FALSE RIVER REGIONAL – HZR

"REAL WORLD" LED LIGHTING TESTS

PROGRAM OVERVIEW

SOLAR RETRO-REFLECTOR MARKERS

RWY & SOLAR TWY – PWM & 6.6 / 6.6

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA

AIRPORT LIGHTING COMMITTEE (IESALC) – OCTOBER 16, 2012

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

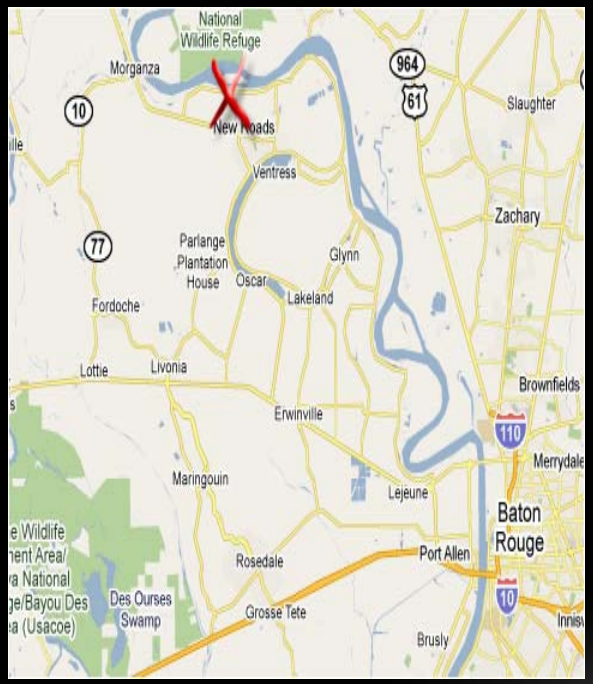
Aviation
LA DOTD

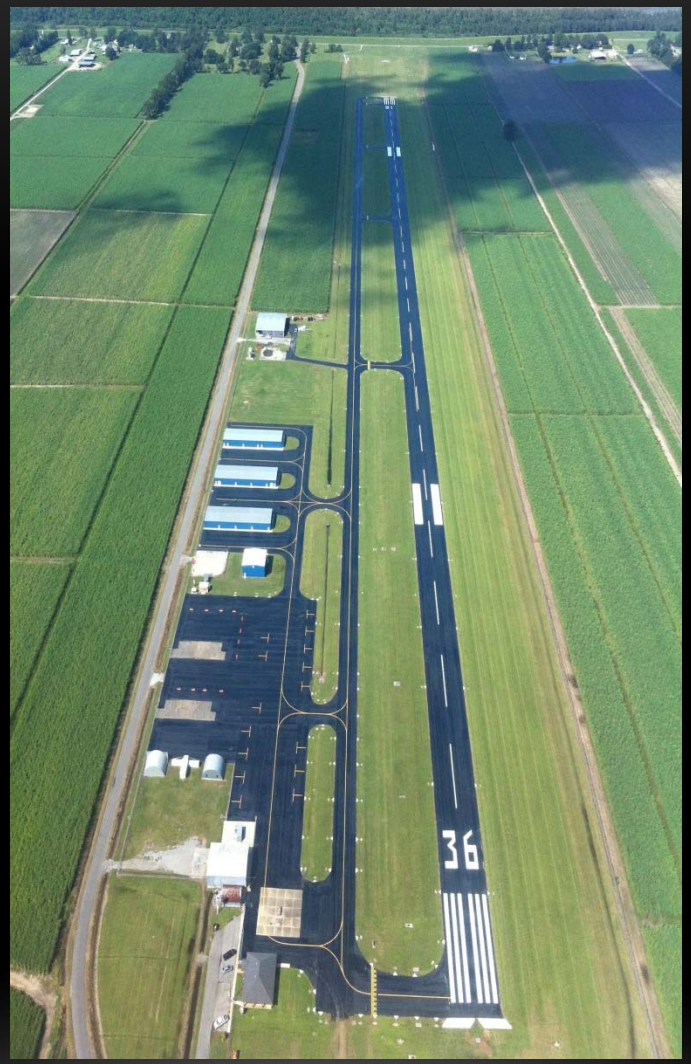
LADOTD NAVAID PROGRAMS

- N36 Airport Rotating Beacons – Concrete Support Structures
- Can & Conduit System Standards for Louisiana Airports
- Pre-Fabricated Concrete Lighting Vault - Design
- PAPI "Location" – Seamless IFR to VFR transitions
- Maximize Pilot – Guidance - Safety - Visual Impact
- AWOS – GCO – ILS – RNAV (GPS) – LPV
- Obstruction Removal – Approach & Transitional
- Standards Development –*"Real World LED Tests"*
- Navaid & Lighting Maintenance Training Seminars

FALSE RIVER REGIONAL AIRPORT - HZR

Pointe Coupee Parish
New Roads, LA
Rwy 5003' x 75'
Elev: 40 Ft.





