

GREEK PHOTOVOLTAIC ENERGY BUSINESS SEMINAR

SPONSORED BY:

**U.S. TRADE AND DEVELOPMENT AGENCY
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MAY 10, 2001

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The U.S. Trade and Development Agency, an independent agency of the U.S. federal government, provides grants that assist in the planning stage of infrastructure and industrial projects in middle-income and developing countries. Through the funding of feasibility studies, orientation visits, training grants, and various forms of technical assistance, TDA facilitates partnerships between American companies and foreign entities.

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May 10, 2001

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Agenda



Agenda

- 9:00 – 10:00 AM **Business Briefing Registration**
- 10:00 – 10:15 **Welcoming Remarks**
Mr. Justin Tomljanovic, U.S. Trade and Development Agency (TDA)

Mr. _____ Los Angeles Department of Water and Power (LADWP),
“Briefing on Roof Top Programs and PV for Electric Vehicles.”
- 10:15 – 11:30 **Solar Business Opportunities in Greece Seminar**

Mr. Nicholas Stavridis, Director Renewable Energy Sources, Public
Power
Corporation (PPC)

Mr. Ioannis Theodorakopoulos, Executive Director Electricity Trade,
Hellenic Electricity System Operator (DESMHE)

Dr. George Argyropoulos, Member of the Board of Directors and General
Director, Regulatory Authority for Energy (RAE)

Mr. John Karangelos, Project Director Energy Matters, Athens 2004
Olympic Games Organizing Committee

Dr. Panagiotis Chaviaropoulos, Research and Technology Director,
Center for Renewable Energy Sources (CRES)
- 11:15 – 11:30 **Coffee Break**
- 11:30 -- 12:30 **Questions and Answer Session**

Open discussion with audience participation
- 12:30 – 1:45 PM **Luncheon**
- 1:45 – 5:00 **One – to – One Meetings**



U.S. TRADE AND DEVELOPMENT AGENCY

The U.S. Trade and Development Agency's (TDA) mission is to assist in the creation of jobs for Americans by helping U.S. companies pursue overseas business opportunities. Through the funding of feasibility studies, orientation visits, training grants, conferences, and various forms of technical assistance, TDA enables American businesses to become involved in the planning stages of infrastructure and industrial projects in middle income and developing countries. Through these programs, TDA provides American firms with market entry, exposure, and information, thus helping them establish a position in markets that are otherwise difficult to penetrate. TDA aims to assist U.S. Companies in creating jobs here at home while simultaneously promoting economic growth in developing and middle income countries. TDA works closely with the government officials and industry leaders in the host countries to ensure that TDA funded projects are of a high development priority for the countries where the projects are located.

Since the U.S. Trade and Development Agency's inception in 1981, TDA has been associated with approximately \$16.8 billion in exports – or nearly \$40 in exports for every dollar invested in TDA activities. In Fiscal Year 2000, TDA obligated \$51.7 million for U.S firms in more than 63 strategically targeted developing and middle-income countries in the following regions: Africa/Middle East; Asia/Pacific; Central and Eastern Europe; Latin America and the Caribbean; and the New Independent States (NIS). TDA is primarily involved in the following sectors: agriculture; energy; environment; health care; information technology manufacturing; mining and minerals development; telecommunications; transportation; and water resources.

TDA's success is often achieved through the cooperation and assistance of colleagues throughout the U.S. Government. TDA works closely with the Department of State, the Department of Commerce's U.S. Foreign Commercial Service, the Agency for International Development, the Department of Transportation's Federal Aviation Administration and Federal Railroad Administration, the Department of Energy and, most recently, the Federal Emergency Management Agency. TDA also works closely with the U.S. Export-Import Bank, and the Overseas Private Investment Corporation.

TDA funds project planning activities that directly influence the procurement decisions related to major industrial or infrastructure projects in developing and middle-income countries - projects that typically represent millions of dollars in U.S. export potential. From radar for airports in Asia to process controls for refineries in Latin America, hundreds of goods and services are required to implement a project. TDA works to ensure that the services and products needed for projects will be stamped "Made in the U.S.A."

For more information, visit TDA's website at www.tda.gov.



Brief Resumes for Delegation from Greece

Mr. Nicholas A. Stavridis
Director Renewable Energy Sources
Public Power Corporation (PPC)

Curriculum vitae

PERSONAL DATA

Name: **Nicholas A. Stavridis**

Address: 10, Navarinou st., 10680, Athens

Nationality: Greek

Date and place of birth: 3.9.1948, Mytilini, Greece.

Married.

EDUCATIONAL QUALIFICATIONS

1971: dipl. Civil Engineer of Athens Technical University

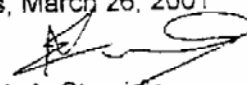
1979: M. Sc. in Hydrology, Delft, The Netherlands.

WORKING EXPERIENCE

From 1973 and onwards I have been working at the Public Power Corporation:

- 1973 – 94: in Hydroelectric Development Dept., responsible for the Hydro-Meteorological network design and operation and for the hydrological studies of large dams as well.
- Since 1994 I am the Director of Alternative Energy Forms Dept. (incl. Wind energy, PV, Geothermal projects, biomass and design, installation and operation of the environmental protection network of PPC).

Athens, March 26, 2001


N. A. Stavridis

DIMOSIA EPICHRISI ILECTRISMOU

NICHOLAS A. STAVRIDIS
DIRECTOR
OF ALTERNATIVE ENERGY FORMS

PPC / DEME
NAVARINOU 10
ATHENS 106 80

TEL: (01) 36 21 531
FAX: (01) 36 14 700
E-mail: stavridis@del.gr

May 10, 2001

Ioannis Theodorakopoulos
Executive Director Electricity Trade,
Hellenic Electricity System Operator (DESMHE)

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12 APR 2001

OFFICE OF COMMERCIAL AFFAIRS **THEODORAKOPOULOS IOANNIS**
AMERICAN EMBASSY ATHENS
ACTION CM INFO _____ FILE _____

DATE OF BIRTH : April of 1941
NATIONALITY : Greek
ADDRESS : 30, Chalkokondyli, Athens - GREECE
EDUCATION : Mechanical and Electrical Engineer, graduate of "Technical University of Athens", (1964)
LANGUAGES : Greek - native language
English - good

PROFESSIONAL EXPERIENCE

Since 2001 : **HELLENIC TRANSMISSION SYSTEM OPERATOR**
Executive Director of Power Exchange.

From 1991 to 2000 : **PUBLIC POWER CORPORATION**
Director of the Organization Department,
PPC Project Manager of the study and implementation of the
"Reorganization and Modernization of PPC".

Member of the executives' committee, responsible of defining the PPC Administration views, during all stages of the Draft Law elaboration, on the liberalization of the Electricity Market in Greece by the Ministry of Development.

PPC representative in the Ministry of Development for the adaptation of the legal framework of the Directive 96/92 EC, (L. 2773/1999), concerning the Renewable Energy Sources and the Combined Heat and Power Generation.

Member of the Coordination Committee, established by the PPC Administration, for carrying out all necessary actions for the establishment of the Hellenic Transmission System Operator, (Presidential Decree, Organization and executives' employment, Market Rules, Grid Code, Power Exchange Code, Transmission System list of tariffs).

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From 1967 to 1991 : **PUBLIC POWER CORPORATION**
Engineer in several actions of the Distribution Division.
In charge of : studies,
" " " : constructions,
" " " : operation,
" " " : Technical section of District,
" " " : Technical section of the Region
of Peloponneese - Epirus,
Assistant Manager at the Region of Peloponneese – Epirus.

From 1965 to 1967 : **PUBLIC POWER CORPORATION "E.A.H.E. GLAFKOS"**
Senior engineer, in charge of construction, maintenance and
operation at the Power Corporation "E.A.H.E. GLAFKOS".

Dr. George S. Argyropoulos
Member of the Board of Directors and General Director
Regulatory Authority for Energy (RAE)

Biographical Summary

15 March 2000

GEORGE S. ARGYROPOULOS, Ph.D.

26 Pondou - Kifissia, 14563 Greece

Tel. No: (301) 800.0060

Background

Over thirty years of professional experience as Engineer, Project Planner, Technical Manager, Educator, Administrator and Senior Executive.

Education

1960-1965

California Institute of Technology, Pasadena, California:

Ph. D. in Engineering Science, Physics and Economics, 1965.

M.S. in Mechanical Engineering, 1961.

1955-1960

National Technical University, Athens, Greece:

Mechanical and Electrical Engineer's Diploma, summa cum laude (Chrysosoverghi Prize), 1960.

Employment

July 2000 -

Member, Regulatory Authority for Energy, Athens, Greece:
One of the 5 Members

1990-2000

Federation of Greek Industries, Athens, Greece:
Director General.

1988-1990

Center of Renewable Energy Sources (C.R.E.S.), Greece:
Director of Programmes.

1985-1988

Avco Research Laboratory, Inc., Everett, MA 02149:
Principal Research Scientist.

1984-1985

Consultant to venture capital firms in the Boston area. Fields:
Management and Marketing.

1982-1984

Sequoia Systems, Inc., Marlboro, MA 01752:
Director of OEM, International Operations and Subcontracts.

1976-1981

Ministry of Coordination, Athens, Greece:
Head of the Scientific Research and Technology Agency of Greece (1977-81).
Assistant Exec. Secretary of the National Energy Council and Representative of Greece at the International Energy Agency (1976-77).

1975-1976

Massachusetts Institute of Technology (MIT), Cambridge, MA:
Senior staff of the MIT Energy Laboratory.

1964-1975

STD Research Corporation, Pasadena, California:
Vice President and Senior Research Scientist.

Publications	Dr. Argyropoulos has authored over 100 technical reports and articles published in scientific journals and proceedings. He has participated in numerous technical and policy review panels, both in Europe and in the U.S.
Languages	Fluent in French, in addition to Greek and English. Good working knowledge of German, Italian and Spanish.
Personal	Born 1936 in Athens, Greece. Married, 2 children.

John Karangelos
Project Director Energy Matters
Athens 2004 Olympic Games Organizing Committee

CURRICULUM VITAE (April 2001)

- 1. Family Name : KARANGELOS**
- 2. First Name : John**
- 3. Date of birth : February 25, 1942**
- 4. Nationality : Greek**

5. Education

Institution : NATIONAL TECHNICAL UNIVERSITY OF ATHENS
Date : 1965
Degree : Diploma in Mechanical and Electrical Engineering

Institution : UNIVERSITY OF ASTON IN BIRMINGHAM (U.K)
Date : 1969
Degree : Master of Science in Nuclear Reactor Technology

6. Language Skills (1= basic , 5 =fluent)

	Reading	Speaking	Writing
Greek	5	5	5
English	5	5	5

7. Present Position

Athens 2004 Olympic Games Organising Committee
Project Manager on Energy matters

8. Professional Experience record

With the Public Power Corporation of Greece

Date : From 1969 – 1971
Position :
Description :

Date : From 1969 – 1971
Position : Exploitation Department/ Project engineer
Description : Hydroelectric Station Exploitation Optimisation Studies – Contract
Negotiations with the UKAEA for a 450 MW SGHWR power plant

Date : From 1972 – 1975
Position : Nuclear Office / Project engineer
Description : Pre-construction activities for the integration of a 600 MW NPP

Date : From 1976 – 1981
Position : Nuclear Office Head of Safety and Licensing Section
Description : Nuclear legislation and relevant regulations preparation. Site selection studies. Preparation of bidding documents

Date : From 1981 – 1985
Position : Alternative Energy Forms Department
Description : Project manager for a wind and a photovoltaic Projects. Participation in a Geothermal Unit bidding documents preparation team. Follow up of the evolutions in the Nuclear field.

Date : From 1986 – 1987
Position : Hydroelectric projects Department/Attached to the director
Description : Consultation on Electromechanical aspects

Date : From 1988 – 1990-
Position : Alternative Energy Forms Department/Attached to the director
Description : Consultation on Wind, Solar, Geothermal and Nuclear aspects

Date : From 1990 – 1990 (6 months)
Position : Education Department / Head of Safety of works Section
Description : Coordination , support and training for safety aspects of all PPC's activities

Date : From 1990 – 1994
Position : Alternative Energy Forms Department / Director
Description : Management of all Wind, Solar, Geothermal and Environmental monitoring activities of PPC. Procurement and erection of Wind turbines and wind farms with total capacity of 24,5 MW, of independent photovoltaic units (70) in various Aegean islands, of a 2 MW geothermal Unit as well as preparation of environmental reports for various PPC's units

Date : From 1994 – 2001
Position : Director attached to the Assistant General Director
Description : Consultant for environmental and European Union matters

With the Centre for Renewable Energies

Date : From 1991 – 1994
Position : Member of the Board of Directors
Description : General supervision and final approval of projects mainly under the European Community programmes , for the promotion of alternative energies, energy technology and energy conservation.

With the National Technical University of Athens

Date : From 1971 to 1995 with various intervals
Position : Scientific Collaborator / Mechanical Eng. Dep
Description : Tutorial / Supervision of laboratory exercises

Date : From 1997- 1999
Position : Scientific Collaborator/ Civil Eng . Dep
Description : Tutorial on alternative energies technology

9. Professional Bodies membership

Technical Chamber of Greece
Greek Society of Mechanical and Electrical engineers
Hellenic Wind Energy Association
Greek Nuclear Society
British Nuclear Society

Dr. Panagiotis K. Chaviaropoulos
Research and Technology Director,
Center for Renewable Energy Sources (CRES)

Curriculum Vitae

Dr. PANAGIOTIS K. CHAVIAROPOULOS
Mechanical Engineer NTUA

Work Address:
19th Km Marathonos Ave.
19009 Pikermi, GREECE
Tel. No.: -301-6039900
Fax. No.: -301-6039904

Home Address:
38, Rostoviou Str.
11526 Athens,
GREECE
Tel. (301) 6927375

Education

1982 NATIONAL TECHNICAL UNIVERSITY of ATHENS (NTUA)
Mechanical Engineering Diploma, Msc degree.
1987 Doctor's degree, Mech. Engineering School, NTUA

Key Qualifications :

More than seventeen years experience in R&D projects funded by the E.U., the European Industry and the Greek State. Participation in 35 research programs (co-ordinator in three of them). Deep knowledge of Aerodynamics, Fluid Mechanics and CFD techniques. Recent work in the fields of horizontal axis wind turbines aeroelasticity and complex terrain wind field modelling. More than 20 Journal and 40 Conference publications, co-editor of two books on optimum aerodynamic design.

Professional Experience and Activities :

1982 **Diploma Thesis in Thermal Turbomachinery Lab (TTL) of NTUA**
(Director : Prof. K.D. Papailiou).

1983-1987 - **Research Assistant in (TTL/NTUA)**

1987 **PhD Thesis defend** (Supervisor : Prof. K.D. Papailiou)
"Contribution to the Numerical Simulation of Three-dimensional, Inviscid, Subsonic, Rotational Flow-Fields" of Mech. Engineering, NTUA.

1987-1994 **Laboratory of Thermal Turbomachines of NTUA.**

- Research Engineer in the Lab.
- Working on research contracts funded from E.U. and European Industries.
- CFD experience on Euler and Navier-Stokes solvers, Unsteady Flows, Inverse methods, Grid Generation methods.

1994-1997 Centre for Renewable Energy Sources (CRES)

- Research Engineer in the Wind Energy Dept. of CRES, head of the modelling group.
- Mainly Working on EU and National research contracts.
- Working areas : Aerodynamic and Aeroelastic modelling and design of wind turbine rotors, wind potential and turbulence modelling, CFD in wind engineering.

2/98-5/98 Centre for Renewable Energy Sources (CRES)

- Head of the Wind Energy Sector

6/98-today Centre for Renewable Energy Sources (CRES)

- Director of Applied Research and Technological Development



Industrial Participants from Greece

Dr. Platon Baltas, Manager of Renewable Energy at Sunlight – Germanos S.A. Dr. Baltas is the manager of R&D projects in renewable energy, power electronics, energy storage and hybrid systems.

Dr. James A. Walker, Vice Chairman and Managing Director – IWEKO, Aeolian Energy
Dr. Walker is developing solar and wind energy projects in Greece and other countries.



Greece

GDP	\$124 billion	Population	10.7 million
Real Growth GDP	3.5%	Inflation Rate	2.4%
Per Capita GDP	\$11,545	Exchange Rate	\$1US = 278.5 Drachmas

Source: FY 2000 Country Commercial Guide: Greece, U.S. Department of State, July 1999.



