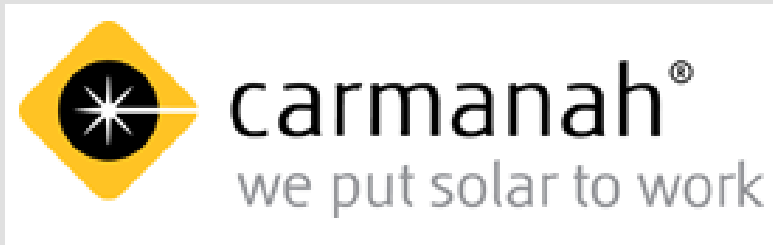


by
Miguel Vasquez-Lavado



Hard-Wired Solar Powered Runway Lighting System

IES Conferences '10



GT *Services
of Morgan City*



- Fossil Energy Resources are being depleted... and energy prices are increasing...
- Like other industries, the Airfield Lighting Industry and its regulatory agency are taking steps to address this issue (6.6A LED fixtures).
- The results we want to share with industry is that we can reduce energy usage in a smarter way without compromising safety (**Smart-Energy**)

Presentation Overview

WHO: Louisiana D.O.T.D.

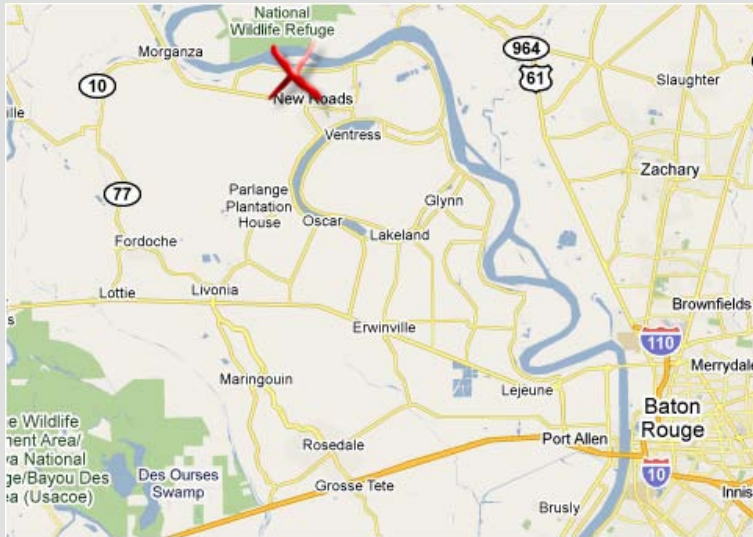
WHERE: False River Regional Airport

WHAT: Hard-Wired Solar Powered
Taxiway Lighting System



WHY: **SMART-ENERGY** can be applied to hardwired Taxiways and Runways.

About False River Regional Airport



**False River Regional Airport,
New Roads, Louisiana**



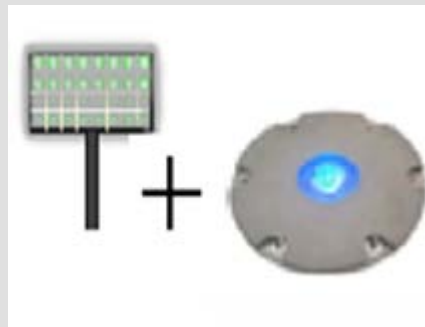
What ➡ Why (background)



LED RWY
MED INTENSITY



NEW LED POWER SUPPLY (NLPS)



LED RWY
(NLPS)

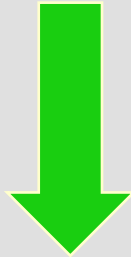
LED Twy (NLPS)



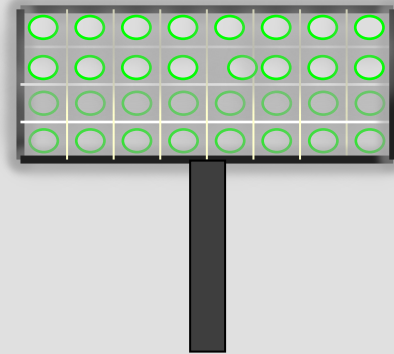
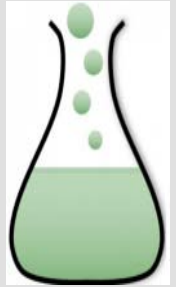
TIME

Catalyst to go to Solar ?

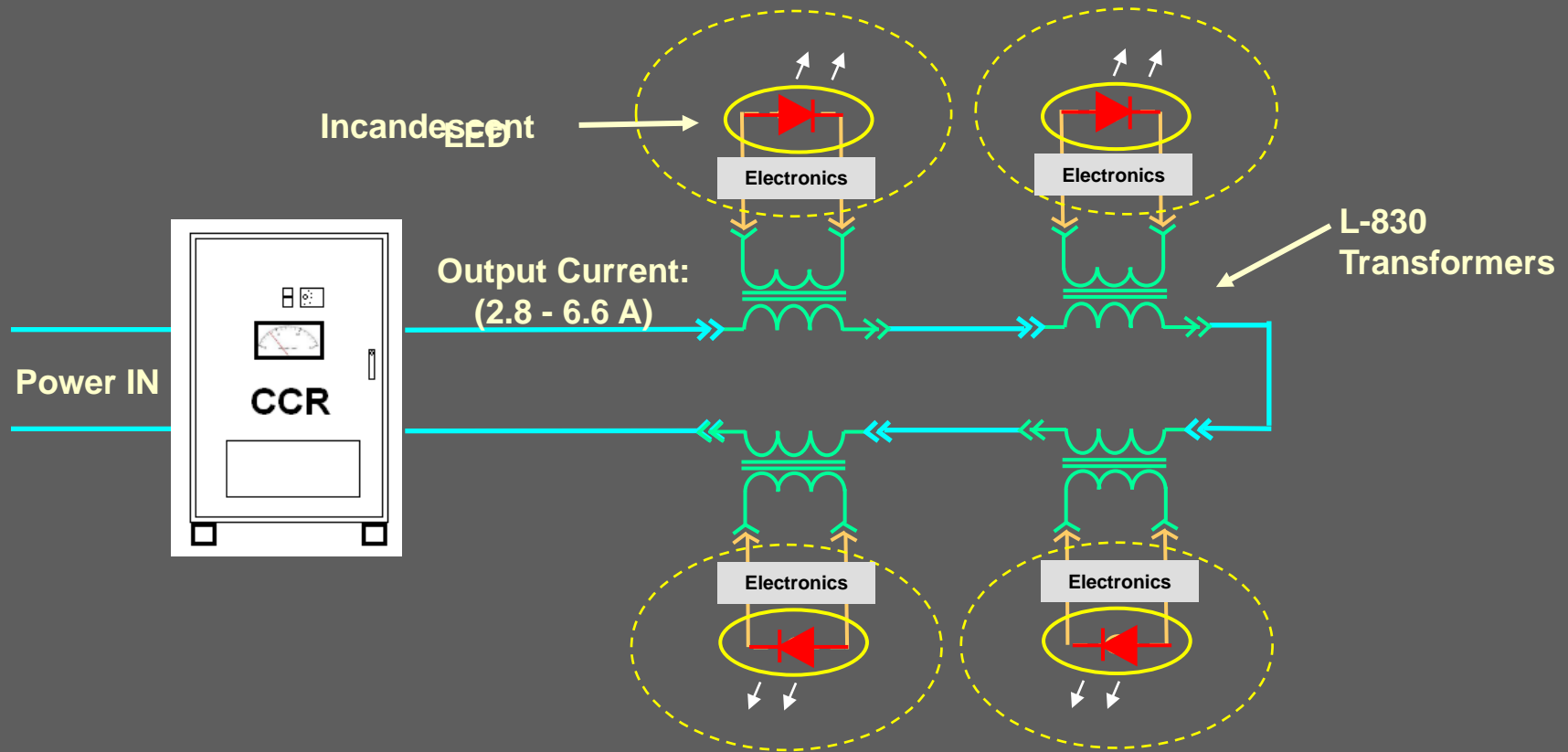
A New Architecture of LED Power Supply (NLPS) ? !!



