FSU/SESEC presents: theOGZEB

	Cortex or text of text
~ ~	
We WE WE	

Proposal	1
Special Features	3
Supporting the project	4
Appendix:	
Budget	Α
Energy system	В
Design Plans	С
Who is the USGBC?	D
What is LEED certification?	
LEED brochure	

SUSTAINABLE ENERGY SCIENCE & ENGINEERING CENTER



FLORIDA STATE UNIVERSITY Mail Stop 4471 Tallahassee, Florida 32306-4471 Voice: 850-644-5885; Fax: 850-644-5262

THE OFF-GRID, ZERO EMISSION BUILDING AT FSU





Purpose of the Project

The Off-Grid Zero Emission Building (OGZEB) is a prototype for buildings that will meet the needs of our current lifestyle while also protecting our environment. This project involves the design, construction and operation of a completely solar-powered building that achieves Leadership in Energy and Environmental Design-New Construction (LEED-NC) platinum certification. The OGZEB will be a combination of staff offices and living quarters for graduate students, providing a real world testing scenario for alternative energy and green technologies.

Designed by local professionals and Florida State University (FSU) faculty and graduate students, the OGZEB is the ideal combination of cutting edge technology and occupant livability. It was the goal of the design team to create a building that is completely environmentally friendly, while ensuring the comfort of the people living and working in the building. The OGZEB not only serves as an accomplishment in green building but also serves as a tool for educating the public and developing new and innovative technologies.

Each system in the house will be monitored to determine its cost-benefit ratio which will allow companies to optimize their technologies from real world data. This data will allow companies to provide economically viable products that best serve the consumer. The house is an incubator for the technologies that will make green housing affordable. The OGZEB is an opportunity to show the world that we can protect our planet without sacrificing our current way of life; the ability to combine comfort and environmental innovation is not only desired but a reality.

Project Description

The sun is the primary source of energy on the earth: the sun provides energy for the earth's plants, winds, water currents, and thermal patterns. This project mimics the natural patterns of the earth by relying on the sun's energy to power all aspects of a home and office combination.

Since the sun's energy is not consistent throughout the entire day, excess energy produced by the sun during daylight hours will need to be stored to provide energy to the house during non-daylight hours. The typical solution to this problem is the use of high efficiency batteries for energy storage. However, high efficiency batteries are extremely expensive, use harsh chemicals and they have a limited lifetime.

The OGZEB will use the excess energy produced by the photovoltaic (PV) panels, also known as solar panels, to produce hydrogen. This hydrogen will be produced using a highly efficient water electrolysis device that is currently being developed at the Sustainable Energy Science and Engineering Center (SESEC). It will be stored until energy is required by the house, at which time the hydrogen will be fed to an innovative fuel cell, which is also being developed at SESEC. The fuel cell will convert the hydrogen to the energy that the house needs. This project will not be the first to use hydrogen as an energy storage medium, but it will be the first to employ innovative and affordable hydrogen technologies that are being developed at FSU and not currently commercially available.

The OGZEB, being a test bed for alternative energy and environmentally friendly appliances and building practices, will be used by numerous companies for development and



testing of hydrogen technology. Some of the companies that have partnered with SESEC for hydrogen research are Solaire, Rinnai, Pure Choice, Johnson Controls, Haskel International and solarenergy.com. Other companies, both local and international, are supporting this project by donating products and services. Some of these are PBS&J, WaterFurnace, Lumber Liquidators, TLC Engineering, Renew Aire, Eco-Smart, Mad Dog Design and Construction Company, and Gilchrist, Ross and Crowe Architects. Unlike other testing methods for hydrogen technology, the OGZEB will provide real results by monitoring every aspect of the house while the house is being lived in.

One of the largest consumers of energy in the house is water heating. Hot water will be generated through the use of an on-demand hot water heater that will be modified to use hydrogen as its working gas. The use of hydrogen to meet these needs is unique to this project.