Executive Summary

Over the recent years, major improvements have been recorded in the Greek environment, and macro- and micro-economic performance, leading to acceptance of Greece as a full member of the European Union (EU) and the Economic and Monetary Union (EMU). The steps taken by the Greek government included deregulation of the electric power sector on February 19, 2001. In addition, Athens was selected to host the 2004 Olympics.

Deregulation of the multi-million dollar electricity market and increase in electricity demand, means that U.S. companies have new export opportunities as suppliers of technology, equipment, and services in this sector. This is particularly true for the U.S. manufacturers, exporters, consulting engineers, and construction firms involved in the renewable energy market.

Developing sources of renewable energy remains a priority for the Greek government, presenting opportunities for U.S. firms with advanced technology. The Ministry of Energy, the Public Power Corporation (PPC), and the Centre for Renewable Energy (CRES) plan to spend approximately \$2 billion (USD) in renewable energy projects over the next six years. Solar photovoltaic (PV), solar thermal, wind, biomass, and geothermal technologies will be considered. Projects will be undertaken with approval from the Public Power Corporation (PPC). Accelerated use of renewables is key to meeting the targets of the EU's Third Community Support Framework (III CSF). Some of the funding for these projects will come from the European Economic and Monetary Funds. In addition, the Greek National Operational Program for Energy – (NOPE) and the Operational Program for Energy (OPE) will also provide funding for projects. Public sector funds are expected to be supplemented by private sector funds.

Greece, particularly the Aegean islands, is very well suited for solar, photovoltaic, and other renewable energy technologies. It is inefficient to transmit energy from the mainland to the islands, and diesel engine generator power plants create undesirable environmental and aesthetic problems, especially for islands with a tourism-based economy. Peak loads are associated with the tourist season – a time when sunshine is the most prevalent.

III CSF presents a number of opportunities for U.S. firms. There will be abundant opportunities to collaborate with EU firms and regional governments on projects in Greece, including under-developed areas. In some cases, ventures can receive up to 50% of the funds required for buildings, equipment, and feasibility studies in grants from the EU. In addition, long-term loans will be available from the European Investment Bank.

Electricity Market Profile

Domestic consumption of electricity has been steadily increasing over the past 10 years, growing from 42.3 billion kilowatt-hours (BkWh) in 1998 to 43.3 BkWh in 1999, 70% of which was powered by lignite, 21% oil, 8% hydropower, and 1% from PV and other renewables. Energy demand is projected to continue to grow by 3 to 5% annually over the next several years. Renewables including PV are expected to become an important electricity generation source particularly in areas with a tourism-based economy.

The PPC, founded in 1950, is the largest state-owned utility in Greece, serving 6.5 million customers and employing about 33,000 people. According to the country's electricity deregulation timetable, privatization of the PPC went into effect on February 19, 2001. As a result of liberalization, the PPC expects to retain only 33 percent share in the market by the year 2005. PPC, which operates as an independent entity controlled by the Ministry of Development, holds the exclusive right to transmit and distribute electricity, and currently produces 98.1% of the total production of electricity throughout the country.

The transmission/transport system for electric energy from the power plants to the large consumption centers, which will continue to be under PPC control, consists of high-voltage lines of 66 kilovolt (kV), 150 kV, and 400 kV. This system covers a total length of almost 10,200 kilometers (km) and is connected with the corresponding networks of Albania, the former Yugoslavia, and Bulgaria. In addition, 23 large industrial consumers are supplied directly from the transmission system. The vast majority of the lines comprising this system are overhead 150 KV lines, though the system also includes approximately 110 km of underground and submarine lines.

PPC is involved in a number of projects that link the Greek electric grid with neighboring countries. Greece and Italy plan to link their grids via a cable under the Ionian Sea. Italy's ENEL has begun laying the 102 mile, 500 megawatt (MW) cable linking Otranto, Italy, and Aetos, Greece. The project is a joint venture between ENEL (75%) and PPC (25%) and will cost an estimated \$305 million.

Greece's power network currently connects with the networks of Albania, the former Yugoslavia and Bulgaria, allowing Greece to export electricity to Kosovo, Yugoslavia, through Albania and Macedonia (although transmission problems in those countries prevented much of this electricity from reaching its intended recipients). Six countries – Albania, Bosnia-Herzegovina, Bulgaria, the former Yugoslavia, Greece, and Romania – agreed in September 1999 to work to create a regional electricity market.

Improved Greek-Turkish relations also are affecting the Greek electricity sector. In January 2000, a Greek-Turkish-U.S. (Copelouzos-Gama-ExxonMobil) consortium announced plans to construct a gas-fired power plant in Greece. The plant will have a capacity between 400 MW and 600 MW and will be used to generate and export electricity to Turkey in addition to helping supply increasing Greek domestic demand.

Government Strategy

The Greek Ministry of Development has set the following strategic objectives:

- Securing energy supplies across all Greek territory;
- Competitive operation of the energy markets;
- Contribution of the energy sector to the competitiveness of the Greek economy;
- Protection of environment; and
- Strengthening of Greece's role in the development of the energy sector in the Southern Mediterranean Sea, Balkans, and the Black Sea regions.

Based on the above, Ministry officials have developed a six-year plan that focuses on accomplishing the following goals:

- Completion and improvement of the infrastructure in the energy sector (transmission, distribution, and tank networks);
- Joining international energy networks of oil, electric power, and natural gas;
- Strategic actions for the effective operation of the energy sector;
- Decreasing energy consumption with investments in energy efficient technologies, renewable energy sources; and
- Decreasing environmental pollution generated by energy providers.

Liberalization of the Electricity Market

The Greek electricity market is currently undergoing the deregulation process. The Law 2773/99 “Liberalization of the Electricity Market – Regulation of Energy policy issues and other provisions” was issued in 1999. The liberalization of electricity market came into force on February the 19th, 2001. As a result of liberalization, many new entities are proposing to enter the electricity generation business. These new generators are subject to certain reviews and approvals except:

- Power plants of a capacity up to 20 kW
- Reserve power plants of a capacity of up to 150 kW and reserve power plants of a capacity of up to 400 kW, provided that the latter shall be installed in industrial or manufacturing plants.
- Power plants of a capacity up to 2 MW installed by educational or research institutions for exclusively educational or experimental purposes.
- Power plants installed by the Center of Renewable Energy Sources (CRES) for certifications or measuring purposes and for such a period as the carrying out of the said certifications or measuring shall require.

According to the above Law, two bodies are established, the “Regulatory Authority for Energy” (RAE) and the Hellenic Transmission System Operator (HTSO). The main tasks of the RAE are to ensure the operation of the liberalized electricity market, according to certain rules, and to make recommendations to the Ministry of Development for the issue of Authorization for Generation and Supply. HTSO operates, utilizes, and plans the development of the system in order to ensure the reliable and efficient operation of the power system.

Tariffs

The system of power generation in Greece is divided into two categories: the so-called interconnected system of mainland and the autonomous power plants of the islands. In the liberalized electricity market as well as before, a single charging price exists in both systems, depending on the consumer and the voltage class. The new law, however, provides the Ministry of Development the right to ask the producers for a discount. The following tariffs have been in effect since May 7, 1998:

Low Voltage: 26.60 Drs/kWh (\$0.09/kwh)

Medium Voltage: 21.51 Drs/kWh and 994 Drs/kW (\$0.077/kwh) – peak power.

The prices paid by the HTSO for renewable energies are based on the actual selling price. Tariffs for both autonomous and grid-interconnected generators have two components: energy and power (capacity credit). The energy component is set at 90% of the medium voltage tariffs, i.e. 19.359 Drs/kWh, while the power component is set at 50% of the respective PPC’ power charge, i.e. $497.0 \text{ Drs/kW} \times P$, where P is the maximum measured power production over the billing period. However, renewable energy will be dispatched on a priority basis.

Renewable Energy Market Profile
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With 300 sunny and warm days a year, over 1,000 islands that have sea winds with an average wind speed exceeding 7.5 meters/second, and an important number of geothermal fields, Greece is an ideal country for solar, wind, and geothermal energy production. Because Greece possesses high solar and wind energy potential, the government aims to reduce the demand for expensive imported fuel, currently used for electricity production in a large part of the Greek territory, by developing the country’s renewable energy resource potential.

In order to promote renewable energy, the Greek government established the Center of Renewable Energy Sources (CRES) under the Development Ministry in 1994. CRES has worked to accelerate the introduction of a full range of renewable energy technologies in Greece. Renewable electricity generation projects are on the rise in Greece, especially in the islands, which possess enormous potential for solar and wind power. The first U.S.-based independent power producer (IPP) to enter Greece now provides 15,000 customers on the island of Crete with wind energy. PPC is planning a 100-kilowatt PV park for Gavdos Island, in addition to already existing PV capability on the island. An Australian company has constructed a 13-MW landfill-gas-fired power plant at Ano Liossia, from which PPC purchases power.

Concerning renewable energy, the main difference between Law 2773/99 and Law 2244/94, in effect since 1995, is the tariff policy for renewable energy produced. Under the new tariff policy, HTSO will dispatch renewable electricity produced on a priority basis. However, the Minister of Development can now ask the producers of renewable sources for discounts on prices.

The Greek National Statistical Service has no official data on the Greek market for Electrical and Renewable Energy Machinery, Equipment, Products, and Parts. Industry analysts however estimate that the total market for electrical and renewable power system, equipment, and products (EPS and REQ) was \$760 million in 2000.

Statistical Data – Estimated Greek Market for Electrical and Renewable Energy Machinery, Equipment, Products, and Parts (U.S. Dollar Millions)

	2000	2001	2002	3-yr. Estimate (growth)
Imports (total)	1,200	1,400	1,400	16.0%
Imports (from U.S.)	45	66	95	11.0%
Total Market Size	1,450	1,680	1,680	16.0%

Source: U.S. Embassy – Athens

This EPS/REQ market will grow over the 2001-2002 period at an expected annual rate of 13-15 percent as Greece expands its electric power network and updates its equipment. However, the real growth will be realized when the new power units are built.

Economic Profile

Greece has a mixed capitalist economy with the public sector accounting for about half of Gross Domestic Product (GDP). The government plans to privatize some leading state enterprises. Tourism is a key industry, providing a large portion of the GDP and foreign exchange earnings. Greece is a major beneficiary of EU aid, accounting for about 4% of the GDP.

Economic growth strengthened for the seventh consecutive year in 2000 and the GDP expanded at about 4 percent. Economic growth was led by robust domestic demand, with a further acceleration of investment, while private consumption was buoyed by sizable wage increases and by a rapid acceleration of credit growth. The strong growth performance failed, however, to reduce the unemployment rate through 1999 (the latest year for which data are available), which is the second highest among European Union countries. Exports were boosted by vigorous demand from trading partners. Nevertheless, the demand for import-intensive capital goods and consumer durables fueled import growth and resulted in a further widening of the external current account deficit. It is estimated the demand for exports to have accounted for 7 percent of the GDP in 2000 – one of the highest levels among advanced economies.

In 1998, imports were \$28.5 billion while exports were only \$10.7 billion. Traditionally, European countries have been the largest exporters to Greece. In 1998, imports from the United States accounted for 3.3% of the Greek import market, totaling \$939 million. With \$498 million in U.S. imports of Greek products, the U.S. trade surplus with Greece reached \$441 million.

Greek Prime Minister Costas Simitis was re-elected on April 9, 2000, in a close election in which an important issue was Simitis' efforts to reach the convergence criteria for EMU. On June 19, 2000, the EU council of ministers approved Greece's application to become the twelfth member of EMU, in recognition of Simitis' successful efforts to stabilize and liberalize the Greek economy. Greece must realign its economy as part of an extended transition to full EU membership that began in 1981. Greek businesses are adjusting to competition from EU firms and the government has had to liberalize its economic and commercial regulations and practices.

Principal growth sectors

Services make up the largest and fastest growing sector of the Greek economy, accounting for about 63 percent of the GDP (at factor cost). Trade and banking (22 percent), transportation and communications (9 percent), health and education (9.5 percent) and tourism are the largest sectors.

Banking and Trade: Growth in the banking system ensued from higher volume, provision of new services, and rapid consolidation towards larger groups to cope with increased competition associated with the more competitive environment stemming from EMU. Private insurance continues growing rapidly and there are increased prospects for business from the large projects associated with the 2004 Olympics in Athens. Higher demand boosted retail trade volume by 2.4 percent. The volume increase in banking and finance was 8 percent in 1998.

Transportation and Communications: The transport sector (including shipping) was particularly active as foreign trade expanded further in 1998. Land transport was up. Conversely, The number of air passengers carried by the national airline Olympic Airways (OA) fell by 7.6 percent. However, following the liberalization of air transport on April 1997, a number of private companies are becoming active and seeking a larger share in air transport. Conversely, transport of goods by rail dropped 2.8 percent, following a 5.3 percent drop in 1997 and a 14.2 percent increase in 1996. Telecommunications volume rose by 5 percent. This was due to increased competition to the Hellenic Telecommunications Organization (OTE) which has been expanding its digital network and increasing revenues as a result. In the cellular companies sector the entrance of an OTE subsidiary has intensified competition with the other two established cellular phone companies (both foreign based).

Tourism: The tourist industry reported a strong recovery in 1998. According to Bank of Greece data, in the first nine months of 1998 overnight stays rose by 6.3 percent. Preliminary data for 1999 and 2000 indicate an increase in tourist arrivals and bookings but less than anticipated due to Yugoslav conflict. The 2004 Olympics will dramatically increase tourism and business travel between now and then.

The near-term outlook points to continued strong growth, with domestic demand benefiting from the euro-entry related easing of monetary conditions. Moreover, investment demand should continue to respond favorably to the stable macroeconomic environment. The staff projects GDP growth of around 4 percent in 2001, with downside risks mostly related to the external environment (a more marked economic slowdown in partner countries or a sharp appreciation of the euro). On the other hand, growth could be higher than projected should domestic demand

respond more strongly to past interest rate declines. Inflation prospects depend critically on the second round effects of earlier import price increases (including for energy); these could lead to only a gradual reversal of inflation rates from current levels.

Investment Climate

Import Climate

Greeks are very receptive to U.S. made products. They have historically regarded the United States as the world's leader in technology, and look to U.S. firms for innovative products and equipment. U.S. energy related machinery and equipment are known in Greece for high quality and durability and enjoy an excellent reputation. Consequently, there are opportunities for U.S. firms interested in technical/joint venture collaboration to produce either finished products or parts in Greece. U.S. firms adopting such an approach will have the best prospects for enhancing their market share.

There are no restrictions or non-tariff barriers on imports of EPS and REQ machinery and equipment. As a full member of the EU, Greece applies the common EU external tariff schedule on products imported from non-EU countries. All products, regardless of origin, (foreign and domestic), are subject to the Value Added Tax (VAT). The VAT on non-EU products is applied to the total Cost, Insurance, and Freight (CIF) value plus the import duty. The VAT is 18% on food packaging machinery and equipment. Import duties for non-EU products are 3.5 percent.

Government controlled agencies and private sector buyers require all imported EPS and REQ machinery, equipment, accessories, and parts to conform to EU standards. This means that FPME being shipped into Greece must have a CE mark certificate and conform to the EU Regulations. UCL and TUV certificates are essential.

Financing

Credit and financing are important to the success of any import and distribution effort in Greece. In the year 2000, the Greek government liberalized the import payment process. Banks are now virtually free to finance imports as they see fit and to make payments in foreign exchange without approval from the Bank of Greece. The import payment process corresponds to that experienced in the rest of Europe, using cash against documents sight drafts, time drafts, and letters of credit. Greek banks have extensive correspondent relationships with U.S. banks. Citicorp, Bank of America, and American Express have offices in Athens.

U.S. exporters should be aware that letters of credit and drafts are very expensive for Greek importers. Greek banks usually require a cash equivalent on deposit before issuing any guarantees. In a country where working capital loans carry high interest rates, this creates a heavy economic burden for the importer. Therefore, Greek businesses often seek cash against documents, or extended credit terms of 30-60 days or longer, from their suppliers. European companies routinely deal on this basis. U.S. suppliers, unfamiliar with the market, require more stringent payment terms, making U.S. products less competitive.

Incentive Policies

A number of laws govern Greek policy concerning investment activity, and establish a variety of financing mechanisms and incentives for investors in the public and private sectors.

The incentives provided include:

- Third Community Support Framework Funds for energy;
- Grants for new investments in energy and energy saving;
- Interest rate subsidies;
- Tax-free allowances;
- Extra depreciation rates;
- Lower social security contributions; and
- Favorable tax rates.

Law 2687/1953 on foreign capital investment and Law 1892/90, which replaced 1262/1982 for the stimulation of economic and regional development, have specific provisions for investments resulting in energy savings.