Suggest an Smart-Energy Approach (Solar) to **Hardwired Circuits**

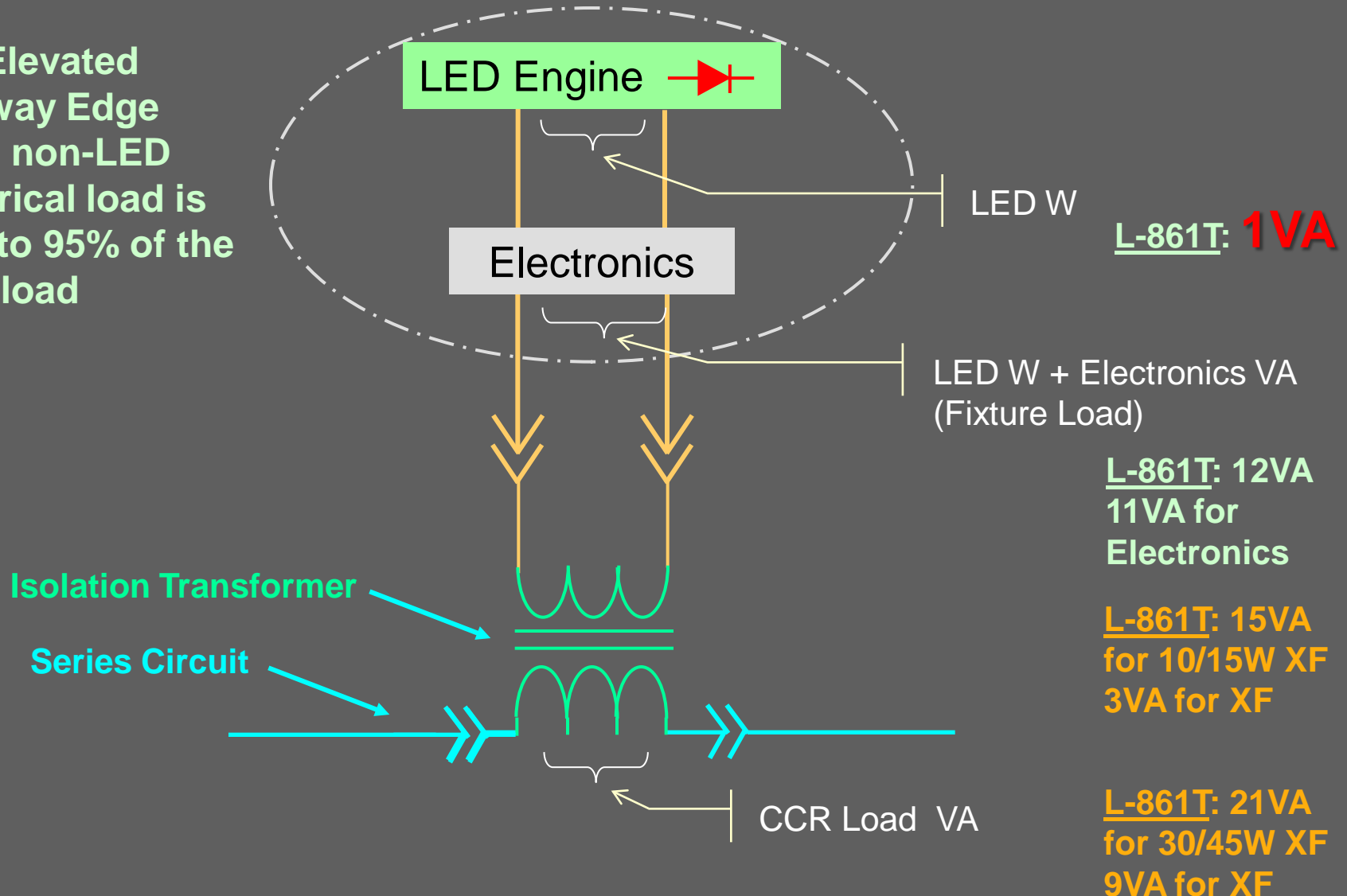


New LED Power Supply (NLPS-Background)



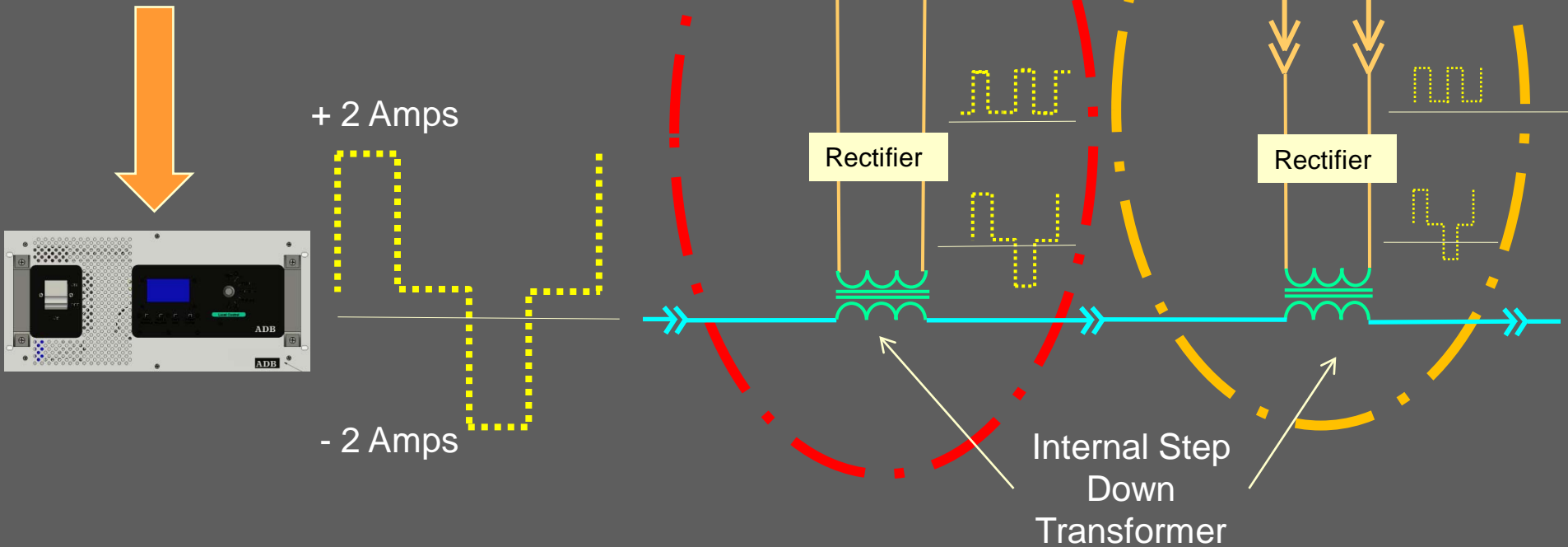
New LED Power Supply (NLPS-Background)

For Elevated
Taxiway Edge
light, non-LED
electrical load is
93% to 95% of the
total load



NLPS (a new system architecture)

NEW LED POWER SUPPLY (NLPS)



Existing vs NLPS

False River Regional Airport, Louisiana

(Existing System)

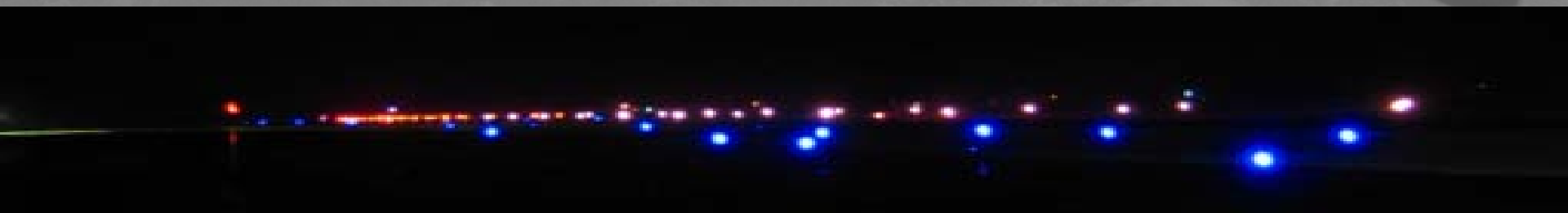
TWY Circuit Elevated:	45 Watts
Transformer:	9 Watts
Quantity:	164
Circuit Length:	14,000 ft
Cable Power Loss:	517 Watts

Circuit Power (Watts):	~8,906 Watts
CCR required:	15 KW CCR

(New Power System)

