



U.S. Department of Energy
Energy Efficiency and Renewable Energy

What's New Under the Sun: Recent Advances in Photovoltaics

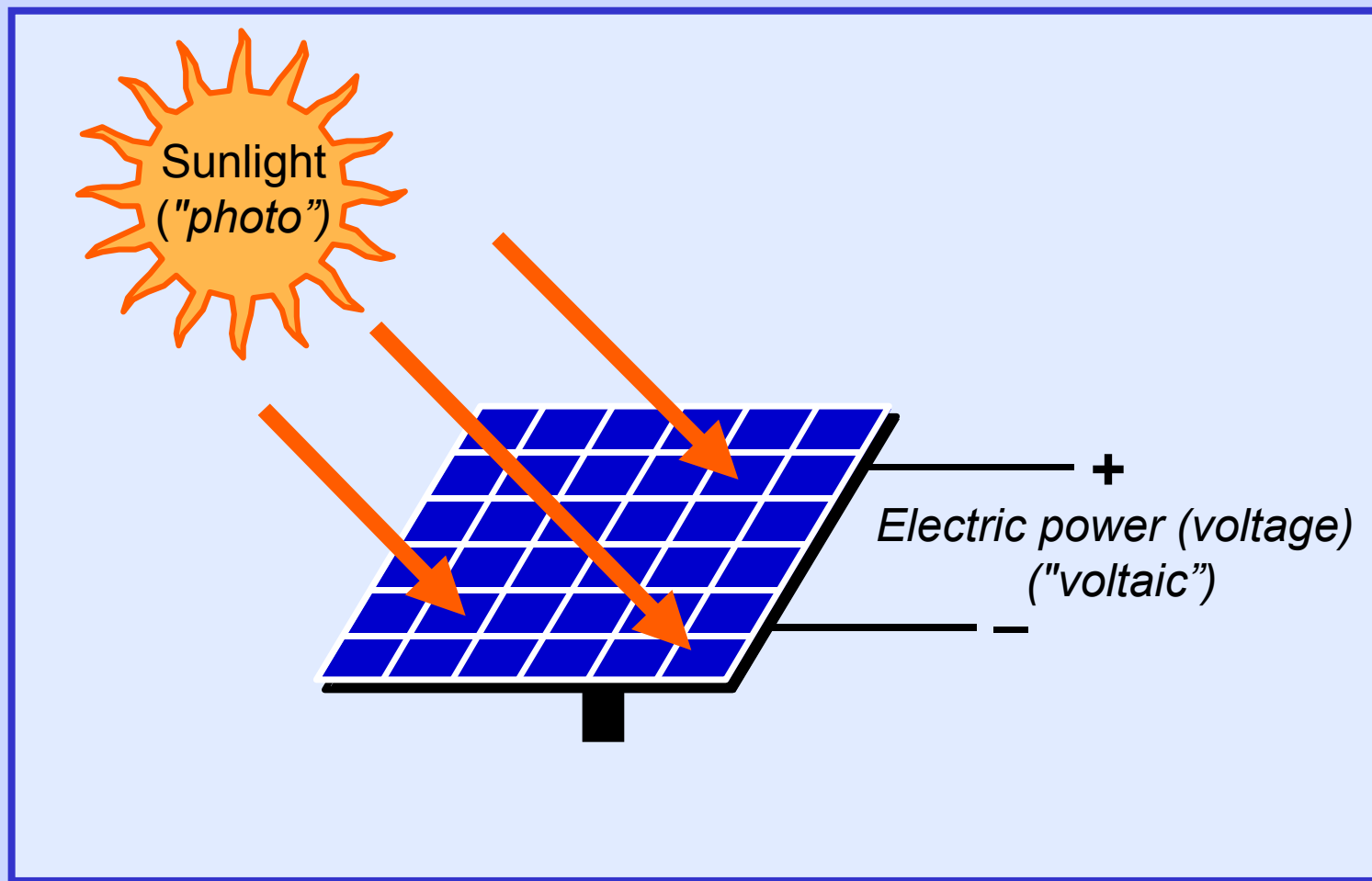
John P. Thornton, P.E.

