

RAY DARBY
Sustainable Energy Group Inc.
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EDUCATION: B.S. in Environmental Engineering, California Polytechnic State University, San Luis Obispo, CA, 1979. Concentrations: AC&R (Air Conditioning & Refrigeration) and Solar Energy (not formally available at graduation).

EXPERIENCE:

**June 1997 -
Present**

Licensed Mechanical Engineer and President of "Sustainable Energy Group, Inc.," an energy consulting and design/build business incorporated in September 2004 (formerly dba "The Energy Guy"; it grew into a group). Nevada City, CA

Specific Duties:

- ◆ Provide comprehensive energy, economic, system design/specification and design/build services. Projects include energy efficiency and renewable energy based electric and thermal systems for residential, commercial and industrial applications. Design/build projects involve working in partnership with licensed general, mechanical and electrical contractors throughout the design, implementation and commissioning process. The energy technologies involved include, but are not limited to, photovoltaic and hydroelectric power generation, HVAC/lighting systems & controls, building envelope alternatives, manufacturing processes, and transportation systems.

- ◆ Provide hands-on trouble-shooting and repair of active solar hot water and hydronic radiant panel heating systems; evaluate and assess repair needs, address system control and plumbing problems and effect repair work.

- ◆ SMUD Contract: "Analysis and Recommendations Report, Evaluation Of An Indirect-Direct Evaporative Cooling System, Montessori Country Day Child Care Center," September 1997. Provided on-site measurement of system performance parameters (electrical, temperature, humidity, air flow), developed a life cycle cost analysis of existing system and alternative cooling options, economic feasibility study of additional cooling conservation measures and production of report including comfort parameter discussion. Provided under subcontract with Melas Energy Engineering(formerly Darby Energy Engineering) of Nevada City, CA. SMUD contact person is Bruce Vincent.

- ◆ "New Concepts for Solar Thermal Systems," RFP No. RDC-7-17675, November, 1997. Proposal to refine the Morley High Sierra Solar Drainback hot water heating system design and measure energy savings based on a gas water

heater. Included project team consisting of Bob Pelton (Morley Manufacturing); Charles Newcomb (Chair, Dept. of Physics & Astronomy) and Dr. Sukhbir Mahajan (Professor, Dept. of Physics & Astronomy), Sacramento State University, Sacramento, CA; researchers Jim Huggins and Steve Long of the Florida Solar Energy Center (FSEC), Cocoa, FL. Note: although this proposal was determined to be competitive for the subject RFP by the National Renewable Energy Lab (NREL), the contract was not awarded due to the lack of funding originally anticipated to be available.

◆ Provided technical review of Phase II grant applications submitted to the Department Of Energy's Small Business Innovation Research (SBIR) program, Spring 1998. DOE contact person is Robert E. Berger, SBIR Program Manager. A list of projects selected for Phase II awards is available on the web at <http://sbir.er.doe.gov.sbir>

◆ Development and maintenance of "The Energy Guy" Web Site. The web site is intended as a resource for everyone, from energy professionals to the general public, interested in sustainable energy. See www.TheEnergyGuy.com for more.

**September 1998 –
July 2002**

Associate Mechanical Engineer (AME)

Energy Efficiency Division; Non-Residential Office; Energy Services Group
California Energy Commission, 1516 9th Street MS-26, Sacramento, CA 95814.

Specific Duties:

Responsible for development and management of the Cool Savings with Cool Roofs (Peak Load) Program; contract manager for the Energy Management Technician Training contract; technical assistance and contract management of projects participating in the Energy Partnership and Bright Schools Programs; contract development and management of Public Interest Energy Research (PIER) contracts; lead author of "A Market Assessment Report For Energy Efficiency in California Schools."

**August 1993 -
June 1997**

Associate Mechanical Engineer (AME); July 1996 - June 1997

Associate Energy Specialist (AES); August 1993 - June 1996

Energy Technology Development Division; Research and Development Office;
Technology Assessment and Market Development Group.
California Energy Commission, 1516 9th Street, Sacramento, CA 95814.

Specific Duties:

Provided technical assistance regarding most "end use" energy technologies in the Opportunity Technologies Commercialization (OTCOM) Program.

Completed training in meeting facilitation through the course "Mastering Meetings For Results - The Interaction Method," offered by Interaction Associates, Inc.

Acted as lead staff for the California Solar Water Heating Collaborative. Worked with stakeholders for several years, addressing barriers and actions to help commercialize solar water heating. Developed a wide range of solar fact sheets, economic analyses and technical assistance materials on behalf of the collaborative. Also provided technical assistance and meeting facilitation for fellow staff leads on the collaboratives for Evaporative Cooling, Passive Solar, Ground Source Heat Pump, and High Performance Wall Systems.

Lead staff for the Energy Technology Status Report (ETSR) update for chapters covering space and hot water heating systems. Duties included extensive research into the latest information covering a wide range of energy technologies, both current and future, assessment of economic parameters and subsequent document changes. Also took the initiative to suggest and assume responsibility, after requesting management approval, for evaluating and verifying the "FAST-123" levelized cost "black box calculation method" used for all ETSR economic analyses.