AWOS-3P/T 121.250
or Tel (225)638-3107
CTAF - - - - 122.800
GCO - - - - - - 135.075
LOC - - - - - - 111.900
NDB – MHW 356
UNICOM - - 122.800

PAPI-2, 3.0°, 50'TCH
RWY 36 - - - ODALS
RWY 18 - - - REILS

LOC RWY 36 – RNAV (GPS) RWY 18 / 36 – VOR/DME-A – NDB RWY 36

LONG TERM TESTING GOALS

- Upgrade Systems – LED / Best Technology
- Minimize Energy Consumption
- Maximize Reliability - MTBF
- Simplify Systems Operation
- Minimize Repair/Troubleshooting Time-MTTR
- Maximize Visual Impact
- Improve Airport Operational Safety
- High Cost to Benefit Ratio - CBR

HZR ENERGY REDUCTION COMPONENTS

- Solar Powered Taxiway Lighting – L-852T – Pulse Width Modulation
- Relocation of L-852T TWY Fixtures from 10’ to 2’
- Install APS Interleaved RWY Lighting System
- Upgrade Vault CCRs & HVAC to Step Capacity
- Upgrade RWY 18 REILS (Strobe) to LED – 6.6A
- Upgrade L-807 Wind Cone - L-858 Signs from Quartz to LED – 6.6A
- Upgrade Three Channel PAPI-2 System to Single Channel – 6.6A
- Solar Reflector Markers – Centerline & Edge
- Convert TWY L-852T to L-861T add Isolation Transformers

L-853 – MARKERS, RETRO-REFLECTIVE

FAA GUIDANCE - 1969 TO 1983

- AC 150/5340-20 – Installation Details and Maintenance Standards for Reflective Markers for Airport Runway and Taxiway Centerlines, February 17, 1969
- Evaluation of Retro-Reflective Pavement Markers for Precision and Non-precision Runways – FAA Technical Center, Guy S. Brown & Larry W. Hackler, DOT/FAA/CT-82/112, DOT/FAA/RD-82/83 – Interim Report, December 1982
- Identification of Exit Taxiways (Retro-Reflective Markers Only) – FAA Technical Center, Larry W. Hackler, DOT/FAA/CT-82/77 Interim Report – June 1982 and DOT/FAA/CT-83/5, DOT/FAA/RD-82/91 – Final Report, April 1983

L-853 – MARKERS, RETRO-REFLECTIVE

FAA GUIDANCE - PRESENT

- AC 150/5345-39D – Specification for L-853 Runway & Taxiway Retro-Reflective Markers, September 26, 2011
- AC 150/5340-30G – Design and Installation Details for Airport Visual Aids, September 21, 2012
- Addendum to AC 150/5345-53D - Certified Equipment and Manufacturers List, September 26, 2012

SOLAR REFLECTOR MARKERS

Taxiway Edge Reflector

Taxiway Centerline Reflector

Taxiway Centerline Solar Reflector Markers

Taxiway Centerline Solar Reflector Markers

Part 2

Taxiway Centerline Solar Reflector Markers

Part 3

SOLAR REFLECTOR MARKERS

TWY to RWY Lead In - Exit

TWY to RWY Lead In - Exit

Taxiway Centerline With Runway Exit

Taxiway Centerline Solar Reflector Markers

Taxiway to Ramp

SOLAR LED REFLECTOR MARKER - RESULTS

- Taxiway Centerline Markers Installed “All Colors” – 260

  Total Failure – 6

  One to Two or One to Three of Four LED Failure – 13
- Red “Danger” Uni-Directional Markers Installed – 5