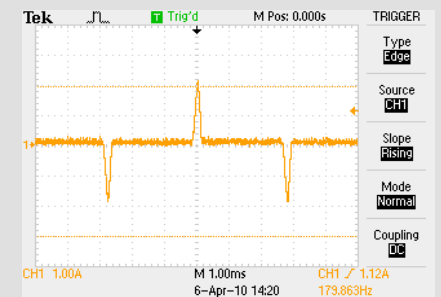
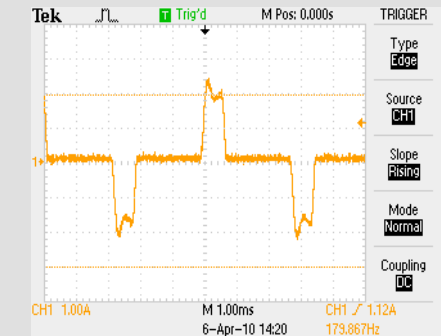
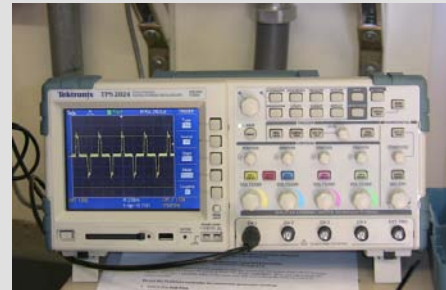
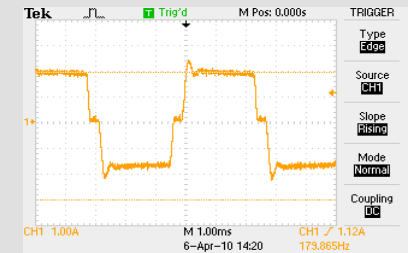
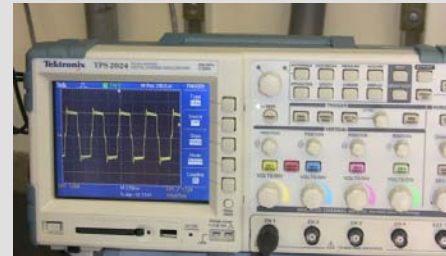
4.15 Watts (LED)
0 Watts (In-pavement)
Same
Same
47.52 Watts

686 Watts
1 KW



NLPS Data

STEP	Input Current	Input Voltage	Input VA
B100	2.78 A	257	717
B30	0.96 A	257	247
B10	0.49 A	257	126



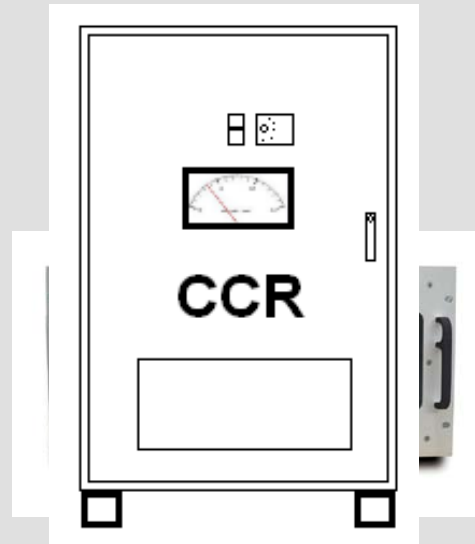
NLPS (Additional Characteristics)

- **Based on a Series Circuit**
- **Maximize use of Existing Electrical Infrastructure**
- **No Isolation Transformer Required**
- **Same LED optics as in a 6.6A LED Fixture, but with less components (reduced complexity)**

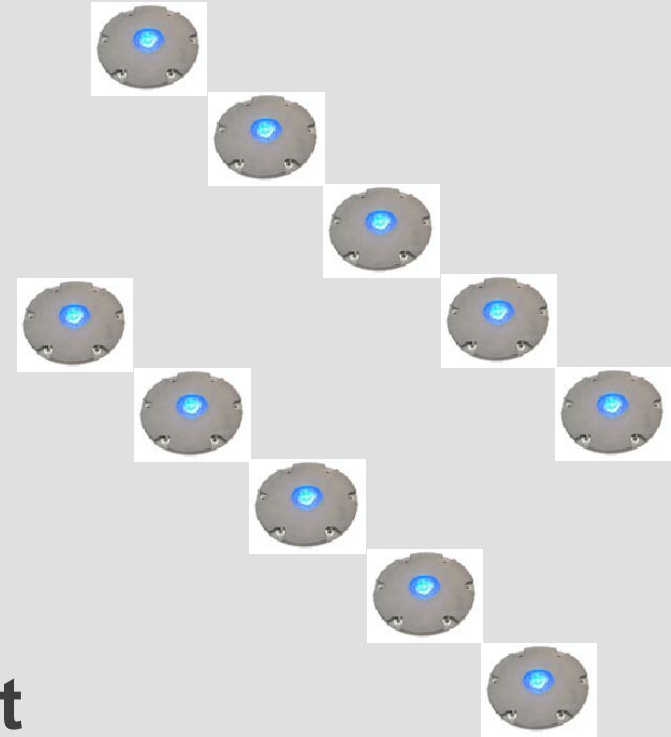
Let's look at Solar!



Solar Array

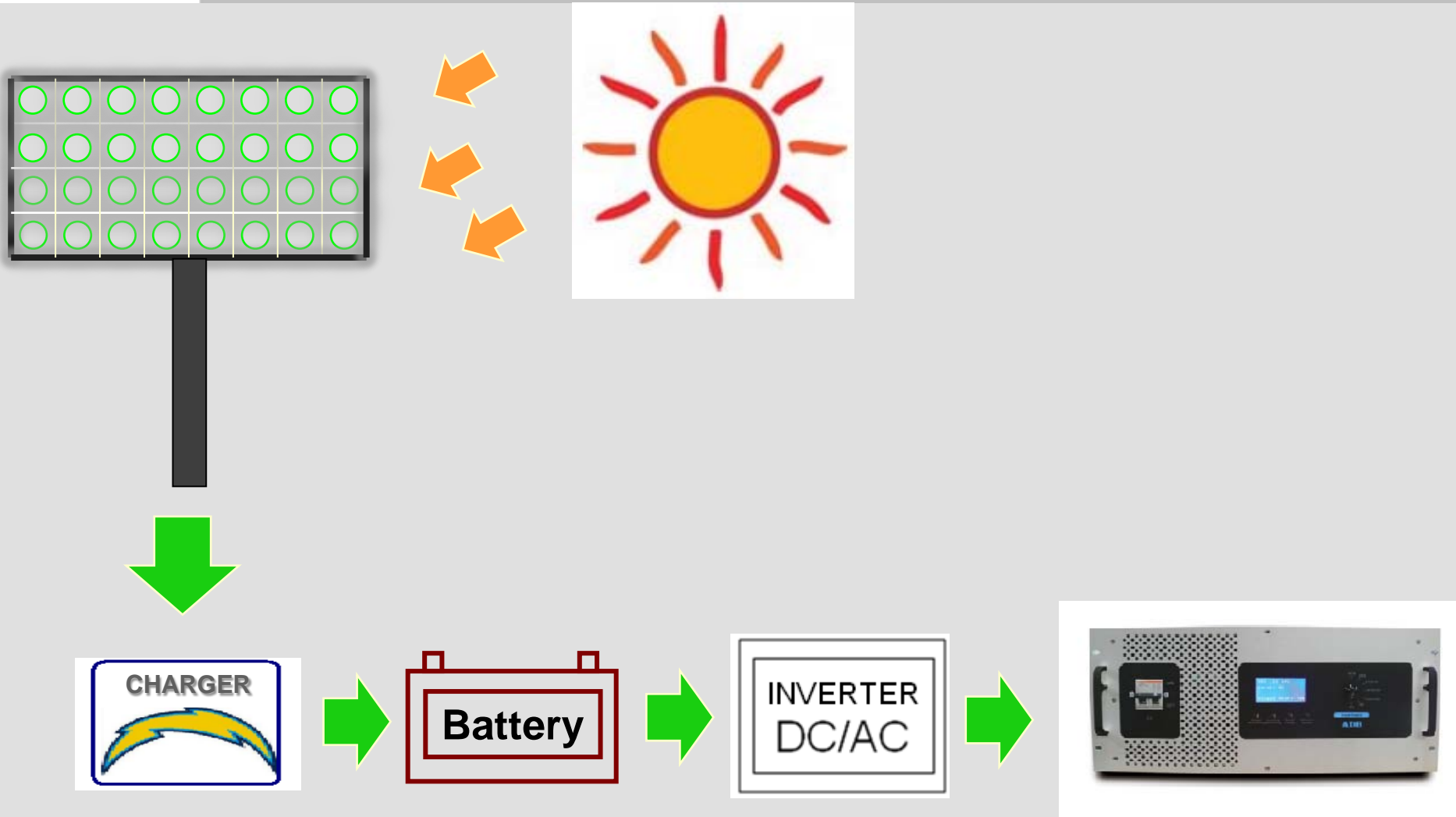


NLPS
**Constant Current
Regulator**



**LED TWY
Fixtures**

What's in the system?



