



3rd Annual DOE/UN Hybrid Conference
PowerLight Corporation

May 14, 2003



PV Basics – Photovoltaics vs. Other Solar



***Solar
thermal***



***Parabolic
trough***



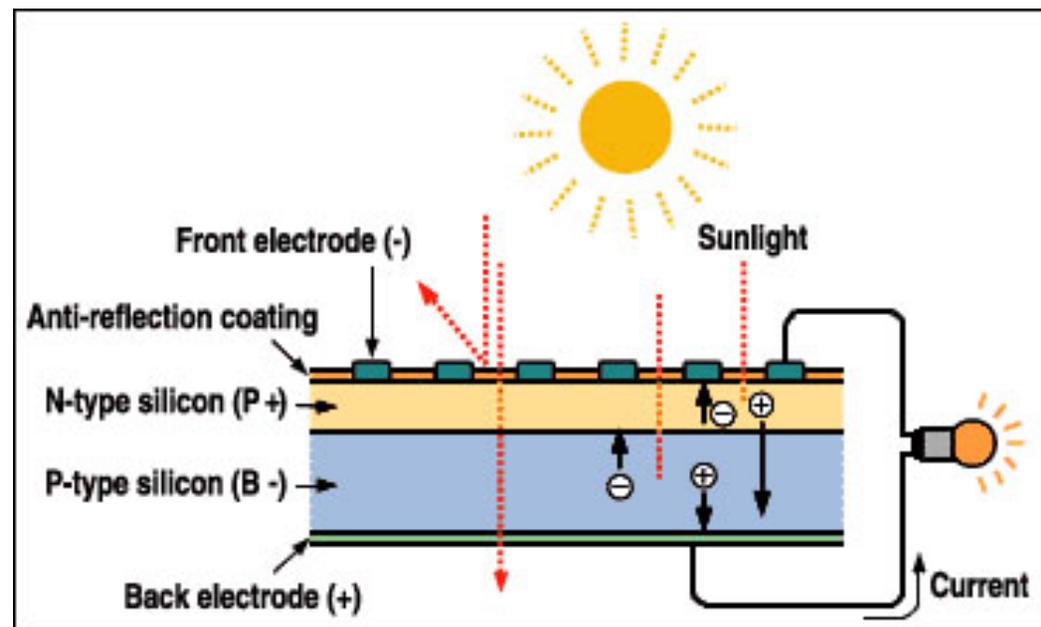
Photovoltaics



PV fundamentals – the Photovoltaic Effect

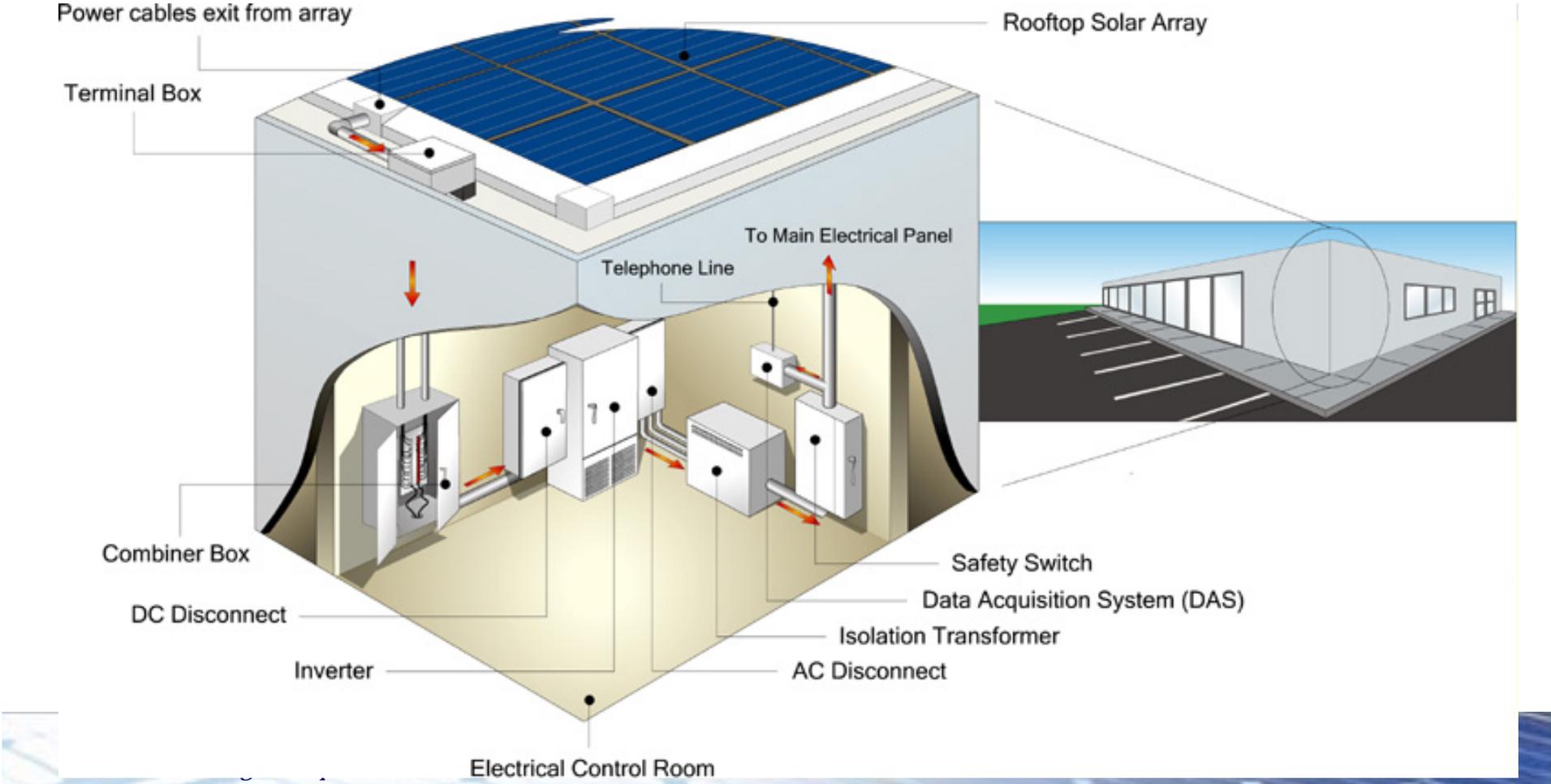
- Sunlight excites electrons in PV
- Excited electrons concentrate on one side of cell
- Concentration of charge creates polarity
- Connecting positive and negative sides across a circuit creates electricity

The Photovoltaic Effect





PV system components





PV is an excellent choice for clean, reliable DG

- **Financially prudent**
 - Zero fuel cost
 - Price volatility hedge
 - Coincident w/ peak
- **Reliable**
 - Proven
 - 20-25 yr warranties
 - Virtually no maintenance
- **Clean**
 - Emission & noise free
 - Distributed
 - Well suited for urban areas
- **Highly popular**



**37 kWp PowerGuard PV Installation
US Coast Guard Facility, Boston, MA**



Grid-Connected PV

The Fastest Growing PV Segment

- **CAGR of 55% for the past 5 years - no sign of slowing**
- **Segment will exceed \$3.1B by 2010**



