



**Solar Lighting Applications
for
Re-Build Hawaii**
**Presentation prepared by
Jim Wollam**

June 24, 2004



Agenda

- **SOL INC - Who we are**
- **Our Experience**
- **Solar Lighting Basics**
- **Why Save Energy?**
- **Benefits of Solar Lighting**
- **How to Design a Solar System**
- **SOL Features & Benefits**
- **Photo Gallery**



SOL INC. – WHO WE ARE

- SOL is a privately owned company founded in 1990
- Headquartered in Palm City, FL (100 miles North of Miami)
- SOL has the widest range of solar powered lighting solutions
- A dedicated R&D Group and the strongest warranties in the industry
- SOL has satisfied customers in over 30 countries on 6 continents
- Most recognizable customers include:
 - ✓ All Branches of the US Military, including the Pentagon
 - ✓ NASA (Cape Canaveral & Marshall Space Flight Center)
 - ✓ US Dept. of Interior – NPS, USF&WS, BLM, BOR, USDA
 - ✓ US Olympic Games in Atlanta in '96



Hawaii Installations – Partial List

Piilani Gardens	Maui	Parking Areas
Wailea Point	Kahului	Sign
IAO Intermediate School	Kahului	Door Light
Kauai County	Lihue	County Parks
Okohele Sugar Company	Kaunakani	Security
US Coast Guard	Various Locations	Security
US Navy	Barbers Point	Housing, Security
US Navy	Pearl City	Housing, Signs
US Naval Shipyard	Pearl Harbor	Security
US Air Force	Hickam AFB	Parking
US Air Force	Hickam AFB	Pathway
US Army	Schofield Barracks	Parking
US Army	Ft. Shafter	Parking, Signs
US Marine Corps	Kaneohe	Entrance
USS Arizona Memorial	Pearl Harbor	Parking
GSA Federal Building	Honolulu	Parking

Parking Lot Lighting – Ft. Hood, TX



Fort Hood, Texas



Trail Lighting – Champion Trail



SOL Engineering and R & D

- Concentration on No Maintenance and Vandal Resistance.
 - ✓ Gel batteries, long life, no maintenance
 - ✓ New CCFL lamp with guarantee 30,000 hour life
 - ✓ Proprietary controllers for extended system life
 - ✓ Designed to withstand hurricane force winds
- Concentration on Increased Intensity of Light
 - ✓ Max-Lite reflectors put more light on the ground
 - ✓ Improved fixture designs
- Concentration Quality Products – ISO 9001 Certified
 - ✓ UL Listing and National Electrical Code compliant
 - ✓ Stainless steel hardware, quick assembly connect plugs, anti-corrosive and light weight aluminum components



