summer of 1992. ADG faced the formidable task of completing construction drawings so state approvals could be obtained, which would allow the project to be put out for construction bid.

At this time, available construction dollars included \$4 million from the State, \$560,000 from the Florida Energy Office, and \$2.453 million from the Air Force. These three sources added up to a construction budget, excluding architectural fees and incidentals, of \$6.2 million. The completed construction drawings, done by ADG under the leadership of Kevin Ratigan, led to a project bid announcement in June 1993. At the bid opening on July 13, 1993, five bids were opened, with the lowest bid being \$6.9 million, or \$700,000 over budget. At this point, the building would have to be redesigned to meet the construction budget and then re-bid.



JoAnn Stirling at party celebrating acceptance of H.J. High construction bid (November 1993)



David Block, UCF President John Hitt and BCC President Max King performing groundbreaking ceremony (April 1994)



Building under construction – front view (September 1994)

Redesign began immediately following the failed bid opening. The redesign made the auditorium an alternative bid item, eliminated the back interior stairway, did away with the light shades in the front of the Visitors Center and eliminated a number of costly building finish items. ADG then altered the construction plans, which were submitted for re-bid in September 1993. On November 1, 1993, the second bid opening was held at UCF. The winning bid of \$6,094,000 was submitted by H. J. High Construction Co. and included everything but the auditorium.

On March 8, 1994, H. J. High signed the construction contract and immediately began construction.



Completed lab building (August 1995)



Building construction (December 1994)

Completed building from south (August 1995)



Completed building without auditorium (August 1995)

After a groundbreaking ceremony on April 24, 1994, construction of the New Energy Center was officially under way. Construction progressed with minimal problems, following a well-defined plan, and the building was completed 16 months later. The contractor, H.J. High, did an outstanding job.

In August 1995, FSEC moved from the Cape to the newly completed facilities at BCC. The actual move took approximately one week, and the Center was rapidly back in operation in its new facilities, capping a remarkable accomplishment. The building was officially dedicated with a black-tie event on September 16, 1995.



Visitors Center (September 1995)



New building black-tie dedication party (September 1995)



David Block, Max King and John Hitt at new building dedication party (September 1995)



UCF President John Hitt, Griff Carrison, Jordan Carrison, Jane Bockel, Allison Ingram, Khaki Haber and BCC President Max King at H. George Carrison Auditorium dedication (October 1996)



H. George Carrison Auditorium (October 1996)

#### A bronze plaque near the auditorium entrance states:

This Auditorium is dedicated to the memory of H. George Carrison (1911-1992), a prominent Florida investment banker. His donation of land on the Intracoastal Waterway near Charleston, South Carolina, enabled the State of Florida to build this \$1.1 million auditorium. A man of vision, Mr. Carrison played a major role during his successful 50-year banking career in airports, hospitals, water and sewage utilities and the Gator Bowl stadium. His generous gift to the University of Central Florida was in keeping with his history of activities to benefit Florida, and reflects the Carrison family's strong support of solar technology development. We especially acknowledge the support of the donor's son, Mr. Griffin Carrison, who instituted this gift.

## Auditorium Construction

The original construction contract excluded the auditorium, which would be constructed from proceeds from the Carrison gift. While the Carrison land was sold in September 1994, the state legislature has a program that all private foundation gifts can be matched with state funds. So, FSEC had to wait for the spring 1995 legislative session for an appropriation to match the Carrison gift. FSEC received the match in July 1995, which resulted in a total of \$1.1 million to complete the building, including construction of the auditorium.

FSEC asked H.J. High Construction to submit a bid for the auditorium construction as a change order. High's bid of \$880,000 was accepted, and auditorium construction began in December 1995. The auditorium was completed in six months and dedicated on October 17, 1996. The auditorium was officially named the H. George Carrison Auditorium in gratitude for the gift that made it possible.

Special thanks are given to Mr. Carrison and to his family – his wife, Nancy Carrison, and children Jordan Carrison, Allison Carrison Ingram, Jane Carrison-Bockel, Griffin Carrison, and Khaki Carrison-Hager for this generous donation.

## **Chromosphere** Lace

The state's Art in Public Buildings program requires that one-half of one percent of the construction costs of new state buildings be set aside for the acquisition of works of art. The art selected for the FSEC building is a polished aluminum sculpture suspended over the reception desk in the Visitors Center. This aluminum sculpture, on permanent display as part of the state's art collection, is a 30-foot-long arc designed and created by sculptor Bruce Hilding White of Illinois, who named it Chromosphere Lace.