Regional Opportunities

Greece can offer excellent opportunities for U.S. companies to expand to other markets nearby such as Central and Eastern European countries, some Middle East countries and also Cyprus. Many Greek businesses have extensive experience doing business in these regions. Good prospects exist throughout the Balkans as a middle class develops. Greece, and especially the city of Thessaloniki in Northern Greece, offers a unique springboard into the surrounding markets of Southeastern Europe.

Greek Energy Industry Profile

Major energy projects funded by III CSF are:

Renewable Energy/Power

- The creation of a 100 kW photovoltaic park on the island of Gavdos in Southern Aegean Sea
- The construction of the following wind energy parks:
 - a) The island of Lesbos with a capacity of 2 MW;
 - b) The island of Crete with a capacity of 10 MW. (note the present installed capacity on this island is 24 MW); and
 - c) The islands of Kos and Leros with a capacity of 4 MW each.
- The construction of one 400-500 MW new combined cycle power plant near the northern/eastern border of Greece/Bulgaria and Turkey;
- The interconnection and upgrading of the Greek grid with the neighboring countries.

Natural Gas

- The construction and completion of the natural gas networks in the main cities of Greece;

- The construction of the undersea natural gas pipeline connecting Italy with Greece;
- The expansion of the natural gas pipeline to the eastern boarder of Greece and to Peloponnese.

Oil

- The modernization and expansion of the ELDA, Athens and EKO, Thessaloniki refineries;
- The construction of the Burgas, Bulgaria, Alexandroupolis, Greece oil pipeline.

Recently a large number of renewable energy projects were submitted to the PPC and RAE for approval. These projects are now being considered for authorization, so details are not currently available. Additional information will be provided at the PV Business Opportunity Seminar.

The electric power generation is disbursed throughout the numerous islands in the Aegean Sea. Nearly all of these islands use diesel engine generators and consequently represent a potential market for integration of PV power systems. A list of 37 island power systems, including their peak generating capacity and annual electricity production are tabulated below. In addition, a second table lists the thermo electric power stations on the islands of Rhodes and Crete. Although these data are several years old it is considered to be reasonably accurate today.

1999 Production Data

A/A	Island	Production KWh	Peak KW
1	Agathonissi	278,440	95
2	Agios Efstratios	755,223	220
3	Amorgos	6,295,090	2,190
4	Anafi	808,990	340
5	Andros	32,613,549	9,300
6	Antikythira	96,436	38
7	Astypalea	3,818,455	1,350
8	Donoussa	283,945	150
9	Ereikousa	407,743	195
10	Zakynthos		
11	Thira (Santorinis)	67,122,166	22,700
12	Ikaria	18,589,697	5,400
13		12,582,860	4,380
14	Kagnnos-Kos	217,823,998	57,300
15	Karapathos – Kasos	24,389,377	6,600
16	Kea		
17	Cephalonia		
18	Kythnos	5,215,830	1,960
19	Kos		
20	Lesvos	209,733,280	45,700
21	Lemnos	47,129,645	11,700
22	Megisti	1,239,107	320
23	Mylos	23,911,697	5,970
24	Mykonos	51,802,470	17,500
25	Nissyros		
26	Othoni	497,850	240
27	Paros	117,512,912	36,000
28	Patmos	11,347,804	3,560
29	Samotarakis	7,098,328	2,400
30	Samos	99,371,853	24,400
31	Serifos	4,777,150	1,900
32	Sifnos	9,437,038	3,360
33	Skyros	12,402,860	3,750
34	Symi	7,813,640	1,950
35	Syros	85,116,928	18,700
36	Chios	136,333,732	29,800
37	Psarra		
	TOTAL	1,216,343,694	

Source: U.S. Embassy Athens – Commercial Section

Thermoelectric Power Stations of the Islands of Crete and Rhodes

Power Station	Total Capacity (MW)	Total Net Capacity (MW)	Energy Source	Year Built
CRETE				
Linoperamata I	1X6.2	6.1	Oil	1965
Linoperamata II	1X15	14.2	Oil	1971
Linoperamata III	1X15	14.2	Oil	1971
Linoperamata IV	1X25	23.3	Oil	1977
Linoperamata V	1X25	23.4	Oil	1981
Linoperamata VI	1X25	24.1	Oil	1981
Diesel Linop. I-IV	4X12.28	47.0	Oil	1989
Hania Turbine I	1X16.20	13.0	Diesel	1969
Hania Turbine II	1X12.5	11.0	Diesel	1976
Hania Turbine III	1X12.5	11.0	Diesel	1979
Hania Turbine IV	1X24	20.5	Diesel	1986
Hania Turbine V	1X36	30.1	Diesel	1987
Hania Turbine VI	2X45.5	86.6	Diesel	1992
RHODES				
Soronis I	1X15	14.5	Oil	1976
Soronis II	1X15	14.5	Oil	1976
AS. Rhodes Turbine I	1X12.5	10.0	Diesel	1971
AS. Rhodes Turbine II	1X12.5	10.0	Diesel	1974
Soronis Turbine I	1X24	20.6	Diesel	1986
Soronis Turbine I	1X36	24.0	Diesel	1989
AS. Rhodes Diesel	1X2.2	2.6	Diesel	1966
AS. Rhodes Diesel	1X3.3	1.9	Oil	1970
Soronis Diesel	2X12.28	23.5	Oil	1990
Source: U.S. Embassy Athens – Commercial Section				

The tourist industry represents a potentially large market for environmentally friendly and noiseless energy sources like PV. There are thousands of hotels and resorts in Greece that can be markets for PV systems. Roof mounted, sun shade and building facade integrated PV systems are considered to be the best near term options for development.



United States

U.S. Industry Profile

In 1839, a French physicist found that certain materials would produce small amounts of electric current when exposed to light. The first PV device to actually generate electric power was made of silicon at Bell Laboratories in 1954. The proportion of sunlight energy that those early cells converted to electrical energy was between 1% and 2%. The efficiency of today's best solar electric cells is about 32%. Efficiency is an important benchmark for PV technology, and it is theoretically possible for solar cells to operate at greater than 40% efficiency.

Commercial use of solar electric cells began in 1958, when the Vanguard 1 satellite carried PV cells to power a 5-milliwatt backup transmitter. Today, virtually all satellites and spacecraft use solar cells to generate their electrical power. Interest in making PV technology affordable for commercial (including industries) and residential use was sparked by rising energy costs in the mid-1970s. Since then, the federal government, working with universities and industry partners, has conducted an aggressive research and development (R&D) program to further develop this promising technology.

The production of a full range of PV technology has been increasing. Production of PV cells and modules increased 13 % from 1998 to 1999, and increased again by 23% from 1999 to 2000. The output from the leading U.S. manufacturers is summarized below.

US PV CELL/MODULE PRODUCTION By Company (MW)

Company	1998	1999	2000
Siemens Solar	20.00	22.20	28.00
BP Solar	15.90	18.00	20.47
Solec International	4.00	0.60	0.00
Advanced PV Systems	0.00	0.00	0.00
Astropower	7.00	12.00	18.00
USSC	2.20	3.00	3.00
ASE Americas	4.00	4.00	4.00
Other*	0.60	1.00	1.50
Total	53.70	60.80	74.97

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* Amonix, PVI, Iowa Thin Film, Midway Labs, Entech, EPV, Evergreen

Expanded use of solar electric systems depends on lowering the cost of systems while increasing production volume and ultimately reducing the cost of the energy they produce. System costs have declined as the U.S. industry has developed new, higher efficiency materials, improved manufacturing processes, and engineered greater reliability into all parts of the generating system. Annual increases in U.S. companies' module production capacity range from 15% to over 70% and reductions in module production costs exceed 35%. The leading U.S. PV cell/module production companies, equipment installers, industry organizations and consultants are listed in the Directory section of this Briefing Book.

U.S. Project Profiles

Project: Olney Elementary School Installation
Type: Grid Connected PV
Location: Olney, Maryland

Background: On March 27, 2000, the Maryland Energy Administration (MEA) and BP Amoco officially activated the first grid-connected PV system installed under the Maryland Solar Schools program. The system was dedicated at Olney Elementary School with the participation of students and faculty. Co-funded by BP Amoco and MEA, the Maryland Solar Schools Program seeks to install 1 kWp or larger PV systems on ten primary or secondary schools throughout Maryland. MEA and BP Amoco will fully fund six of the systems.

The primary purpose of the Maryland Solar Schools Program is to educate students about renewable energy resources. Under the program, MEA will assist interested schools with obtaining funding, finding the best available PV installers, and locating educational materials to comprise a curriculum package. BP Amoco, which joined MEA in sponsoring the program during October 1999, brings additional funding and a newly designed solar energy curriculum, which will be made available to classrooms throughout the state.

Olney Elementary School, the first solar school under the MEA and BP Amoco partnership, hosts an enhanced solar energy education program, due to the unique "Solar Cents" promotion held at Bobby Fletcher's Amoco station in Olney. On November 1, 1999 BP Amoco launched the "Solar Cents" campaign, which allowed customers of Fletcher's Amoco station to support the Olney Elementary School solar energy education program through their gasoline purchases. During that month BP Amoco donated a penny for every gallon of gasoline pumped at the station to the school's solar energy education program.

Bobby Fletcher's Amoco station was the first service station in the world to offset its regular electricity supply with thin-film solar modules. A total of 144 Solarex Millennia™ thin-film modules were installed on the station's canopy over the pumps, generating 6 kW of electricity, enough to replace fifteen percent of



the station's traditional electricity supply with solar generated electricity. At the grand opening ceremony for the solar-powered service station, BP Amoco announced its sponsorship of the solar education program in Maryland.

System Description: A 1 kW Solarex system, consisting of 24 Solarex Millennia™ photovoltaic panels, was flush mounted to the south side of Olney Elementary School's angled roof. Typically, most schools have flat roofs, in which case, additional supporting pieces would have been necessary for installing the PV system installation. Olney Elementary had the ideal, pitched, residential-style roof.

Additional system components include an Omnion inverter and wiring kits. As part of the educational component, the school also received a solar electric meter to monitor the electricity generated by the system and a hallway display board showing the total electricity generated by the project.

Installed Cost: The total installed project cost was \$10,112, including the system and installation costs. The total VASE-subsidized system cost, including modules and balance of system components, was \$6,000. The total installation cost, including labor, permits, electrical hookup, meter, and numerous site visits was \$4,112.

Contact: For additional information contact the Maryland Energy Administration at 1-800-72-ENERGY or Dan Larson, BP Amoco at 410-494-3741.

Project: Western Area Power Administration - Elverta Maintenance Facility
Type: Grid-Connected PV System
Location: Elverta, California

Background: The Western Area Power Administration is a Power Marketing Agency established in 1977 under the Department of Energy Organization Act. It markets and transmits more than 10,000 mega-watts of electric power, primarily from the hydroelectric assets previously managed by the Bureau of Reclamation. It serves 638 wholesale customers in 15 western states from 56 power plants, 16,857 miles of high voltage transmission lines and 258 substations.

In 1998, Western Area Power Administration (Western) installed a 38 kW PV system on its Elverta, California Maintenance Facility. The system is the culmination of a step by step process by Western to develop the knowledge and experience to implement PV projects on its own. Western's first PV project, a 3 kW building-integrated prototype system (Powerguard by Powerlight Corporation) was installed in 1994 at its Folsom, CA site. Western partnered with the Sacramento Municipal Utility District (SMUD), which provided the funding and technical expertise. Based on the success of the Folsom project, Western joined forces again with SMUD to submit a proposal for Round II of the Utility Photovoltaic Group (UPVG) TEAM-UP competition. The proposal, a 40 kW version of the 3 kW prototype Powerguard system at Folsom, was awarded a grant from the UPVG and installed in 1996 at Western's Elverta Maintenance Facility. SMUD and Western also provided funds. As with the Folsom project, Western collected data on the electrical performance of the PV modules as well as the thermal insulating attributes of the Powerguard system. These two projects enabled Western to leverage the financing and to learn from a recognized utility leader in photovoltaics. Based on the experience and confidence derived from partnering with SMUD, Western took the initiative to fully fund and implement the follow-on 38 kW project at Elverta. The combined 40 and 38 kW Powerguard systems completely cover the Elverta roof and are the largest application of its kind in the continental United States. Western is now sharing its PV experiences with its public utility customers and encouraging them to initiate their own PV programs.



System Description: The 38 kW Powerguard system consists of 762 Solarex Millennia PV modules (43 Watts each) and 264APS modules (22 Watts each). The PV system uses thin film amorphous silicon and produces 38kW peak DC. The DC output from the PV modules are converted to 96 volt AC by a Trace inverter. The output is raised to 480 volts by a 45 KVA transformer for direct connection to the building's service panel. In addition to replacing grid power, the system protects the roof membrane and provides two inches of installation board, equivalent to R10 insulation, which reduces the cooling and heating loads and,

thus, decreases energy consumption. The system generates 67,500 kWh/year and has a lifetime expectancy of 20 years.

Total installed cost: \$231,000

Direct Savings: \$9,900 annually

Contact: For additional information contact Bob Parkins, 916.353.4490 or Krishna Shah, 916.353.4483. E-mail: parkins or shah@wapa.gov. Website: <http://wapa.gov>.

Project: Channel Islands National Park PV installation
Type: Off-grid PV installation
Location: Santa Rosa Island, California

Background: Channel Islands National Park has a history of utilizing renewable energy to provide power and reduce fossil fuel consumption on the islands. Due to the proven ability of solar technologies to meet other island energy requirements, the decision to utilize solar energy for the new housing area was easy. Solar energy technologies are particularly well suited to the island, where diesel is expensive and risky to transport. On the islands, as in other non-grid applications, solar energy is the clear choice to provide power with minimal maintenance or intrusion and in a clean, quiet, non-resource depleting manner.

System Description: Santa Rosa Island is a 52,794 acre island off the Santa Barbara coast, 44 miles west of the Park headquarters in Ventura, California. It was incorporated in the Channel Islands National Park in 1980 and purchased by the National Park Service on December 29th, 1986. The park employee-housing site is located in a remote location on the island, which requires its own independent power systems. To provide energy to the housing facility, two off-grid 6.4 kW photovoltaic systems were installed in May 1998. (Four solar hot water systems were also installed in August 1988. See Channel Islands solar hot water case study). All of the system hardware was purchased through a General Services Administration contract. Siemens Solar of Camarillo, California provided the solar modules and mounting racks used in the project. The 116 SM55 modules are mounted on 13 SGM-8 mounts, which were installed on the rooftops of the adjacent garage structures. Applied Power of Lacy, Washington provided the balance-of-systems including the combiner boxes, batteries, and inverters. Applied Power obtained the Power Panels from Trace Engineering of Arlington, Washington. The SW5548 Power Panels deliver approximately 11 kW each. The Battery Storage Banks each consist of eight 6-volt batteries that are wired in series to 48 volts DC. Combined they provide 102 kWhrs of electrical storage for each system.

Each system has the potential to produce 35.2 kW of electricity daily and 12,848 kW annually. However, the actual (metered) consumption will be less. Once the batteries are fully charged and loads are provided for, excess electricity is shunted off. In the event that occasional fog prevents adequate power production, or power consumption demands increase, supplemental power could be generated by 300 watt wind chargers that take advantage of the excellent wind power conditions on the island.

Total Installed Cost: Each photovoltaic system cost \$65,758 for a total cost of \$131,516.

Optimum Maintenance Costs: Annual maintenance costs are under \$100 per system.

Direct Savings: Simple payback will occur in 6.5 years and discounted payback will occur in 8.5 years. The savings will equal \$36,000 in 10 years, \$116,000 in 15 years, \$166,000 in 20 years, and \$246,000 in 25 years.

Contact: Project Manager- Kent Bullard, Offshore Maintenance Supervisor, Channel Islands National Park, 1901 Spinnaker Drive, Ventura, CA 93001, kent_bullard@nps.gov 805-658-5745.



Project: Sholder Family Residence
Type: Solar Electric Back-Up System
Location: Evergreen, Colorado

Background: In March 1998, Public Service Company of Colorado filed a tariff with the Colorado Public Utilities Commission to install up to 200 net metered systems in Colorado by 2001, resulting in the creation of *Solarsource*[™], a solar electric program implemented by Altair Energy of Colorado. Officially announced in July 1998, the *Solarsource*[™] program provides Altair Energy and Public Service Co. of Colorado customers with the option of purchasing some or all of their power from the sun's energy by installing a photovoltaic system on or adjacent to their home or business. As of January 2000, Altair Energy had installed nearly 60 residential grid-connected systems in Colorado as a result of the partnership. The majority of customers who have participated in this program have chosen to include back-up power features on their grid-connected systems. Back-up systems, such as the one featured in this case study, provide energy to pre-selected appliances during utility outages. Altair Energy has found that back-up features add significant customer value to grid-tied solar electric systems.