High efficiency electronics and lighting, along with excellent insulation, will greatly reduce the energy needed to make the atmosphere in the building comfortable. The OGZEB will include low energy, spectrally selective windows, LED lighting, low air infiltration, extensive use of passive solar heating and day lighting practices.

Environmental consciousness is also considered during the design and construction of the OGZEB. Every attempt will be made to build the home with recycled and recyclable materials that are not detrimental to the environment during their creation and use. In fact, the design and construction of the OGZEB will be guided by the LEED Green Building Rating System, which has been developed by the United States Green Building Council (USGBC/www.usgbc. org). The LEED system is based on well-founded scientific standards and emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental guality. There are four levels of certification in the LEED rating system: Certified, Silver, Gold and Platinum. Platinum LEED-NC will be pursued for the OGZEB which will make it the first such building in Florida.

The students and faculty of SESEC, in close collaboration with local architects and engineers, have designed the OGZEB so that it meets all of the above-mentioned goals, as well as all federal, state, local and university building codes. Construction on the OGZEB is anticipated to begin during the summer of 2007 with project completion during the fall of 2008.

Conclusion

The successful completion of the OGZEB will accomplish a number of goals. First, it will provide SESEC with a test bed for the further development of alternative energy based technologies that can be implemented in residential and commercial applications. This will allow SESEC to develop cost effective alternative energy solutions. Second, it will show that a building can be constructed that will exceed the needs of its occupants without burdening the local utility system or damaging our world during construction and operation.

Due to its unique nature, it is expected that the OGZEB will attract a number of people for tours and garner positive national attention. It will also provide the faculty and students of SESEC with the experience required to be competitive in the Solar Decathlon 2009, the proposals for which must be submitted during Fall 2007. Lastly, and possibly most important, the OGZEB will expose the world to the benefits of sustainable, "green" building and engineering, as well as alternative energy sources through tours, presentations, and an online interactive website. The website will provide a comprehensive view of each system and product used in the house. It will educate design and construction professionals, as well as the public, to the pros, cons, and cost of each of the technologies used in the house. Individuals and professionals can pick and choose from the items they learn about to design a green building within their means. It is SESEC's goal to use the OGZEB to develop affordable green housing, allowing the allure of green to be within everyone's grasp. This type of exposure is necessary to change public opinion and overcome some of the negative stereotypes that have been promulgated regarding these types of technologies.

Special Features of the OGZEB:
 Hydrogen Appliances – (Burn hydrogen rather than natural gas, cleaner)
o Water Heater
o Stove/Oven
o HVAC
Rain Water Collection
o Store water for irrigation purposes
o Manage storm water run off
High Efficiency Water Use
o Low flow fixtures
o Recycle grey water
High Efficiency Lighting
o LEDs
§ Reduce power consumed
§ Reduce heat emitted by lights
o Passive Solar Skylights
§ Harness sun light efficiently
§ Our Design reduces heat transfer
o Reduce Light Pollution
§ Prevent light from escaping building and effecting the environment
Completely Solar Powered
o Solar Cells provide electricity
o Collectors Concentrating Solar Provide
§ Hot water
§ Solar Heat Powered HVAC
Hydrogen Production and Use
o New electrolyzer developed by SESEC
o New fuel cell developed by SESEC
Construction Waste Management and Reuse
o Design the building based on available materials to reduce building waste
o Reuse when at all possible
Regional Materials
o Utilize materials within a 500 mi radius of Tallahassee
Rapidly Renewable Materials
o Use materials that take under 10 yrs to grow
o Easy to replace and less detrimental to the environment
Data Collection
o Collected data
§ Inside conditions
§ Outdoor air used in house
§ Ventilation and emissions
§ Lighting effectiveness
Platinum Certification from the United States Green Building Council
o Highest Level of Certification
o One of only 20 buildings with this level of certification
o one of only 20 buildings with this rever of certification

Who is the USGBC?

Core Purpose

The U.S. Green Building Council's core purpose is to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.

