

# Emergency Shelter Electrification Legislation

Powering all of Florida's 1800 emergency  
shelters with clean dependable power

**Draft Outline**

# Need

- The 1,800 Emergency Shelters are critical to welfare of the citizenry of Florida, particularly during hurricanes.
- These shelters are under powered and/or are using unreliable, potentially dangerous, logistically complex and costly backup generators.



## South Florida Prepares For Hurricane Wilma

NAPLES, FL - OCTOBER 23: Clio and her daughter Katia take shelter at Golden Gate High School at a Red Cross shelter in advance of the arrival of Hurricane Wilma which is churning out in the Gulf of Mexico as a Category 2 storm October 23, 2005 in Naples, Florida. The shelter for evacuees has over 1100 people registered and has capacity for only 1000. Hurricane Wilma is expected to make landfall somewhere in South Florida in the next 24 hours as a Category 2 storm.

Photo: Carlo Allegri/Getty Images  
Oct 23, 2005



## Florida Coast Prepares For Hurricane Frances

PORT ST. LUCIE, FL - SEPTEMBER 3: Residents take shelter at Morningside Elementary School in preparation for the arrival of Hurricane Frances September 3, 2004 in Port St. Lucie, Florida. The storm is currently a category 3 hurricane with winds reaching 140 mph.

Photo: Jose Jimenez/Getty Images

Sep 03, 2004



## Southwest Florida Continues Cleanup From Charley

ENGLEWOOD, FL - AUGUST 17: Francesca Fasciano, 2, rests in a crib as her father Anthony comforts her in a Red Cross shelter August 17, 2004 in Englewood, Florida. The family's home was damaged by Hurricane Charley and they are living with hundreds of other hurricane victims in the shelter.

Photo: Mario Tama/Getty Images

Aug 17, 2004

# Opportunity

- Florida can improve the electrical infrastructure at these shelters, while increasing the clean generation within the state at reasonable costs by replacing backup generation with dedicated power plants.
- Utility owned and operated power plants at these locations will provide dependable electricity with multiple benefits including, but not limited to:
  - Shelter improvements
  - Bringing more renewables to Florida
  - Education and school energy efficiency savings
  - Smart Grid / Energy storage

# History

- Who operates the shelters
  - FEMA (Federal Emergency Management Agency)
  - ARC (American Red Cross)
  - Florida Division of Emergency Management
- Current Restoration Procedures
  - Emergency shelters are not always a top restoration priority
  - Top 20% established by the local county emergency management division
  - Remaining establishments are energized according to the overall impact on customers and other essential services
- Current Status of Shelters
  - All generation is emergency use only with no other benefit
    - Extremely high cost for minimal use
    - All capital and O&M expenditures are for emergency use only
  - All generation is fossil fuel derived – dangerous, necessary re-fueling, expensive maintenance, harmful air emissions, noisy
  - Logistics (8 hours of electricity minimum only)
  - Energy is the responsibility of the shelter

# West Gadsden High School





# Coral Glades High School



**Jose Murguido, AIA, UBCI, NCARB**  
**Principal-in-Charge of Zyscovich Education Group**  
2006 Governor's Hurricane Conference  
EHPA Shelters in K-12 Educational Facilities

# Design of EHPA Shelters in K-12 Educational Facilities

## ⌚ Excluded Spaces

- ⌚ Non-habitable areas secure school equipment, computers, etc.