System Description: This 7,000 square foot home features a 2.4 kilowatt electric back-up system comprised of 32 Siemens 75 watt crystalline modules that have been ground-mounted about 25 feet from the home. The system includes two Trace SW 5548 inverters and a battery bank, which stores electricity for use during power outages. Both the inverters and battery bank are stored in two compact cabinets located in the basement of the home. The system generates approximately 3,100 kWh of electricity per year, meeting about one-quarter of the family's household electric needs.

The system is net metered, sending excess power back into the utility grid. The home's electric meter runs backward when the system produces more electricity than is being used by the house, crediting the customer for this excess energy on his/her electric bill. If the home requires more energy than the PV system produces, it uses electricity from the utility grid.

This PV system has the added benefit of providing back-up power to the well pump, heat circulation pump, refrigerator, computer, selected lights and home security system during utility outages. Although the family has utility power, they live in a mountain community that is susceptible to frequent power outages as a result of lightning, wind, and snow storms.



Once power is restored, the system will resume its normal operation, producing electricity during the day to power appliances, selling excess power back to the utility, and recharging the battery bank for future power outages.

Total Installed Cost: approximately \$30,000.

Direct Saving: On average, the family's monthly electric bill is reduced by about 25 percent.

Project: New London Ledge Lighthouse
Type: Off-Grid PV
Location: New London, Connecticut

Background: The Coast Guard Civil Engineering Unit Providence has undertaken a project to solarize all off-shore lighthouses in the Northeast First District. One such lighthouse is the New London Ledge lighthouse off the coast of New London, Connecticut. The unusual aspect of this project was the limited available space on the catwalk of the lighthouse to install a low-profiled solar array system to satisfy the historicity factor as required by the State Historic Preservation Office.

Previously, the lighthouse had been connected to the utility grid via a 6081 foot long submarine cable running underwater from a utility pole in Groton, Connecticut to the offshore lighthouse. The primary voltage was 2400 volts, stepped down to 240/120V via a transformer. The Coast Guard has found and repair they require. In addition, the Coast Guard faced higher-than-normal utility bills that are associated with the high-voltage electrical service to offshore structures.

Since the lighthouse is no longer manned, substantially less power is needed for its operation. Therefore, solar power is a more logical source of primary and emergency power to meet the decreased electrical load.

System Description: The ideal position for the PV system - due south - was located on a corner of the square lighthouse. Therefore, to keep the profile as low to the deck as possible, the electrical engineer/solar designer decided to wrap the support structures around two corners. There was also a concern about loss of valuable sun hours. Two arrays of six 43-watt panels were placed on the due south corner, and one array of five 43-watt panels was placed on the southeast and southwest corners. The system had to be at least 800 watts in order to operate the primary system. In order to obtain 800 watts the engineer calculated they would need nineteen 43-watt high density panels if all the panels faced due south.



The system had to be at least 800 watts in order to operate the primary system. In order to obtain 800 watts the engineer calculated they would need nineteen 43-watt high density panels if all the panels faced due south. Since the two arrays facing southwest and southeast would provide less power, twenty-two 43-watt panels were installed to operate the load. The overall potential output is approximately 847.1watts with the solar array at a 60 degree tilt.

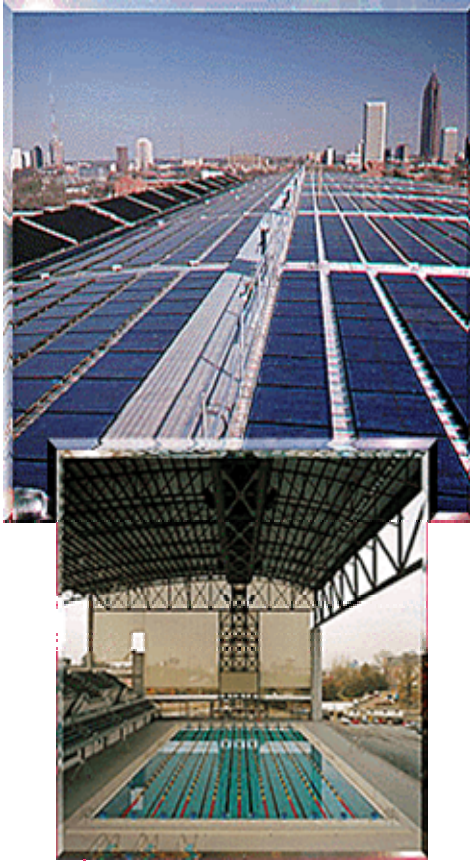
The emergency system consists of one 48-watt high-density solar panel wired directly to 10 NICAD 240 A-H (1.2 volt cells) batteries. The batteries are tied in series. During power loss or low voltage, the charge controller will switch over to auxiliary modes and the emergency batteries will operate a 300 mm optic as the emergency light (with flasher, 2.03 amp lamps, and 6-place lamp changer). Also operated from the emergency power is the fog detector and one FA-232 sound signal (½ mile horn).

Total Installed Cost: approximately \$50,000.

Savings: approximately \$15,000 per year.

Contact: For additional information contact Scott Arsenault, DT2 Electrical Engineer, (401) 736-1725.

Project: 1996 Olympic Games
Type: Grid-Connected PV System
Location: Atlanta, Georgia



Background: Photovoltaics played a vital role in the 1996 Olympic games. The PV modules installed on the roof of the main swimming facility, the Natatorium, provide 340 kW of peak electrical power, making it the world's largest installation of PV in buildings and reducing the demand on the local electricity grid. DOE worked with Georgia Institute of Technology, Roger Preston + Partners (who designed the system), and Solarex Corporation to implement this project.

System Description: There is also a unique PV system incorporated into the canopy over the entrance to the Natatorium. The canopy system consists of 18 Solarex 240, large-area ac modules (4.3 kW) and incorporates Advanced Energy Systems (AES) 250-W Module Integrated Inverters. The system was designed under contract to DOE with assistance from Solar Design Associates. The modules, made especially for the swimming facility, have a clear backing to allow light to pass through. The AES inverters incorporate built-in power tracking and built-in power-line carrier communications.



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Sponsors

AstroPower

Solar Park
461 Wyoming Road
Newark, Delaware 19716-2000
Phone: (302) 366-0400
Fax: (302) 366-6474

AstroPower produces solar cells from sheets of Silicon-Film™ material. This large-area sheet material is produced in a continuous manner that could be compatible with in-line processing. The company fabricated cells processed with an in-line, water-based cleaning system. It evaluated a prototype in-line chemical etching system to prepare the silicon surface prior to the diffusion step and to remove post-diffusion oxides. AstroPower designed and purchased an in-line diffusion-oxide etch system for processing Silicon-Film™ sheets. Continuous, in-line processing increases production speed and reduces costs. As a result AstroPower is the fastest growth in production since 1999.

BP Solar

630 Solarex Court
Frederick, Maryland 21703
Phone: (301) 698-4200
Fax: (301) 698-4201

BP Solar is working to reduce the costs of producing its polycrystalline silicon PV modules and to increase the capacity of its manufacturing plant. The company is using an optimized wire-saw process and has incorporated the recycling of SiC and oil. BP Solar has also begun environmental testing of the cells resulting from a new ultrasonic doper and a silicon-nitride deposition system. The company is developing new methods for detecting cracks in wafers and finished cells, to reduce the cost of consumables and speed up methods for in-line, nondestructive testing of cell interconnects.

First Solar

6720 North Scottsdale Road, Suite 355
Scottsdale, Arizona 85253
Phone: (408) 607-4961
Fax: (408) 596-3410

First Solar continues its work on its CdTe thin-film module manufacturing processes that have the potential for producing up 100 MW annually in their new plant in Toledo, Ohio. The company adopted a new UL-listed mounting method and developed a new “cord-plate” contact termination method, replacing potted polyurethane termination “pigtails.” Improved module lamination process and high-throughput finishing are used in the First Solar production line. Another production-line improvement is an automated, single-laser scribing system that is up to 10 times faster and shows a 15-fold improvement in registration of consecutive laser-scribe lines over existing systems. First Solar’s improved modules passed UL 1703 qualification testing.

Siemens Solar

4650 Adohr Lane
Camarillo, California 93012
Phone: (800) 947-6527 (U.S.)
(805) 482-6800
Fax: (805) 388-6395

Siemens Solar PV modules are made with Czochralski crystalline silicon. The company is working to produce solar cells that are thinner and larger in surface area and that have back-surface field processes to increase efficiency. These changes reduce module-manufacturing costs by 30%. To produce the new 17%-efficient thin cells, the company has developed a pilot crystal-growth process for silicon ingots, which are sliced into 150-micron-thick wafers and then processed into 125-micron-thick cells. Siemens has also developed a pilot process for fabricating the thin cells so that they have a back-surface field. The company demonstrated prototype 125-micron-thick cells that were 16.5% efficient. To produce larger-area cells, Siemens grew a 200-mm-diameter ingot and developed a new process for fabricating these cells.

PowerLight

P.O. Box 354

Crosswicks, New Jersey 08515

Phone: (609) 291-7490

Fax: (609) 291-7491

PowerLight Corporation produces Power- Guard® tiles for rooftop solar electric systems. The company's process mounts PV modules (crystalline silicon or thin-film) on 3-inch-thick boards of extruded polystyrene foam covered with a cement-like coating. In FY 2000, Power- Light increased production from 200 to 400 tiles per day. The company improved handling and application of the cement coating by designing a new hopper that included pneumatic mixing, easy cleaning, and an electronic motion-control circuit, and it eliminated the need to handle laminates twice by integrating a spacer attachment process into the production line. Other improvements include incorporating electronic sensors to monitor and control steps in the process line, better edge trimmers, and a better hydraulic tool for moving finished tiles to pallets for shipment. In FY 2000, the company estimated an overall cost reduction per board foot of tile of nearly 60% compared with costs in 1999. PowerLight has increased production capacity from 5 MW to 20 MW per year.

Princeton Energy Resources International

1700 Rockville Pike, Suite 550

Rockville, Maryland 20852

Phone: (301) 881-0650

Fax: (301) 230-1232



Directory of U.S. Photovoltaic Industry

U.S. PV Module Manufacturers

ASE Americas, Inc.
4 Suburban Park Drive
Billerica, Massachusetts 01821
Phone: (978) 667-5900
Fax: (978) 663-2868
email: sales@asepv.com
Internet: <http://www.asepv.com>
Products: modules, crystalline EFG ribbon silicon cells, laminated cell circuits

AstroPower, Inc.
Solar Park
461 Wyoming Road
Newark, Delaware 19716-2000
Phone: (302) 366-0400
Fax: (302) 366-6474
email: sales@astropower.com
Internet: <http://www.astropower.com>
Products: modules, multicrystalline silicon

Atlantis Energy, Inc.
4610 Northgate Blvd. #150
Sacramento, California 95834
Phone: (916) 920-9500
Fax: (916) 927-1697
email: info@atlantisenergy.com
Internet: <http://www.atlantisenergy.com>
Products: modules

BP Solar
P.O. Box 4587
Houston, Texas 77210-4587
Phone: (707) 428-7800
Fax: (707) 428-7878
email: solarusa@bp.com
Internet: <http://www.bpsolar.com>
Products: modules, crystalline silicon

BP Solar
630 Solarex Court
Frederick, Maryland 21701
Phone: (301) 698-4200
email: info@solarex.com
Internet: <http://www.solarex.com>
Products: modules, crystalline silicon, amorphous silicon

Carrizo Solar Corporation
1320 12th St. NW
Albuquerque, New Mexico 87104
Phone: (505) 764-0345
Fax: (505) 242-7684

Crystal Systems, Inc.
27 Congress Street
Salem, Massachusetts, 01970-5597
Phone: (978) 745-0088
Fax: (978) 744-5059
Email: chandra@crystalsystems.com
Internet: <http://www.crystalsystems.com>
Products: multicrystalline-silicon ingot production

Ebara Solar, Inc.
811 Route 51 South
Large, Pennsylvania 15025
Phone: (412) 382-1254
Fax: (412) 382-1251
Products: modules, crystalline, dendritic web silicon

Energy Conversion Devices
1675 West Maple Road
Troy, Michigan 48084
Phone: (248) 280-1900
Fax: (248) 280-1456
email: michelle@ovonic.com
Internet: <http://ovonic.com>
Products: (through United Solar Systems Corp.) modules, amorphous silicon roll-to-roll process

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Energy Photovoltaics, Inc.
P.O. Box 7456
Princeton, New Jersey 08543
Phone: (609) 587-3000
Fax: (609) 587-5355
email: info@epv.net
Internet: <http://www.epv.net>
Products: modules, copper indium diselenide

ENTECH, Inc.
1077 Chisolm Trail
Keller, Texas 76248
Phone: (817) 379-0100
Fax: (817) 379-0300
email: marketing@entechsolar.com
Internet: <http://www.entechsolar.com>
Products: linear concentrating Fresnel lens modules

Evergreen Solar, Inc.
259 Cedar Hill St.
Marlboro, Massachusetts 01752
Phone: (508) 357-2221
Fax: (508) 357-2278
Email: info@evergreensolar.com
Internet: <http://www.evergreensolar.com>
Products: modules

First Solar
6720 North Scottsdale Road
Suite 285
Scottsdale, AZ 85253
Phone: (480) 607-5221
Fax: (480) 607-3882
Email: fsinfo@firstsolar.com
Internet: <http://www.firstsolar.com>

Global Solar Energy, L.L.C.
12407 W. 49th Ave.
Wheat Ridge, Colorado 80033
Phone: (303) 420-1141
Fax: (303) 420-1551
Email: jarmstrong@globalsolar.com
Internet: <http://www.globalsolar.com>
Products: thin-film modules, copper indium diselenide

Hoxan America Inc.
One Centennial Plaza, #3F
Piscataway, New Jersey 08854
Phone: (908) 980-0777
Fax: (908) 980-0488
Products: modules, crystalline silicon

International Solar Electric Technology, Inc.
8635 Aviation Blvd., Unit E
Inglewood, California 90301
Phone: (310) 216-1423
Phone: (310) 216-4427
Fax: (310) 216-2908

Iowa Thin Film Technologies
2501 North Loop Dr.
Ames, Iowa 50010
Phone: (515) 294-7005
Fax: (515) 292-1922
Internet: <http://www.iowathinfilm.com>
Products: flexible thin-film amorphous-silicon modules

Keep It Simple Systems
32 S. Ewing, Suite 330
Helena, Montana 59601
Phone-Sales: (800) 327-6882
Phone-Service: (406) 442-3434
Fax: (406) 449-8946
email: solarinfo@wildwestweb.com
Internet: <http://wildwestweb.com>
Products: specialty modules for powering and charging computers

Kyocera America, Inc.
8611 Balboa Avenue
San Diego, California 92123
Phone: (858) 576-2600
Fax: (858) 569-9412
email: kajcorp@kyocera.com
Internet: <http://www.kyocera.com>
Products: modules: crystalline silicon

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Kyocera Solar, Inc.
7812 E. Acoma Dr.
Scottsdale, Arizona 85260
Phone: (800) 223-9580
Fax: (800) 223-9086
email: info@kyocerasolar.com
Internet: <http://www.kyocerasolar.com>
Specialty: Clean power generation through
the engineered application of PV technology

Materials Research Group
12441 W. 49th Ave.
Wheat Ridge, Colorado 80033
Phone: (303) 425-6688
Fax: (303) 425-6562
email: jmpilmanis@aol.com
Products: deposition systems for
manufacturing

Midway Labs Inc.
350 N. Ogden
Chicago, Illinois 60607
Phone: (312) 432-1796
Fax: (312) 432-1797
email: midway@megsinet.net
Internet: <http://www.megsinet.com/midway>
Products: concentrators

NEPCCO Environmental Systems
2140-100 N.E. 36th Ave.
Ocala, Florida 34470
Phone: (352) 867-7482
Fax: (352) 867-1320
email: jsreese@nepcco.com
Internet: <http://www.nepcco.com>
Products: low-concentrating systems

Photovoltaics International, LLC
3500 Thomas Rd., Suite E
Santa Clara, California 95054
Phone: (408) 986-9231
Fax: (408) 986-9233
Products: modules

Siemens Solar Industries
4650 Adohr Lane
Camarillo, California 93010
Phone: (805) 777-8466
Fax: (805) 388-6395
email: ssi.sales@siemenssolar.com
Internet: <http://www.siemenssolar.com>
Products: modules, crystalline silicon

Solar Cells, Inc.
1702 N. Westwood Ave.
Toledo, Ohio 43607
Phone: (419) 534-3377
Fax: (419) 534-2794
Products: modules, cadmium telluride