Who is the U.S. Green Building Council?

The U.S. Green Building Council (USGBC) is the nation's foremost coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. Our more than 6,000 member organizations work together to develop a variety of programs and services, and forge strategic alliances with key industry and research organizations and federal, state and local government agencies. Our collective power is leading the transformation of the building industry and market to sustainability. Council programs are Committee-Based, Member-Driven, and Consensus-Focused. Click on the links below to learn more about:

• The LEED[®] Green Building Rating System[™]

- The annual Greenbuild International Conference and Expo
- Educational offerings, including LEED workshops and the
- LEED Professional Accreditation program
- Tools for federal, state and local government agencies
- Green building research and publications
- Local and regional advocacy and education

What is the LEED Certification?

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System[®] is a voluntary, consensus-based national standard for developing highperformance, sustainable buildings. USGBC's members, representing every sector of the building industry, developed and continue to refine LEED. LEED standards include: • LEED-NC: New commercial construction and major renovation projects

- LEED-EB: Existing building operations
- LEED-CI: Commercial interiors projects
- LEED-CS: Core and shell projects
- LEED-H: Homes
- LEED-ND: Neighborhood development
- LEED Application Guides: Retail (currently in pilot), Multiple Buildings/Campuses, Schools, Healthcare, Laboratories, Lodging

Product Manufacturers and Service Providers: Learn how you can get involved with USGBC and LEED.

LEED was created to:

• define "green building" by establishing a common standard of measurement

- promote integrated, whole-building design practices
- recognize environmental leadership in the building industry
- stimulate green competition
- raise consumer awareness of green building benefits
- transform the building market

LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state of the art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources. Click below to view the LEED Foundations documents: • LEED Committee Charters - describes the purpose and scope of each LEED Committee

• LEED Foundations Policy Manual - describes USGBC policy for consensus based development of the LEED family of products

• LEED Product Development Handbook - describes the operating procedures for management and administration of LEED Products

For more information on:

The OGZEB:

Justin Kramer (850) 445-3432 jkramer@sesec.fsu.edu

How to make a donation:

John Gerhm (850) 410-6600 jgerhm@foundation.fsu.edu

Supporting the Sustainable Design Project

In making a gift:

Make Checks Payable to: Florida State University Foundation For: College of Engineering Sustainable Design Project

Mail To: John Gehrm FSU Foundation 2010 Levy Avenue Building B, Suite 300 Tallahassee, FL 32306-2739



Appendix A: OGZEB Budget

FSU Off Grid Zero Emission Building Budget May 27, 2007

Building Item Description	Item Cost	Inkind Donations	Amount to be Raised
PRECONSTRUCTION SERVICES	119,500.00	116,915.00	2,585.00
GENERAL REQUIREMENTS	80,524.69	29,012.56	51,512.13
SITEWORK	9,200.00		9,200.00
CONCRETE	18,400.00		18,400.00
MASONRY	8,500.00	1,050.70	7,449.30
METALS	6,000.00		6,000.00
WOOD & PLASTICS	124,700.00	15,699.00	109,001.00
THERM-MOIST PROTECTION	15,700.00	400.00	15,300.00
DOORS & WINDOWS	15,100.00	4,318.20	10,781.80
FINISHES	36,800.00	2,175.00	34,625.00
SPECIALTIES	1,900.00	100.00	1,800.00
APPLIANCES	2,100.00		2,100.00
MECHANICAL	60,600.00	34,695.00	25,905.00
ELECTRICAL	75,500.00	35,000.00	40,500.00
TOTAL	574,524.69	239,365.46	335,159.23

Appendix B: Energy System



Appendix C: Design Plans



FSU Zero Emission House

AC Frederic Institution vousion









CROSS SECTION SCALE 14" # 70"

Appendix D: United States Green Building Council

Who is the USGBC?

Core Purpose

The U.S. Green Building Council's core purpose is to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life.

Who is the U.S. Green Building Council?