SOL Production



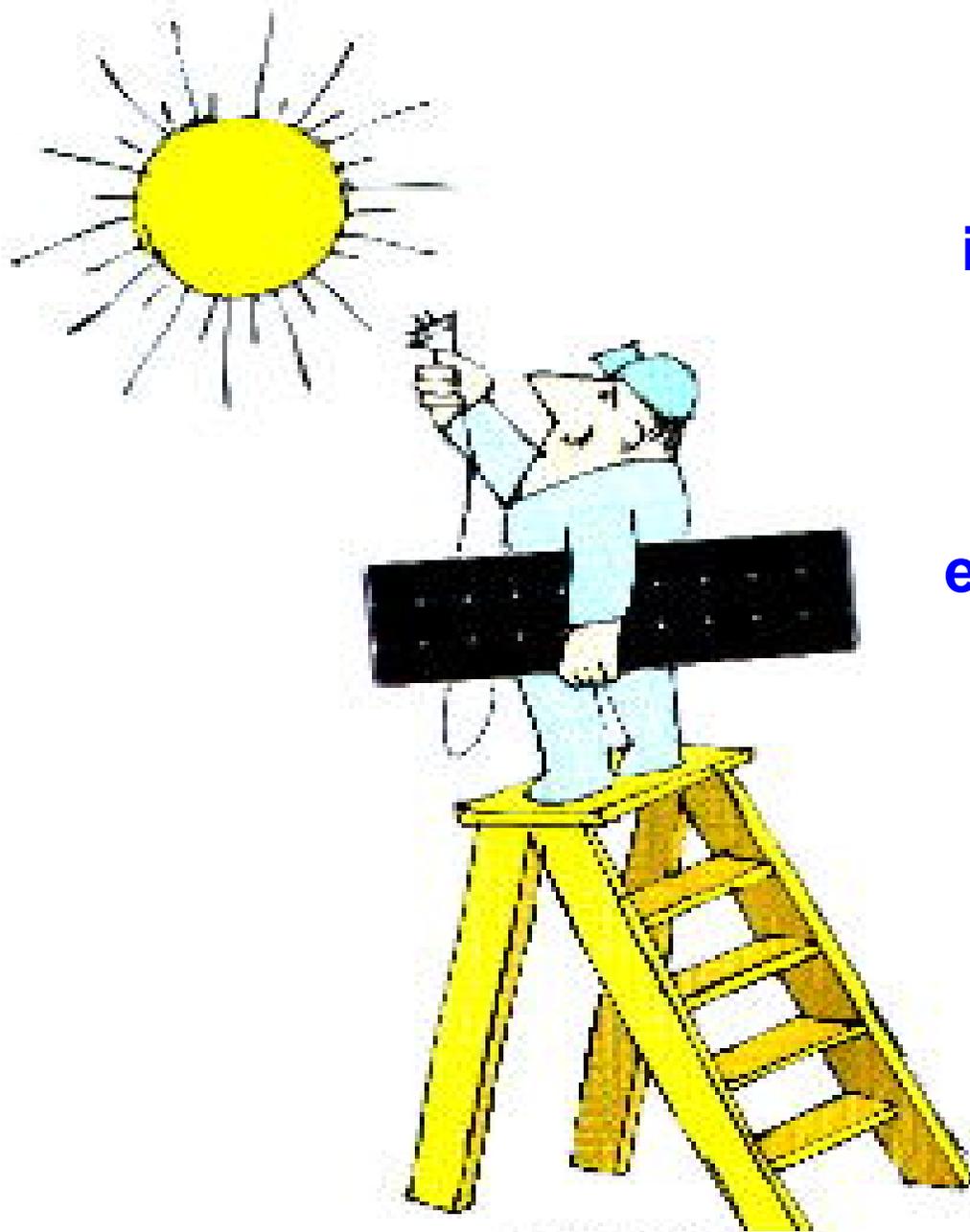
- State of the art factory, pneumatic tools
- Second expansion in 12 months
- Floodlights being assembled in factory



SOL Shipping

- Equipment boxed for shipment; totally protected for safe transport.
- Container prepared for shipment.





cat. Siemens

**The sun
is a direct source of
energy.**

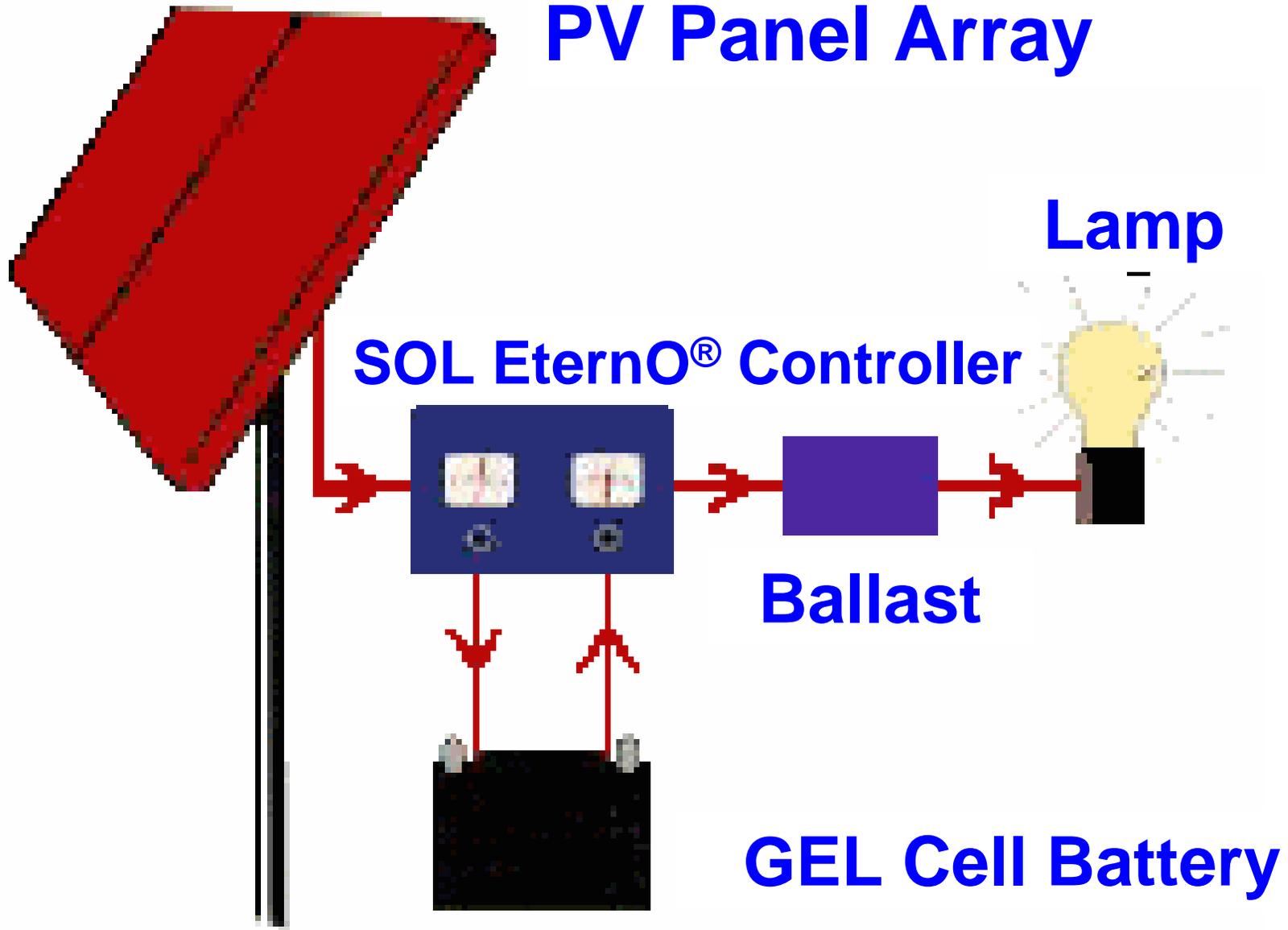
**Using renewable
energy technologies,
we can convert
that solar energy
into electricity.**