White comments on Chromosphere Lace follows:

"The most remarkable property of the chromosphere is the complete dominance of its structure by the magnetic field, resulting in features of great beauty entirely different from any encountered at lower levels." Giovanelli, Secrets of the Sun.

In my studies for this project, I was impressed by how relevant the subject of the sun is to my current direction in sculpture. Since the 1980s, much of my art has been inspired by the science of chaos and the imagery of the irregular and unpredictable patterns in nature. In particular, I became fascinated with the concept of turbulence and the images of flow patterns found in fluids and gases. Several of my works were influenced by the "orderly disorder" in various patterns of natural fluid systems that have extraordinary plastic beauty.

In 1994, I began a series of studies for large rings, which were intended to float above the viewer. The surface perforations were to create a shimmering effect with filtered light, and thereby, an ambiance of celestial space.

Photographs of the chromosphere assured me of how appropriate this concept would be for the Florida Solar Energy Center and of how the cutout surface patterns would express the fantastically rich and strongly textured turbulence within the chromosphere. Since my readings state that most of the chromosphere is fairly quiet, I also introduced occasional cuts to represent disturbances-based on fibrils and chromospheric flares-to increase interest in the overall composition of the piece. However, after seeing FSEC's Visitors Center, I decided that, rather than a ring, an arc would be more suitable. And so Chromosphere Lace echoes the curve of the wall where it now floats. Its satin polished surface softly reflects colors in an allusion to the multiple hues of the chromosphere.

Of course, as in ancient petroglyphs of the sun, this sculpture is not intended to be a literal translation of the chromosphere. Rather it is an artistic interpretation intended to capture the essence of the beauty and dynamic activity at the miraculous center of our universe. March 1996



Chromosphere Lace (November 1995)



Building Science Research and Training Laboratory (October 1999)



Alexander Mack, Director, Florida Energy Office (January 2005)

## Building Science Research and Training Laboratory

Completion of the Building Science Research and Training Laboratory finalized construction of the New Energy Center. This state-of-the-art commercial size building was built to enhance the knowledge of building science and to house building equipment research and training. Alexander Mack, director of the Florida Energy Office, supplied \$150,000 in FEO funds to match FSEC's monies to complete the facility. Construction was completed in December 1999, and the lab was formally dedicated on February 17, 2000.

The lab simulates characteristics of a small "commercial" building, and its design allows buildings researchers to vary air tightness and leakage, thermal boundary conditions and HVAC system parameters. Researchers use the facility to address issues such as:

- Building systems interactions, particularly uncontrolled airflows caused by ceiling space configurations that have varied locations of air barriers and thermal boundaries
- Duct leakage and unbalanced return-air impacts on energy use, HVAC performance, infiltration rates, humidity, building pressure differentials and indoor air quality
- Humidity and energy impacts that result from varying build-ing ventilation rates
- Indoor humidity response to air-conditioner sizing, thermostat cycling and equipment types
- Evaluation of advanced dehumidification technologies.

Trainers and educators also use the facility for hands-on building science and HVAC systems training. In addition to housing training courses, the facility serves as a "live" model, giving instructors the ability to control HVAC equipment, vary duct leakage, and change other operational characteristics while students observe pressure, airflow, energy, air quality and humidity effects on the building system.

#### **Key Individuals**

The following recognizes individuals who were instrumental in, and spent many hours on, accomplishing the design, construction and occupation of the new facilities.

#### Tallahassee and Washington

- Florida Senators Bud Gardner and John Vogt key legislators in the state appropriation process.
- Senator Bob Graham and SUS Chancellor Charlie Reed successfully completed negotiations with the Air Force and gained Congressional appropriations.

#### UCF

- John Bolte, Vice President for Administration worked on entire budget process.
- Peter Newman, Director of Facilities Planning oversaw planning and construction process.
- Jack Price provided daily construction oversight and problem solving.

#### **Brevard Community College**

 Maxwell King – successfully negotiated BCC site location and assisted in legislative negotiations.

#### **Architects Design Group**

- Kevin Ratigan, John Page and Keith Reeves project architects
- Brian Cumming mechanical engineering and energy-efficiency design with R. Douglas Stone and Associates.

## Florida Energy Office

- Jim Tait, Director supplied state dollars for energy-efficient building construction and PV systems.
- Alexander Mack, Director supplied matching state dollars for Building Science Research and Training laboratory.

## FSEC

- Jim Roland FSEC's key individual, who led all FSEC's efforts in relocation and construction.
- Philip Fairey, Danny Parker, Tim Merrigan supplied critical technical support in design and construction. Fairey has been especially valuable in oversight of all aspects of the building.

#### Others

• Griff Carrison, President, Thermal Conversion Technology, Inc. – critical in obtaining his father's donation.