Solardyne Corporation
20 South Main St.
Gainesville, Florida 32601
Phone: (352) 372-0333
Fax: (352) 373-1653
Products: modules

Solec International Inc.
12533 Chadron Avenue
Hawthorne, California 90250
Phone: (310) 970-0065
Fax: (310) 970-1065
Products: modules, crystalline silicon

Spectrolab, Inc.
12500 Gladstone Avenue
Sylmar, California 91342
Phone: (818) 365-4611
Fax: (818) 361-5102
Internet: <http://spectrolab.com>
Products: modules, gallium arsenide

Spire Corporation
One Patriots Parks
Bedford, Massachusetts 01730-2369
Phone: (781) 275-6000
Fax: (781) 275-7470
email: email@spirecorp.com
Internet: <http://www.spirecorp.com>
Products: manufacturing equipment

SunCat Solar
17626 N. 33rd Pl.
Phoenix, Arizona 85032
Phone: (602) 404-4929
Fax: (602) 404-4929
email: AHMChuzel@aol.com
Internet: <http://www.users.uswest.net/~tkreider>
Products: Custom solar panels, module manufacturing equipment, solar testing equipment, composite material manufacturing

TECSTAR Inc.
15251 Don Julian Rd.
City of Industry, California 91745-1002
Phone: (626) 934-6500
Toll free: (888) 832-7827
Fax: (626) 336-8694
email: info@tecstar.com
Internet: <http://www.tecstar.com>
Products: high efficiency modules, cascade space cells

United Solar Systems Corp.
1100 West Maple Road
Troy, Michigan 48084
Phone: (248) 362-3120
Fax: (248) 362-4170
email: info@uni-solar.com
Internet:
<http://www.ovonic.com/unisolar.html>
Products: modules, thin-film amorphous silicon

Utility Power Group, SECO Company
9410-G DeSoto Ave.
Chatsworth, California 91311
Phone: (818) 700-1995
Fax: (818) 700-2518
email: 71263.444@compuserve.com
Products: modules, thin-film amorphous silicon

U.S. PV System Designers and Installers

AAPS Alternative Power Systems
3612 Cheshire Ave. C
Arts and Crafts, California 92008
Phone: (877) 946-3786
Fax: (760) 434-3407
email: info@AAPSPower.COM
Internet: <http://WWW.AAPSPower.COM>
Specialty: system design, ISO 9000, net metering, remote-stand-alone power, computer power, B2B e-commerce

Abraham Solar Equipment
124 Creekside Place
Pagosa Springs, Colorado 81147
Phone: (800) 222-7242
Specialty: systems installation, distributor

AeroVironment, Inc.
222 E. Huntington Drive
Monrovia, California 91016
Phone: (626) 357-9983
Fax: (626) 357-9628
email: solar@aerovironment.com
Internet: <http://www.aerovironment.com>
Specialty: systems design

Altair Energy, LLC
600 Corporate Circle, Suite M
Golden, Colorado 80401
Phone: (303) 277-0025, (800) 836-8951
Fax: (303) 277-0029
email: info@altairenergy.com
Internet: <http://altairenergy.com>
Specialty: on- and off-grid, turn-key PV systems for homes, businesses and schools (schools include data monitoring)

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Alternative Energy Engineering P.O. Box
339-PV
Redway, California 95560
Phone/order line: (800) 777-6609
Phone/techline: (707) 923-7216
Internet: <http://www.asis.com/aee>
Specialty: systems design, installation,
distributor

American Photovoltaic Homes and Farms,
Inc.
5951 Riverdale Ave.
Riverdale, New York 10471
Phone: (718) 548-0428
Specialty: systems design and construction
PV-integrated homes and buildings

Amonix
3425 Fujita St.
Torrance, California 90505
Phone: (310) 325-8091
Fax: (310) 325-0771
email: dave@amonix.com
Internet: <http://www.amonix.com>
Specialty: concentrators, utility, remote, and
stand alone

Applied Power Corporation
1210 Homann Dr., SE
Lacey, Washington 98503
Phone: (360) 438-2110
Fax: (360) 438-2115
email: APCTJB@aol.com
Internet: <http://www.appliedpower.com>
Specialty: systems design

Ascension Technology, Inc.
235 Bear Hill Road
Waltham, Massachusetts 02451
Phone: (781) 890-8844
Fax: (781) 890-2050
email: info@ascensontech.com
Internet: <http://www.ascensontech.com>
Specialty: systems design and balance of
systems

Atlantic Solar Products, Inc.
P.O. Box 70060
Baltimore, Maryland 21237
Phone: (410) 686-2500
Fax: (410) 686-6221
Email: mail@atlanticsolar.com
Internet: <http://www.atlanticsolar.com>
Specialty: systems design and integration

Atlantis Energy, Inc.
4610 Northgate Blvd. #150
Sacramento, California 95834
Phone: (916) 920-9500
Fax: (916) 927-1697
email: info@atlantisenergy.com
Internet: <http://www.atlantisenergy.com>
Specialty: systems, modules

B.C. Solar
P.O. Box 1102
Post Falls, Idaho 82854
Phone: (208) 667-9608
Specialty: systems design, installation,
training

Backwoods Solar Electric Systems
8530 Rapid Lightning Creek Rd.
Sandpoint, Idaho 83864
Phone: (208) 263-4290
Fax: (208) 265-4788
Specialty: systems design, installation,
distributor

Big Frog Mountain Corporation
100 Cherokee Boulevard Suite 321
Chattanooga, TN 37405
Phone: (877) 232-1580 toll free in U.S.
Phone: (423) 265-0307
Fax: (423) 265-9030
Email: sales@BigFrogMountain.com
Internet: <http://www.bigfrogmountain.com>
Specialty: residential and remote power
systems, systems for monitoring devices,
back-up power supplies, water pumping

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C-RAN Corporation
666 4th Street
Largo, Florida 34640
Phone: (813) 585-3850
Fax: (813) 586-1777
Internet: <http://www.scild.com/web/cran>
Specialty: water purification, lighting,
security systems design

CEM Design
520 Anderson Avenue
Rockville, Maryland 20850
Phone: (301) 294-0682
Fax: (301) 762-3128
Specialty: systems design, architecture

California Solar
675 Greenwich Drive
Thousand Oaks, California 91360
Phone: (805) 379-3113
Fax: (805) 287-3027
email: CaSolar@aol.com
Internet: <http://www.californiasolar.com>
Specialty: systems design

Communications International, Inc.
P.O. Box 80063
Ontario, California 91758
Phone: (909) 628-6440
Fax: (909) 628-6440
email: jclothi@ibm.net
Internet:
<http://www.globalpac.com/cisolar/cisolar.htm>
Specialty: power systems, pool heating,
lighting, battery chargers, inverters

Currin Corporation
P.O. Box 1191
Midland, Michigan 48641-1191
Phone: (517) 835-7387
Fax: (517) 835-7395
Specialty: systems design, installation

Dankoff Solar Products, Inc.
New Mexico
Phone: (505) 820-6611
Fax: (505) 820-3160
email: sunrise@danksolar.com
Specialty: systems design, installation,
distributor

Direct Gain, LLC
23 Coxing Road
Cottkill, New York 12419
Phone: (914) 687-2406
Fax: (914) 687-2408
Specialty: systems design, installation

Direct Power and Water Corporation
3455-A Princeton NE
Albuquerque, New Mexico 87107
Phone: (505) 889-3585
Fax: (505) 889-3548
Specialty: systems design, installation

ECS Solar Energy Systems
6120 SW 13th Street
Gainesville, Florida 32608
Phone: (904) 377-8866
Fax: (904) 338-0056
Specialty: systems packaging, modular power
stations

Eclectic Electric
127 Avenida del Monte
Sandia Park, New Mexico 87047
Phone: (505) 281-9538
Specialty: systems design, installation,
training

Ehlert Electric and Construction
HCR 62, Box 70
Cotulla, Texas 78014-9708
Phone: (210) 879-2205
Fax: (210) 965-3010
Specialty: pumping systems design,
installation

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ElectriSol Ltd.
1215 E. Harmont Dr.
Phoenix, Arizona 85020
Phone: (602) 997-6855
Fax: (602) 943-5842
Specialty: systems design and integration

Electro Solar Products, Inc.
502 Ives Place
Pensacola, Florida 32514
Phone: (904) 479-2191
Fax: (904) 857-0070
Specialty: systems design, traffic control,
lighting, pumping

Electron Connection
P.O. Box 203
Hornbrook, California 96044
Phone/Fax: (530) 475-3401
Toll free: (800) 945-7587
email: econnect@snowcrest.net
Internet: <http://www.snowcrest.net/econnect>
Specialty: system design, installation,
distributor

Endecon Engineering
347 Norris Court
San Ramon, CA 94583
Phone: (925) 552-1330
Fax: (925) 552-1333
email: chuckw@endecon.com
Internet: <http://www.endecon.com>

Energy Management Corporation
2525 Tiller Lane
Columbus, Ohio 43231
Phone: (614) 895-9035
Fax: (614) 895-8643
email: chris@energymgtcorp.com
Internet: <http://www.energymgtcorp.com>
Specialty: sales, design, and installation;
portable and hybrid systems for home and
business; community development
(residential and school)

Energy Outfitters
136 S. Redwood Highway.
P.O. Box 1888
Cave Junction, Oregon 87523
Phone: (800) 467-6527 (GO-SOLAR)
Office phone: (541) 592-6903
Fax: (541) 592-6747
Internet: <http://www.energyoutfitters.com>
Specialty: systems design, integration

Energy Photovoltaics, Inc.
P.O. Box 7456
Princeton, New Jersey 08543
Phone: (609) 587-3000
Fax: (609) 587-5355
email: epv@pluto.njcc.com
Specialty: water pumping and lighting
systems

Energy Products and Services, Inc.
321 Little Grove Lane
Fort Myers, Florida 33917-3928
Phone: (941) 997-7669
Fax: (941) 997-8828
Specialty: systems design, integration,
training

Enersol Associates
1 Summer Street
Somerville, Massachusetts 02143
Phone: (617) 628-3550
Fax: (617) 623-5845
email: jasmith@igc.apc.org
Specialty: systems design, integration,
training

Enertron Consultants
418 Benvenue Avenue
Los Altos, California 94024
Phone: (415) 949-5719
Fax: (415) 948-3442
Specialty: systems design, building
integration

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ENTECH, Inc.
1077 Chisolm Trail
Keller, Texas 76248
Phone: (817) 379-0100
Fax: (817) 379-0300
email: marketing@entechsolar.com
Internet: <http://www.entechsolar.com>
Specialty: concentrating systems from 1 kW
to 100+ MW

ETA Engineering, Inc.
2010 E. University Dr., #11
Tempe, Arizona 85281
Phone: (480) 966-1380,
Toll free (877) 964-4188
Fax: (480) 966-1516
email: sales@etaengineering.com
Internet: <http://www.etaengineering.com>
Specialty: residential and commercial PV
system design and installation, OEM of PV
charge regulators and battery meters.
Complete PV engineering services.

Florida Solar Products, Inc.
1244 Bell Ave.
Fort Pierce, Florida 34982
Phone: (407) 464-2663
Fax: (407) 466-7937
Specialty: systems design and installation

Fowler Solar Electric
226 Huntington Road, P.O. Box 435
Worthington, Massachusetts 01098
Phone: (800) 914-4131
Specialty: systems design, integration, book

Fran-Mar
9245 Babcock Road
Camden, New York 13316
Phone: (315) 245-3916
Fax: (315) 245-3916
Specialty: systems design, integration

Geosolar Energy Systems, Inc.
3401 N. Federal Highway, Suite 100
Boca Raton, Florida 33431
Phone: (561) 218-3007
Fax: (561) 487-0821
email: abtahi@geosolar.com
Internet: <http://www.geosolar.com>
Specialty: systems design, integration

Glidden Construction
3727-4 Gregory Way
Santa Barbara, California 93105
Phone: (805) 966-5555
Fax: (805) 563-1878
Specialty: systems design, integration

Global Resource Options, LLP
4 Kibling Hill Road P.O. Box 51
Strafford, Vermont 05072
Phone: (802) 765-4632
Toll free: (800) 347-4494
Fax: (802) 765-9983
email: global@sover.net
Internet:
<http://www.globalresourceoptions.com>
Specialty: utility-tied and off-grid power
systems, products, appliances

Great Northern Solar
Route 1, Box 71
Port Wing, Wisconsin 54865
Phone: (715) 774-3374
email: gosolar@win.bright.net
Specialty: systems design, integration,
distributor

Hitney Solar Products, Inc.
2655 N. Highway 89in
Chino Valley, Arizona 86323
Phone: (520) 636-1001
Fax: (520) 636-1664
Specialty: systems design, integration

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Horizon Industries
2120 LW Mission Rd.
Escondido, California 92029
Phone: (888) 765-2766 (SOLAR NOW) toll-free
Fax: (619) 480-8322
Specialty: systems/product distributor, service

Hutton Communications
1775 MacLeod Drive
Lawrenceville, Georgia 30043
Phone: (770) 963-1380, (800) 741-3811
Fax: (770) 963-7796
email: admin@huttoncom.com
Internet: <http://www.huttoncom.com>
Specialty: systems design, integration

Innovative Power Systems, Inc.
2380 Wycliff St.
St. Paul, Minnesota 55114
Phone: (651) 647-0070
Specialty: solar and wind power systems design, sales, and service

Integrated Power Corporation
7618 Hayward Road
Frederick, Maryland 21702
Phone: (301) 663-8279
Fax: (301) 631-5199
Email: sales@integrated-power.com
Specialty: systems design, integration

Integrated Solar, Ltd.
1331 Conaut St., Suite 107
Maumee, Ohio 43537
Phone: (419) 893-8565
Fax: (419) 893-0006
email: is111@ix.netcom.com
Internet: <http://www.tpusa.com/isolar>
Specialty: systems design, large and small power systems

Inter-Island Solar Supply
761 Ahua St.
Honolulu, Hawaii 96819
Phone: (808) 523-0711
Fax: (808) 536-5586
Specialty: systems design, integration, distributor

IPC Photocomm
4585 McIntyre St.
Golden, Colorado 80403
Phone: (303) 271-7122
email: telecomm@goldengenesi.com
Internet: <http://www.ipcphotocomm.com>
Specialty: rural telephony, cathodic protection, system design and integration of industrial solar electric systems

Johnson Electric Ltd.
2210 Industrial Dr., P.O. Box 673
Montrose, Colorado 81402
Phone: (970) 249-0840
Fax: (970) 249-1248
Email: johnson@montrose.net
Specialty: systems design, integration, distributor

Kyocera Solar, Inc.
7812 E. Acoma Dr.
Scottsdale, Arizona 85260
Phone: (800) 223-9580
Fax: (800) 223-9086
email: info@kyocerasolar.com
Internet: <http://www.kyocerasolar.com>
Specialty: cathodic protection, communications, pumping, lighting, generators, refrigeration, electrical hardware/software, hybrid systems, system controls, concentrators, trackers/structures, batteries

GREEK PHOTOVOLTAIC ENERGY BUSINESS SEMINAR
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L&P Enterprise Solar Systems
P.O. Box 305
Lihue, Hawaii 96766
Phone: (808) 246-9111
Fax: (808) 246-3450
Specialty: systems design, integration

Leetzow Lighting Consultant
P.O. Box 990-C
Brandenton, Florida 34206
Phone: (941) 756-5666
Fax: (941) 751-5483
Specialty: lighting systems

M C Solar Engineering Corp.
1168 Aster Ave., Suite H
Sunnyvale, California 94087
Phone: (408) 261-1211
Fax: (408) 261-1342
email: pv@mcsolar.com
Internet: <http://www.mcsolar.com>
Specialty: grid-connected and stand-alone PV systems

Moonlight Solar
3320 Mount Zion Rd.
Blacksburg, Virginia 24060
Phone/Fax: (540) 953-1046
Internet: <http://www.moonlightsolar.com>
Specialty: systems design, integration, electric vehicles

NEPCCO Environmental Systems 2
140-100 N.E. 36th Ave.
Ocala, Florida 34470
Phone: (352) 867-7482
Fax: (352) 867-1320
email: jsreese@nepcco.com
Internet: <http://www.nepcco.com>
Specialty: remote systems design, integration

New World Power Corporation
1 North Wind Road
Waitsfield, Vermont 05673
Phone: (802) 496-2955
Fax: (802) 496-2953
email: info@nwvt.com
Internet: <http://www.nwvt.com>
Specialty: system integration, hybrid and remote systems

Northwest Energy Storage
6791 South Main, Suite C
Bonners Ferry, Idaho 83805
Phone: (800) 718-8816
Fax: (208) 267-3973
email: batteries@nwes.com
Internet: <http://www.nwes.com>
Specialty: systems design, integration, distributor

Off Line Independent Energy Systems
P.O. Box 231
North Fork, California 93643
Phone: (209) 877-7080
Fax: (209) 841-7001 email: ofln@aol.com br
Specialty: systems design, integration

Pacific Solar Company
C/O M. Walpert
2819 San Ardo Way
Belmont, California 94002
Phone: (650) 553-9450
Fax: (650) 556-9451
email: mwalpert@pacificsolar.com
Internet: <http://www.pacificsolar.com>
Specialty: grid-connected PV systems

Phasor Energy Company
4202 E. Evans Drive
Phoenix, Arizona 85032-5469
Phone: (602) 788-7619
Fax: (602) 404-1765
Specialty: systems design, integration

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Photon Technologies, Inc.
P.O. Box 790
Severna Park, Maryland 21146
Phone: (410) 544-0911
Fax: (410) 544-4075
email: photontek@aol.com
Internet:
<http://members.aol.com/photontek/photon/photon.html>
Specialty: charging systems for small electric appliances (phones, tools, toys, etc.)