SOLAR LIGHTING BASICS

- The sun provides a direct source of energy to the solar panel.
- The battery is recharged during the day by direct-current (DC) electricity produced by the solar panel.
- The light source is powered by the battery each night.
- Electronic controls are used between the battery, light source and solar panels to protect the battery from overcharge and discharge, and to control the timing and operation of the light.



PV Panel Array



WHY SAVE ENERGY?

- The Environment

As overseers of our future generations, you need to also make a statement about protecting our environment

Using renewable energy shows your students your concern for the environment.

Each time a light is turned on, a power plant consumes fuel to generate electricity. When fossil fuels are burned to produce electricity, pollutants are released into the air, affecting climate change and increasing smog and acid rain. If you lower your demand for energy, this helps reduce the amount of energy generated and that means less pollution.

- Tax Dollars

When you cut overall energy costs, you also save tax dollars.



BENEFITS OF SOLAR LIGHTING

- **Security:** Lighting works well to deter crime.
- **Safety:** People feel safer when areas are illuminated.
- **Community Activity:** Lighting can extend hours that recreational facilities can be enjoyed.
- **Maintenance Free:** No cost for daily operation.
- **Economics:** Very cost effective over life cycle
- **Dependability:** Not connected to grid power. Solar lights have no power interrupted
- **Conservation:** Renewable energy, avoids consumption of fossil fuels
- **Environment:** Will help protect Hawaii for present and future generations.



The Performance of Solar Lighting Systems is measured in foot candles on the ground.

These are influenced by:

- 1.** Type of light bulb
- 2.** Power of light bulb
- 3.** Reflector
- 4.** Refractor or Lens
- 5.** Pole Height
- 6.** Spacing of Poles