## ⌚ Capacity

- ⌚ 50% of net area less excluded spaces
- ⌚ 20 NSF/person
- ⌚ 1 toilet & sink per 40 occupants (no additional required)

## • Water & Sewer

- ⌚ Controls for normal & emergency modes

## ⌚ Food Service Distribution Areas

## ⌚ Emergency Management Office

Coral Glades High School Shelter  
Max. 1250 Occupant Capacity



**Jose Murguido, AIA, UBCI, NCARB**  
**Principal-in-Charge of Zyscovich Education Group**

2006 Governor's Hurricane Conference  
EHPA Shelters in K-12 Educational Facilities

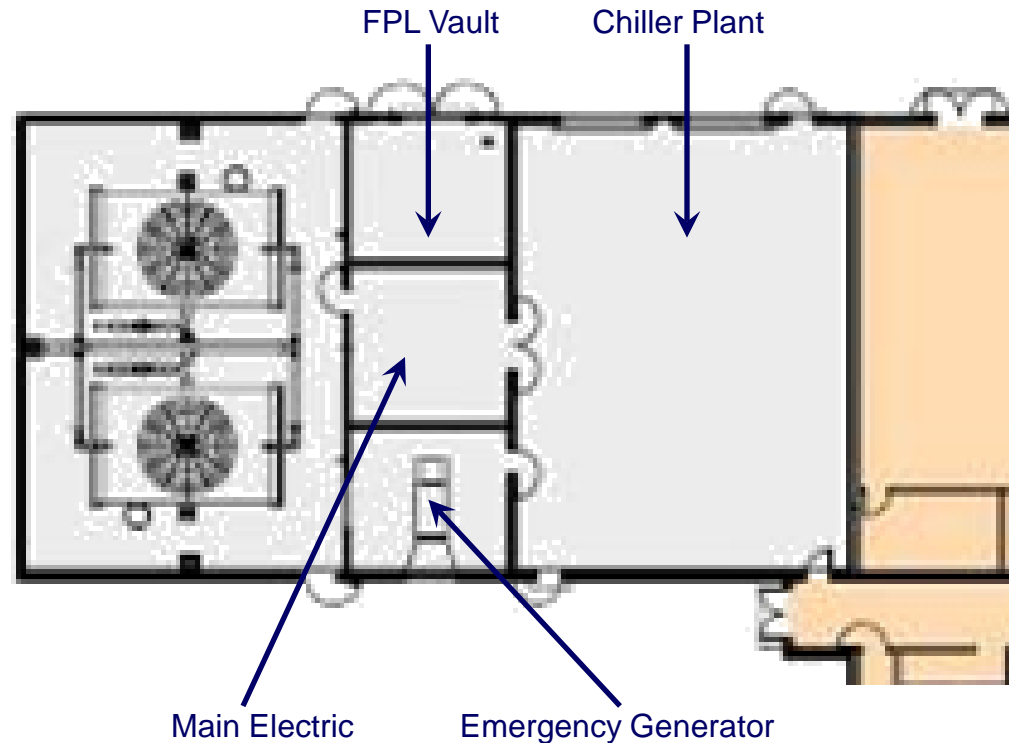
# Electrical & Standby Power

## Emergency Power

- ⌚ Lighting – 10 footcandle minimum
- ⌚ Exit Signs
- ⌚ Fire Protection Systems, Alarm & Sprinklers
- ⌚ Minimum Ventilation
- ⌚ Food Storage Equipment (optional)

## Manager's Office

- ⌚ Fire Alarm Panel
- ⌚ Remote Annunciator Panel
- ⌚ Minimum of 4 Emergency Receptacles



**Jose Murguido, AIA, UBCI, NCARB**  
**Principal-in-Charge of Zyscovich Education Group**

2006 Governor's Hurricane Conference  
EHPA Shelters in K-12 Educational Facilities

# Lessons Learned

## 6 Best Spaces

- 6 Gym
- 6 Dining
- 6 Wrestling
- 6 Dance
- 6 Mini-Gym

## 6 Best Facility – High School

- 6 Large Spaces with Nearby Toilet Facilities
- 6 Provisions for Special Needs Residents??
- 6 Provisions for Pets??
- 6 Ground Floor (above flood plain)
- 6 Minimize Roof Penetrations
- 6 4-6% Impact on Construction Cost