WHAT (...else?)

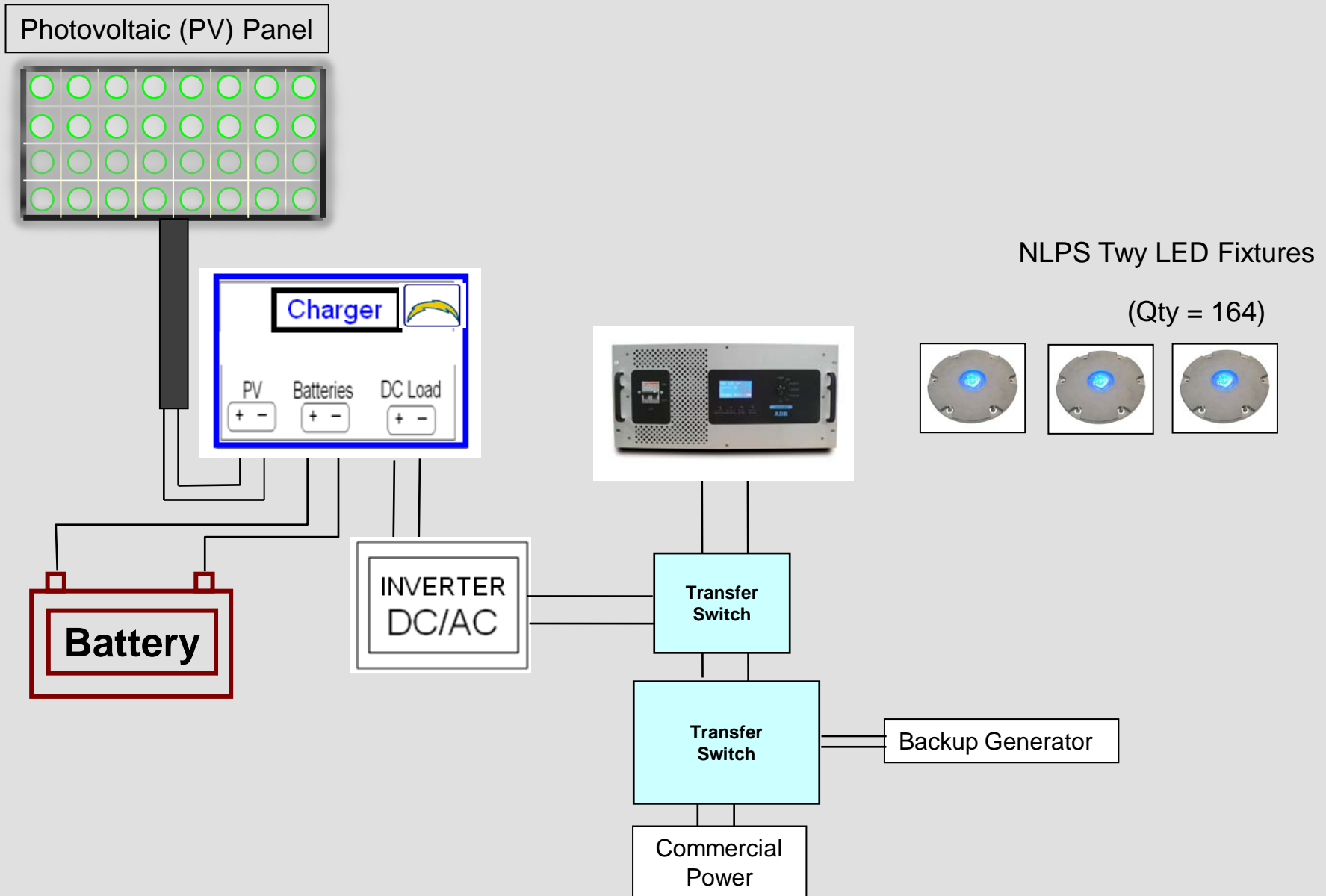
What else determined the Characteristics of the Solar System?

- Max Load-1KW

STEP		Input Current	Input VA	Real Ops Condition (Night Time)
B10	10%	.49A	126	80%
B30	30%	.96A	247	10%
B100	100%	2.78A	717	10%

- Autonomy (time system can operate without sun)
- Solution if system Fails? **SAFETY!**