Planetary Systems
P.O. Box 340,
262 Badger Rd.
Ennis, Montana 59729
Phone: (406) 682-5646
Fax: (406) 682-5644
email: brethorst@blissnet.com
Internet: <http://www.planetarysystems.com>
Specialty: systems design, integration, distributor

PowerLight Corporation
2954 San Pablo Ave.
Berkeley, California 94710
Phone: (510) 540-0550
Fax: (510) 540-0552
email: mail@powerlight.com
Internet: <http://www.powerlight.com>
Specialty: roofing systems, shade and tracking systems

Prairie Wind & Sun
P.O. Box 1296
Miles City, Montana 59301
Phone: (406) 232-4223
email: solarb@servco.com
Internet: <http://www.sunenergy.com>
Specialty: modules and power systems for large and small applications

PV-Design Pro
2511 S. Kihei Road
Kihei, Hawaii 96753
Phone: (808) 879-7880
Fax: (808) 879-5060
email: sales@mauisolarsoftware.com
Internet: <http://www.maui.net/~sandy/PV-DesignPro.html>
Specialty: PV software

Remote Power, Inc.
12301 North Grant Street, #230
Denver, Colorado 80241-3130
Phone: (800) 284-6978
Fax: (303) 452-9519
Specialty: systems design, integration

Renewable Energy Concepts, Inc.
1545 Higuera St.
San Louis Obispo, California 93401
Phone: (805) 545-9700
Fax: (805) 547-0496
email: info@reconcepts.com
Internet: <http://www.reconcepts.com>
Specialty: systems design (solar and wind turbines), installation, sales

Renewable Energy Services, Inc., of Hawaii
P.O. Box 278
Paauilo, Hawaii 96776
Phone: (808) 775-8052
Fax: (808) 7775-0852
email: res@ilhawaii.net
Internet: <http://www.renewableenergy.com>
Specialty: systems design, integration

Renewable Energy Works
290 Genesee St.
Avon, New York 14414
Phone: (712) 226-2920
email: renuabil@eznet.net
Specialty: system dealer, installer

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RGA, Inc.
454 Southlake Boulevard
Richmond, Virginia 233236
Phone: (804) 794-1592
Fax: (804) 379-1016
Specialty: lighting systems

SBT Automation dba SBT Designs
25840 IH-10 West #4
Boerne, Texas 78006
Phone: (210) 698-7109
Fax: (210) 698-7147
email: sbtdesigns@bigplanet.com
Internet: <http://www.sbt designs.com>
Specialty: System design, sales, installation, service

Sierra Solar Systems
09 Argall Way
Nevada City, California 95959
Phone: (530) 265-8441
Toll free: (800) 517-6527
Fax: (530) 265-6151
email: solarjon@oro.net
Internet: <http://www.sierrasolar.com>
Specialty: systems design, integration

Solar Depot
61 Paul Drive
San Rafael, California 94903
Phone: (415) 499-1333
Fax: (415) 499-0316
email: staff@solardepot.com
Internet: <http://www.solardepot.com>
Specialty: systems design, integration

Solar Design Associates
P.O. Box 242
Harvard, Massachusetts 01451
Phone: (978) 456-6855
Fax: (978) 456-3030
email: sda@solar design.com
Internet: <http://www.ultranet.com/~sda>
Specialty: systems design, building integration, architecture

Solar Electric Light Fund
1734 20th Street, NW
Washington, DC 20009
Phone: (202) 234-7265
Fax: (202) 328-9512
email: solarlight@self.org
Internet: <http://www.self.org>
Specialty: systems design, integration

Solar Electric Specialties Co.
101 N. Main St.
Willits, California 95490
Phone: (800) 344-2003
Fax: (707) 459-5132
email: seswillits@aol.com
Internet: <http://www.solarelectric.com>
Specialty: systems design, integration

Solar Electric Inc.
5555 Santa Fe St., #J
San Diego, California 92109
Phone: (800) 842-5678
Phone: (619) 581-0051 (collect)
Fax: (619) 581-6440
email: solar@cts.com
Internet: <http://www.solarelectricinc.com>
Specialty: systems design, integration, distributor

Solar Electric Systems of Kansas City
13700 W. 108th Street
Lenexa, Kansas 66215
Phone: (913) 338-1939
Fax: (913) 469-5522
email: 73173.452@compuserve.com
Internet:
<http://www.kansascity.com/solar/solar2.htm>
Specialty: lighting systems, OEM panels

Solar Energy Systems of Jacksonville
4533 Sunbeam Road, #302
Jacksonville, Florida 32257
Phone: (904) 731-2549
Fax: (904) 731-1847
Specialty: systems design, integration

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Solar Engineering and Contracting
P.O. Box 690
Lawai, Hawaii 96765
Phone: (808) 332-8890
Fax: (808) 332-8629
Specialty: systems design, integration

Solar Quest, Becker Electric
28706 New School Rd.
Nevada City, California 95959
Phone: (800) 959-6354
Phone: (916) 292-1725
Fax: (916) 292-1321
Specialty: systems design, integration, distributor

Solar Village Institute, Inc.
5840 Jewell Road
Graham, North Carolina 27253
Phone: (336) 376-9292
Toll free: (800) 376-9530
Fax: (336) 376-1809
Internet: <http://www.solarvillage.com>
Specialty: systems design, integration

Solo Power
1011-B Sawmill Road, NW
Albuquerque, New Mexico 87104
Phone: (505) 242-8340
Fax: (505) 243-5187
Specialty: systems design, integration

Southwest Photovoltaic Systems, Inc.
212 East Main Street
Tomball, Texas 77375
Phone: (713) 351-0031
Fax: (713) 351-8356
Specialty: systems design, integration

SPS Associates Ltd.
1250 N. Winchester, Suite C
Olathe, Kansas 66061
Phone: (913) 764-4460
Fax: (913) 764-6161
Specialty: custom panels

SunAmp Power Company
7825 E. Evans Rd., Suite 400
Scottsdale, Arizona 85260
Phone: (800) 677-6527 (MR SOLAR)
email: sunamp@goodnet.com
Specialty: systems design, integration, distributor

SunCat Solar
17626 N. 33rd Pl.
Phoenix, Arizona 85032
Phone: (602) 404-4929
Fax: (602) 404-4929
email: AHMChuzel@aol.com
Internet: <http://www.users.uswest.net/~tkreider>
Specialty: System design and testing, consulting, training
Products: custom solar panels, module manufacturing equipment, solar testing equipment, composite material manufacturing

Sundance Power Systems, Inc.
Rt. 3 Box 121A
Mars Hill, North Carolina 28754
Phone: (828) 689-2080
email: Earthfaith@aol.com
Products: modules, power systems

Sundance Solar Designs
P.O. Box 321
Placerille, Colorado 81430
Phone: (970) 728-3159
Fax: (970) 728-3159
email: solar@rmii.com
Specialty: systems design, integration

Sunelco
P.O. Box 1499 100 Skeels St.
Hamilton, Montana 59840
Phone: (800) 338-6844
Tech. assistance phone: (406) 363-6924
Fax: (406) 363-6046
email: sunelco@montana.com
Internet: <http://www.sunelco.com>
Specialty: systems design, integration

Sun Electronics International
511 NE 15th St.
Miami, Florida 33132
Phone: (305) 536-9917
Fax: (305) 371-2353
email: info@sunelec.com
Internet: <http://www.sunelec.com>
Specialty: system sizing/design, integration,
installation, custom manufacturing
Products: inverters, chargers, solar electric,
wind, hybrid, generators, cables, fuses, ups,
voltage regulators, energy efficient
lights/refrigerators

Sunlight Homes
902 Roma NW
Albuquerque, New Mexico 87102
Phone: (505) 856-5888
Fax: (505) 856-5777
email: sunlight@sunlighthomes.com
Internet: <http://www.sunlighthomes.com>
Specialty: passive solar home designs and
construction

Sun, Wind and Fire
7637 SW 33rd Avenue
Portland, Oregon 97219-1860
Phone: (503) 245-2661
Fax: (503) 245-0414
Specialty: systems design, integration

SunWize Technologies, Inc.
1155 Flatbush Road
Kingston, NY 12401
Phone: (800) 817-6527
Fax: (845) 336-0457
email: sunwize@besicorp.com
Internet: <http://www.sunwize.com>
Specialty: industrial system design and
manufacturing

Superior Solar Systems, Inc.
1302 Bennett Drive
Longwood, Florida 32750
Phone: (800) 478-7656
Fax: (407) 331-0305
Specialty: systems design, integration

Talmage Solar Engineering
18 Stone Rd.
Kennebunkport, Maine 04046
Phone: (888) 967-5945
Fax: (207) 967-5745
email: tse@talmagesolar.com
Internet: <http://www.talmagesolar.com>
Specialty: systems design, large and small
systems

Thomas Solarworks
P.O. Box 171
Wilmington, Illinois 60481
Phone: (815) 476-9208
Fax: (815) 476-2689
Specialty: systems design, integration

Tideland Signal Corporation
P.O. Box 52430
Houston, Texas 77052
Phone: (713) 681-6101
Fax: (713) 681-6233
Specialty: marine and navigational products
and systems

Utility Power Group
9410-H DeSoto Avenue
Chatsworth, California 91311
Phone: (818) 700-1995
Fax: (818) 700-2518
email: info@utilitypower.com
Internet: <http://www.utilitypower.com>
Specialty: utility grid-tied solar electric
systems, design and integration

Vermont Solar Engineering
P.O. Box 697
Burlington, Vermont 05402
Phone: (800) 286-1252
Phone: (800) 863-1202
Fax: (802) 863-7908
email: vtsolar1@together.net
Internet: <http://vtsolar.com> Specialty: sales of
modules, inverters, batteries, wind generators,
power systems

Whole Builders Cooperative
2928 Fifth Avenue, South
Minneapolis, Minnesota 55408-2412
Phone: (612) 824-6567
Fax: (612) 824-9387
Specialty: systems design, integration

**U.S. Companies for Balance-of-Systems
Components, Including Batteries**

3M Solar Optical Products
3M Center, 260-5S-15
St. Paul, Minnesota 55144
Phone: (612) 733-1898
Fax: (612) 736-3893
Products: Fresnel lenses for concentrating
systems

A.C.I.
P.O. Box 10463
Santa Ana, California 92711
Phone: (800) 245-1827
Products: inverters, switches, pumps

Abacus Controls Inc.
80 Reddington Rd.
Sommerville, New Jersey 08876
Phone: (908) 526-6010
Fax: (908) 526-6866
Products: inverters, sunverters, trimode, pump
controllers, max power trackers

Advanced Energy Systems
P.O. Box 262
Wilton, New York 03086
Phone: (603) 654-9322
Fax: (603) 654-9324
email: pwormser@advancedenergy.com
Internet: <http://www.advancedenergy.com>
Products: inverters, power electronics

AeroVironment, Inc.
222 E. Huntington Drive
Monrovia, California 91016
Phone: (626) 357-9983
Fax: (626) 357-9628
email: solar@aerovironment.com
Internet: <http://www.aerovironment.com>
Products: inverters

AFG Industries, Inc.
1400 Lincoln St.
Kingsport, Tennessee
Phone: (423) 229-7200
Toll free: (800) 251-0441
Fax: (423) 229-7459
email: scott_buchanan@afg.com
Internet: <http://www.afg.com>
Products: clear and solar glass

American SunCo
P.O. Box 789
Blue Hill, Maine 04614
Phone: (207) 374-5700
Fax: (207) 374-5100
Email: sunco@acadia.net
Internet: <http://www.acadia.net/sunco>
Products: trackers

Ananda Power Technologies, Inc.
14618 Tyler Foote Rd.
Nevada City, California 95959
Phone: (916) 292-3834
Fax: (916) 292-3330
email: jeffr@aptsolar.com
Internet: <http://www.aptsolar.com>

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Products: controllers, monitors, safety disconnects, safety switches, fuse blocks, battery indicators, integrated controls

Architectural Energy Corp.
2540 Frontier Ave., Suite 201
Boulder, Colorado 80301
Phone: (303) 444-4149
Fax: (303) 444-4303
email: AECinfo@aol.com
Products: portable data-acquisition systems and energy analysis, diagnostic/commissioning software

Array Technologies
3402 Stanford NE
Albuquerque, New Mexico 87107
Phone: (505) 881-7567
Fax: (505) 881-7572
Products: trackers (Wattsun)

Ascension Technology, Inc.
235 Bear Hill Rd.
Waltham, Massachusetts 02451
Phone: (781) 890-8844
Fax: (781) 890-2050
email: info@ascensiontech.com
Internet: <http://www.ascensiontech.com>
Products: source circuit protectors, roof jacks, street lighting system controllers

Atlantic Solar Products, Inc.
P.O. Box 70060
Baltimore, Maryland 21237
Phone: (410) 686-2500
Fax: (410) 686-6221
email: mail@atlanticsolar.com
Internet: <http://www.atlanticsolar.com>
Products: lead-acid battery de-sulfation controllers, mounting structures

AWS Scientific, Inc.
3 Washington Square Albany, New York
12205-5591
Phone: (518) 869-5637
Fax: (518) 869-5729

Products: measuring and monitoring devices

Bobier Electronics, Inc.
3701 Murdoch Ave.
Parkersburg, West Virginia 26101
Phone: (304) 485-7150
Fax: (304) 422-3931
email: solar@sunselector.com
Internet: <http://www.sunselector.com>
Products: inverter/residential digital power centers, small controls, pump controllers

Bogart Engineering
19020 Two Barr Road
Boulder Creek, California 95006
Phone: (408) 338-0616
Products: V/A/Ah battery system monitor

B.Z. Products
7614 Marion Ct.
St. Louis, Missouri 63143
Phone: (314) 644-2490
Fax: (314) 644-6121
email: frank9966@inlink.com
Products: PWM charge controllers

Concorde Battery Corporation
2009 San Bernardino Rd.
West Covina, California 91790
Phone: (818) 813-1234
Fax: (818) 338-3549
Internet: <http://www.xyt.com/concorde>
Products: batteries

Cone Construction/Solar Technologies
P.O. Box 52
Salida, Colorado 81201
Phone: (719) 530-0718
email: coneco@rmii.com
Products: battery box vent and back-draft dampers

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C-RAN Corporation
666 4th Street
Largo, Florida 34640
Phone: (813) 585-3850
Fax: (813) 586-1777
Internet: <http://www.scild.com/web/cran>
Products: controllers, light fixtures, ballasts,
battery chargers

Cruising Equipment Company
6315 Seaview Ave., NW
Seattle, Washington 98107
Phone: (206) 782-8100
Fax: (206) 782-4336
email: ceco@nwlinc.com
Internet: <http://www.cruisingequip.com>
Products: Ah meters, data loggers, kWh
meters, regulators

Direct Power and Water Corporation
3455-A Princeton NE
Albuquerque, New Mexico 87107
Phone: (505) 889-3585
Fax: (505) 889-3548
Products: mounting racks, battery/equipment
enclosures

East Penn Manufacturing Co., Inc.
Deka Rd.
Lyon Station, Pennsylvania 19536
Phone: (610) 682-6361
Fax: (610) 682-4781
Products: flooded and valve-regulated
batteries

ExelTech
2225 East Loop 820 North
Ft. Worth, Texas 76118-7101
Phone: (800) 886-4683
Phone: (817) 595-4969
Products: inverters

Exide Corp.
645 Penn St.
Reading, Pennsylvania 19601
Phone: (610) 378-0826
Fax: (610) 378-0748
Internet: <http://www.exideworld.com>
Products: batteries