**Jose Murguido, AIA, UBCI, NCARB**

**Principal-in-Charge of Zyscovich Education Group**

2006 Governor's Hurricane Conference  
EHPA Shelters in K-12 Educational Facilities

# Proposed Scope of Work

**Electrification of existing and future emergency shelters through the following means:**

- **Clean Dedicated Power Plants**
  - **Solar PV**
    - Ground mounted installations
    - Rooftop installations where necessary
- **Smart Grid**
- **Energy Storage**
  - Multiple technologies available
    - Batteries
    - Hydrogen Fuel Cells
    - Flywheels
    - Super capacitors

# Benefits

- Shelter improvements
  - Increased lighting
  - Healthier atmosphere (physical and emotional)
  - Stability of location (extended operational availability)
  - electric utility maintains and guarantees electric service
  - EMA - frees resources for other necessities
- Brings more renewables to Florida
  - Creates jobs
  - Increases energy independence
  - Cleaner environmental profile
- Education and School Energy Savings
  - Establish school programs to educate about renewables and energy efficiency
  - Real time energy measurements
- Energy storage
  - Smart Grid Capabilities / Peak shaving
    - reduces greenhouse gases, fuel consumption, water use

Reduced costs by combining multiple uses through one solution

# Electric Utility's Role

- Owner and Operator
  - Increased reliability
  - Reduced O&M
  - Reduced Capital expenditures through bulk purchases and standardization
  - Grid integrated
- Smart Grid & Peak Shaving opportunities through energy storage
- Utility controls charge/discharge cycles during normal operational conditions
- During emergencies electricity dedicated to shelter
- Smart Meters throughout school

# Approach

- Phase 1 (FSEC Grant)
  - Electrify 90 EHPA shelters with 10kW+ solar PV systems and energy backup to ensure autonomy for 72 hours of operation
  - Identify future shelter needs
- Phase 2 (Legislation Needed)
  - Electrify all 1300 EHPA Shelters with 100kW+ solar PV systems and energy backup to ensure autonomy for 72 hours of operation
- Phase 3 (Legislation Needed)
  - Electrify remaining 500 Emergency Shelters with 100kW+ solar PV systems and energy backup to ensure autonomy for 72 hours of operation
  - Electrify all special needs shelters with the necessary solar PV systems and energy backup to ensure autonomy for 72 hours of operation



# Summary

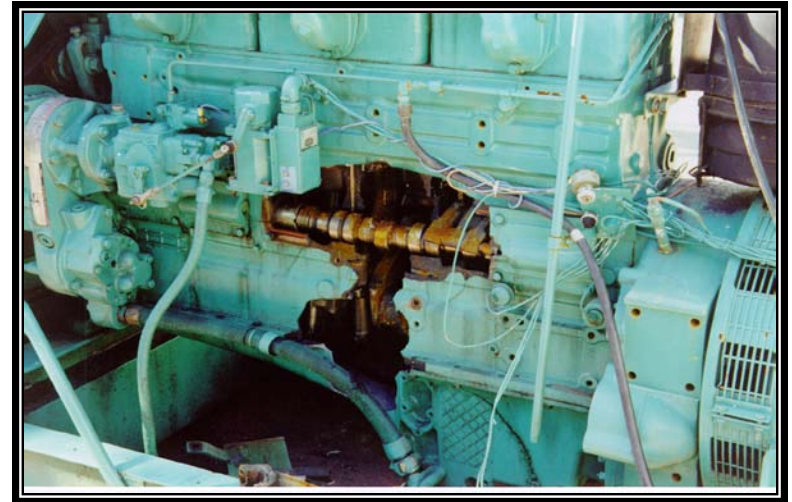
- **Emergency Shelter Electrification Legislation is needed**
- Shelter
- Electrical Generation
  - Totals 180 MW installed capacity
    - Results in XX houses power
    - XX cars off the road
    - Etc.