The complete system



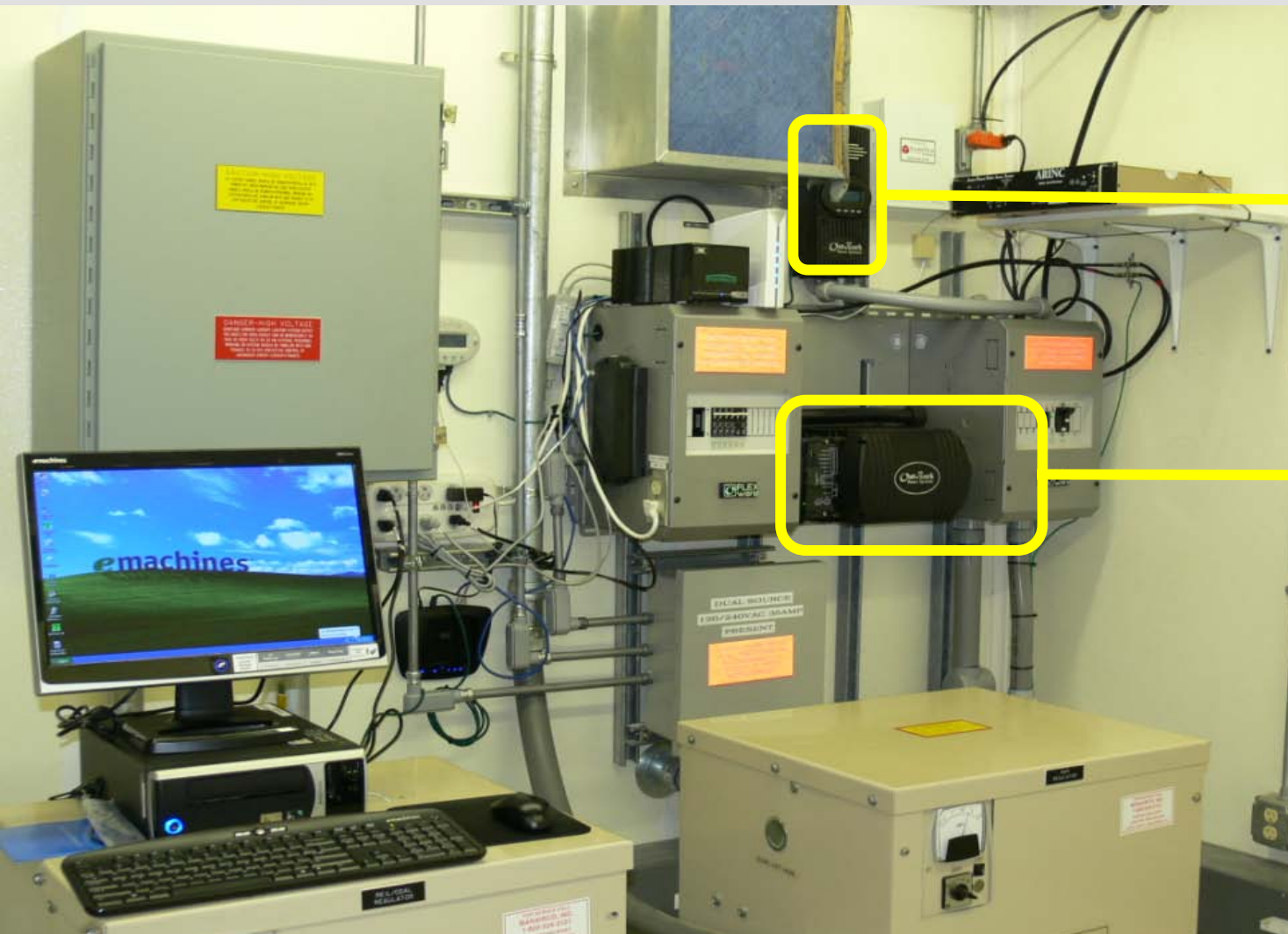
Solar Array Photo



BATTERIES PHOTO



CHARGER & INVERTER



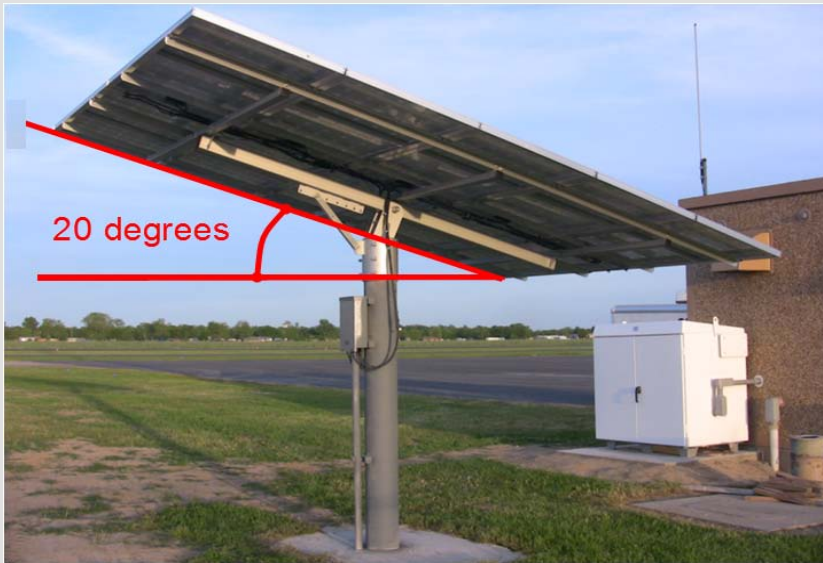
CHARGER

INVERTER

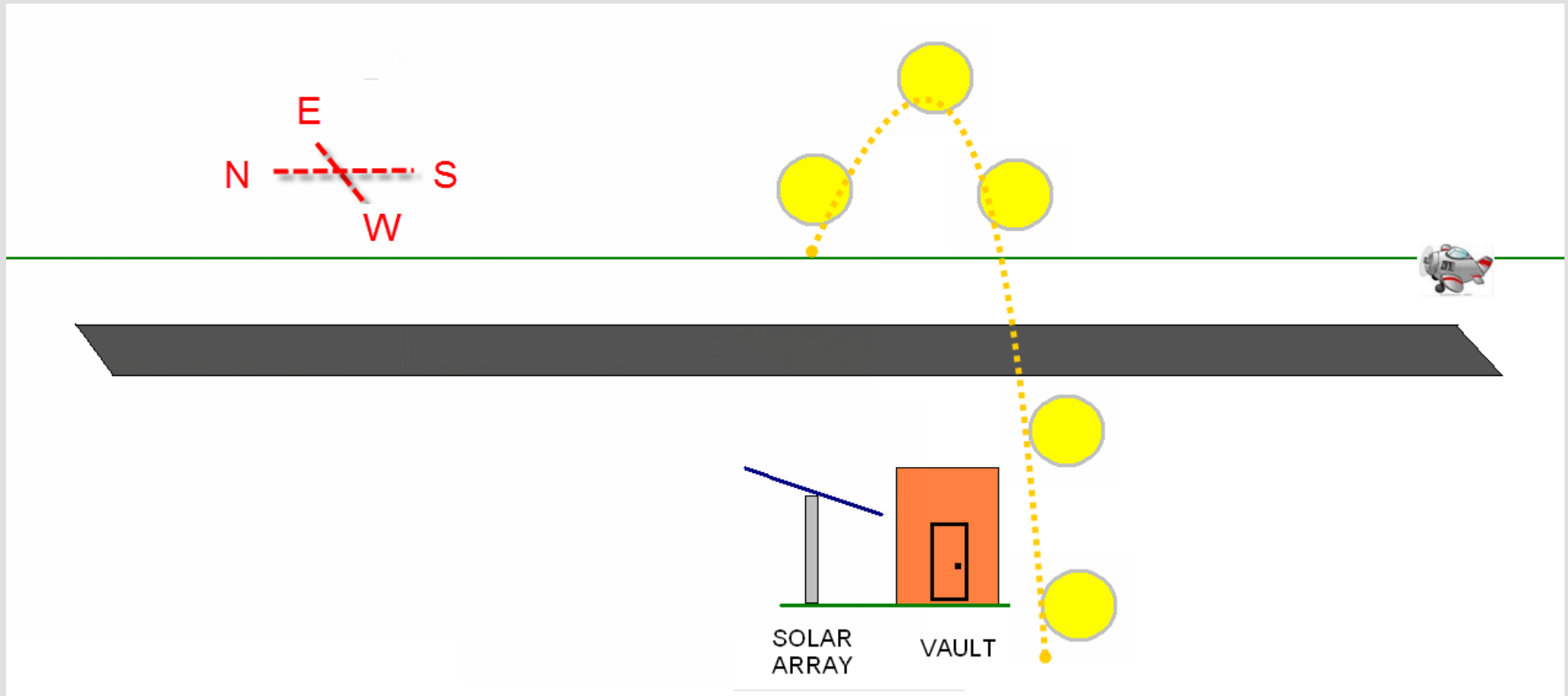
About the Solar Array

Characteristics:

- Modules: 1,750 Watts (10 x 175 Watts, Monocrystalline Silicon Cell)
- Array Dimension: 140 sq-ft (10.5 x 13.3)
- Top-Pole Wind loading: (90 MPH)
- Array angle: 20 degrees facing South



About the Solar Array Location



Orientation reduces risk of glare

About the Batteries

Characteristics:

- 12 x 12Volts, 265 A-H each (Lead Acid Gel Battery)
- 795 A-H Total Wired Series/Parallel
- Designed to provide 3.5 Days of Autonomy at 50% depth of discharge
- 5 Year lifetime



