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
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
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

- Best Spaces
  - Gym
  - Dining
  - Wrestling
  - Dance
  - Mini-Gym

- Best Facility – High School
  - Large Spaces with Nearby Toilet Facilities

- Provisions for Special Needs Residents??

- Provisions for Pets??

- Ground Floor (above flood plain)

- Minimize Roof Penetrations

- 4-6% Impact on Construction Cost

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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

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

<table>
<thead>
<tr>
<th>Medical Item</th>
<th>Watts</th>
<th>Hours</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen concentrator</td>
<td>400</td>
<td>24</td>
<td>day</td>
</tr>
<tr>
<td>Nebulizer</td>
<td>20-50</td>
<td>0.1</td>
<td>3-4 hr</td>
</tr>
<tr>
<td>Apnea monitor</td>
<td>120</td>
<td>sleeping</td>
<td>day</td>
</tr>
<tr>
<td>G-tube-feeding machine</td>
<td>350</td>
<td>feeding</td>
<td>day</td>
</tr>
<tr>
<td>Track tube machine</td>
<td>450</td>
<td>24</td>
<td>day</td>
</tr>
<tr>
<td>Dialysis/RO</td>
<td>2200</td>
<td>4-5</td>
<td>3 days</td>
</tr>
<tr>
<td>Defibrillator</td>
<td>160</td>
<td>0.1</td>
<td>as needed</td>
</tr>
<tr>
<td>Ventilator</td>
<td>400</td>
<td>24</td>
<td>day</td>
</tr>
</tbody>
</table>
## PV Sized For Medical Loads

<table>
<thead>
<tr>
<th>Medical item</th>
<th>PV Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen concentrator</td>
<td>3,200</td>
</tr>
<tr>
<td>Trach tube machine</td>
<td>3,000</td>
</tr>
<tr>
<td>Ventilator</td>
<td>3,000</td>
</tr>
<tr>
<td>Dialysis/RO</td>
<td>2,400</td>
</tr>
<tr>
<td>G-tube-feeding machine</td>
<td>600</td>
</tr>
<tr>
<td>Apnea Monitor</td>
<td>500</td>
</tr>
<tr>
<td>Nebulizer</td>
<td>100</td>
</tr>
<tr>
<td>Defibrillator</td>
<td>100</td>
</tr>
</tbody>
</table>
## General shelter energy needs (normal healthy people)

<table>
<thead>
<tr>
<th>Item</th>
<th>Power</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical ventilation</td>
<td>0.35 watts per cfm</td>
<td>15 cfm per person</td>
</tr>
<tr>
<td>Air conditioning</td>
<td>1000 watts</td>
<td>500 sq. ft./ton</td>
</tr>
<tr>
<td>Life safety systems</td>
<td>10 watts</td>
<td>LED exit light charger</td>
</tr>
<tr>
<td>Standby lighting</td>
<td>40 watts</td>
<td>backup ceiling florescent</td>
</tr>
<tr>
<td>Standby branch wall circuit</td>
<td>Standby branch wall circuit</td>
<td>Standby branch wall circuit</td>
</tr>
</tbody>
</table>
Building Design

Coral Glades High School

Max. 1250 Occupant Capacity

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Principal-in-Charge of Zyscovich Education Group
2006 Governor’s Hurricane Conference
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Building Design
Coral Glades High School

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. Hesher’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