**HOW TO DESIGN
A
SOLAR POWERED
LIGHTING SYSTEM**

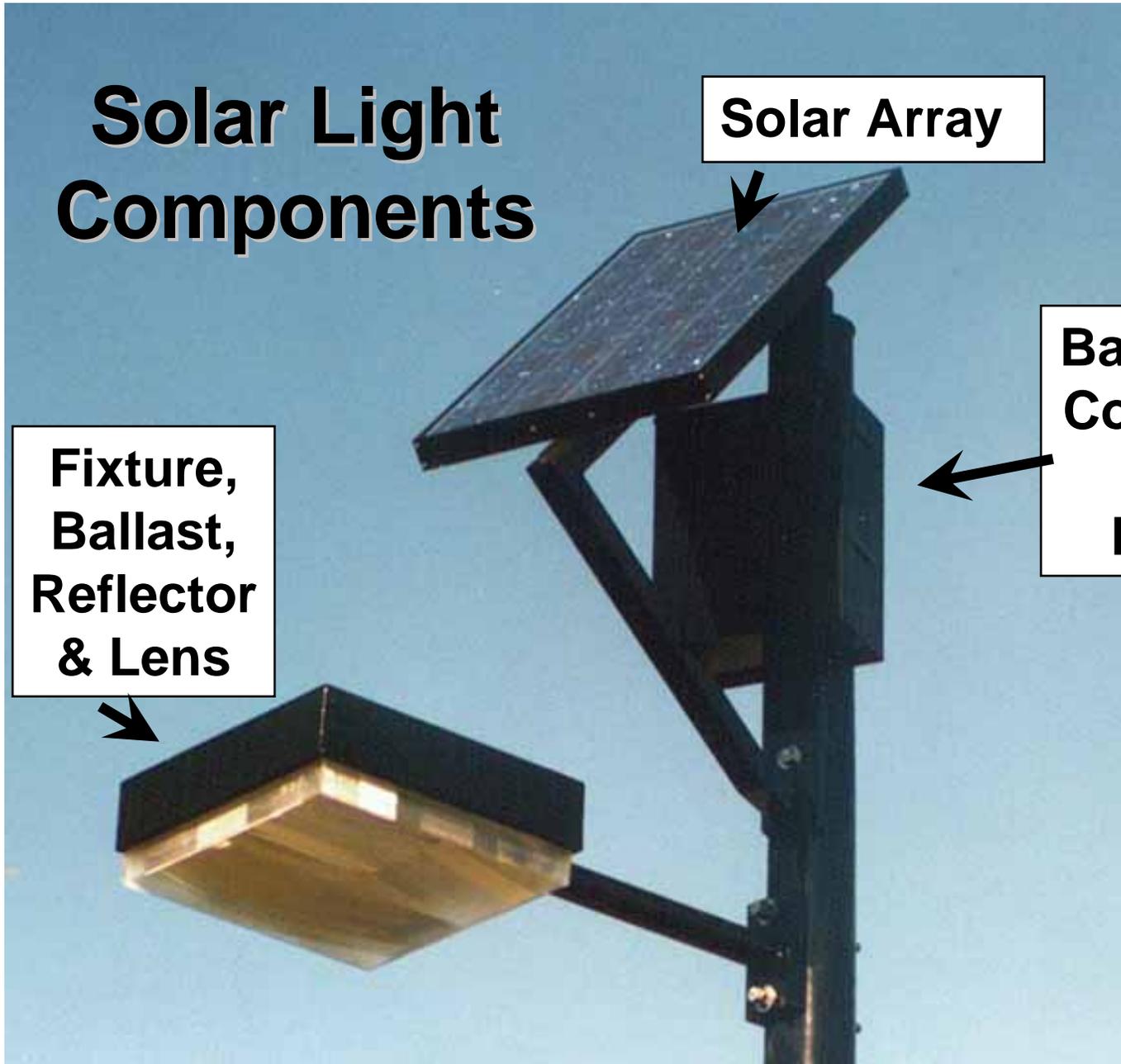


Solar Light Components

Solar Array

Battery Box,
Controller &
Wiring
Harness

Fixture,
Ballast,
Reflector
& Lens



How to Scrutinize Projects for Viability

- **Common Sense - Avoid Shaded Areas**

Solar panels need the sun. In heavily shaded areas, solar arrays can be mounted remotely to gain access to sun. Be sure there is a clear southern sun exposure.

- **Check any lighting level requirements**

- **Evaluate Required Operation Time(s)**

The longer a light needs to stay on, the larger the system, and subsequently the more expensive it is.

- **Determine Reliability/Security Issues**

When security lighting is critical, full dusk to dawn is available. Systems with different run times can be used because they are stand-alone systems.

- Consider cost of running wire from traditional power grid and cost of sidewalk or other paving to be torn up, tunneled under and replaced.



How To Design A Solar System (1)

You Determine:

- **Geographic Location** – Hawaiian Islands
 - ✓ Different geographic locations have different solar insolation which determines the size of the required solar panels
- **The Application**
 - ✓ Different applications need different amounts of light
- **Preferred Bulb**
 - ✓ Cold Cathode (CCFL), Compact Fluorescent (CF) or LPS
- **Run Time (Duration of the Load)**
 - ✓ Number of hours you need the lights to be on each night Examples: Dusk to dawn, 12 hours, 6 hours, split time controllers (4 hours after dusk & 2 hours before dawn), etc.
- **Fixture Model**
 - ✓ We have a variety of standard fixtures available.
- **Solar Panel -- Flat or 45 Degree Angle**
 - ✓ Because the solar panels on the SL systems are flat, the SL has a lower EPA and can withstand higher wind velocity. PM models are generally more cost effective because they take better advantage of the sun's location.