**924 kWp PowerShade PV Installation
US Navy, Coronado Island**

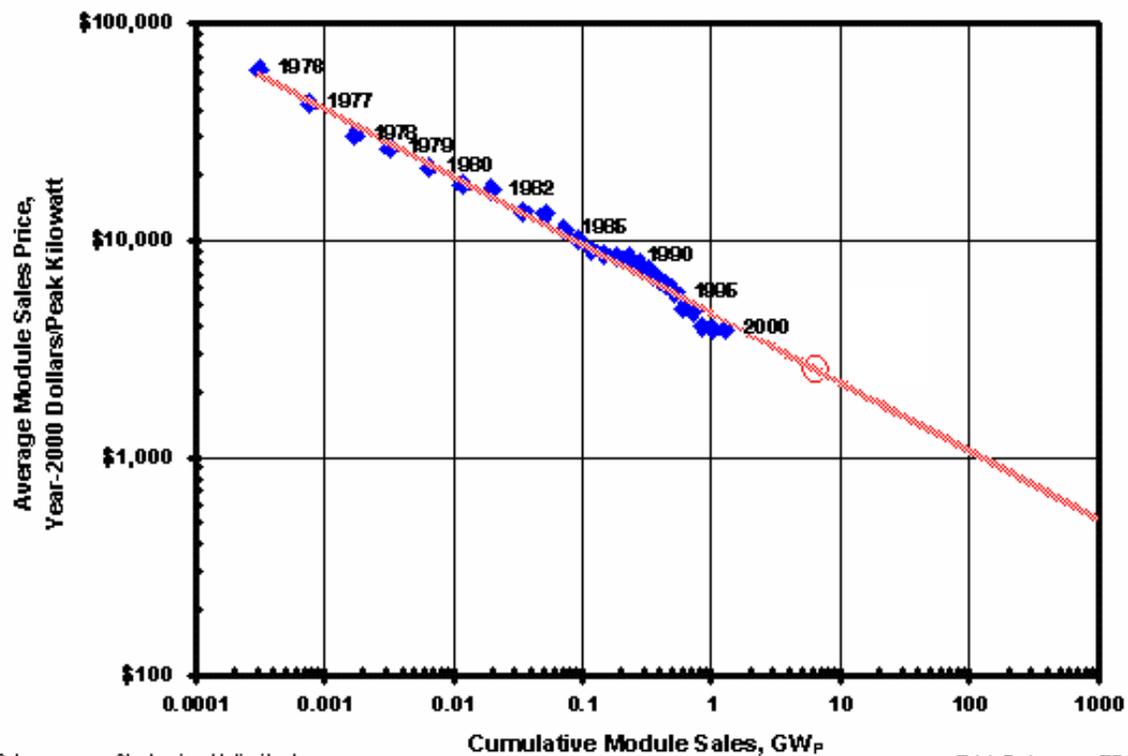


**470 kWp PowerGuard PV Installation
Franchise Tax Board, Sacramento, CA**



PV prices have fallen 10x in the last 25 years

Global PV Module Price Experience



Data source: Strategies Unlimited

T.M. Peterson, EPRI



PowerLight is a worldwide leader in large-scale grid-tied PV systems

- Focus:
 - PV systems manufacturer
 - Turnkey solutions provider
- Founded 1991
- High growth
 - 140% average growth per year since 1997
 - INC 500 listed for the past three years.
- Solid technology base ~ 50 US and international patents
- Profitable since inception





Who uses PowerLight systems?



CYPRESS



ARDEN REALTY, INC.





High initial capital cost can be mitigated by optimizing the integration of PV into the facility

- PV and demand side management complement each other
 - 1) Clean kWh too precious to waste
 - 2) EMS - optimizes use of PV output
 - 3) Lengthen time horizon of demand reduction benefits
- Smart contracting strategy
 - 1) Single point of contact/accountability for end customer
 - 2) Lower administrative costs
- Showcase facilities as models for the future
 - 1) Greater control/operational flexibility of equipment
 - 2) Enhanced facility with reduced need for maintenance





PowerLight partnered with Viron Energy Services to take PV/demand side management integration to the next level

Measure	Examples	Source of Savings
Onsite PV generation	<ul style="list-style-type: none"> • Rooftop PV system • Solar carports • Ground mounted trackers 	Variable and some fixed utility fees via reduced consumption (incr efficiency for rooftop PV systems)
Energy Conservation Measures	<ul style="list-style-type: none"> • Lighting retrofit • HVAC upgrades • Variable speed drives 	Variable and fixed utility fees via reduced consumption and increased efficiency
Energy Controls Technology	<ul style="list-style-type: none"> • Peak shaving – load shedding based on PV system output and real time demand 	Fixed utility fee reduction (demand charges) by permanently reducing peak demand