The U.S. Green Building Council (USGBC) is the nation's foremost coalition of leaders from every sector of the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. Our more than 6,000 member organizations work together to develop a variety of programs and services, and forge strategic alliances with key industry and research organizations and federal, state and local government agencies. Our collective power is leading the transformation of the building industry and market to sustainability. Council programs are Committee-Based, Member-Driven, and Consensus-Focused. Click on the links below to learn more about:

• The LEED[®] Green Building Rating System[™]

- The annual Greenbuild International Conference and Expo
- Educational offerings, including LEED workshops and the
- LEED Professional Accreditation program
- Tools for federal, state and local government agencies
- · Green building research and publications
- Local and regional advocacy and education

What is the LEED Certification?

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. USGBC's members, representing every sector of the building industry, developed and continue to refine LEED. LEED standards include: • LEED-NC: New commercial construction and major renovation projects

- LEED-EB: Existing building operations
- LEED-CI: Commercial interiors projects
- LEED-CI. Commercial intenois projects
 LEED-CS: Core and shell projects
- LEED-C3. Core and she
- LEED-H: Homes
- LEED-ND: Neighborhood development
- LEED Application Guides: Retail (currently in pilot), Multiple Buildings/Campuses, Schools, Healthcare, Laboratories, Lodging

Product Manufacturers and Service Providers: Learn how you can get involved with USGBC and LEED.

LEED was created to:

• define "green building" by establishing a common standard of measurement

- promote integrated, whole-building design practices
- recognize environmental leadership in the building industry
- stimulate green competition
- raise consumer awareness of green building benefits
- transform the building market

LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state of the art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources. Click below to view the LEED Foundations documents: • LEED Committee Charters - describes the purpose and scope of each LEED Committee

- LEED Foundations Policy Manual describes USGBC policy for consensus based development of the LEED family of products
- LEED Product Development Handbook describes the operating procedures for management and administration of LEED Products

udubon Center at Debs Park Inland Empire Utilities Agency NRDC - Santa Monica Office, Donald Bren School of Environmental Interface, Inc. Showroom and Offices oe Serna Jr. - Cal/EPA Headquarters Building Philip Merrill Environmental Center, The Chicago Center for Green Technology, Cambria Office Building, Commonwealth f Pennsylvania Capitol Area East End Complex Carkeek Park Environmental Learning Center Clearview Elementary School, David L. Lawrence Convention Center, DEP

Map of the Nation's Platinum and Gold LEED® Certified Buildings

Brought To You By

GreenTouchscreen

Providing Industry Leading Touch Screen Kiosk Solutions.

Each of our kiosks are individually designed and developed utilizing the latest technology.



To learn more, visit www.GreenTouchscreen.com

THE MCADAMS GROUP

Fundraising & Grantwriting Consultants for Commercial and Public Green Buildings



www.FundingGreenBuildings.com

Jan McAdams - Jan@FundingGreenBuildings.com 702.407.7888 • Fax 702.407.0017 1350 East Flamingo Road, Suite 362, Las Vegas, NV 89119



Los Angeles, California

We salute all the people involved in making each green building possible.

Current as of 04/11/06

Map Legend

Platinum LEED[®] Certified

- 1 Alberici Corporate Headquarters St. Louis, Missouri
- 2 Artists for Humanity EpiCenter Boston, Massachusetts
- 3 Audubon Center at Debs Park Los Angeles, California
- 4 Chicago Center for Green Technology Department of the Environment Chicago, Illinois
- **5** CNT Renovation Center for Neighborhood Technology Chicago, Illinois
- 6 Donald Bren School of Environmental Science & Management Santa Barbara, California
- 7 Genzyme Center Genzyme Corporation Cambridge, Massachusetts
- 8 Inland Empire Utilities Agency Administrative Headquarters Chino, California
- 9 Interface, Inc. Showroom and Offices Atlanta, Georgia
- 10 Joe Serna Jr. Cal/EPA Headquarters Sacramento, California
- 11 Lake View Terrace Branch Library Los Angeles Public Library District Lake View Terrace, California
- 12 Natural Energy Laboratory of Hawaii Authority Gateway Distributed and **Renewable Energy Center** Kailua-Kona, Hawaii
- 13 NRDC Santa Monica Office Santa Monica, California