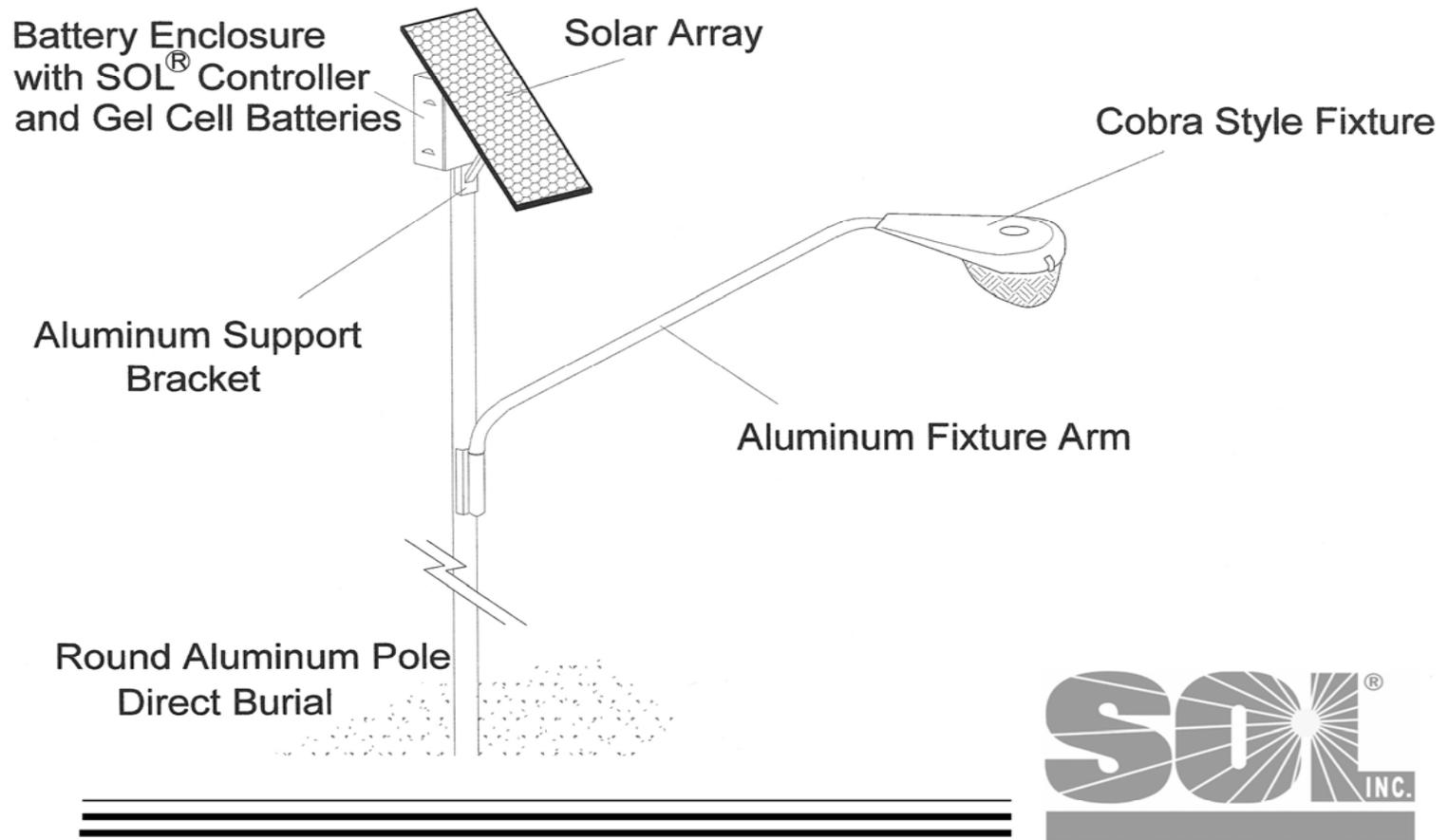
How To Design A Solar System (2)

We Determine:

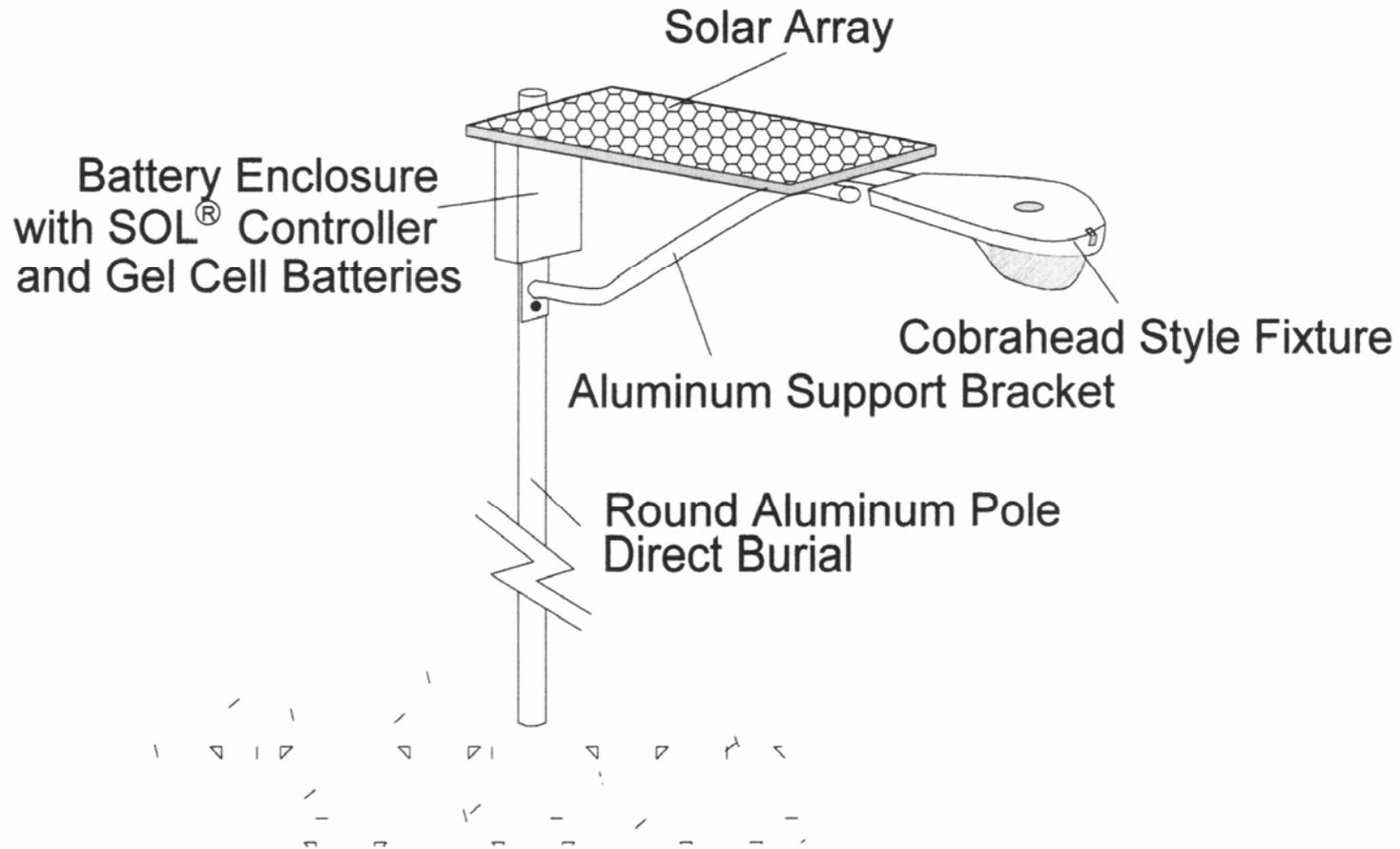
- **Sun Hours Based on your location**
- **The Bulb Size**
 - ✓ Based on the amount of light you need for your particular application or specific footcandles on the ground
- **The Size of the Required Solar Panels**
 - ✓ Solar panels typically come a variety of sizes. We always calculate a 10% reserve and round up to the next higher panel size.
- **The Model – SL or PM**
 - ✓ Based on your particular parameters, we can recommend which system will be more cost effective.
- **The Size and Number of Batteries**
 - ✓ Our systems are sized to work after 5 dark or cloudy days
 - ✓ Additional battery back-up can be added if needed.
 - ✓ In addition, we build in a 20% safety factor.
- **The most suitable Reflector and Refractor**
 - ✓ Drop lens or cut off lens are available.



Solar Area Lighting - PM Style



Solar Area Lighting (SOL-L)



SOL Features and Benefits

- CCFL Bulb – provides 30,000 hours with 5 year warranty
- Max-Lite Reflector, specially designed to maximize light output
- Aluminum backing on solar panel - Eliminates vandalism
- No maintenance gel cell batteries
- Batteries located in vented battery box at top of pole
 - ✓ Avoids vandalism
 - ✓ Shields batteries from sun's heat, provides longer life
- Plug-in components for quick & easy installation



Cold Cathode Fluorescent Lamps

30,000 hour guaranteed lamp life!