WM'03

February 25, 2003

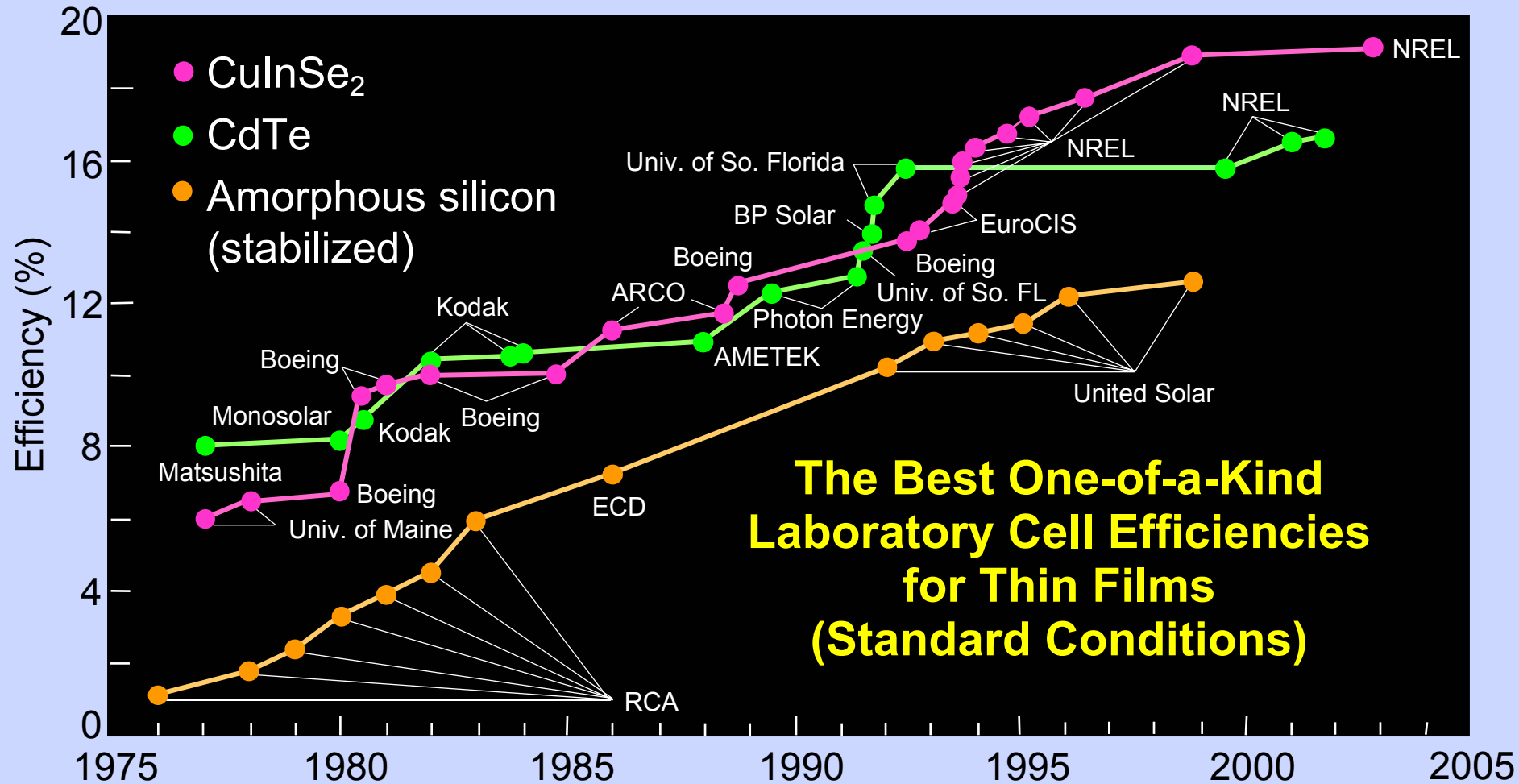


Operation of A Photovoltaic (PV) Cell



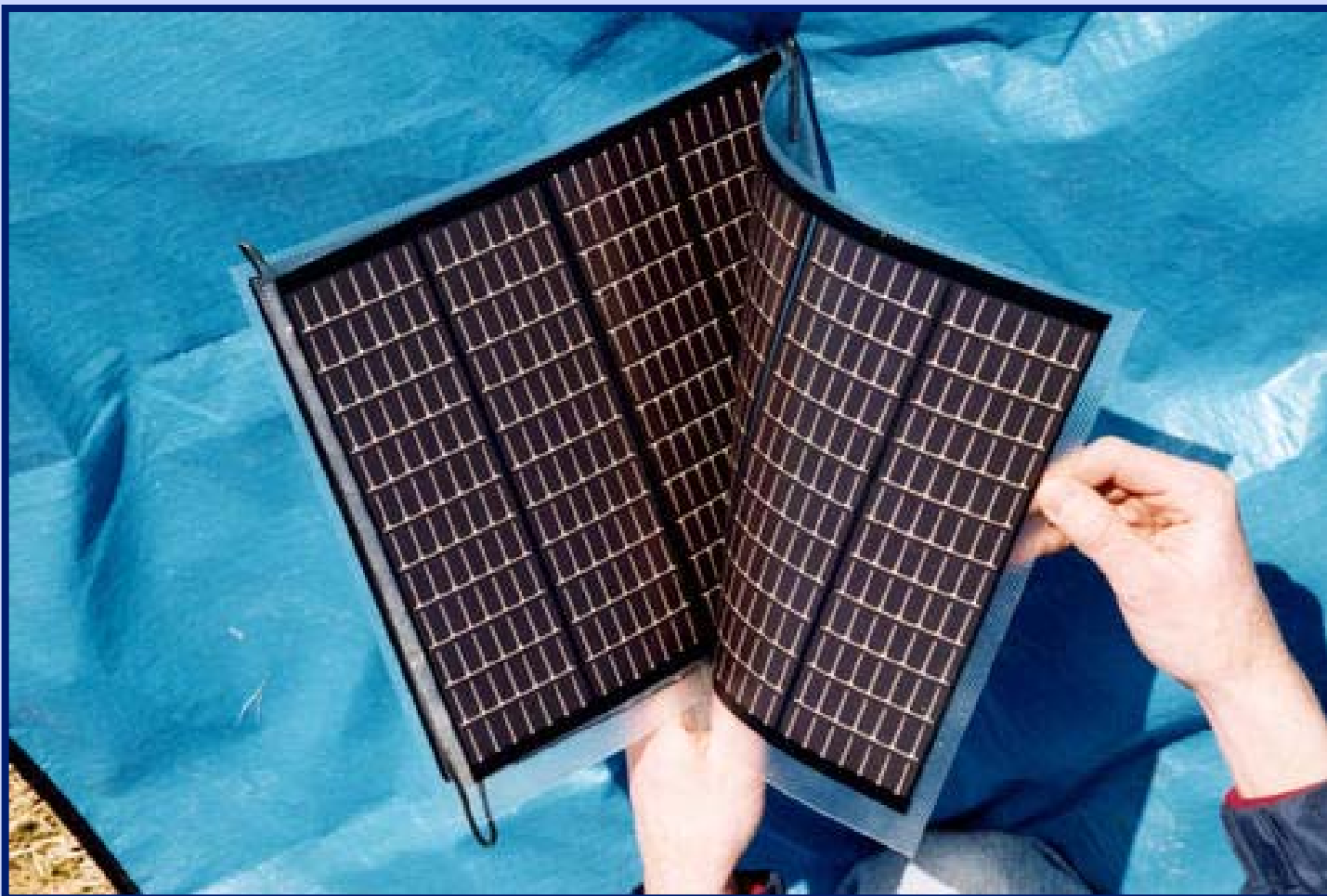


Improvements in Efficiency





Flexible PV





Communications Power





Communications Power



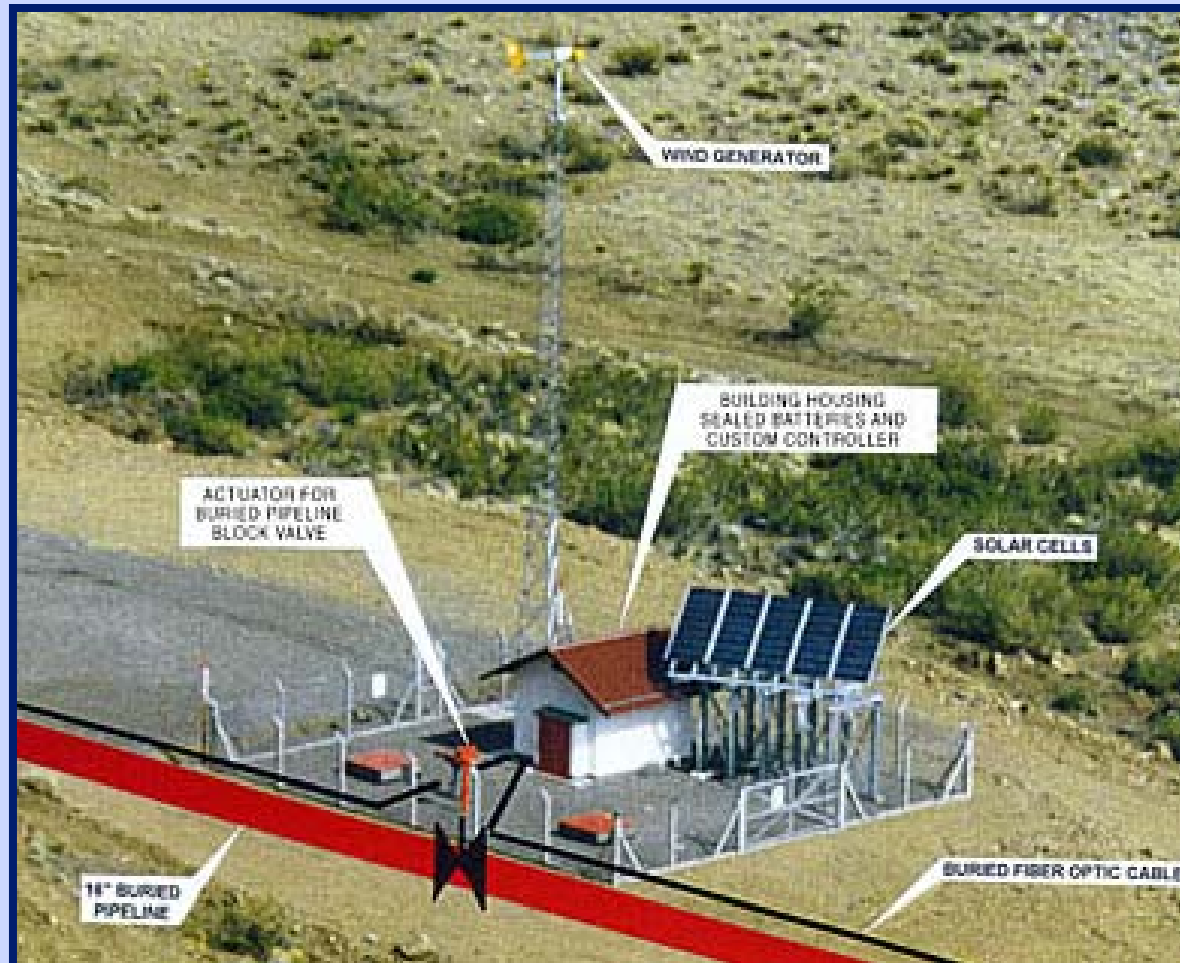


Oil and Gas Field SCADA





Pipeline Control and Monitoring





Solar Shingles on Residence East Lansing, Michigan





Flexible Solar Shingles





Grid-Connected PV at the Pentagon





Flexible PV for Standing Seam Metal Roofs Silverthorne, Colorado





Renewable Power for FERC Washington, D.C.