  Total Failure – 1
- Taxiway Edge Markers Installed “Blue” – 68

  Total Failure “First Night” - 2

7% Failures - August 17 2011 to Sept 14 2012

THE BEGINNING – LOW PROFILE RUNWAY EDGE

LOW PROFILE RUNWAY – (TAXIWAY) LED FIXTURES

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

LED PWM RUNWAY EDGE & THRESHOLD FIXTURES AT HZR

L-861

L-861E

RWY 36 to Exit TWY

LED Low Profile Fixtures

Exit TWY to RWY 36 End

LED Low Profile Fixtures

TWY Looking South

LED TWY Lights with LED Reflectors

Runway 18 End to Midfield

Medium Intensity

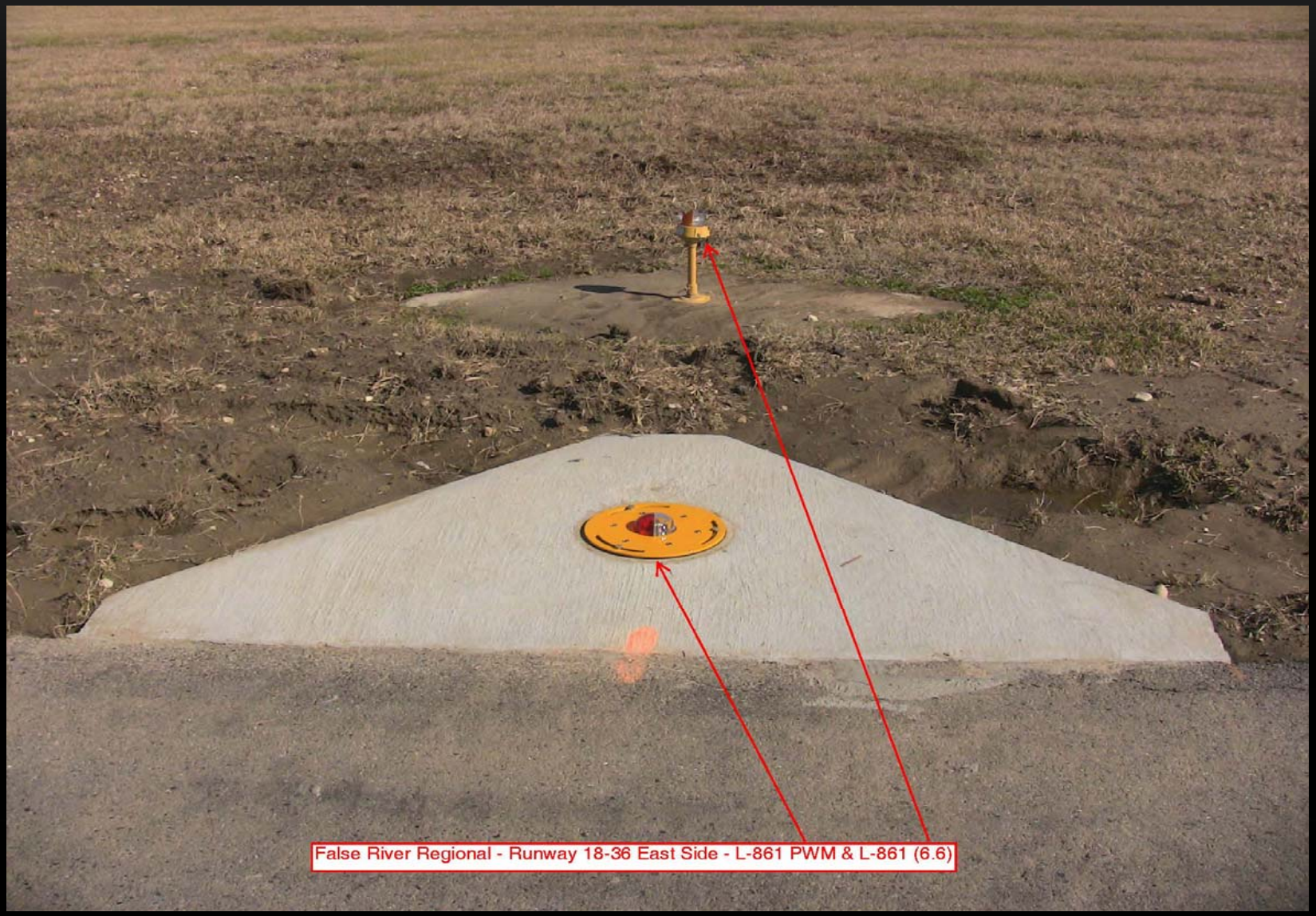
Exit TWY to 36 End

LED Low Profile Fixtures

PWM LED & 6.6 QUARTZ THLD FIXTURES - INITIAL

LED & QUARTZ THLD FIXTURES – LATEST

RUNWAY EDGE FIXTURE (TYPICAL)



RUNWAY EDGE FIXTURE – ELEVATED
COLOR CODED 5KV CABLE CIRCUIT – APS (PWM)