This one is mounted in a GE Cobrahead fixture





Highly Polished Aluminum Reflector

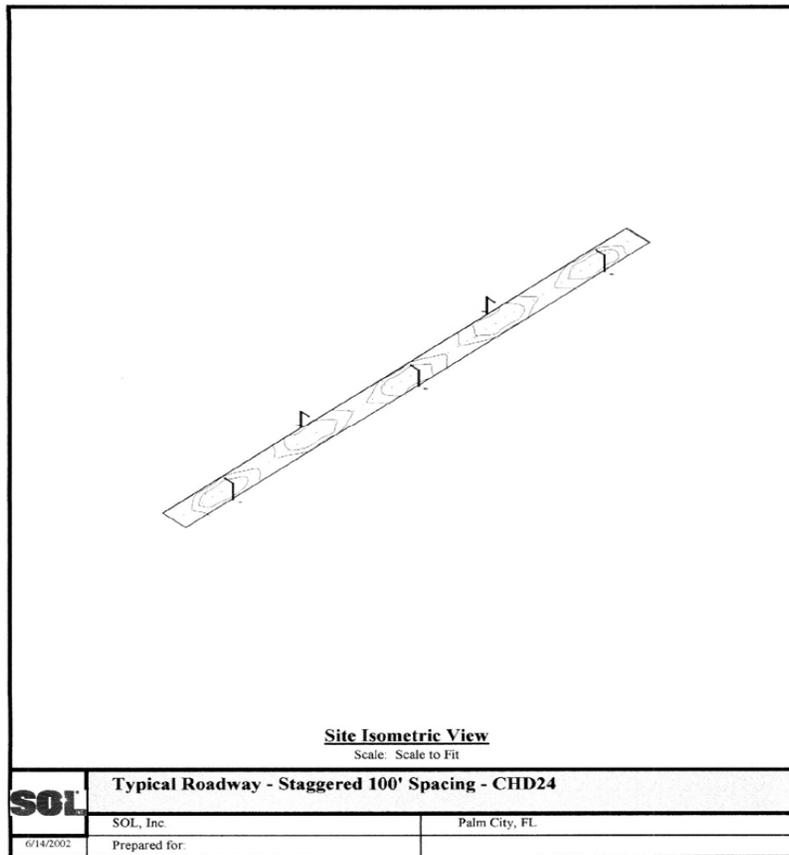


SOL BENEFITS

- No trenching, no metering, no wiring
- Can be installed in the most remote locations
- Will turn on even after cloudy days
- Meets DOT specifications and wind load requirements
- Independent Lab Testing Reports
- 5-Year System Warranty



Photometrics Provide Light Locations



SOL Calculation Grid: 2 Lane Roadway (Site)

Horizontal Illuminance

Calculation Grid Summary

Grid Name: 2 Lane Roadway	Grid Origin: (0.00, 0.00)	Grid Surface: n/a
Grid Type: Horizontal Illuminance	Grid Orient: 0.00	Grid Hinge: 0
Grid Units: Footcandles	Grid Elev.: 0.00	Grid Azimuth: 0

Statistical Area Summary

Stat_Area	Avg	Max	Min	Ave/Min	Max/Min	Std_Dev
2 Lane Roadway	0.16	0.32	0.04	3.77	7.37	0.06

Calculation Grid

	0.00	10.18	20.36	30.54	40.71	50.89	61.07	71.25	81.43	91.61	101.79	111.96	122.14	132.32
24.71	0.04	0.06	0.09	0.13	0.14	0.12	0.15	0.14	0.11	0.10	0.11	0.13	0.16	0.21
12.35	0.07	0.11	0.16	0.23	0.31	0.30	0.31	0.22	0.18	0.15	0.14	0.16	0.19	0.26
0.00	0.06	0.10	0.13	0.18	0.15	0.18	0.17	0.18	0.14	0.12	0.10	0.10	0.12	0.15

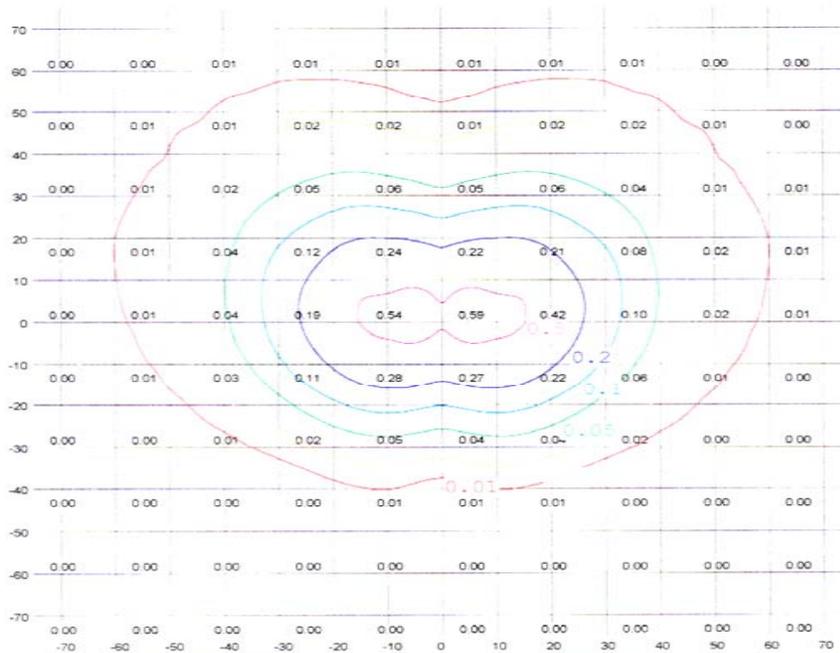
Output generated by Lumen Micro 2000. Copyright 2001.