**Extra**

**slides**

- Here is how the numbers shake out--  
92% of the shelters are general shelters, 8% are special needs shelters  
Out of the special needs shelters, only 2% (48!!) have generators presently  
I haven't been able to finish the % tabulation on EHPA. I'll try to get that to you tomorrow afternoon.  
~Penny

# ***Problems with Conventional Generators***



# *Lighting Systems Before and After Hurricane Andrew - 1992*



**Before Hurricane Andrew, Picture Facing N.E.**



**After Hurricane Andrew, Picture facing N.W.**

**26 such systems survived Hurricane Andrew  
Systems provided by Solar Outdoor Lighting of Florida**

# Gasoline for generators?



# Special Health Conditions

## **Health conditions/individuals that require special care:**

- People on oxygen or Nebulizer
- Imminent death - Hospice patients
- Alzheimers, senile dementia and epilepsy
- Bedsores
- Monitored apnea
- Recent surgery or heart failure
- Dialysis or brittle diabetics patients
- Continuous IV or catheter patients
- G-tube feeding, trach tube & ventilator

# *Medical Equipment Loads*

<u>Medical Item</u>	<u>Watts</u>	<u>Hours</u>	<u>Period</u>
Oxygen concentrator	400	24	day
Nebulizer	20-50	0.1	3-4 hr
Apnea monitor	120	sleeping	day
G-tube-feeding machine	350	feeding	day
Track tube machine	450	24	day
Dialysis/RO	2200	4-5	3 days
Defibrillator	160	0.1	as needed
Ventilator	400	24	day



# *PV Sized For Medical Loads*

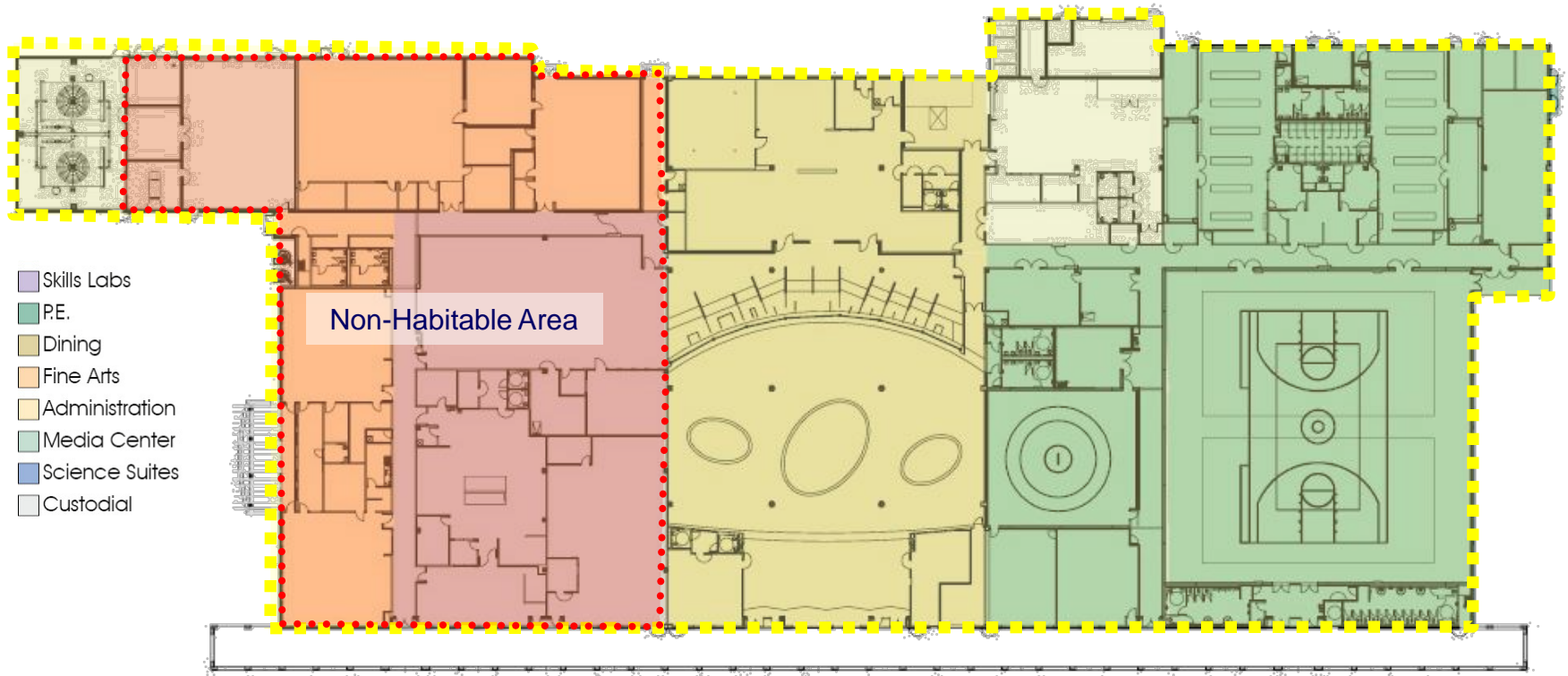
<u>Medical item</u>	<u>PV Watts</u>
Oxygen concentrator	3,200
Trach tube machine	3,000
Ventilator	3,000
Dialysis/RO	2,400
G-tube-feeding machine	600
Apnea Monitor	500
Nebulizer	100
Defibrillator	100