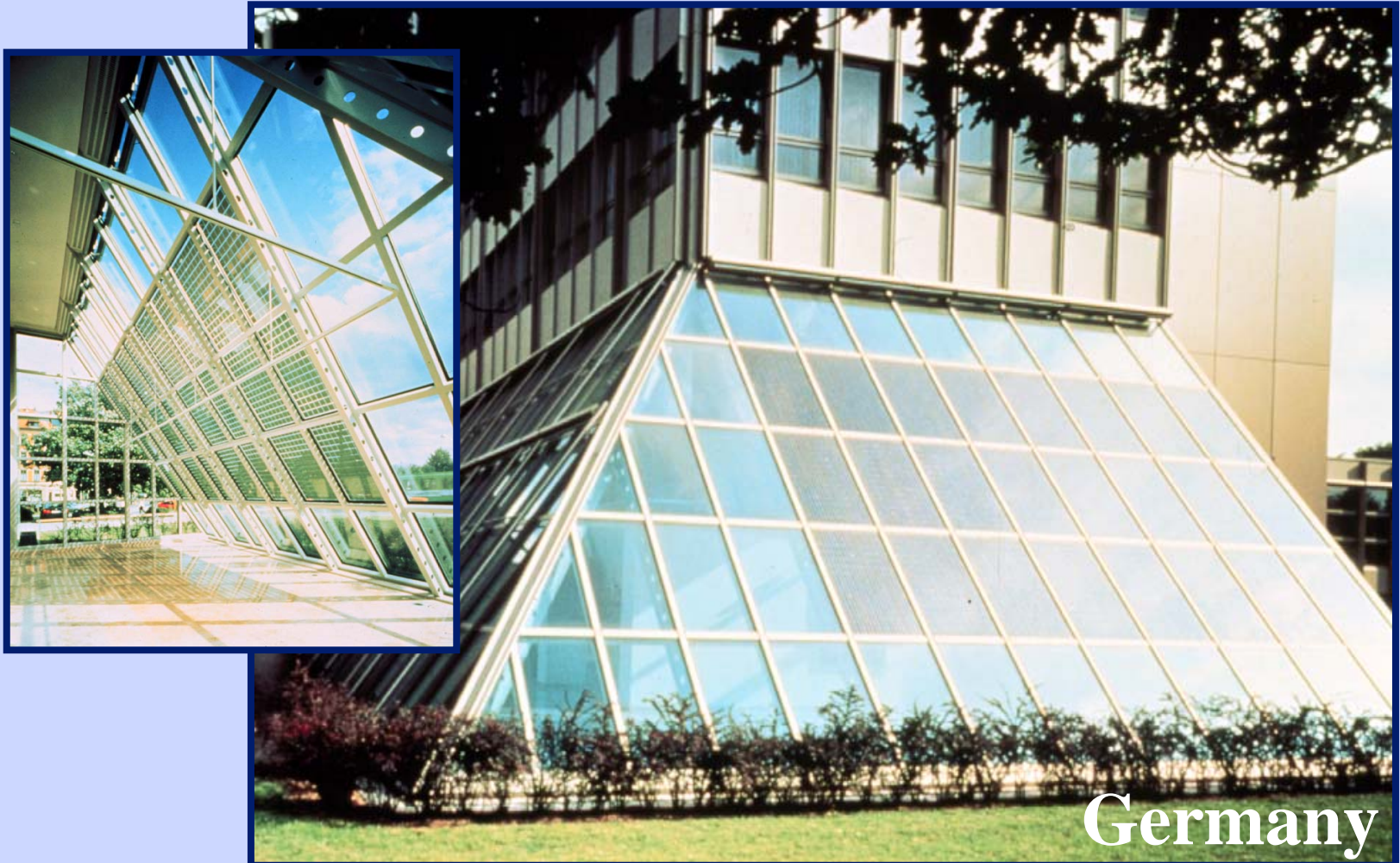


240 KW Rooftop PV System Arden Realty • Irving, California



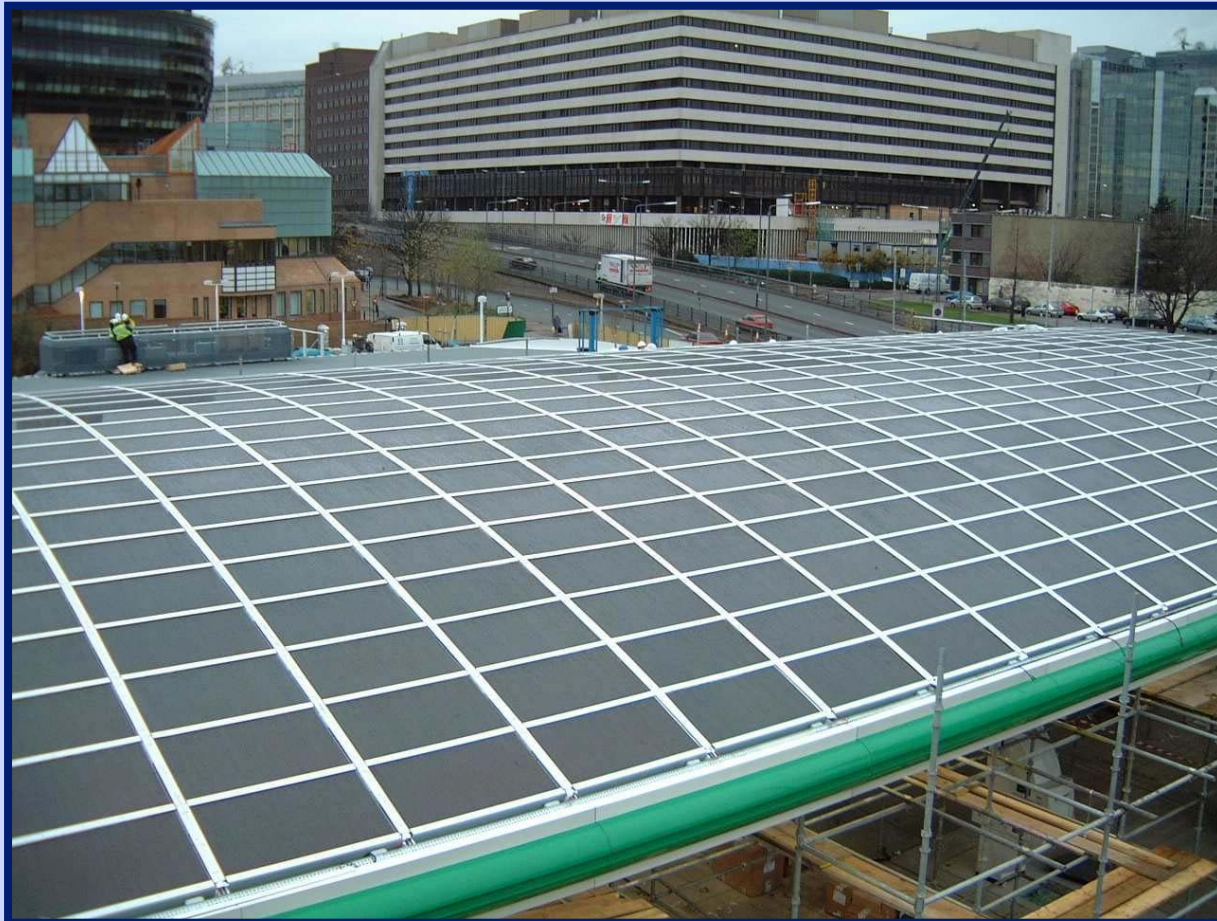


Building Integrated Photovoltaics





PV-Powered Gas Station London, UK





Natatorium at Georgia Tech 1996 Olympics • Atlanta, Georgia