LED

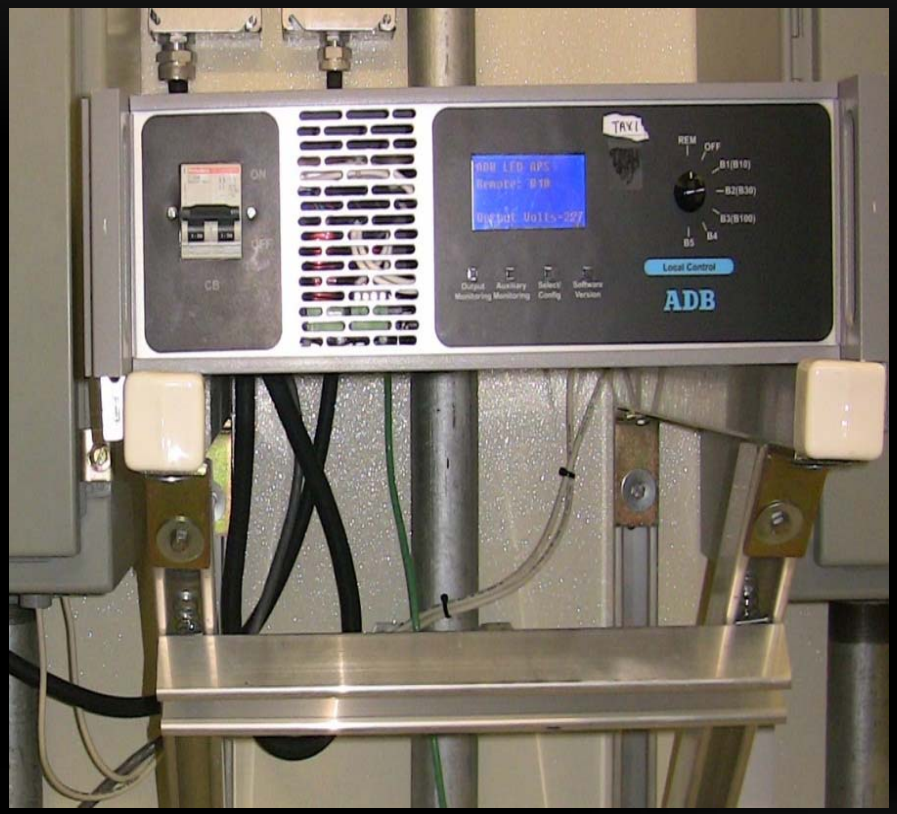
vs

Quartz Lighting Fixtures

LED vs Quartz: Comparison

SOLAR TAXIWAY LIGHTING ENABLED BY PWM TECHNOLOGY

ADVANCED POWER SUPPLY (APS) @ 10% INTENSITY

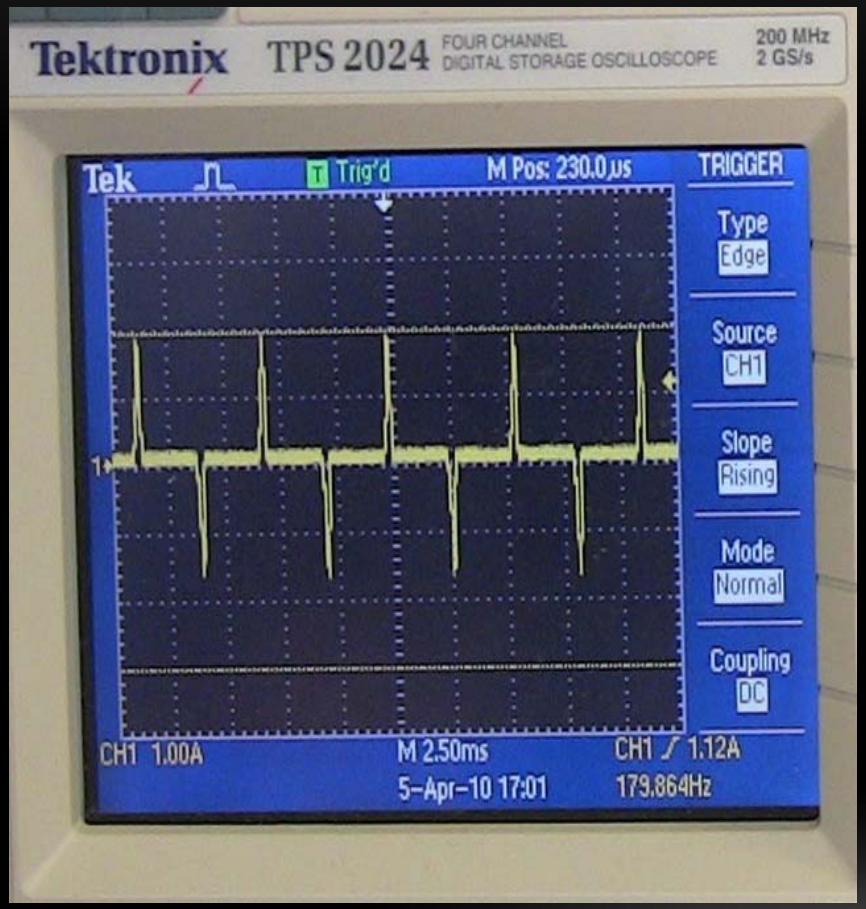


160 Taxiway L-852T Fixtures
APS Connected Load 863 Watts