- SOL provides lighting layout showing:
 - ✓ Area to be illuminated
 - ✓ Placement of lights at point of installation

Light Pattern - SOL Provides Computer Printout



Solar Outdoor Lighting, Inc.
Photometric Template
1 - Cobrahead 24 Watt Cobrahead



Catalog Number	Lumens	LLF	MH	Orien.	Tilt	Spin
24 Watt Cobrahead	1800	0.66	20	0.0	0.0	0.0

● Footprint shows:

- ✓ Bulb
- ✓ Fixture type
- ✓ Mounting height of pole
- ✓ Light Pattern
- ✓ Light Intensity

Maximum Illuminance: 0.6 fcs

Scale: 1 in. = 25.2 ft.

Page 1 of 1



Design Options

Photo Gallery



Parking Lot Lighting





Temporary Parking Lots

Dual Fixture Parking Lot Lighting



Campus Roadways





Perimeter Fenceline & Bus Depot Areas

Walkway Lighting



Playground Lighting



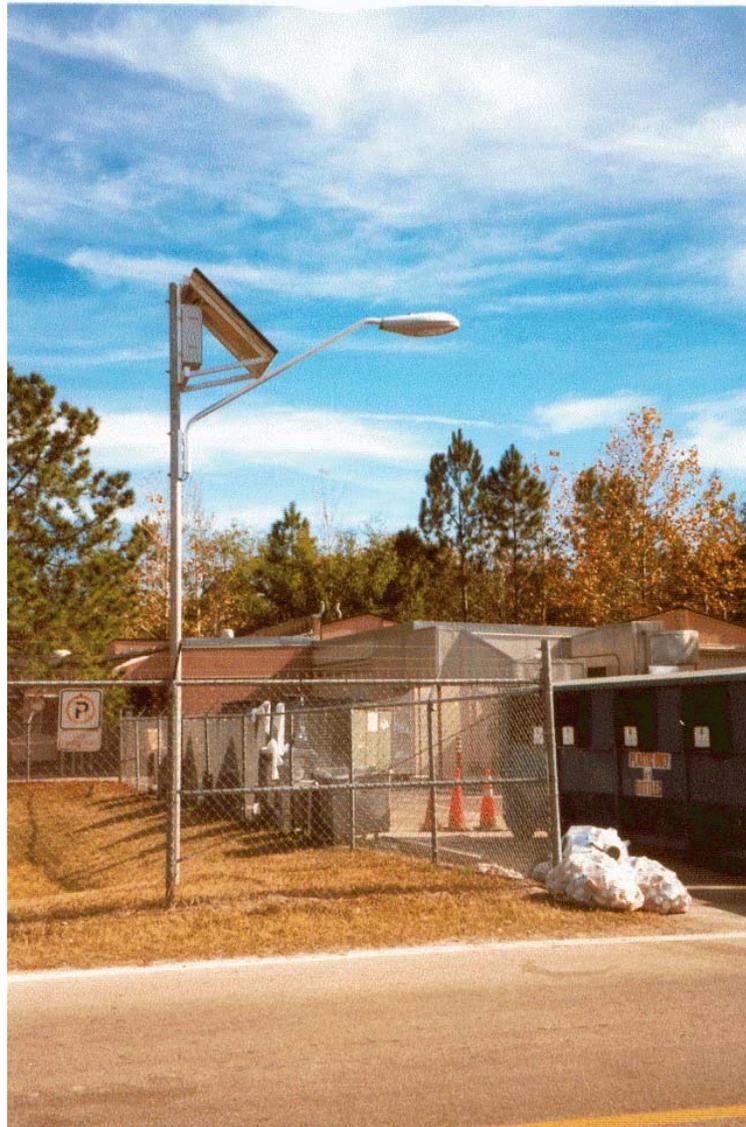
Playground Lighting



Playground Lighting



Area Security Lighting



Flashing Lights



Sign Lighting





The Statue of Liberty

Monarch Series

Modern Design



Spun Copper Hooded Fixture



Decorative Fixtures



BOLLARDS





SOL [®]
INC.

