Welcome to Avion Solutions

Presenter: Randy Buckner
Building Information

- 20,140 Square Feet
- Purchased in 2011 to serve as the new corporate main office
- Completely redone to LEED (Leadership in Energy and Environmental Design) standards
- 27 VAV’s with electric reheat
- 1 AHU (nominal airflow of 25,000 cfm)
- 1 Condenser Unit (80 tons of cooling)
Avion Technologies

- Building Automation System - Carrier i-Vu

- Occupancy sensors - PW-100 Passive infrared sensor Wattstopper (Lighting only)

- Exterior LED lighting - Globaltech LED Model M21

- 50 kW PV System – 185 Suniva 270W solar modules and 4 Fronius 12,000 W invertors
Building Issues

- High energy bills
  - High energy usage (kWh)
  - High billing “Demand” (kW)

- High humidity on occasion

- Inefficient parking lot lighting
How Did We Know?

• In the winter of 2012 it was discovered that the building was constantly heating and cooling air.

• Data was collected from the BAS and analyzed.

• Building input into the DOE Energy Star Portfolio Manager.

DOES NEW ALWAYS MEAN EFFICIENT?
What is BAS Data?
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DOE Portfolio Manager

Avion Solutions HQ
4905 Research Drive NW, Huntsville, AL 35805 | Map It
Portfolio Manager Property ID: 3930059
Year Built: 2011

Does new always mean efficient?

Current Score: 85
Baseline Score: 2
Baseline

- Energy Star Score – 2
- Source EUI – 432.9 kBtu/ft²
- Site EUI - 137.9 kBtu/ft²
- Energy Cost - $73,518.45
- GHG Emissions 577.9 Metric Tons CO²
Initial Efficiency Efforts

• Heating and Cooling 100% of the time
  ▫ Guaranteed Humidity level (set up in spring)

• No set backs at night and weekends

• Updated BAS for Optimization efforts
  ▫ Added Humidity/Temp sensors
  ▫ Connected Condenser Unit to BAS

DOES NEW ALWAYS MEAN EFFICIENT?
LED Upgrade

The Solstice Mini (M21) Retrofit System

Prismatic Refractor Retrofit

Refractor Post Top Retrofit
LED Upgrade

Project Benefits Over 10 Year Period:

- **4 - Year** Payback Period
- **22.7%** Internal Rate of Return
- **$ 31,554** Cumulative Net
- **43,440 kWh** Annual Energy Saved

Total Annual Energy Savings: $4,224 (11.6%)
DOE Portfolio Manager

**Energy Use by Calendar Month**

- Scheduling and no simultaneous Heating/Cooling
- LED Upgrade

**Water Use by Calendar Month**

- Potable Outdoor
- Potable Indoor
Comparisons

Baseline (December 2012)
- Energy Star Score – 2
- Source EUI – 432.9 kBtu/ft²
- Site EUI - 137.9 kBtu/ft²
- Energy Cost - $73,518.45
- GHG Emissions 577.9 Tons CO2

Current (September 2016)
- Energy Star Score – 85
- Source EUI – 144.8 kBtu/ft²
- Site EUI – 46.1 kBtu/ft²
- Energy Cost - $27,451.21
- GHG Emissions – 193.3 Tons CO2
PW-100 Passive Infrared Wall Switch

PW-100 Passive Infrared Wall Switch Occupancy Sensor

Product Overview
The PW-100 passive infrared (PIR) wall switch sensor can turn lights OFF and ON based on occupancy. It is characterized by high sensitivity to small and large movements, appealing aesthetics, and a variety of features.

Features
- Detection Signature Processing eliminates false triggers and provides immunity to IR1 and SH1
- Zero-crossing for long relay life
- Vandal-resistant lens combines precise coverage with durability
- Choice of Manual-ON in Auto-ON operation
- Selectable wall-through mode turns lights OFF three minutes after the room is initially occupied or six minutes after the first 30 seconds
- Test mode allows quick and easy adjustments
- Selectable audible and/or visual alarms for impending shut-off

Manual-on Control
Factory default operation is for Manual-ON, so that users turn lights on only when needed. This control strategy is proven to save more energy than Auto-ON, and in ASHRAE 90.1-2010, if desired. The PW-100 may be reconfigured to turn lights on automatically.

Specifications
- Coverage: Major motion 30 x 30
- Minor motion 30 x 15
- Sensitivity adjustment: PW (high/medium)
- Dimensions: 2.70" x 1.75" x 1.32" (68mm x 44mm x 34mm)
- Weight: 1.2 lbs (0.5 kg)
- UL listed, CSA tested
- Five-year warranty

Controls & Settings
Product Controls
DIP Switch Setting

Coverage & Wiring
Coverage Pattern
Wiring Diagrams

Ordering Information
Catalog No. Color Voltage Load Rating

Pub. No. 2380 Rev. 3/2013
Avion’s PV System
Suniva OPT Series: OPT 60 Cell Modules

Suniva OPT Series

Suniva OPT Series, OPT 60 Cell Modules

**SUNIVA OPTIMUS SERIES MONOCRYSTALLINE SOLAR MODULES**

**OPT SERIES: OPT 60 CELL MODULES (SILVER FRAME)**

Optimus modules are known for their superior quality and long-term reliability. These high-powered modules consist of Suniva's premium ARTism Select cell technology and are designed and manufactured in the U.S. using its pioneering rear implantation technology. Suniva's high-power-density Optimus modules provide excellent performance and value.