Inverter - 1.00 Amp @ 240 VAC
Battery Voltage 51.29 VDC

PULSE WIDTH MODULATION (PWM) WAVE FORM

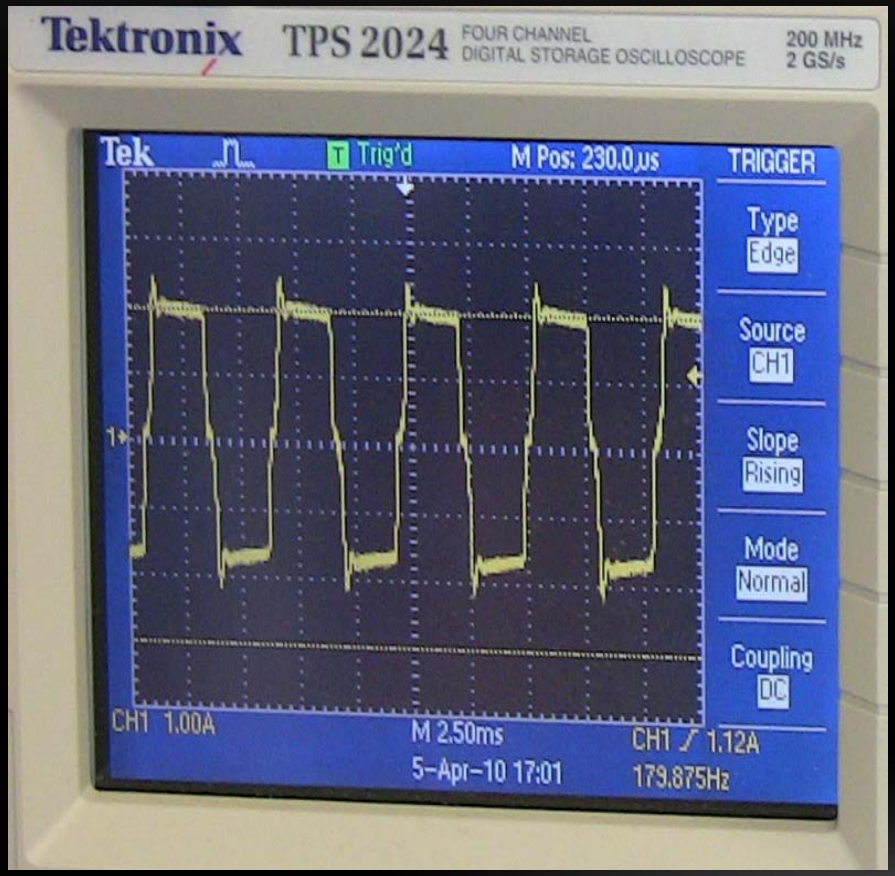
From The Advanced Power Supply (APS)



APS – 10% Intensity 231 VDC @ 2 Amps

PULSE WIDTH MODULATION (PWM) WAVE FORM

From The Advanced Power Supply (APS)



