



# ClearWorld

» Lighting the Way in Solar LED Technology



# RETROFLEX Solar LED Technology

ClearWorld's RetroFlex is a retrofit lighting solution originally designed to harness solar energy and provide efficient outdoor lighting. The patented retrofit design vertically wraps the complete RetroFlex system to poles of any dimension, diameter and finish.

Additionally, RetroFlex is currently being developed as stand-alone solar distributed generation system as well as the centralized resilient power source and communication node for Smart Grid infrastructure.

RetroFlex is focused on providing solar lighting solutions for:



**MUNICIPALS**



**ENGINEERING  
& DESIGN**



**PRIVATE  
DEVELOPERS**

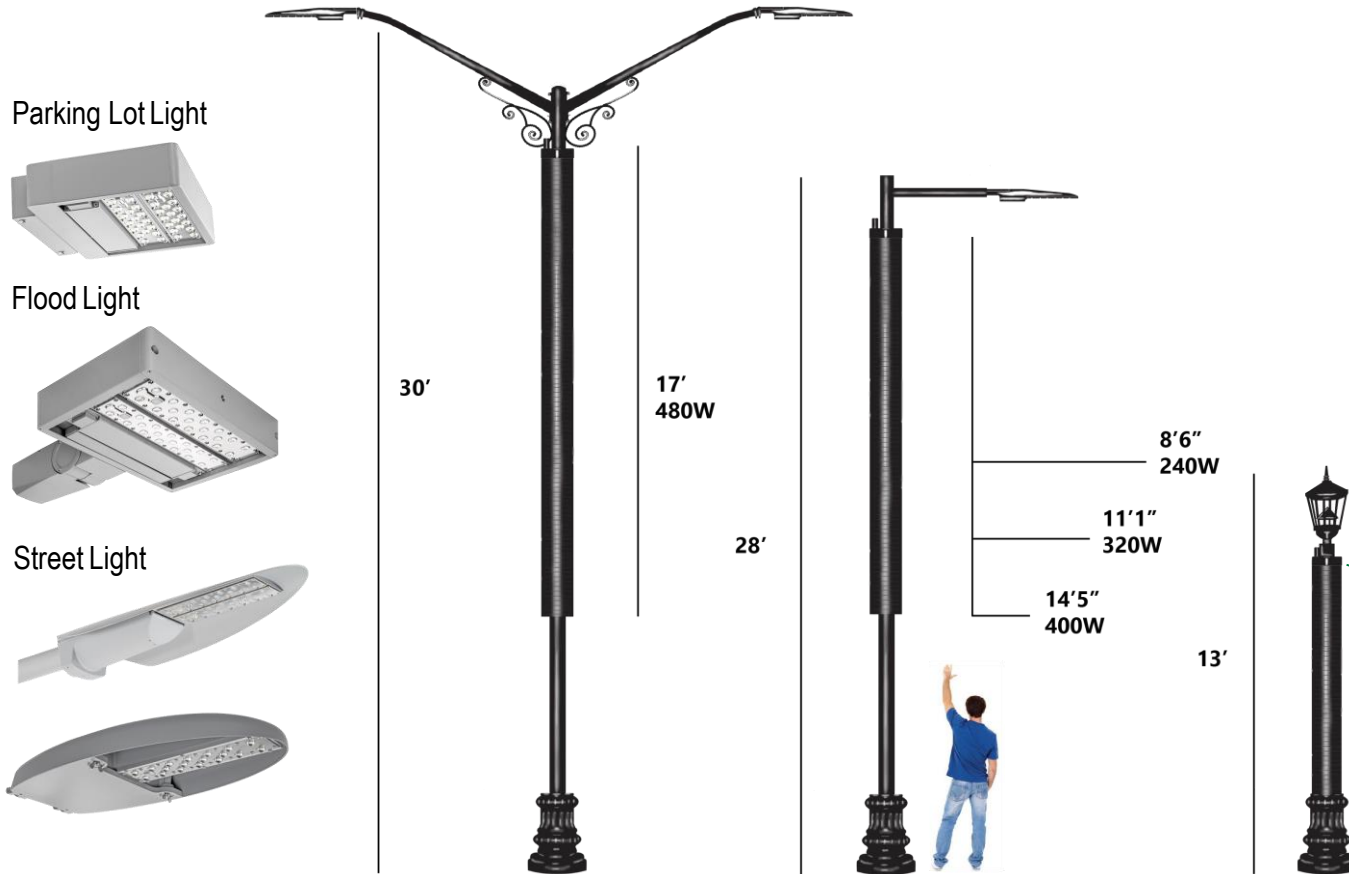


**FEDERAL  
CONTRACTS**



# RETROFLEX Solar LED Technology

Patented Retrofit with Integrated Components



### External Components

- 1 LED Street Light
- 2 Patented Universal Array
- 3 Flexible Solar Panels

### Internal Components

- 4 Lithium Ion Battery Pack
- 5 Intelligent Charge Controller
- 6 Power Inverter (On-grid)
- 7 Lighting Controls & Wiring



# RETROFLEX Solar LED Technology

## Applications

### Off-Grid: New Installations

Available NOW

- Minimal install requirements
- Eliminate trenching & cabling
- Reduce capital & recurring costs
- Remote power supply for urban & rural area developments

### Off-Grid: Retrofit Installations

Available NOW

- Retrofit existing poles
- Reduce recurring costs
- Increased reliability and safety during adverse weather conditions
- Systems combine renewable energy & energy efficiency

### On-Grid: Lighting & Generation

Testing & Certification 2018

- Optimize solar generation with robust energy storage
- Manage time-of-day load swings for lighting loads
- Mitigate line losses through distributed power on poles

### Smart City: Foundation of Power

In Development

- Customizable power supply for most devices and sensors
- Retrofit is easy installation and fully scalable
- High line of sight on pole
- Rugged exterior protects components

# RETROFLEX Solar LED Technology

EXAMPLE: New Installations



## Customer Profile

- The customer needs to install 100 streetlights in an existing neighborhood to replace old poles and rerun conduit.