**FEATURES**

- Contains premium ARTism Select cell technology - over 19%
- Extensive materials testing and certifications safeguard reliability
- Positive only tolerance ensures predictable output
- Marine grade aluminum frame with hard anodized coating
- Buy America-compliant upon request
- Qualifies for U.S. EXIM financing
- System and design services available
- Industry leading linear warranty: 10 year warranty on workmanship and materials, 25 year linear performance warranty delivering 80% power at STC

**CERTIFICATIONS**

AGS203 Compliant

**OPTIMUS SERIES, OPT 60 CELL MODULES**

**ELECTRICAL DATA: (Nominal)**

<table>
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<tr>
<th>Model Number</th>
<th>OPT 60-60-00099</th>
<th>OPT 60-60-01099</th>
<th>OPT 60-60-02099</th>
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<tr>
<td>Peak Output</td>
<td>590.10 Wp</td>
<td>590.10 Wp</td>
<td>590.10 Wp</td>
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<tr>
<td>Voltage (Max.</td>
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<td>60.00 V</td>
<td>60.00 V</td>
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<tr>
<td>Current (Max.</td>
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<td>10.00 A</td>
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<tr>
<td>Open Circuit Voltage</td>
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</tr>
<tr>
<td>Short Circuit Current</td>
<td>5.50 A</td>
<td>5.50 A</td>
<td>5.50 A</td>
</tr>
</tbody>
</table>

The electrical data apply to standard test conditions (STC): insolation of 1000 W/m² with AM 1.5 spectrum at 25°C.

**CHARACTERISTIC DATA**

- **Type of Solar Cell**: High-efficiency ARTism® Select cells of 156 x 156 mm (6 x 6 in.)
- **Frame**: Silver-anodized aluminum, anod.
- **Glass**: Tempered (frame), anti-reflection coating
- ** Junction Box**: NEMA 1597 rated, 5 terminal hypalon hubs
- **Cable & Connectors**: 12 AWG (34 mm²) PV Micro cables with multiple connector options: available cable lengths: 2400 mm

**MECHANICALS**

- **Cell / Module**: 60 (10 x 6)
- **Module Dimensions**: 1652 x 962 mm (65.04 x 38.06 in.)
- **Module Thickness (Depth)**: 40 mm (1.57 in.)
- **Apparent Weight**: 17.9 ± 0.25 kg (39.6 ± 0.5 lb)

**TEMPERATURE COEFFICIENTS**

- **Voltage**: -0.3% / C
- **Current**: -0.4% / C
- **Power**: -0.4% / C
- **MPP Shift**: -0.2% / C

**LIMITS**

- **Max. System Voltage**: 1050 VDC for DC, 1000 VDC for UL
- **Max System Curtailed Voltage**: 15 amps
- **Operating Module Temperature**: -40°C to +40°C (-40°F to +104°F)
- **Insulation Resistance (Basic Load)**: 1 GΩ (DIN 41305-1) for 3400 Vrms (115 VAC), half and wind resistant

Suniva reserves the right to change the data at any time. Please refer to the installation manual at suniva.com: 00Y0 80-WF, F2084-2080-00.
Grid-Tied System
Fronius Dashboard

- Current power: 40.59 kW
- Energy today: 81.98 kWh
- Yield today: 11.48 USD
- CO2 savings today: 43.45 kg
Solar Days
Economic Impacts

Project Benefits Over 20 Year Period

- **7 - Year** Payback Period
- **8.98%** Internal Rate of Return
- **$111,989** Net Profit
- **70,000 kWh** Annual Energy Produced

With solar, Avion has reduced TVA energy consumption by 15.8%

**Solar PV Annual Revenue**

- **$6,840 per year**
- **$4,886 per year**

(Revised)
Conclusions

• Property Optimizations
  ▫ Baseline your building(s)
  ▫ Look for low cost/ no cost options
  ▫ Pursue “low hanging fruit”

• Capital Investments
  ▫ Solar PV Systems
  ▫ Wind Turbines
  ▫ Cogeneration
Avion's Energy Efficiency Steps

Average Original Energy Load: 896,173 kWh
BLDG Efficiency Energy Load: 425,656 kWh
Post LED Upgrade Energy Load: 385,656 kWh
Post Solar Instal Energy Load: 315,656 kWh

Yearly Energy Consumption (kWh)
THANK YOU!