14 Philip Merrill Environmental Center Annapolis, Maryland

Gold LEED® Certified

- 15 AIA Honolulu Honolulu, Hawaii
- 16 Arthur M. Blank Foundation Family Office Atlanta, Georgia
- **17** Brengel Technology Center Johnson Controls, Inc. Milwaukee, Wisconsin
- 18 Calvin College Bunker Interpretive Center Grand Rapids, Michigan
- **19** Cambria Office Building Commonwealth of Pennsylvania Department of Environmental Protection Ebensburg, Pennsylvania
- 20 Cambridge City Hall Annex Cambridge, Massachusetts
- 21 Camp Aldersgate Commons Building The Women's Division of the General Board of Global Ministries of the United Methodist Church Little Rock, Akansas
- 22 Capitol Area East End Complex **Block 225 Office Building** State of California Sacramento, California 95814
- 23 Carkeek Park Environmental Learning Center Department of Parks & Recreation Seattle, Washington
- 24 Carl T. Curtis Midwest Regional Headquarters National Park Service/U.S. Dept. of the Interior Omaha, Nebraska
- 25 Chong Partners Architecture S.F. Office San Francisco, California

- 26 Clean Water Services Administrative Offices 41 The Getty Center Hillsboro, Oregon
- 27 Clearview Elementary School Hanover Public School District Hanover, Pennsylvania
- 28 Colorado Court Community Corporation of Santa Monica Santa Monica, California
- 29 Conservation Consultants Inc. Center Pittsburgh, Pennsylvania
- **30** CORO Center for Civic Leadership Pittsburgh, Pennsylvania
- 31 David L. Lawrence Convention Center Pittsburgh, Pennsylvania
- 32 Denver Place N/S Towers Denver, Colorado
- 33 DEP California Office Building State of Pennsylvania Harrisburg, Pennsylvania
- 34 DEP Southeast Regional Office Building State of Pennsylvania Norristown, Pennsylvania
- 35 DPR Construction, Inc. Office Building Sacramento, California
- 36 EPA Science and Technology Center Kansas City, Kansas
- 37 Far Southeast Austin EMS Station # 28 Austin, Texas
- 38 Ford Rouge Visitor Center Dearborn, Michigan
- **39** French Wing Addition to Conservation Center Society for the Protection of NH Forests Concord, New Hampshire
- 40 Frito-Lay Jim Rich Service Center Henrietta, New York

- Los Angeles, California
- 42 Goizueta Business School **Emory University** Atlanta, Georgia
- 43 Happy Feet Plus, Inc. Clearwater, Florida
- 44 Hayward Building Systems Plant Santa Maria, California
- 45 Haworth Chicago Showroom Chicago, Illinois
- 46 Hensley Field Operations Center Dallas, Texas
- 47 Herman Miller C1 Main Site Zeeland, Michigan
- 48 Herman Miller MarketPlace Zeeland, Michigan
- 49 Herman Miller National Design Center Washington, DC
- 50 Herman N. Hipp Hall Furman University Greenville, South Carolina
- 51 Hillsdale Library Portland, Oregon
- 52 Howard Hall, Lewis & Clark College Portland, Oregon
- 53 Institute of EcoTourism Sedona, Arizona
- 54 IslandWood: A School in the Woods Bainbridge Island, Washington
- 55 J. Richard Carnall Center PFPC Worldwide Headquarters Wilmington, Deleware
- 56 Jean Vollum Natural Capital Center Portland, Oregon