# General shelter energy needs (normal healthy people)

Item	Power	Conditions
Mechanical ventilation	0.35 watts per cfm	15 cfm per person
Air conditioning	1000 watts	500 sq. ft./ton
Life safety systems	10 watts	LED exit light charger
Standby lighting	40 watts	backup ceiling florescent
Standby branch wall circuit	Standby branch wall circuit	Standby branch wall circuit

# Building Design

## Coral Glades High School



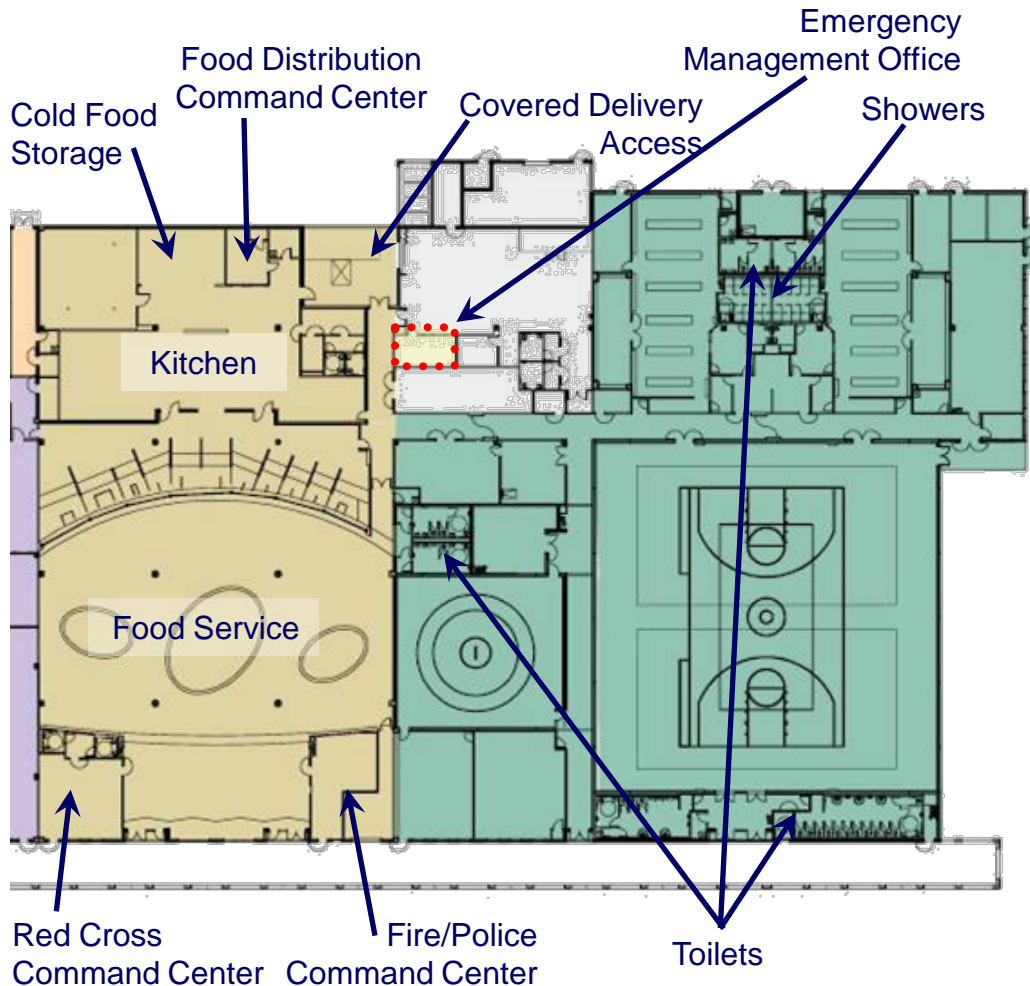
Max. 1250 Occupant Capacity

**Jose Murguido, AIA, UBCI, NCARB**  
**Principal-in-Charge of Zyscovich Education Group**

2006 Governor's Hurricane Conference  
EHPA Shelters in K-12 Educational Facilities

# Building Design

## Coral Glades High School



Red Cross Command Center



Fire & Police Command Center

2006 Governor's Hurricane Conference

EHPA Shelters in K-12 Educational Facilities

# Electrical & Standby Power



Olympian D200P3 200kW stand By generator set

# EHPA Shelter Facilities



EHPA Vents

2006 Governor's Hurricane Conference

EHPA Shelters in K-12 Educational Facilities

Archbold's generator,  
at rest after +5.5 days  
of constant use,  
30 Sept. 2004.





## Hurricane Wilma Makes Landfall In Florida

NAPLES, FL - OCTOBER 23: [Alejandro Santiago](#) (L) his daughter Jennifer 1 1/2 years-old and mother [Erica Hernandez](#) (R) take shelter at Golden Gate High School at a Red Cross shelter in advance of the