4 Times Square • Manhattan, New York City





Electric Vehicle Charging





Emergency Operations





PV Systems are Disaster-Resistant



Before Hurricane Andrew, Picture facing N.E.

Before

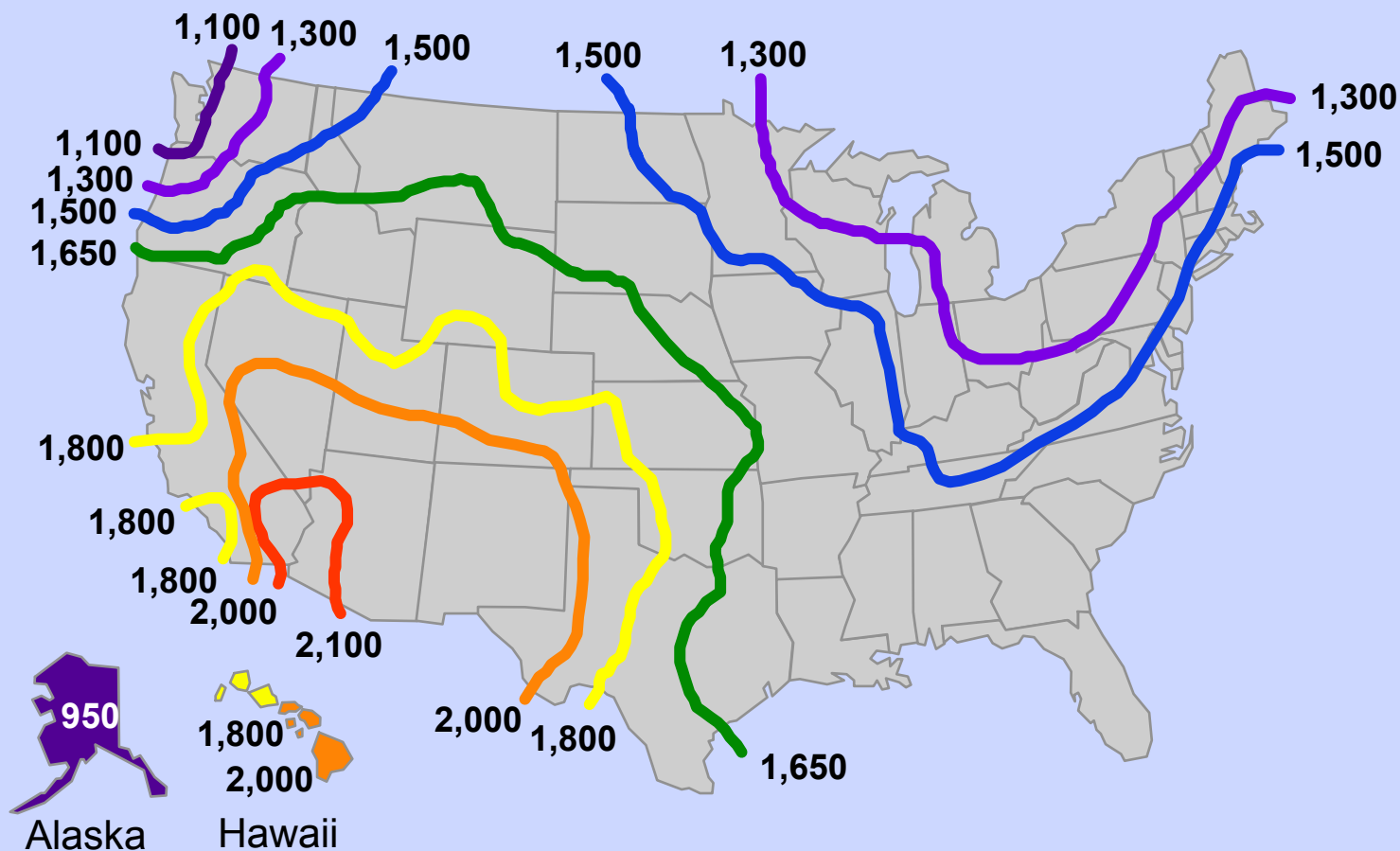


After Hurricane Andrew, Picture facing N.W.