APS – 100% Intensity 371 VDC @ 2 Amps

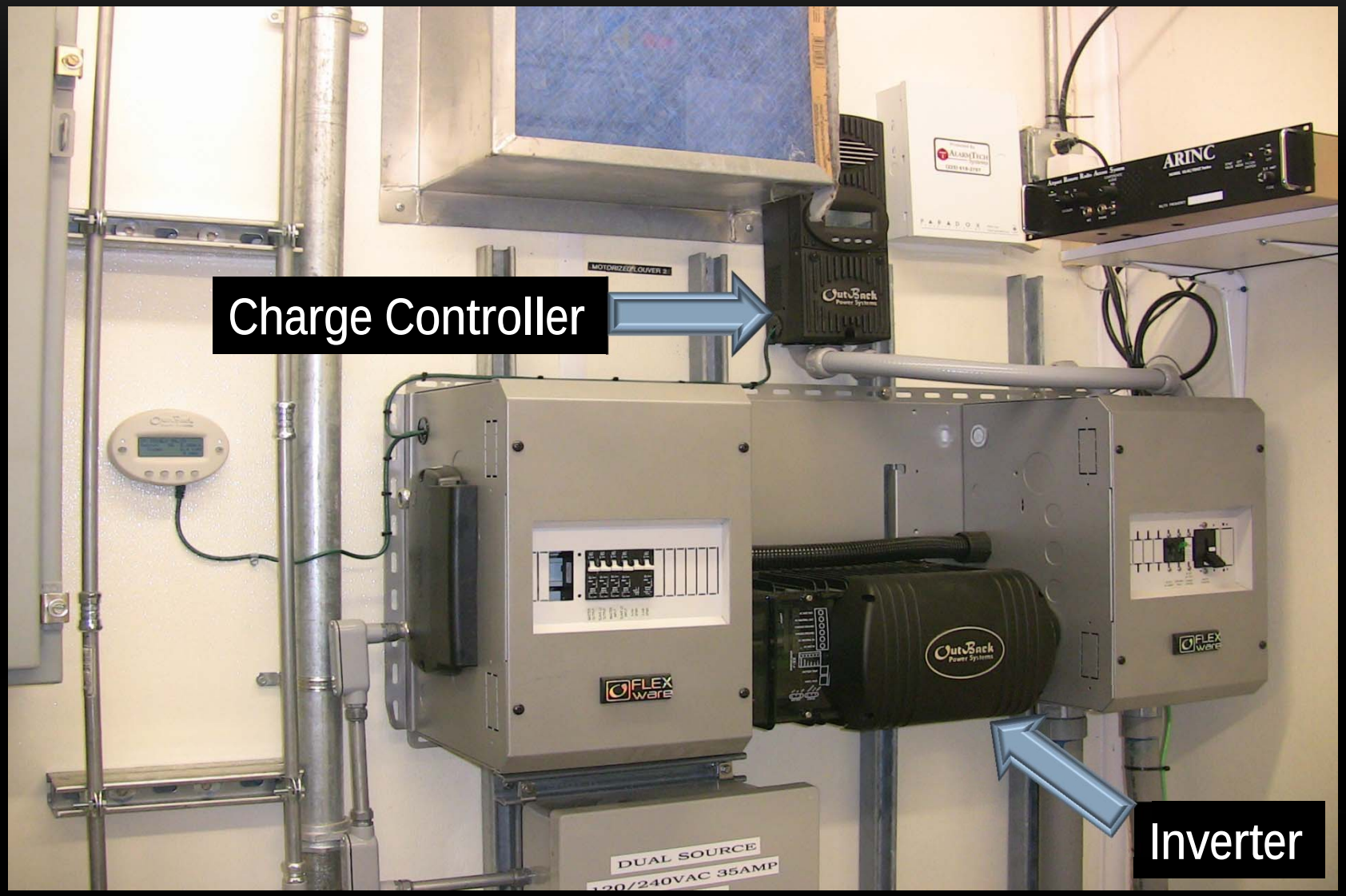
1.75 KW OFF-GRID PHOTOVOLTAIC ARRAY

48VDC PASSIVE COOLING BATTERY ENCLOSURE

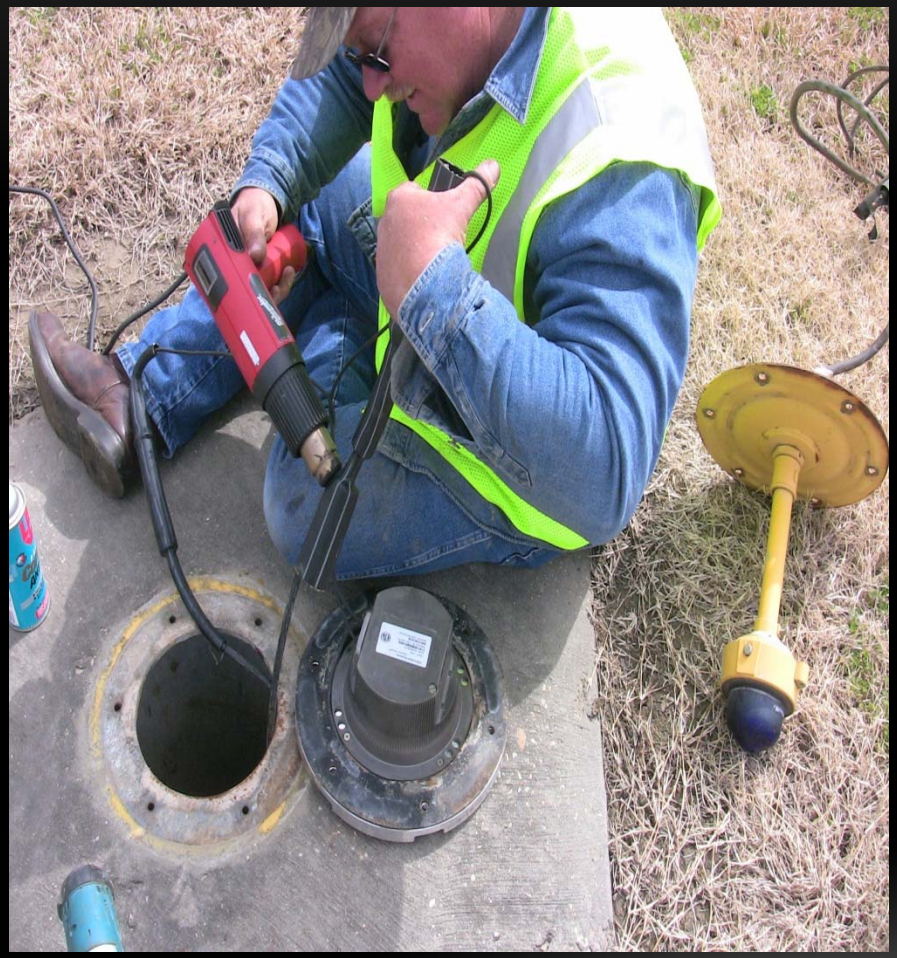
WATER JACKETED "COOL CELL" ENCLOSURE

GEL CELLS - 795 AMP HOUR @ 48 VDC

3 KW INVERTER & CHARGE CONTROLLER



INITIAL L-852T LED TAXIWAY FIXTURE TEST - PWM



Removal of L-861T Quartz 6.6A

Install L-852T – 2.0A DC - PWM

L-852T TWY FIXTURE RELOCATION PHASE
10’ TO 2’ FROM PAVEMENT EDGE

LIGHTING VAULT EQUIPMENT UPGRADE

TWY & RWY LIGHTING – APS

SIGNS-PAPI-REIL-LEGACY RWY–6.6A CCR

1 KW TWY APS, 4KW PAPI, 4KW REIL

2KW RWY ADVANCED POWER SUPPLY

APS & Solar Computer Console

(APS) – Pulse Width Modulation (PWM)

EVOLUTION OF PWM LED TAXIWAY EDGE FIXTURES AT HZR

L-852T

L-861T “IMIL”

LOUISIANA FIRE ANTS “LOVE” SOFT RUBBER 600 VOLT INSULATION – ORIGINAL L-852T

L-823 PRIMARY CONNECTOR FAILURE

ENERGY REDUCTION - KWH USAGE

JANUARY 2009 THRU SEPTEMBER 2012

FALSE RIVER REGIONAL AIRPORT - HZR																
MONTHLY ELECTRICAL USAGE IN KWH - AIRPORT NAVAIDS - RWY - TWY LGTS - PAPI - REILS - WIND CONE - ROTATING BEACON																
														Monthly Average		
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC		ALL	with Twy Solar	
															Prior To	After
KWH use 2009	N/A	6051	6341	6858	6017	6351	7635	6382	6152	6977	7225	7052		6640		
KWH use 2010 **	7371	6405	4739	5088	4523	4543	4562	5433	6415	5511	4622	4560		5314	5901	4562
KWH use 2011	3750	2224	2979	3187	3387	3075	3824	3171	3311	3742	3000	3688		3278		