Ferro Corporation
27 Castilian Dr.
Santa Barbara, California 93117
Phone: (805) 968-5000
Fax: (805) 968-8624
Internet: <http://www.ferro.com>
Products: thick film inks

Heart Interface
21440 68th Ave., S
Kent, Washington 98032
Phone: (253) 872-7225
Fax: (253) 796-7620
email: sales@heartinterface.com
Internet: <http://www.heartinterface.com>
Products: inverters, chargers

Heinz Solar
16575 Via Corto East
Desert Hot Springs, California 92240
Phone: (619) 251-6886
Fax: (619) 251-6886
Products: lighting systems design, integration

Heliotrope General
3733 Kenora Rd.
Spring Valley, California 91977
Phone: (800) 552-8838
Phone: (619) 460-3930
Fax: (619) 460-9211
email: heliotro@heliotro.com
Internet: <http://www.heliotro.com/heliotro>
Products: charge controllers, charging power
centers, low voltage disconnects

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Hydrocap
975 NW 95th St.
Miami, Florida 33150
Phone: (305) 696-2504
Products: automatic battery watering

Morningstar Corporation
1098 Washington Crossing Rd.
Washington Crossing, Pennsylvania 18977
Phone: (215) 321-4457
Fax: (215) 321-4458
email: info@morningstarcorp.com
Internet: <http://www.morningstarcorp.com>
Products: controllers

Omnion Power Engineering Corp.
P.O. Box 879
East Troy, Wisconsin 53120-0879
Phone: (262) 642-7200
Fax: (262) 642-7760
Internet: <http://www.omnion.com>
Products: inverters, controllers

Pacific Inverter
509 Granite View Lane
Spring Valley, California 91977
Phone: (619) 479-5938
Fax: (619) 479-1549
Products: utility cogeneration inverters

PVCAD, Inc.
1440 W. Meseto
Mesa, Arizona 85202
Phone: (602) 834-1622
Fax: (602) 835-8480
Products: PV system design software

PV-Design Pro
2511 S. Kihei Road
Kihei, Hawaii 96753
Phone: (808) 879-7880
Fax: (808) 879-5060
email: sales@mauisolarsoftware.com
Internet: <http://www.maui.net/~sandy/PV-DesignPro.html>
Specialty: PV software

RAE Storage Battery Company
51 Deming Rd., P.O. Box 8005
Berlin, Connecticut 06037
Phone: (860) 828-6007
Products: batteries

Simpler Solar Systems
3118 W. Tharpe St.
Tallahassee, Florida 32303
Phone: (904) 576-5271
Fax: (904) 576-5274
email: Simpler@SimplerSolar.com
Internet:
<http://www.SimplerSolar.com/simpler>
Products: design/pricing software

Solectria Corporation
33 Industrial Way
Wilmington, MA 01887
Phone: (978) 658-2231
Fax: (978) 658-3224
email: rajan@solectria.com
Internet: <http://www.solectria.com>
Products: 10-200 kW three-phase inverters,
DC/DC converters, 1-2 kW solar maximum
power trackers

Solar Pathfinder
25720 465th Ave., Dept. PV
Hartford, South Dakota 57033-6473
Phone/Fax: (605) 528-6473
email: solarpf@aol.com
Products: solar site assessment tool

Solo Power
1011-B Sawmill Road, NW
Albuquerque, New Mexico 87104
Phone: (505) 242-8340
Fax: (505) 243-5187
Products: trackers, racks, battery boxes

Southwest Photovoltaic Systems, Inc.
212 East Main Street
Tomball, Texas 77375
Phone: (713)351-0031
Toll free: (800) 899-7978
Fax: (713) 351-8356
Products: mounting racks, battery enclosures

Specialty Concepts, Inc.
8954 Mason Ave.
Chatsworth, California 91311
Phone: (818) 998-5238
Fax: (818) 998-5253
email: 102402.3243@compuserve.com
Internet: <http://www.wp.com/scinc>
Products: charge controllers and system electronics

Sun Selector
3701 Murdoch Ave., P.O. Box 1545
Parkersburg, West Virginia 26101
Phone: (304) 485-7150
Fax: (304) 422-3931
email: solar@sunselector.com
Internet: <http://www.sunselector.com>
Products: battery charge controller

Trace Engineering
5916 195th NE
Arlington, Washington 98223
Phone: (360) 435-8826
Fax: (360) 435-2229
email: inverters@traceengineering.com
Internet: <http://www.traceengineering.com>
Products: inverters

Trojan Battery Company
12380 Clark Street
Santa Fe Springs, California 96070
Phone: (800) 987-6526
Internet: <http://yesonline.com/trojan>
Products: batteries

UniRac
301 Solano Northeast
Albuquerque, New Mexico 87108
Phone: (505) 256-0907
Fax: (505) 254-8570
email: ems@nmia.com
Internet: <http://www.unirac.com>
Products: module mounting racks

Vanner Inc.
4282 Reynolds Dr.
Hilliard, Ohio 43026
Phone: (614) 771-2718
Fax: (614) 771-4904
email: pwrsales@vanner.com
Internet: <http://www.vanner.com>
Products: inverters, chargers

Zomeworks Corporation
P.O. Box 25805
Albuquerque, New Mexico 87125
Phone: (800) 279-6342
Fax: (505) 243-5187
Products: trackers

U.S. PV-Related Product Manufacturers & Suppliers

AAA Solar
2021 Zearing NW
Albuquerque, New Mexico 87104
Phone: (800) 245-0311
Fax: (505) 243-0885
email: aaasolar@rt66.com
Internet: <http://www.rt66.com/aaasolar>
Products: new and used systems, cabin and recreational vehicle charging

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AAPS Alternative Power Systems
3612 Cheshire Ave.
Carlsbad, California 92008
Phone: (877) 946-3786
Fax: (760) 434-3407
email: info@AAPSPower.COM
Internet: <http://WWW.AAPSPower.COM>
Products: photovoltaic panels and systems,
wind turbines, inverters, complete systems,
catalog

ADDCO
69 Empire Dr.
St. Paul, Minnesota 55103
Phone: (612) 224-8800
Fax: (612) 224-1411
Products: traffic control devices

A.C.I.
P.O. Box 10463
Santa Ana, California 92711
Phone: (800) 245-1827
Products: switches, pumps

AeroVironment, Inc.
222 E. Huntington Drive
Monrovia, California 91016
Phone: (818) 357-9983
Fax: (818) 359-9628
email: solar@aerovironment.com
Internet: <http://www.aerovironment.com>
Products: water pumping, battery charging
systems

AFG Industries, Inc.
1400 Lincoln St.
Kingsport, Tennessee 37664
Phone: (423) 229-7200
Fax: (423) 229-7319
email: scott_buchanan@afg.com
Internet: <http://www.afg.com>
Products: solar glass: solite, solatex

Alpan, Inc.
425-I Constitution Ave.
Camarillo, California 93012
Phone: (805) 383-8880
Fax: (805) 383-8890
Products: garden and security lighting, battery
charging systems

American Bicycle Security Co.
PO Box 7359
Ventura, California 93006-7359
Phone: (800) 245-3723
Fax: (805) 933-1865
email: turtle@ameribike.com
Internet: <http://www.ameribike.com>
Products: bike lockers and electric bike
charging stations using PV panels

Applied Power Corporation
1210 Homann Dr., SE
Lacey, Washington 98503
Phone: (360) 438-2110
Fax: (360) 438-2115
email: APCTJB@aol.com
Internet: <http://www.appliedpower.com>
Products: remote/portable pumping, and
communications systems

Ascension Technology, Inc.
P.O. Box 6314
Lincoln, Massachusetts 01773
Phone: (781) 890-8844
Fax: (781) 890-2050
email: info@ascensioitech.com
Internet: <http://www.ascensioitech.com>
Products: source circuit protectors, roof jacks,
street lighting system controllers

Atlantic Solar Products, Inc.
P.O. Box 70060
Baltimore, Maryland 21237
Phone: (410) 686-2500
Fax: (410) 686-6221
email: mail@atlanticsolar.com
Internet: <http://www.atlanticsolar.com>
Products: standard and portable power
systems for communications, water pumping,
lighting, security, remote, hybrid, recreational
vehicle, and marine and navigation

A.Y. McDonald
4800 Chavenelle Rd.
Dubuque, Iowa 52002
Phone: (319) 583-7311
Fax: (319) 588-0720
Products: water pumps

Bobier Electronics, Inc.
3701 Murdoch Ave.
Parkersburg, West Virginia 26101
Phone: (304) 485-7150
Fax: (304) 422-3931
email: solar@sunselector
Internet: <http://www.sunselector.com>
Products: residential digital power centers,
small controls, pump controllers

C-RAN Corporation
666 4th Street
Largo, Florida 34640
Phone: (813) 585-3850
Fax: (813) 586-1777
Internet: <http://www.scild.com/web/cran>
Products: portable systems for water
purification, lighting, security, message signs,
battery chargers

Cone Construction/Solar Technologies
P.O. Box 52
Salida, Colorado 81201
Phone: (719) 530-0718
email: coneco@rmii.com
Products: battery box vent and back-draft
dampers

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Currin Corporation
P.O. Box 1191
Midland, Michigan 48641-1191
Phone: (517) 835-7387
Fax: (517) 835-7395
Products: stand-alone/remote, lighting, and
water pumping systems

DC to Light
5825 N. Calle Tiburon
Tucson, Arizona 85704-1725
Phone/Fax: (520) 293-0031
Products: dc lighting

Delivered Solutions
P.O. Box 891240
Temecula, California 92589
Phone: (800) 429-7650
Phone: (909) 694-3820
Fax: (909) 699-6215
email: sunrise@danksolar.com
Products: miscellaneous PV products

Direct Power and Water Corporation
3455-A Princeton NE
Albuquerque, New Mexico 87107
Phone: (505) 889-3585
Fax: (505) 889-3548
Products: portable water pumping systems

DuPont Microcircuit Materials
14 TW Alexander Drive Research
Triangle Park, North Carolina 27709-3999
Phone: (919) 248-5216 Fax: (919) 248-5208
Internet: <http://www.dupont.com/mcm>
Products: thick film pastes

EcoMall
P.O. Box 20553
Cherokee Station New York, NY 10021
Phone: (212) 535-1876
Fax: (212) 535-4394
email: ecomall@ecomall.com
Internet: <http://www.ecomall.com>
Products: solar PV, hot water, lighting

Ehlert Electric and Construction
HCR 62, Box 70
Cotulla, Texas 78014-9708
Phone: (210) 879-2205
Fax: (210) 965-3010
Products: pumping systems

Electro Solar Products, Inc. 5
02 Ives Place Pensacola, Florida 32514
Phone: (904) 479-2191
Fax: (904) 857-0070
Products: traffic control, lighting, pumping
systems

ElectriSol Ltd.
1215 E. Harmont Dr.
Phoenix, Arizona 85020
Phone: (602) 997-6855
Fax: (602) 943-5842
Products: portable systems

Energy Conservation Technologies
8095 South Lake Circle
Granite Bay, California 95746-8132
Phone: (916) 791-4372
Fax: (916) 797-3022
email: rwp@quiknet.com
Internet: <http://www.polar-ply.com>
Products: Radiant barriers/roof decking,
reflective insulations

Energy Conversions Services
6120 SW 13th Street
Gainesville, Florida 32608
Phone: (904) 377-8866
Phone: (904) 338-0056
Products: portable, modular power stations
and pumping systems

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Energy Photovoltaics, Inc.
P.O. Box 7456
Princeton, New Jersey 08543
Phone: (609) 587-3000
Fax: (609) 587-5355
email: epv@pluto.njcc.com
Products: portable systems, water pumping,
lighting

Energy Products and Services, Inc.
321 Little Grove Lane
Fort Myers, Florida 33917-3928
Phone: (941) 997-7669
Fax: (941) 997-8828
Products: portable systems

Florida Solar Products, Inc.
1244 Bell Ave.
Fort Pierce, Florida 34982
Phone: (407) 464-2663
Fax: (407) 466-7937
Products: water pumping systems

GeoSolar Energy Systems
3401 N. Federal Highway
Boca Raton, Florida 33431
Phone: (561) 393-7127
Fax: (561) 487-0821
email: abtahi@geosolar.com
Internet: <http://www.geosolar.com>
Products: water pumping, street and security
lighting, home and remote power systems,
pool and water heating

Grundfos Pumps
2555 Clovis Ave.
Clovis, California 93612
Phone: (209) 292-8000
Fax: (209) 291-1357 Products: water pumps

Heart Interface
21440 68th Ave., S
Kent, Washington 98032
Phone: (206) 872-7225
Fax: (206) 872-3412
email: sales@heartinterface.com
Internet: <http://www.heartinterface.com>
Products: inverters, chargers

Heinz Solar
16575 Via Corto East
Desert Hot Springs, California 92240
Phone/Fax: (619) 251-6886
Products: lighting systems

Heliotrope General
3733 Kenora Rd.
Spring Valley, California 91977
Phone: (800) 552-8838
Phone: (619) 460-3930
Fax: (619) 460-9211
email: heliotro@heliotro.com
Internet: <http://www.heliotro.com/heliotro>
Products: charge controllers, charging power
centers, low voltage disconnects

Hitney Solar Products, Inc.
2655 N. Highway 89in
Chino Valley, Arizona 86323
Phone: (520) 636-1001
Fax: (520) 636-1664
Products: water pumping systems

Hydrocap
975 NW 95th St.
Miami, Florida 33150
Phone: (305) 696-2504
Products: automatic battery watering

Interplex Solar, Inc.
1003 W. Thomas St.
Arlington Heights, Illinois 60004-4547
Phone/Fax: (708) 392-1976
Products: barrier warning lights, highway
warning and regulatory signs

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Jade Mountain
P.O. Box 4616
Boulder, Colorado 80306
Phone: (800) 442-1972
Fax: (800) 449-8266
email: Jade-Mtn@indra.com
Internet: <http://www.jademountain.com>
Products: miscellaneous, catalogue

Keep It Simple Systems
32 S. Ewing, Suite 330
Helena, Montana 59601
Phone-Sales: (800) 327-6882
Phone-Service: (406) 442-3434
Fax: (406) 449-8946
email: solarinfo@wildwestweb.com
Internet: <http://wildwestweb.com>
Products: specialty modules for powering and charging computers

Low Keep Refrigeration Company
P.O. Box 409
Fennville, Michigan 49408
Phone: (616) 236-6179
Fax: (616) 236-6186
email: hinax@macatawa.org
Internet: <http://www.macatawa.org/~climax/lowkeep.html>

Maple State Battery
Sutton, Vermont 05867
Phone: (802) 467-3662
Products: batteries, miscellaneous systems/products

Midwest Conservation Systems, Inc.
435 NW Independence St.
Topeka, Kansas 66608
Phone: (800) 696-4509
Fax: (913) 232-3914
email: Mcsinc@parod.com
Products: lighting systems

Moonlight Solar
2932 Vicker Switch Rd.
Christiansburg, Virginia 24073
Phone/Fax: (540) 381-4971
Products: systems, electric vehicles

NEPCCO Environmental Systems
2140-100 N.E. 36th Ave.
Ocala, Florida 34470
Phone: (352) 867-7482
Fax: (352) 867-1320
email: jsreese@nepcco.com
Internet: <http://www.nepcco.com/enviro>
Products: environmental remediation systems, water pumping

Photocomm, Inc.
7681 E. Gray Rd.
Scottsdale, Arizona 85260-3469
Phone: (800) 223-9580
Phone: (602) 948-8003
Fax: (602) 483-6431
email: 72731.1235@compuserve.com
Internet: <http://www.photocomm.com>
Products: portable systems

Positive Energy Conservation Products
PO Box 7568
Boulder, Colorado 80306
Phone: (800) 488-4340
Fax: (800) 488-4340
email: diane@positive-energy.com
Internet: <http://www.positive-energy.com>
Products: ventilation fans and accessories, sealing and insulation products, compact fluorescents, set-back thermostats, water-purification and water-saving products, catalog

GREEK PHOTOVOLTAIC ENERGY BUSINESS SEMINAR
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PV-Design Pro
2511 S. Kihei Road
Kihei, Hawaii 96753
Phone: (808) 879-7880
Fax: (808) 879-5060
email: sales@mauisolarsoftware.com
Internet: <http://www.maui.net/~sandy/PV-DesignPro.html>
Products: PV software

Real Goods Trading Corporation
555 Leslie St.
Ukiah, California 95482-5507
Phone: (800) 762-7325
Fax: (707) 468-0301
email: realgood@well.com
Internet: <http://www.realgoods.com>
Products: miscellaneous, catalogue