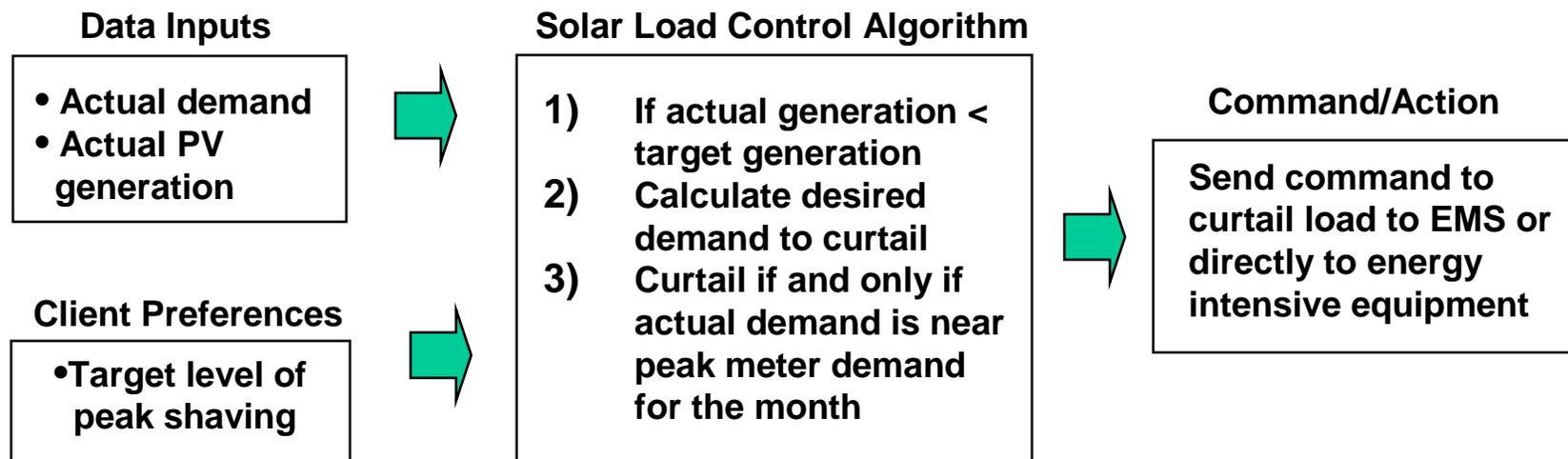
CMS ENERGY

Viron Energy Services



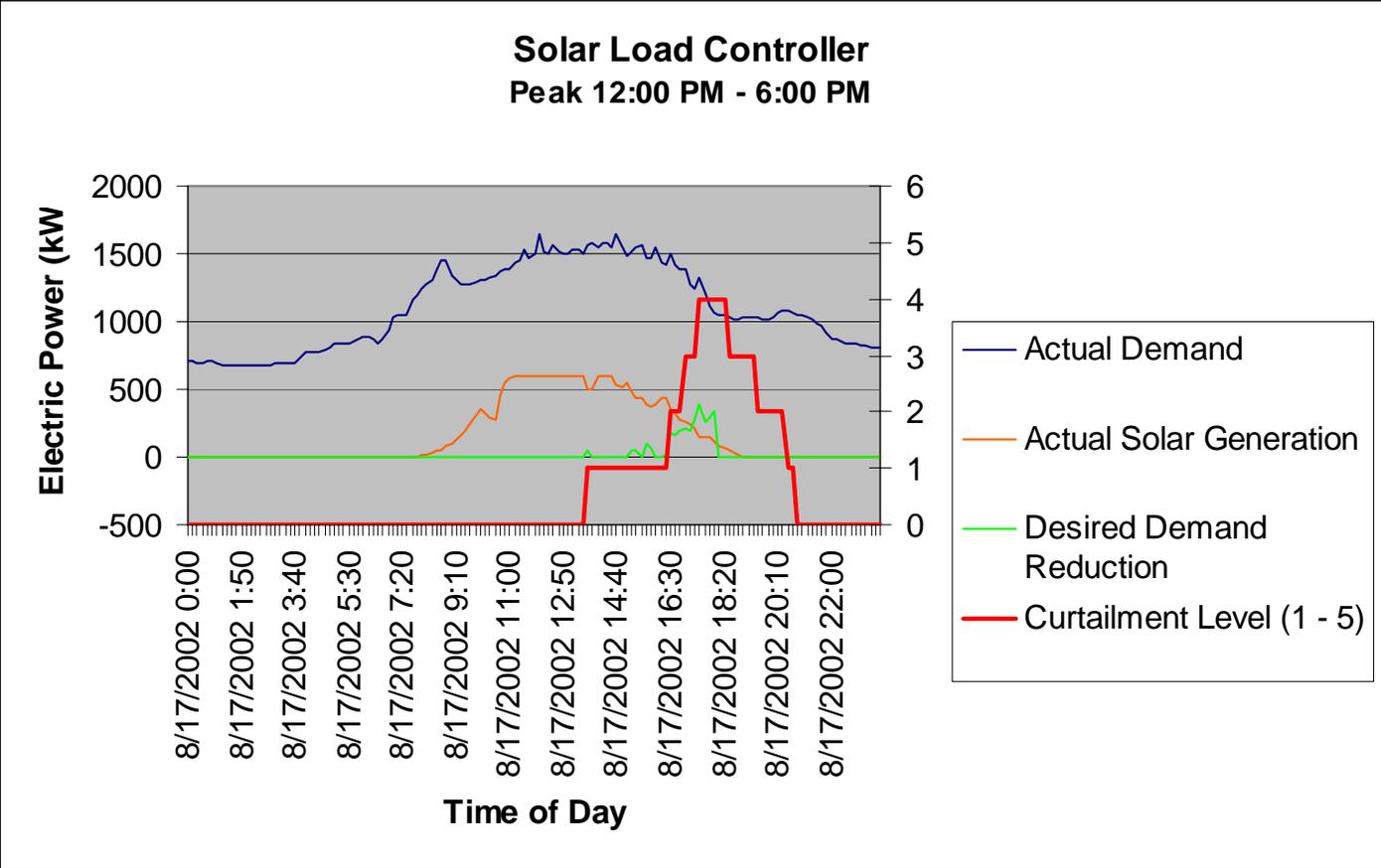
PV + smart energy controls maximizes demand charge savings by shaving system peaks