KWH use 2012	3182	3200	2602	3065	2779	3091	3831	3197	3224					3130		
2012 $ .0956 Kwh	296.76	288.25	228.07	274.96	269.44	314.24	383.67	305.65	312.57							
** NOTE	Aug, Sept, Oct of 2010 removed due to construction issues															
TWY - PWM Conversion - Solar power only																
RWY - PWM Conversion																
PAPI Conversion 3 Channel to Single Channel																
REIL Conversion to LED																

GREEN SAVINGS - 2011 compared to 2009 = 2.4 Metric Tons CO_2

SOLAR PWM TWY - 1400 KWH SAVINGS = .96 Metric Tons CO_2

PWM CONTRIBUTED 80% OF THAT TWY SAVINGS – BEFORE SOLAR !

THINGS NOT TO DO

THINGS TO DO

LED TEST PROGRAM - FUNDING TO DATE

- INITIAL TWY TEST W / PARTNERS - $ 90000.00
- TWY FIXTURE RELOCATION 10 to 2 - $ 225000.00
- RUNWAY LED SYSTEM INSTALLATION - $ 402000.00
- LIGHTING VAULT & PAPI-2 SYSTEM - $ 59000.00
- L-852T to L-861T – ISOLATION XMFRS - $ 138000.00
- 6.6 TO LED - SIGNS – REILS – OBS LGTS - $ 63500.00
- REFLECTORS – MATERIAL & INSTALL - $ 32500.00
- TOTAL ALLOCATIONS - $ 1010000.00

TOTAL PROGRAM EXPENDATURES - $ 975000.00

CONCLUSIONS - TO DATE

- SOLAR RETRO-REFLECTOR MARKERS:

  ALTERNATIVE TO TWY LIGHTING SYSTEMS - YES

  COST EFFECTIVE – YES REPLACE EVERY 4 YR - YES

  INCREASED SITUATIONAL AWARENESS - SAFETY – YES

- PULSE WIDTH MODULATION:

  Minimum 70% to 80% Reduction From 6.6 Amp

  Solar Investment NOT Cost Effective @ .10 KWH

  Required – Teflon Insulation on 600V wiring (Ants)

CONTINUED TESTING THRU 2014

WHICH SYSTEM TO USE LONG TERM ?