Map Legend Continued

- 57 Johnson Diversey Global Headquarters Sturtevant, Wisconsin
- 58 Karges-Faulconbridge Office Building St. Paul, Minnesota
- **59** King Street Center Seattle, Washington
- 60 Len Foote Hike Inn Georgia Department of Natural Resources Dawsonville, Georgia
- 61 Lubin Manufacturing Facility Knoll Inc. East Greenville, Pennsylvania
- 62 McGowan Institute for Regenerative Medicine University of Pittsburgh Pittsburgh, Pennsylvania
- 63 Michigan Alternative and Renewable **Energy Center** Muskegon, Michigan
- 64 Moss Landing Marine Labs CSU Moss Landing, California
- 65 Natural Resources Defense Council. S.F. Office San Francisco, California
- 66 Navy's Energy & Sustainable **Demonstration Facility** Port Hueneme, California
- 67 Navy Federal Credit Union **Remote Call Center** Pensacola, Florida
- 68 Nike, Inc. Ken Griffey Jr. Building Beaverton, Oregon
- 69 Noddle Development Company Omaha, Nebraska
- 70 North Sarasota Library Sarasota, Florida

71 Nusta Spa Washington, DC

- 72 PA DEP Bureau of Laboratories Harrisburg, Pennsylvania
- 73 PA DEP Moshannon District Office Philipsburg, Pennsylvania
- 74 Park 90/5 Building C Seattle, Washington
- 75 Pharmacia Q Building Lab Skokie, Illinois
- 76 Pennsylvania Housing Finance Agency Harrisburg, Pennsylvania
- 77 Plaza at PPL Center Allentown, Pennsylvania
- 78 Pleasanton Fire Station 4 Livermore Pleasanton Fire Department Pleasanton, California
- 79 Recreational Equipment, Inc. (REI) Portland, Oregon
- 80 Regional Training & Distribution Center American Honda Gresham, Oregon
- 81 Rinker Hall University of Florida Gainesville, Florida
- 82 Schlitz Audubon Nature Center Milwaukee, Wisconsin
- 83 Seattle Terminal Radar Approach Control Federal Aviation Administration Burien, Washington
- 84 South Campus Office Development Toyota Motor Sales Torrance, California
- 85 S. T. Dana Building Renovation The University of Michigan Ann Arbor, Michigan

86 Solaire New York, New York

- 87 State of Oregon North Mall Office Building 102 Winrock International Headquarters Salem, Oregon
- 88 SUGEN Building #3 Project South San Francisco, California
- 89 Sun Valley Branch of the Los Angeles **Public Library** Los Angeles, California
- 90 Suwannee River Visitor Center Georgia Department of Natural Resources Fargo, Georgia
- 91 Swinerton Inc. Headquarters San Francisco, California
- 92 The Henry (at The Brewery Blocks) Portland, Oregon
- 93 Third Creek Elementary School Statesville, North Carolina
- 94 TKG Consulting Engineers, Inc. **Oberlin Office** San Diego, California
- 95 Toyota Portland Vehicle **Distribution Center** Portland, Oregon
- 96 Twin Lakes Park Office Complex Sarasota County Government Sarasota, Florida
- 97 U.S. EPA, New England Regional Laboratory North Chelmsford, Massachusetts
- 98 University of Denver College of Law Denver, Colorado
- 99 William and Flora Hewlett Foundation Menlo Park, California
- 100 Willow School Phase I Gladstone, New Jersey

101 Wind NRG Partners, LLC. Hinesburg, Vermont

- Little Rock, Arkansas
- 103 WRT Philadelphia Office Wallace Roberts & Todd, LLC Philadelphia, Pennsylvania

Map of the Nation's Platinum and Gold LEED[®] Certified Buildings

(For a current list of all LEED® Certified Buildings: Platinum, Gold, Silver, and Certified, go to www.usgbc.org)

Current as of 04/11/06



Sponsored by: GreenTouchScreen - www.GreenTouchscreen.com | The McAdams Group - www.FundingGreenBuildings.com Design by The Visual Sense - www.TheVisualSense.com