Automated Curtailment Module of Utility VisionSM





To minimize service impact, the PV system is sized at 20-50% of peak load





Our first joint project at Santa Rita Jail resulted in \$6MM net savings to the County of Alameda

- **Technologies implemented**
 - **1.18MWp PowerGuard BIPV roof system**
 - **Cool roof reflective coating**
 - **New 850 ton high efficiency chiller**
 - **Solar Load Controller (automated curtailment module of Utility Vision)**

- **Other benefits to Alameda County**
 - **More than 1.8 MM kWh avoided electricity per year**
 - **More than 9 MM pounds of avoided greenhouse gas emissions**
 - **Greater control/operational flexibility of equipment**
 - **Lower facility operational cost (reduced electric bills and maintenance)**



PowerLight has installed more than 1.6 MW of solar at federal facilities nationwide

955 kW	U.S. Naval Base Coronado (2 systems)
308 kW	GSA Federal Building
127 kW	U.S. Postal Service
78 kW	U.S. Department of Energy (4 systems)
75 kW	Environmental Protection Agency
47 kW	U.S. Dept. of the Interior, National Park Service
37 kW	U.S. Dept. of Transportation, Coast Guard
<u>35 kW</u>	U.S. Dept. of Commerce
1,662 kW	



U.S. Navy

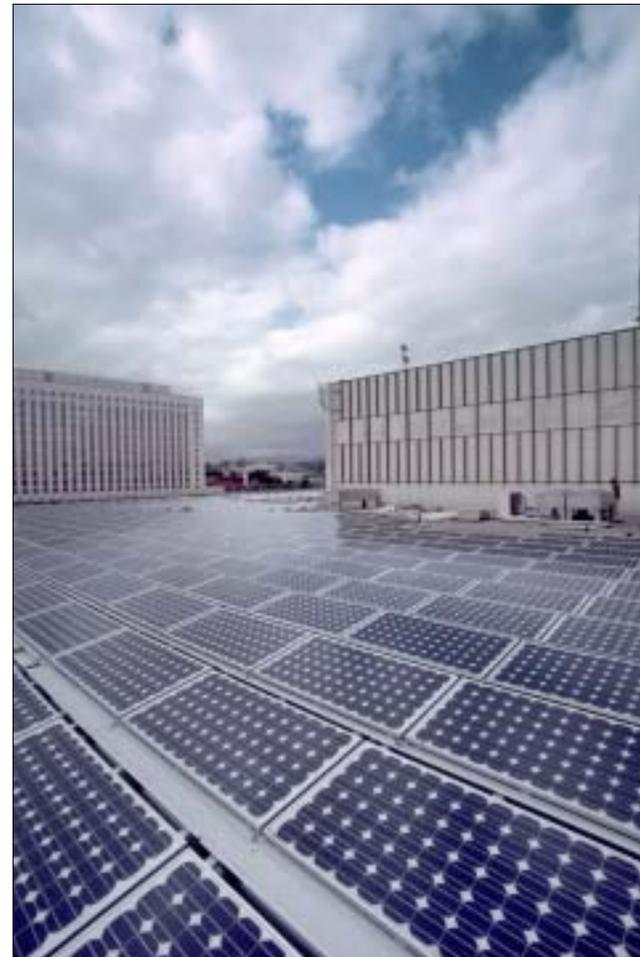
- Naval Base
Coronado, CA
- 924 kW carport and
31 kW rooftop systems
- Completed May 2003