*Customer has two options...*

Details	Traditional Solution	ClearWorld's RetroFlex
Infrastructure	Trenching, conduit, wiring, metering	None
Installation	Concrete footings	Concrete footings
Pole & Light Fixture	Customer supplied	ClearWorld supplied
Energy & Maintenance Costs	Recurring annual costs	None

**Est. Price Tag**  
**\$971,179**

**Price Tag**  
**\$415,000**

## Total Savings with ClearWorld's RetroFlex

<b>SAVINGS: Upfront Costs</b>	<b>\$312,000</b>
<b>SAVINGS: Recurring Expenses</b>	<b>\$244,179</b>
<b>REDUCTIONS: Emissions (CO2)</b>	<b>65,000 lbs/yr</b>
<b>PAYBACK PERIOD</b>	<b>Immediate</b>

EXAMPLE: Traditional Solution 'Estimated Price Tag' based on \$70/ln ft. infrastructure costs, including conduit, wiring, grounds and metering costs for 100 installations. Installation costs including concrete footings is \$900 per pole for both Traditional and ClearWorld installations. Traditional 'Operating Costs' based on \$11.50/month per light energy costs and \$85/year maintenance costs.

# RETROFLEX Solar LED Technology

## Product Differentiation

Product Type	RetroFlex	Flat Solar Panel
<b>Design</b>	Aesthetically pleasing cylindrical pole wrap with integrated communications and electronics	Flat Panel on top of the pole
<b>Safety</b>	Firmly retrofit to pole using industry standard hardware, Aerodynamic design minimizing EPA	Large surface area creates high wind risk
<b>Resiliency</b>	Batteries installed within solar array at the top to avoid flooding Flexible Thin Film Panel withstands strong impacts (hail, stones, flooding)	Battery boxes mounted on pole Crystalline panels vulnerable to external impacts
<b>Performance</b>	High efficiency, low light CIGS panels, no maintenance required due to vertical orientation	Tilted panel = dust and snow accumulation; Fixed orientation
<b>Maintenance</b>	No dirt, dust or snow accumulation due to vertical array	Angled panel surface requires periodic maintenance

# RETROFLEX Models

## RETROFLEX ROADWAY MODELS

SPECIFICATIONS	RW240	RW240X2	RW320	RW400
Model #	RW2402460-OG	RW2402460X2-OG	RW3202475-OG	RW4002475-OG
Hardware	Patented Adjustable Aluminum Array	Patented Adjustable Aluminum Array	Patented Adjustable Aluminum Array	Patented Adjustable Aluminum Array
CIGS Solar Panels	240W	480W	320W	400W
EPA	3.09 ft <sup>2</sup>	6.18 ft <sup>2</sup>	4.03 ft <sup>2</sup>	5.26 ft <sup>2</sup>
Battery Pack	24V, 60AH Lithium Ion	24V, 60AH Lithium Ion	24V, 75AH Lithium Ion	24V, 75AH Lithium Ion
Charge Controller	MPPT Smart Controller	MPPT Smart Controller	MPPT Smart Controller	MPPT Smart Controller
Lighting Control	Bluetooth via Victron Connect App	Bluetooth via Victron Connect App	Bluetooth via Victron Connect App	Bluetooth via Victron Connect App
LED Light	37.5W LED, 162 lumens per watt	(2) 40W LED, 162 lumens per watt	37.5-60W LED, 162 lumens per watt	60W LED, 162 lumens per watt
Dimensions (length)	8' 6"	17'	11' 1"	14' 5"
Weight (lbs.)	74	148	82	93

## RETROFLEX RESIDENTIAL LANTERN MODELS

SPECIFICATIONS	RS240	RS320
Model #	RS2402460-OG	RS3202475-OG
Hardware	Patented Adjustable Aluminum Array	Patented Adjustable Aluminum Array
CIGS Solar Panels	240W	320W
EPA	3.09 ft <sup>2</sup>	4.03 ft <sup>2</sup>
Battery Pack	24V, 60AH Lithium Ion	24V, 75AH Lithium Ion
Charge Controller	MPPT Smart Controller	MPPT Smart Controller
Lighting Control	Bluetooth via Victron Connect App	Bluetooth via Victron Connect App
LED Light	30W LED, 144 lumens per watt	30W LED, 144 lumens per watt
Dimensions (length)	8' 6"	11' 1"
Weight (lbs.)	74	82

### Additional Details

**Lighting Design:** ClearWorld can support third party LED as well.

**Poles & Hardware:** RetroFlex standard design accommodates pole diameters up to 6" round or 6" square. Larger pole diameters require bracket and array modifications by ClearWorld. RetroFlex can be installed with any arm design.

**Solar Access Analysis:** prior to installations, CW or its rep conduct a shade analysis at each installation site to ensure adequate solar access prior to install.