Remote Power, Inc.
12301 North Grant Street, #230
Denver, Colorado 80241-3130
Phone: (800) 284-6978
Fax: (303) 452-9519
Products: portable systems

Renewable Energy Services, Inc., of Hawaii
P.O. Box 278
Paauilo, Hawaii 96776
Phone/Fax: (808) 775-0852
email: res@ilhawaii.net
Internet: <http://www.renewableenergy.com>
Products: portable systems

RGA, Inc.
454 Southlake Boulevard
Richmond, Virginia 233236
Phone: (804) 794-1592
Fax: (804) 379-1016
Products: lighting systems

SBT Automation dba SBT Designs
25840 IH-10 West #4
Boerne, Texas 78006
Phone: (210) 698-7109
Fax: (210) 698-7147
email: sbtdesigns@bigplanet.com
Internet: <http://www.sbt designs.com>
Products: Electronic automatic control, structured wiring and solar consumer products and systems

Shurflo Pumps
12650 Westminster Ave.
Santa Ana, California 92706
Phone: (714) 554-7709
Phone: (800) 854-3218
Fax: (714) 554-4721
email: literature@shurflo.com
Internet: <http://www.shurflo.com>
Products: water pumps

Simpler Solar Systems
3118 W. Tharpe St.
Tallahassee, Florida 32303
Phone: (850) 576-5271
Fax: (850) 576-5274
email: Simpler@SimplerSolar.com
Internet: <http://www.SimplerSolar.com/simpler>
Products: design/pricing software

Solar Beacons, Inc.
P.O. Box 4616
Boulder, Colorado 80306
Phone: (800) 442-1972
Fax: (303) 449-8266
Products: warning beacons

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Solar Depot
61 Paul Drive
San Rafael, California 94903
Phone: (415) 499-1333
Fax: (415) 499-0316
email: staff@solardepot.com
Internet: <http://www.solardepot.com>
Products: turn-key residential and commercial systems, pre-assembled PV systems

Solar Dynamics, Inc.
P.O. Box 651
Ottumwa, Iowa 52501
Phone: (515) 683-1834
Fax: (515) 683-3031
Products: ventillation fans, battery charging for recreational vehicles

Solar Electric Specialties Co.
P.O. Box 537
Willits, California 95490
Phone: (800) 344-2003
Fax: (707) 459-5132
email: seswillits@aol.com
Internet: <http://www.solarelectric.com>
Products: portable systems, water pumping

Solar Electric Systems of Kansas City
13700 W. 108th Street
Lenexa, Kansas 66215
Phone: (913) 338-1939
Fax: (913) 469-5522
email: 73173.452@compuserve.com
Internet:
<http://www.kansascity.com/solar/solar2.ht>
Products: beacons, lighting systems

Solarjack
325 E. Main Street
Safford, Arizona 85546
Phone: (602) 428-1092
Fax: (602) 428-1291
Products: pumps

Solo Power
1011-B Sawmill Road, NW
Albuquerque, New Mexico 87104
Phone: (505) 242-8340
Fax: (505) 243-5187
Products: remote power and water pumping systems

Solar Outdoor Lighting
3210 S.W. 42nd Ave.
Palm City, Florida 34990
Phone: (800) 959-1329
Fax: (561) 286-9616
email: info@solarlighting.com
Internet: <http://solarlighting.com>
Products: outdoor lighting systems

Solo Power
1011-B Sawmill Road, NW
Albuquerque, New Mexico 87104
Phone: (505) 242-8340
Fax: (505) 243-5187
Product: remote power systems

Southwest Photovoltaic Systems, Inc.
212 East Main Street
Tomball, Texas 77375
Phone: (713) 351-0031
Fax: (713) 351-8356
Products: indoor and outdoor lights, water pumping systems

Sun Frost
P.O. Box 1101 824 L Street
Arcata, California 95521
Phone: (707) 822-9095
Fax: (707) 822-6213
Internet: <http://www.alt-energy.com/sunfrost.htm>
Products: dc and ac refrigerators

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Sunlight Homes
902 Roma NW
Albuquerque, New Mexico 87102
Phone: (505) 856-5888
Fax: (505) 856-5777
email: Sunlight@SunlightHomes.com
Internet: <http://www.sunlighthomes.com>
Products: passive solar homes

SunWize Energy Systems, Inc.
9415-19 Enterprise Dr.
Mokema, Illinois 60448
Phone: (708) 479-1600
Fax: (708) 479-1683
Internet: <http://www.sunwize.com>
Products: portable lighting systems

Superior Solar Systems, Inc.
1302 Bennett Drive
Longwood, Florida 32750
Phone: (800) 478-7656
Fax: (407) 331-0305
Products: portable pumping systems

Talmadge Solar Engineering
18 Stone Rd.
Kennebunkport, Maine 04046
Phone: (888) 967-5945
Fax: (207) 967-5745
email: tse@talmagesolar.com
Internet: <http://www.talmagesolar.com>
Products: batteries, pumps, chargers, lights,
BOS components, motors, power centers,
catalog

Thin-Lite
530 Constitution Ave.
Camarillo, California 93012
Phone: (805) 987-5012
Fax: (805) 388-0921
Products: lights

Thomas Solarworks
P.O. Box 171
Wilmington, Illinois 60481
Phone: (815) 476-9208
Fax: (815) 476-2689
Products: pumping and heating systems

Tideland Signal Corporation
P.O. Box 52430
Houston, Texas 77052
Phone: (713) 681-6101
Fax: (713) 681-6233
Products: marine and navigational products
and systems

United Solar Systems Corp.
1100 West Maple Road
Troy, Michigan 48084
Phone: (313) 362-4170
Products: roof-integrated panels, lighting
systems

U.S. PV Consultants

Bari Associates
3370 N. Hayden Rd., Suite 123-306
Scottsdale, Arizona 85251
Phone: (602) 947-2936
email: HBARIKMO@aol.com
Specialty: systems engineering

Community Power Corporation
4001 North Ninth St., Ste. 1108
Arlington, Virginia 22203
Phone/Fax: (703) 524-8372
Voicemail: (703) 358-9663
email: jweingart@mcimail.com
Specialty: PV utility consulting

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Daystar, Inc.
3240 Majestic Ridge
Las Cruces, New Mexico 88011
Phone/Fax: (505) 522-4943
email: pwern@zianet.com
Internet: <http://www.zianet.com/daystar>
Specialty: training, educational materials, test equipment, data analysis

Direct Gain LLC
23 Coxing Road
Cottkill, New York 12419
Phone: (914) 687-2406
Fax: (914) 687-2408
email: DQUS83A@prodigy.com
Specialty: technology, planning, and product development

Domestic Technologies, Inc.
Box 44
Evergreen, Colorado 80439
Phone: (303) 674-7700
Fax: (303) 674-7772 email: dri@domtech.com
Specialty: international applications and markets

DynCorp Information & Engineering Tech., Inc.
6101 Stevenson Ave.
Alexandria, Virginia 22304
Phone: (703) 261-4622
Fax: (703) 261-5090
Internet: <http://www.dyncorp.com>
Specialty: technology, markets, strategic planning

Environmental Advantage
80 Wall St., Suite 713
New York, New York 10005
Phone: (212) 482-0675
Fax: (212) 482-0679
email: ericisea@aol.com
Specialty: investment and financing

Fully Independent Residential Solar Technology (FIRST)
66 Snyderstown Rd.
Hopewell, New Jersey 08525
Phone: (609) 466-4495
email: FIRSTsolar@aol.com
Internet: <http://adams.patriot.net/~wstewart/first.htm>
Specialty: solar home design

Future Specs
121 Mistletoe Rd.
Golden, Colorado 80401
Phone/Fax: (303) 526-5154
email: peiffert@aol.com
Specialty: economics, building-integrated systems

Global Resource Options, LLP
4 Kibling Hill Road
P.O. Box 51
Strafford, Vermont 05072
Phone: (802) 765-4632
Fax: (802) 765-9983
email: global@sover.net
Internet: <http://www.globalresourceoptions.com>
Specialty: conservation consulting

Heliokinetics Corporation
P.O. Box 1040
Agoura Hills, California 91376-1040
Phone/Fax: (818) 991-5235
email: BJATE@aol.com

Hester, Steven
2497 Morello Heights Cr.
Martinez, California 94553
Phone/Fax: (510) 372-7516
Specialty: PV and utilities

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Infinite Energy
1625 Downing St., 2nd Floor
Denver, Colorado 80218
Phone: (303) 832-9210
Fax: (303) 831-8221
email: infinite@dash.com
Specialty: market research and communications

Kelso Starrs and Associates
403 94th Ave., SE
Bellevue, Washington 98004
Phone: (206) 451-9676
Fax: (206) 451-9577
email: tstarrs@garnet.berkeley.edu
Specialty: legal and regulatory issues of PV and utilities

Pacific Energy Group
32 Valla Ct.
Walnut Creek, California 94596
Phone: (510) 937-1750
Fax: (510) 937-0385
email: info@PacificEnergy.com
Internet: <http://www.PacificEnergy.com>
Specialty: markets, economics, policy, software

Planergy, Inc.
901 S. MoPac Expressway
Barton Oaks Plaza, Suite 495
Austin, Texas 78746
Phone: (512) 327-6830
Fax: (512) 327-2553
email: a_macg@planergy.com
Internet: <http://www.planergy.com>
Specialty: energy management, utilities, regulatory issues

Princeton Energy Resources International (PERI)
1700 Rockville Pike, Suite 550
Rockville, Maryland 20852
Phone: (301) 881-0650
Fax: (301) 230-1232
email: jrezaiyan@perihq.com
Internet: <http://www.perihq.com>
Specialty: Comprehensive energy and environmental planning, management, and regulatory analysis, including renewable energy technologies, i.e. solar photovoltaic, solar thermal, wind, geothermal, hydropower, and biomass, as well as convention fossil-fuel electric power projects.

PV-Design Pro
2511 S. Kihei Road
Kihei, Hawaii 96753
Phone: (808) 879-7880
Fax: (808) 879-5060
email: sales@mauisolarsoftware.com
Internet: <http://www.maui.net/~sandy/PV-DesignPro.html>
Specialty: PV software

PV Energy Systems, Inc.
8536 Greenwich Rd.
Catlett, Virginia 20119
Phone/Fax: (540) 788-9626
email: pvenergy@crosslink.net
Specialty: technology, markets, strategic planning

PV Enterprises, Inc.
4620 N. Park Ave., #1606W
Chevy Chase, Maryland 20815
Phone: (301) 657-9110
email: pvaradi@aol.com
Specialty: technology and financing

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Renewable Energy Concepts, Inc.
1545 Higuera St.
San Louis Obispo, California 93401
Phone: (805) 545-9700
Fax: (805) 547-0496
email: info@reconcepts.com
Internet: <http://www.reconcepts.com>
Specialty: systems design, installation, sales

SOLutions in Solar Electricity
PO Box 5089
Culver City, California 90231
Phone: (310) 202-7882
Fax: (310) 202-1399
email: joeldavidson@earthlink.net
Specialty: system design, feasibility studies, marketing, general and project management

Sabrina Corp.
Steve Johnson
95 Defrance Way
Golden, Colorado 80401
Phone: (303) 279-6543
Fax: (303) 202-0454
Specialty: new business development, market development, technology review, business plans

Strategies Unlimited
201 San Antonio Cr., Suite 205
Mountain View, California 94040
Phone: (650) 941-3438
Fax: (650) 941-5120
email: info@strategies-u.com
Internet: <http://www.strategies-u.com>
Specialty: technology, markets, strategic planning

Sherring Energy Associates
Three Bellaire Drive
Princeton, New Jersey 80540
Phone: (609) 799-8889
Fax: (609) 799-5258 email: csherrin@ix.netcom.com
Specialty: international applications and markets

SunCat Solar
17626 N. 33rd Pl.
Phoenix, Arizona 85032
Phone: (602) 404-4929
Fax: (602) 404-4929
email: AHMChuzel@aol.com
Internet: <http://www.users.uswest.net/~tkreider>
Specialty: System design and testing, consulting, training

Solar Electric Light Fund
1734 20th St., NW
Washington, DC 20009
Phone: (202) 234-7265
Fax: (202) 328-9512
email: solarlight@self.org
Internet: <http://www.self.org>
Specialty: international applications and markets

Sun Electronics International
511 NE 15th St.
Miami, Florida 33132
Phone: (305) 536-9917
Fax: (305) 371-2353
email: info@sunelec.com
Internet: <http://www.sunelec.com>
Specialty: system sizing/design, integration, installation, custom manufacturing

Solar Energy for Africa, Inc.
13001 Greenstone Ct.
Silver Spring, Maryland 20904
Phone: (301) 384-6642
Fax: (301) 384-0091
Specialty: South Africa

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UNISUN
587-F Ventu Park Road, PMD 124
Newbury Park, California 91320
Phone: (805) 987-7258
Fax: (805) 987-7268
Specialty: technology, markets, strategic
planning, manufacturing

Institute of Energy Conversion
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-6220
Fax: (302) 831-6226
email: rwb@udel.edu
Internet: <http://www.udel.edu/iec>

Utility PhotoVoltaic Group
1800 M Street, NW, Suite 300
Washington, DC 20036-5802
Phone: (202) 857-0898
Fax: (202) 223-5537
email: SolarElectricPower@ttcorp.com
Internet:
<http://www.ttcorp.com/upvg/index.htm>

National Renewable Energy Laboratory 1617
Cole Blvd.
Golden, Colorado 80401
Phone: (303) 275-3000
email: webmaster@nrel.gov
Internet: <http://www.nrel.gov>

Weinberg, Carl
42 Green Oaks Ct.
Walnut Creek, California 94596
Phone: (510) 933-9394
Specialty: utilities

PowerMark Corporation
4044 E. Whitton
Phoenix, Arizona 85018
Phone: (602) 955-7214
Fax: (602) 955-7295

U.S. PV Equipment Testing Organizations

Arizona State University, Alternative Energy
Development
College of Engineering and Applied Sciences
Tempe, Arizona 85287-5806
Phone: (602) 965-0377
Fax: (602) 965-0745
email: b.hammond@asu.edu
Internet: <http://www.eas.asu.edu>

Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185
Phone: (505) 844-2154
Internet: <http://www.sandia.gov/pv>

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, Florida 32922-5703
Phone: (407) 638-1470
Fax: (407) 638-1010
email: ventre@fsec.ucf.edu
Internet: <http://www.fsec.ucf.edu>

SunCat Solar
17626 N. 33rd Pl.
Phoenix, Arizona 85032
Phone: (602) 404-4929
Fax: (602) 404-4929
email: AHMChuzel@aol.com
Internet:
<http://www.users.uswest.net/~tkreider>
Specialty: System design and testing,
consulting, training

Underwriters Laboratories, Inc. (UL)
1285 Walt Whitman Rd.
Melville, New York 11747-3081
Phone: (631) 271-6200
Fax: (631) 271-8259
email: melville@us.ul.com
Internet: <http://www.ul.com>

U.S. PV Training Organizations

B.C. Solar
P.O. Box 1102
Post Falls, Idaho 82854
Phone: (208) 667-9608

Eclectic Electric
127 Avenida del Monte
Sandia Park, New Mexico 87047
Phone: (505) 281-9538

Energy Products and Services, Inc.
321 Little Grove Lane
Fort Myers, Florida 33917-3928
Phone: (941) 997-7669
Fax: (941) 997-8828

Enersol Associates
1 Summer Street
Somerville, Massachusetts 02143
Phone: (617) 628-3550
Fax: (617) 623-5845
email: jenersol@igc.apc.org

Institute of Energy Conversion (IEC),
U. Delaware
Newark, Delaware 19716
Phone: (302) 831-6220
Fax: (302) 831-6226
email: rwb@udel.edu
Internet: <http://www.udel.edu/iec>

Institute of International Education
1400 K Street, NW
Washington, DC 20005-2403
Phone: (800) 242-1612
Phone: (202) 326-7706
Fax: (202) 326-7694
email: info@iie.org
Internet: <http://www.iie.org>

North Carolina Solar Center
Box 7401
North Carolina State University
Raleigh, North Carolina 27695-7401
Phone: (800) 33-NCSUN
Phone: (919) 515-3480
Fax: (919) 515-5778
email: ncsun@ncsu.edu
Internet: www.ncsc.ncsu.edu

Remote Power
318 Whedbee St.
Fort Collins, Colorado 80524
Phone/Fax: (970) 498-8947
email: jwelch@aol.com
Internet: <http://www.iie.org>

Renewable Energy Development Institute
P.O. Box 94
Willits, California 95490
email: redi@pacific.net

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