After



Photovoltaic System Production (kWh/year)¹



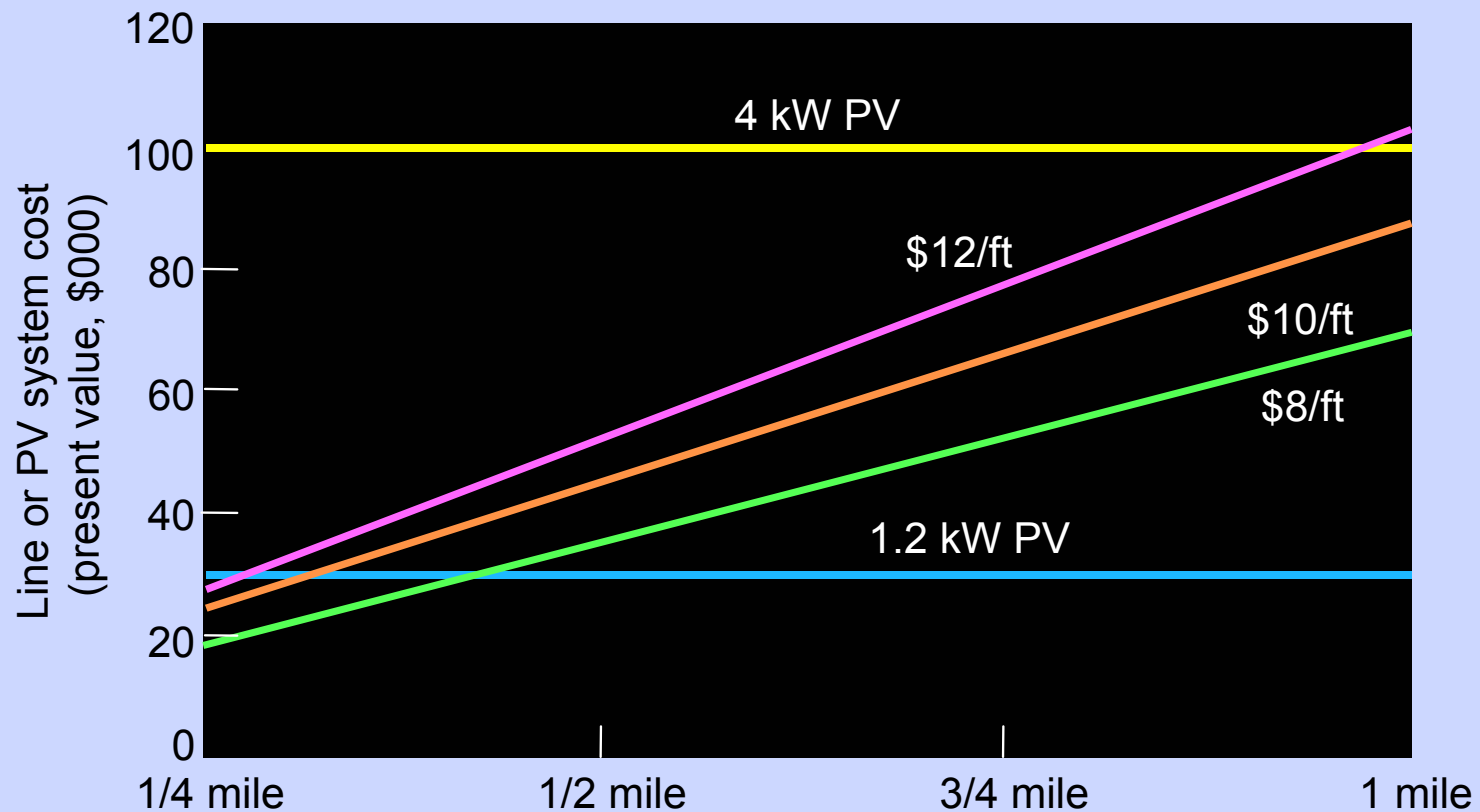


How Much Sunshine Does It Take to Energize America?