arrival of Hurricane Wilma which is churning out in the Gulf of Mexico as a Category 2 storm October 23, 2005 in Naples, Florida. The shelter for evacuees has over 1100 people registered and has capacity for only 1000.





## Southwest Florida Continues Cleanup From Charley

ENGLEWOOD, FL - AUGUST 17: Anthony Fasciano kisses his wife Amanda as their children Joseph (L), 5 months and Francesca, 2, rest in cribs in a Red Cross shelter August 17, 2004 in Englewood, Florida. The family's home was damaged by Hurricane Charley and they are living with hundreds of other hurricane victims in the shelter.

Photo: Mario Tama/Getty Images  
Aug 17, 2004



## Southwest Florida Continues Cleanup From Charley

ENGLEWOOD, FL - AUGUST 17: Wilbur Heshner, 93, rests in a Red Cross shelter August 17, 2004 in Englewood, Florida. Heshner's home was damaged by Hurricane Charley and he is living with hundreds of other hurricane victims in the shelter.

Photo: Mario Tama/Getty Images



## Central Florida Prepares For Hurricane Jeanne

PALM BEACH, FL, SEPTEMBER 25: [Francis Bitterman](#), 93, waits in a shelter that was set up at Fox Trail Elementary School on September 25, 2004 in Davie City, Broward County, Florida. Florida residents are preparing for Hurricane Jeanne which is expected to hit land early Sunday.

In this photo: [Francis Bitterman](#)

Photo: Sharon A. Graham/Getty Images

Sep 25, 2004