General Services Administration Federal Building

- Los Angeles, CA
- 308 kW peak
- Sloped PowerGuard
- Completed May 2003





U.S. Postal Service

- Marina del Rey, CA
- 127 kW peak
- PowerGuard
- PV system completed Nov. 2001
- Solar load controller installed 2/03





U.S. Department of Energy (Western Area Power Administration)

- Folsom, CA
- Four systems,
totaling 78 kW peak
- PowerGuard
- Completed June 1998





Environmental Protection Agency National Computer Center

- Research Triangle, NC
- 75 kW peak
- PowerGuard
- Completed February 2002





U.S. Dept. of the Interior National Park Service

- Yosemite, CA
- 47 kW peak
- PowerGuard
- Completed October 2001





U.S. Department of
Transportation,
Coast Guard Partnership
through GSA

- Boston, MA
- 37 kW peak
- PowerGuard
- Completed Sept. 1999





U.S. Department
of Commerce
(NIST Headquarters)

- Gaithersburg, MD
- 35 kW peak
- PowerGuard
- Completed Sept. 2001





POWERLIGHT[®]

S O L A R E L E C T R I C S Y S T E M S



Total project economics has several components

➤ Geographic location

- 1) Amount of sun available
- 2) Electricity rates, especially daytime and summer
- 3) Local PV financial incentives

➤ Net system cost

- 1) Initial system cost
- 2) Maintenance costs
(virtually none)

➤ Savings from total-system benefits

- 1) Avoided purchases of utility electricity over 25 years
- 2) Reduced roof maintenance costs
- 3) Lower heating and air conditioning costs



PowerLight's Products/Applications

PowerRoof



PowerGuard



PowerShade



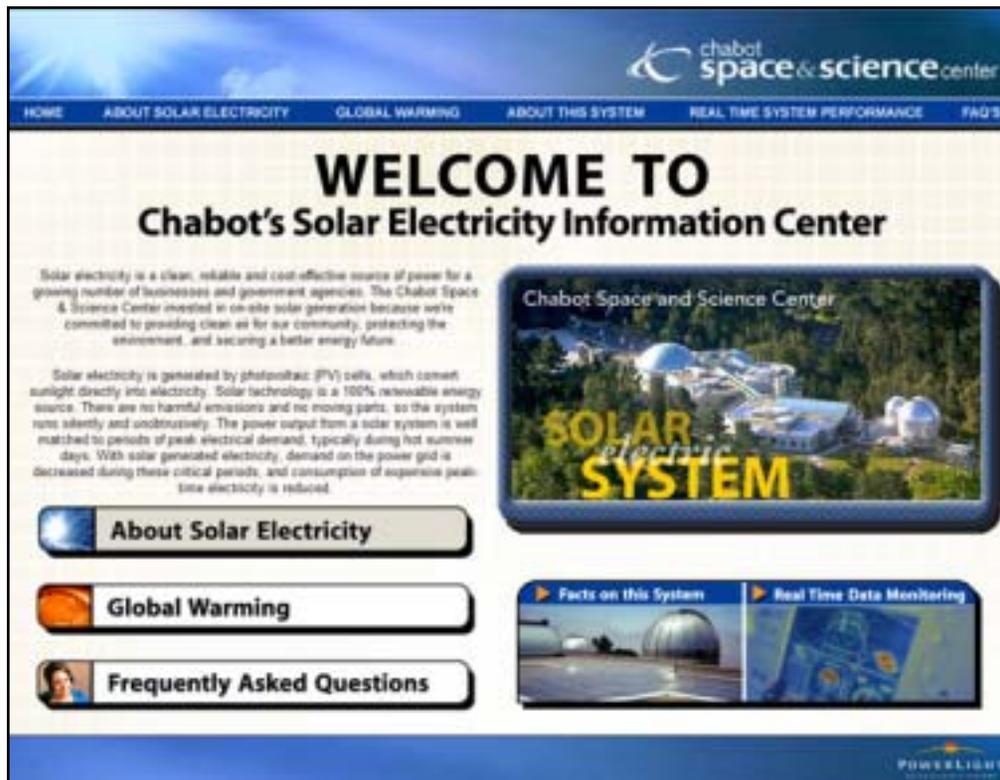
***Sloped
PowerGuard***



PowerTracker



Performance Monitoring for all Systems



Customer access via Internet



Optional display kiosk



Example of Performance Monitoring