Cost Comparisons for PV Systems and Line Extensions



Source: PG&E

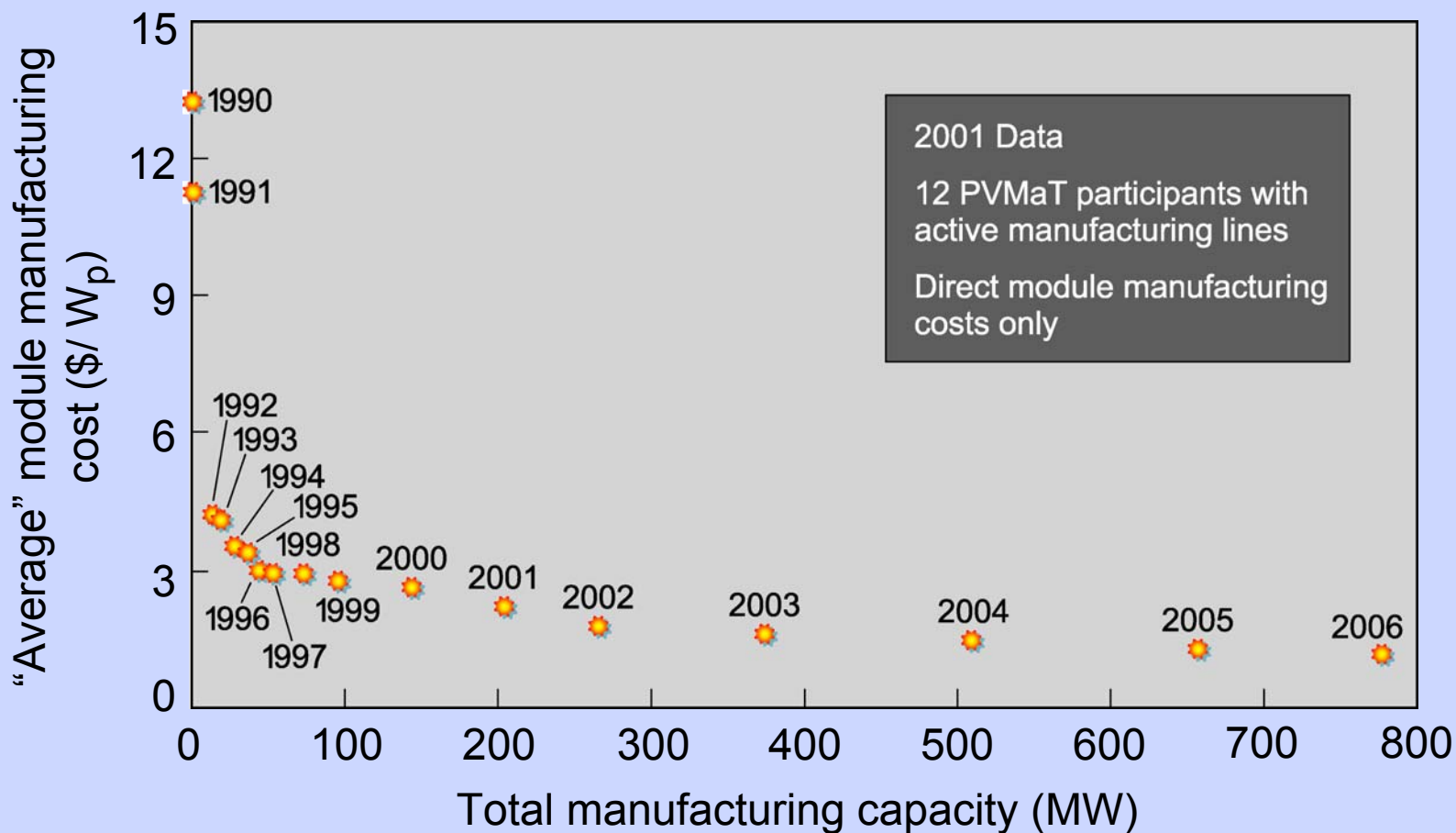


Bus Stop Lighting • Las Vegas, Nevada



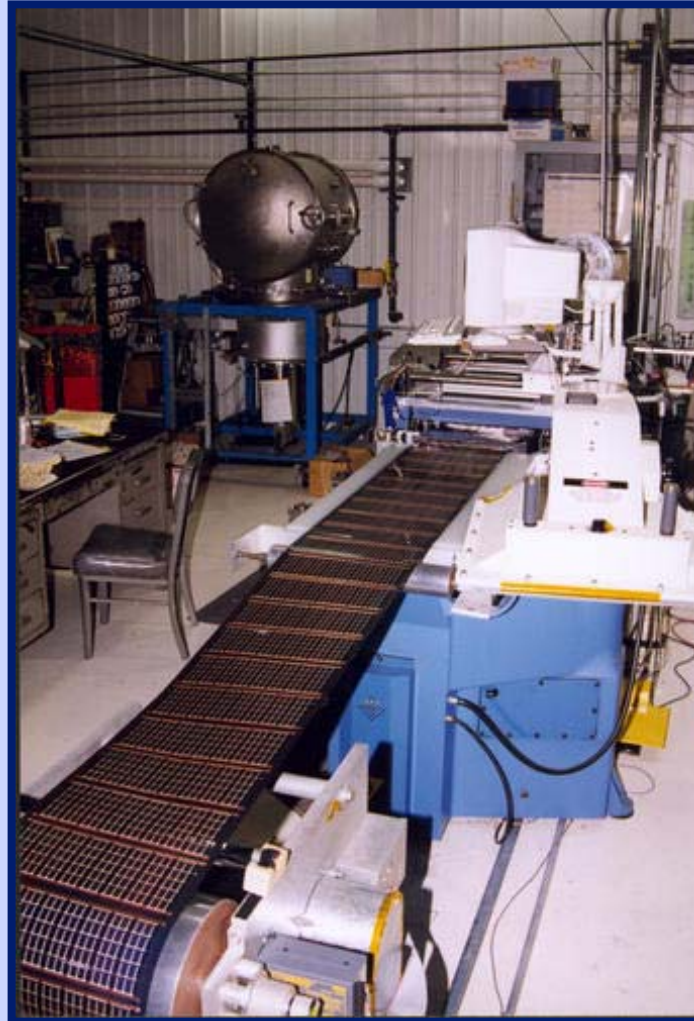


PV Manufacturing Cost/Capacity (DOE/U.S. Industry Partnership)





Automated Manufacturing





One of the World's Best Kept Secrets — Photovoltaics!

- \$3–3.5 billion in sales in 2001
- Average annual sales growth of 20-35% for last five years
- 70% of U.S. production exported at profit
- Annual growth nearly twice that of U.S. PC market
- World demand exceeds world supply



What's Driving the Domestic PV Market?