About the Battery Containers

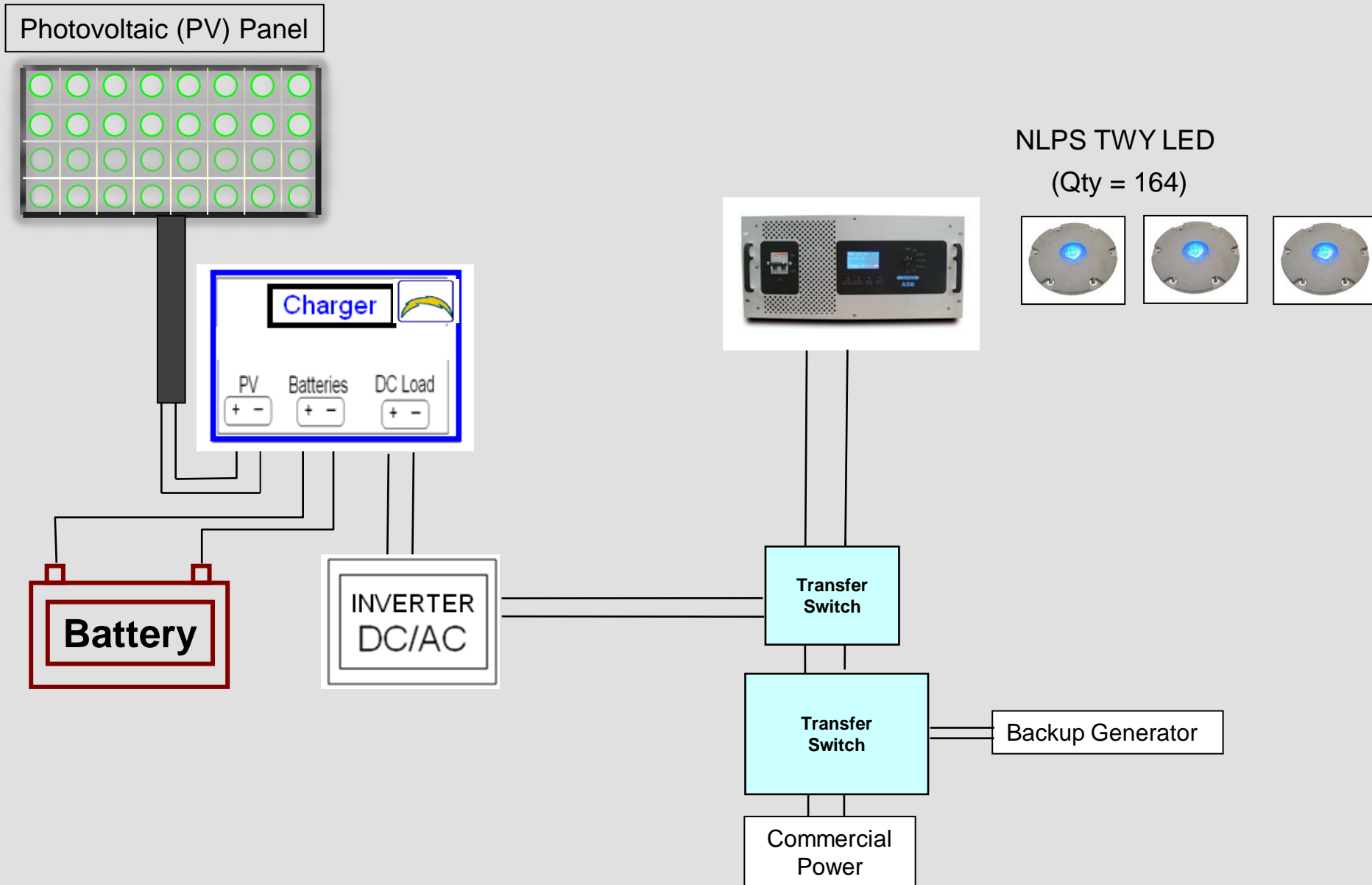
Characteristics:

- “Water Cool” NEMA 4 Container
- Thermo-siphon Circulation



Water filled
panels on side
and top act as
heat sink

About the Inverter



About ATS

- Double Redundancy

- Design not intended to put excess power back into grid

INVERTER
DC/AC



Transfer
Switch

Transfer
Switch

Backup Generator

Commercial
Power

About the Installation

Phase 1:
Solar Array, Batteries & Charger



Phase 2:
New LED Power Supply

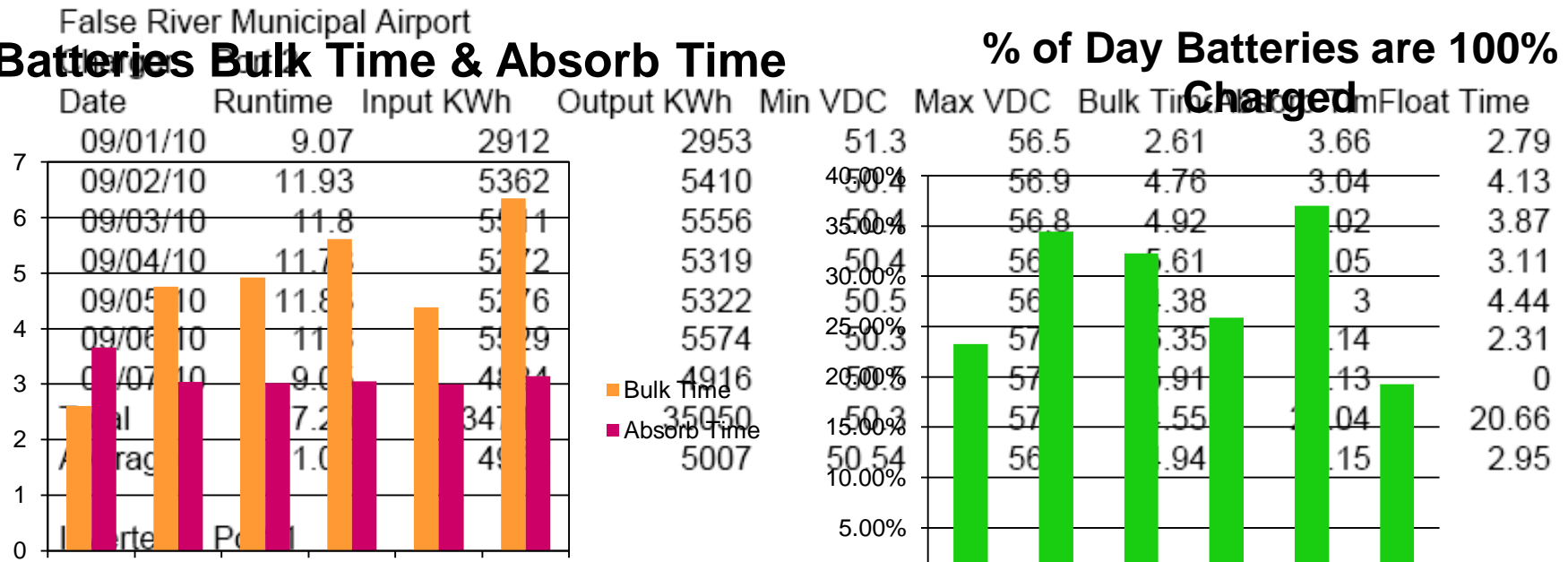
Phase 3:
Automatic Transfer Switch

Phase 4:
164 Lighting fixtures installed

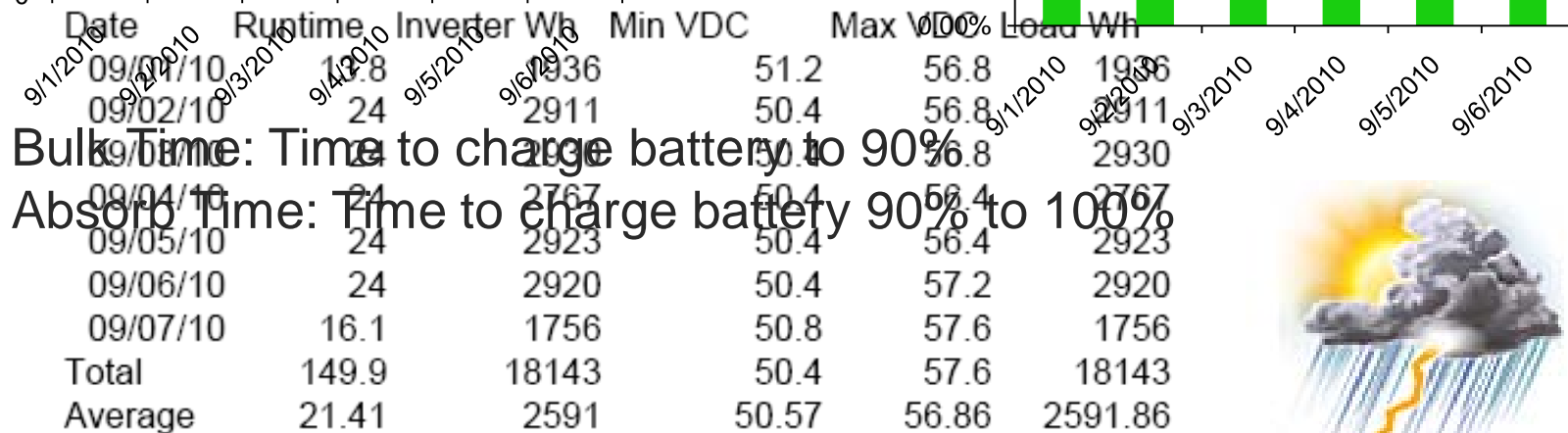


About the Data

Batteries Bulk Time & Absorb Time



% of Day Batteries are 100% Charged



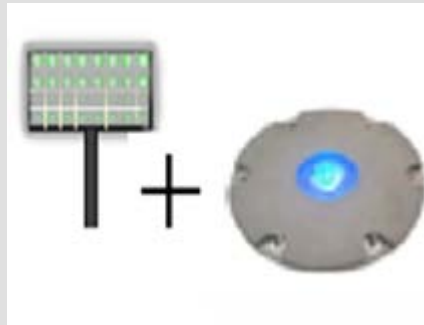
Bulk Time: Time to charge battery to 90%
 Absorb Time: Time to charge battery 90% to 100%



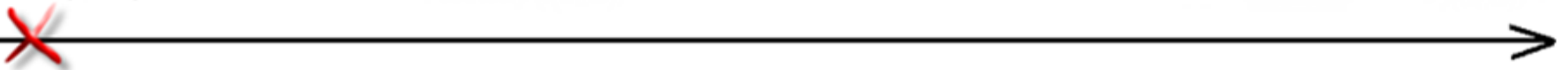
WHAT ➡ WHY (Game plan)



LED RWY
(NLPS)



LED Twy (NLPS)



TIME

Low Profile Runway Edge Light

- LED Technology (CCR or PWM)
- Lowest possible height that prevents tractor/lawn mower damage.
- To have the lowest possible height to eliminate fixture knockdowns.
- Maximize **SAFETY** during aircraft Excursions:
 - ☐ When an elevated fixture is hit while it is energized- with possible fuel spillage, minimize risk of fire due to arc when electrical connection separates.
 - ☐ Aircraft's propeller strikes.