ELECTRICAL INFRASTRUCTURE RESEARCH TEAM – (EIRT)

STANDARDS BASED - ROBUST ARCHITECTURE

- APS (ALTERNATING PWM SERIES CIRCUIT)
- REDUCED CURRENT AC SERIES CIRCUIT
- LOW MODULATED AC CURRENT SERIES CIRCUIT
- 2 AMP POWER LINE CARRIER SERIES CIRCUIT
- PARALLEL

"REAL WORLD – LONG TERM TESTING IS RECOMMENDED"

“IDEAS TO TEST” – FURTHER ENERGY REDUCTION

- Photocell control “Dusk to Dawn” of Circuit “A” of Interleaved LED RWY Lighting
- PCL control “15 minutes” – 3 “Mike Key Clicks” of Circuit “B” of Interleaved LED RWY Lighting
- PAPI-2 Systems Operations T*est* = Variable Intensity

THINK – WHAT IF – WE CAN ?
"IMPROVE FIXTURE REPLACEMENT ECONOMICS"

FOR 6.6A ELEVATED LED

"MOVE – ELECTRONICS"

Move the elevated fixture electronics package inside the L-867 or L-868 can - to be connected between the 6.6A L-830-* isolation xmfr. and the fixture optics.

Shorting Device Example

(Add Light Engine Electronics)

LED TEST PROGRAM PARTNERS

Aviation
LA DOTD

ADB
Airfield Solutions

FALSE RIVER REGIONAL AIRPORT

carmanah®
we put solar to work

DOTD
LOUISIANA DEPARTMENT OF
TRANSPORTATION & DEVELOPMENT

BP
BrightPortal
RESOURCES, LLC
"the universe at work"

FIRSTLIGHT
TECHNOLOGIES

GT *Services*
of Morgan City

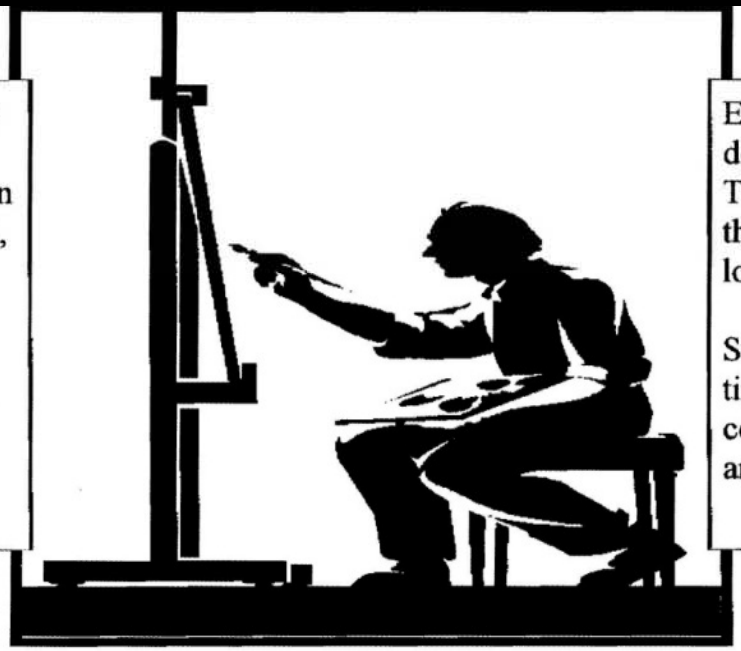
greenHouse

Philosophy Quotes

Illuminating Engineering Society of North America – Airport Lighting Committee

If I give you a dollar and you give me a dollar, we each have a dollar. If I give you an idea and you give me an idea, we each have two ideas.

All success is, really, is having a predetermined plan and carrying it out successfully over a long period of time.



Everyone needs a plan. If you don't have one, write one. Then do the most important thing of all: Go back and look at it once in a while.

Successful people show up on time with a plan and a commitment to carry it out and then execute it.

Anyone who thinks he or she is indispensable should stick a finger into a bowl of water and notice the hole it leaves when it's pulled out.

Allen Taylor, Airway Systems Manager, LA DOTD, Aviation Division

QUESTIONS ?

CONTACT FOR FURTHER INFORMATION & UPDATES

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LOUISIANA DEPARTMENT OF TRANSPORTATION and DEVELOPMENT - AVIATION DIVISION

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www.dotd.la.gov/intermodal/aviation