- Relatively high capital cost
- Difficult to compete with established central power
- PV often competes on capital cost
- PV rarely competes on energy cost
- State incentives, net metering, green power programs

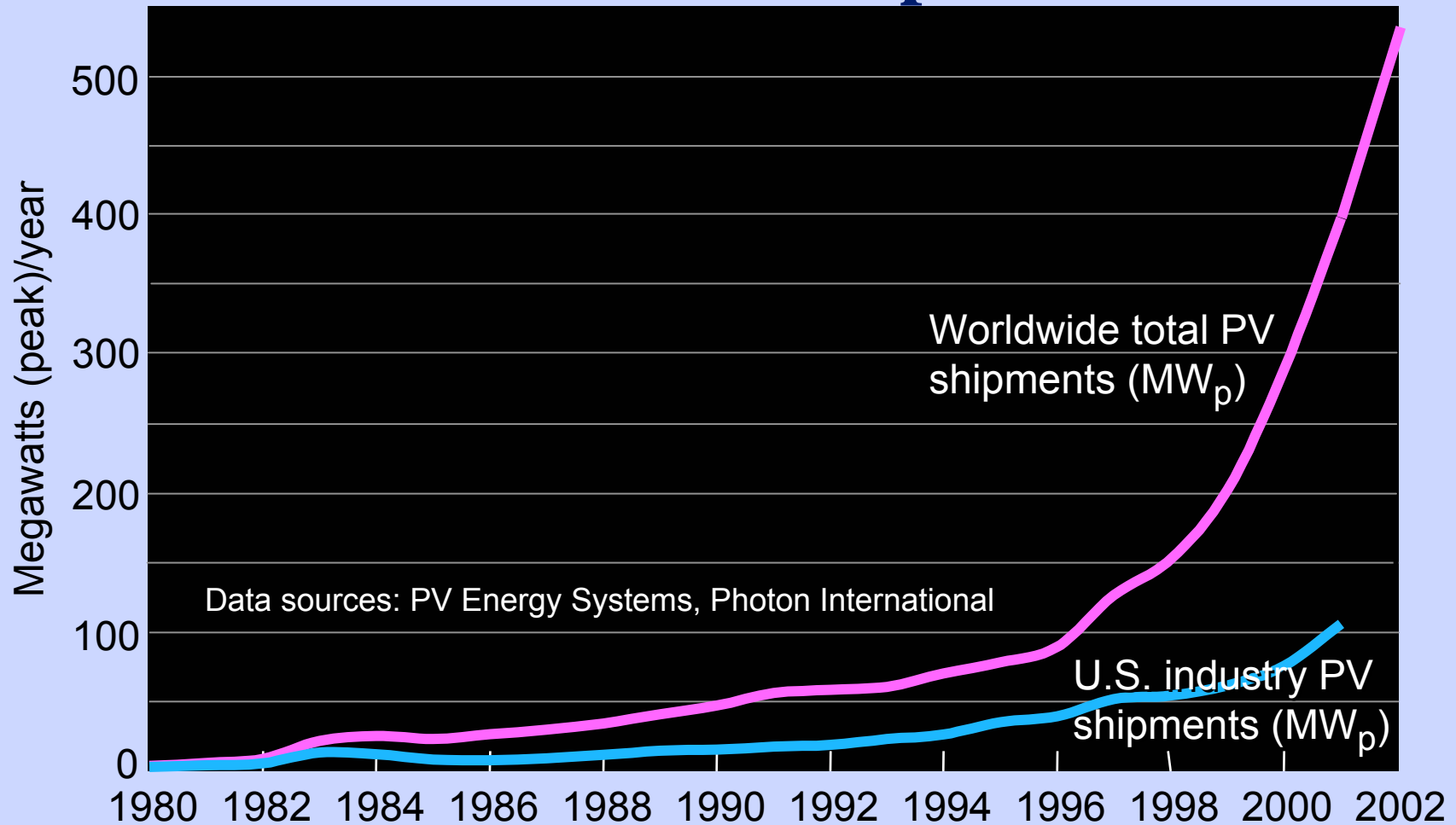


What's Driving the International PV Market?

- World demand exceeds supply
- Available in affordable sizes
- Commercially available systems meet current needs, i.e., water pumping, telecommunications, community power



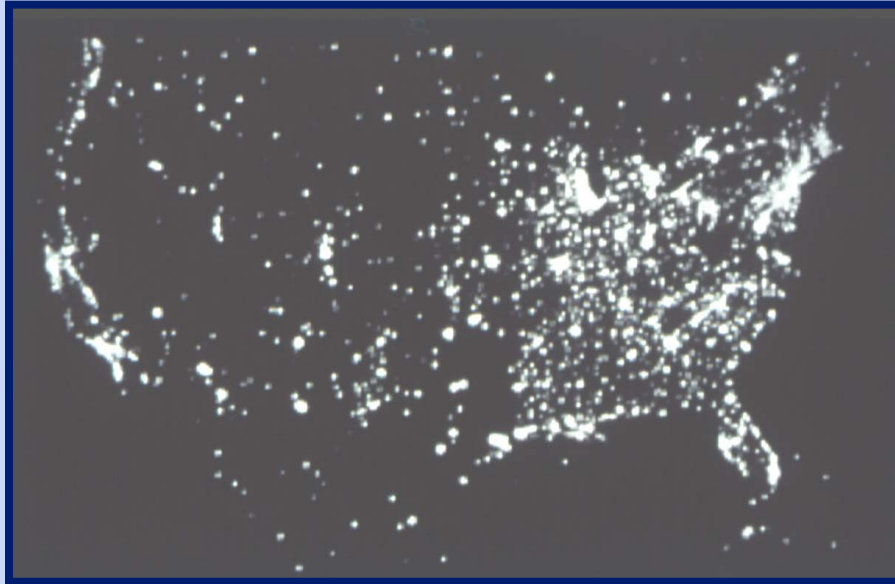
Comparison of U.S. and World Total PV Module Shipments





Blackout! It Can Happen To You.

July 2, 1996



Before



After



*What is the
Value of Electricity
if you don't have any?*



Contact Information

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