Low Profile Runway Edge Light

Compliance with Standards

- FAA:** Designed according to L-861 and L-861E AC 150/5345-46 (Current Edition) and the FAA Engineering Brief No. 67 "Light Sources other than Incandescent and Xenon for Airport Lighting and Obstruction Lighting Fixtures." ETL Certified.
- ICAO:** Annex 14, Vol. 1, para. 5.3.9.7 to 5.3.9.9, 5.3.10.9 and 5.3.11.4
- FCC:** Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise



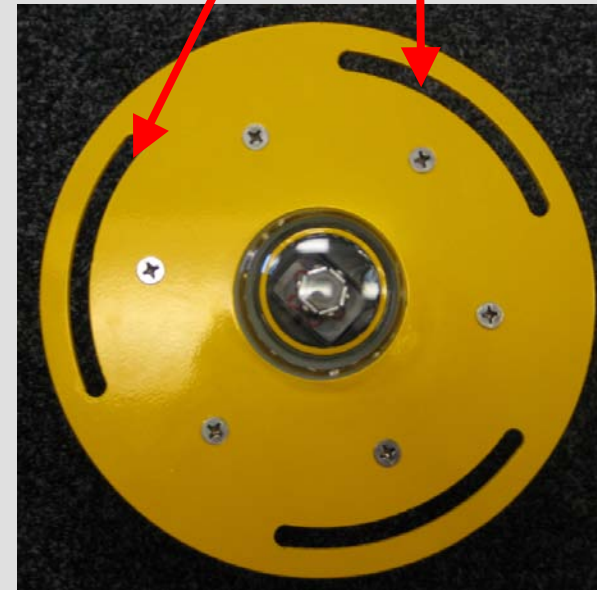
Low Profile Runway Edge Light

Variations:

- Omnidirectional White
- Red/Green
- White/Yellow

Will permit to power a full runway with Solar Technology

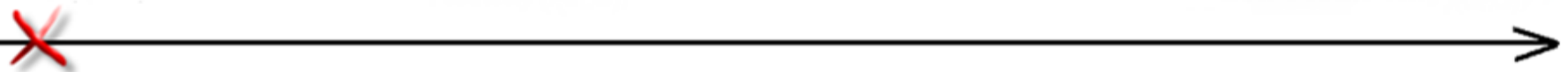
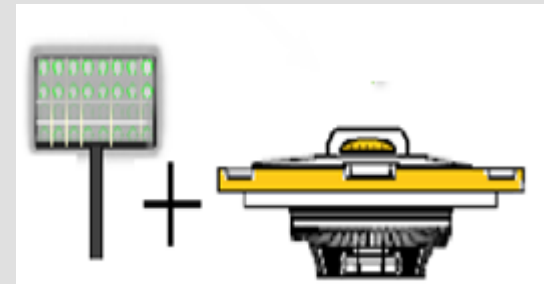
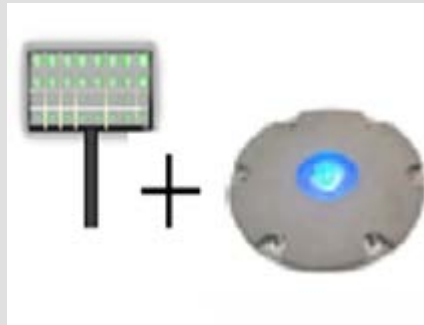
Slots provides for azimuth adjustment



WHAT ➡ WHY (Game plan)

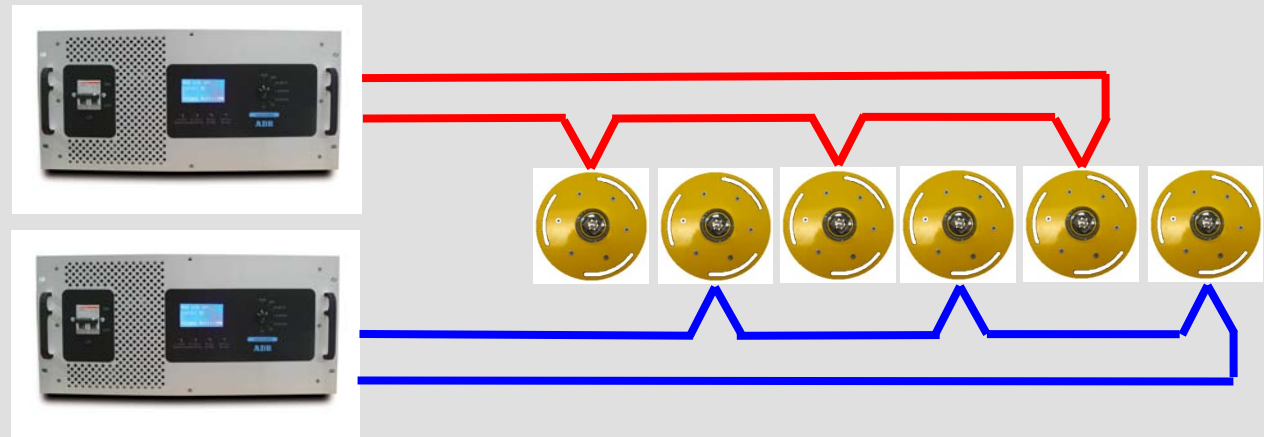


LED Twy (NLPS)



TIME

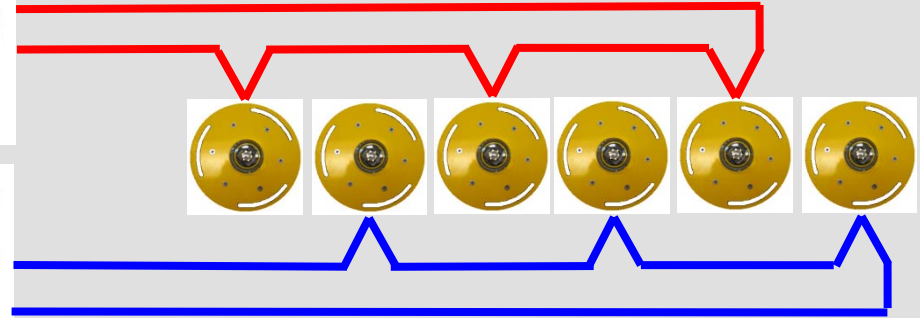
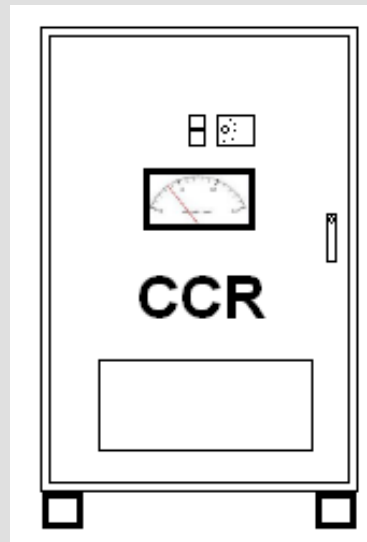
Low Profile Runway Edge Light and New Power Supply



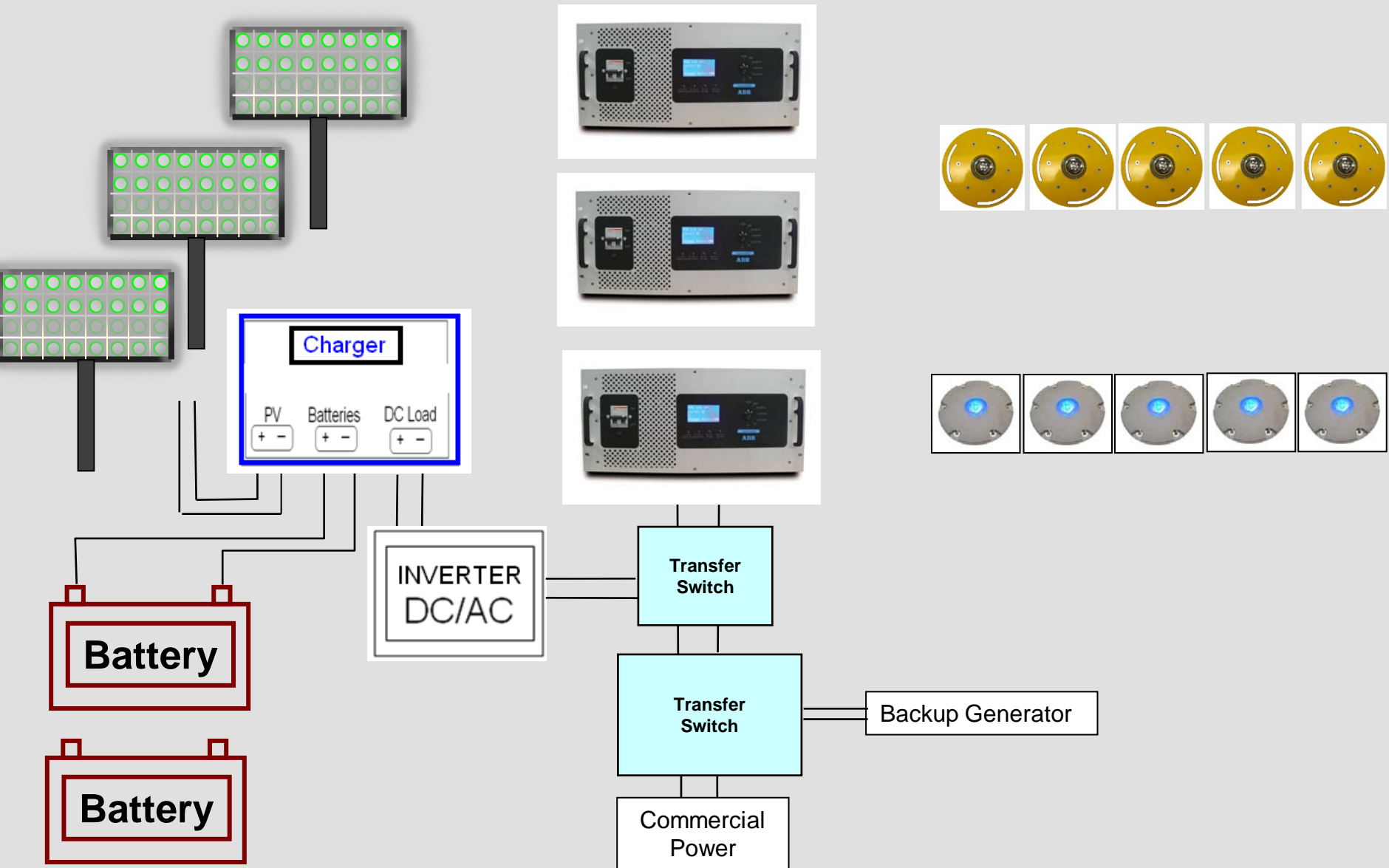
Low Profile Runway Edge Light and New Power Supply



Comparison tests

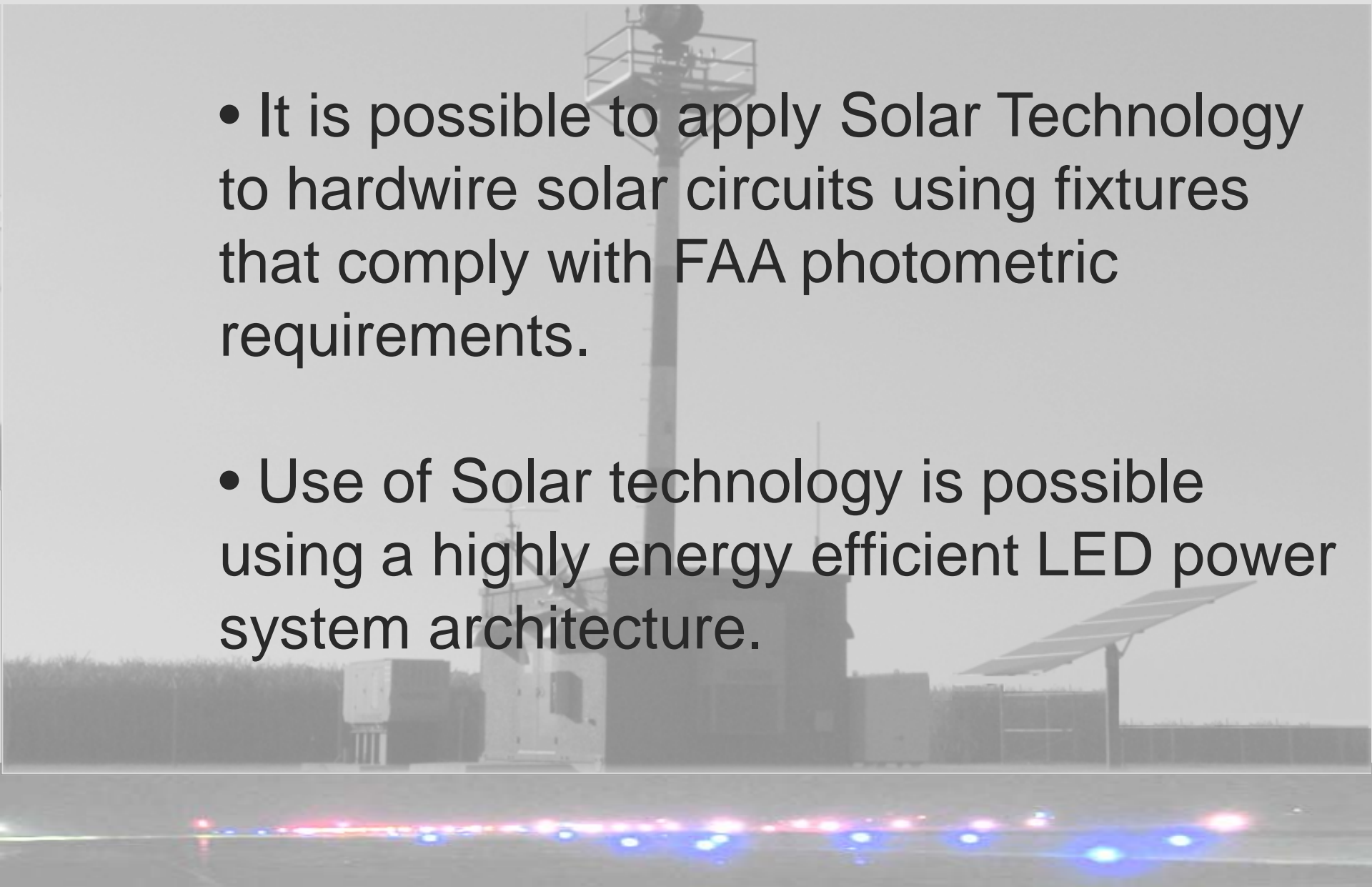


WHY (the future)



Summary

- It is possible to apply Solar Technology to hardwire solar circuits using fixtures that comply with FAA photometric requirements.
- Use of Solar technology is possible using a highly energy efficient LED power system architecture.




The background of the slide is a photograph showing the silhouette of a radio tower with a platform at the top, and a solar panel mounted on a pole to the right. The scene is set against a clear blue sky. A yellow rectangular box with a thin black border is centered over the image, containing the text "Thank you".

Thank you

QUESTIONS ?

We would like to thank:

Yvonne Chenevert, False River Regional Airport
Glenn Thibodoux, GT Services
Justin Taverna, First Light Technologies
Julie Haugh, Greenhouse PC
Ed Runyon, ADB
Allen Taylor, Louisiana D.O.T.D



Did you know that
this is a spun cast
concrete airport
rotating beacon?

And I climbed it !!!