Also, in response to a letter from Jim Cole, Director of the California Institute for Energy Efficiency (CIEE), urged management to allow me to develop a new ETSR section addressing a number of important technologies never before addressed by this document. Note: management needed to be "urged" because the letter came at the very end of the ETSR update cycle, and their initial response was "there is no time." This new section covered a number of technologies under four major categories: Advanced Space Heating and Cooling Distribution Systems; Advanced Space Heating and Cooling Controls; Space Heating, Cooling & Ventilation System (HVAC) and Building Design Optimization; and Other (Miscellaneous) Building Energy Efficiency Technologies.

Contracts Experience:

"Solar Hot Water Test Facility," a multi-agency collaborative project between the California Energy Commission (CEC) and the Sacramento Municipal Utility District (SMUD), in a technology assessment project involving side-by-side testing of four different system approaches to solar domestic hot water heating. This (\$80k CEC budget; \$160k overall) contract took place between the spring of 1995 through the spring of 1997. Provided contract work statement & budget development as well as contract management.

"Passive Solar Design Assistance Training Program," Madlin's Enterprises, Palm Springs, CA prime contractor. This (\$34k) contract took place between the spring of 1995 through the spring of 1997. Provided contract work statement & budget development as well as contract management and technical assistance.

"Evaporative Cooling Technology Demonstration Center," Cal Poly Pomona, Dr. Ho Fu Wu prime contractor. A three year (1995-1997), \$326k contract managed by Phil Misemer of the California Energy Commission (CEC). Provided technical review and task write-up assistance to P. Misemer of the CEC.

"Energy and Economic Evaluation of Opportunity Technology Commercialization (OTCOM) Program Technologies," RFP #500-94-007; OTCOM Program Technologies addressed (for residential and commercial applications) included indirect/direct and direct evaporative cooling, passive solar space heating and cooling, high performance wall systems, geothermal (ground source) heat pumps, and thermal energy storage. This (\$27k) contract was scheduled for completion between 2/95 and 3/96, but was canceled prior to completion. Provided contract work statement and budget development as well as contract management.

"Cooling Technology Demonstration Project With The Sacramento Housing & Redevelopment Agency (SHRA)," a multi-agency collaborative project between the California Energy Commission (CEC), Department Of Energy (DOE), SHRA, Lawrence Berkeley Labs (LBL), and the Sacramento Municipal Utility District (SMUD), in a technology demonstration project involving an assortment of cooling strategies and energy conservation technologies. Two stage evaporative cooling, white roofs, and ground source heat pumps were retrofitted to existing low-income public housing projects in Sacramento. This (\$100k CEC budget; multi-million dollar overall) contract was scheduled between July 1, 1994 to March 31, 1995. Provided contract work statement & budget development as well as contract management until a different manager was assigned due to work load.

Regulation and Policy Experience:

Commission Restructuring

Took the initiative to participate extensively in the electricity restructuring process through optional meeting participation with the executive office as well as the development of a large number of policy papers addressing the needs of key technologies required for a sustainable California future (copies available upon request).

Senate Bill 116

Staff lead for policy analysis development of SB 116, a bill to establish state tax credits for solar water heating applications. Coordinated analysis with fellow staff, management and executive office personnel, as well as other state agencies and groups during the course of the analysis.

Assembly Bill 873

Provided policy analysis of AB 873, a bill to establish state tax credits for various energy efficiency measures for residential and commercial buildings. It also intended to establish tax credits for solar-powered electricity generating facilities smaller than 30 Megawatts.

Solar Rating and Certification Corporation (SRCC)

Served three years on the Board Of Directors and chaired the Standards Committee. Responsibilities included working in concert with the industry, representatives of the Department of Energy, national labs and others in the development and formulation of policy standards and certification requirements for solar water heating components and systems. New policies and requirements developed were based on a strong consensus building process to assure benefits for all stakeholders.

Energy Development Report (EDR)

Took the initiative to provide comments and suggestions for "future trends," the theme of the 1994 EDR update.

**November 1990 -
August 1993**

Associate Energy Specialist (AES)

Energy Efficiency Division; Residential Group.

California Energy Commission, 1516 9th Street, Sacramento, CA 95814.

Specific Duties:

Responsible for technical assistance in the development of the new Title-24 Residential Energy Efficiency Standards for California. Responsibilities included: update of the CALRES2 residential building compliance program code and user manual for the 1992 residential standards; development of an appendix of default construction assemblies U-values for roofs, walls and floors for the residential manual; coordination and technical write-up for energy standard changes including the rating & labeling of duct insulation R-value; and contributions to the new Residential Manual chapter on Energy Efficient Design.

Contracts Experience:

"1992 Residential Measurement Contract," Bruce Wilcox, Berkeley Solar Group prime contractor. This project's objective was to assess the Energy Efficiency Standards for residential buildings for meeting state mandates regarding building energy efficiency. This (\$200k) contract took place between the summer of 1992 and the spring of 1995. Provided contract work statement & budget development as well as contract management.

"Residential Monitoring Contract," CEC Contract #400-90-012, Bruce Wilcox, Berkeley Solar Group prime contractor. This project's objective was to assess the Energy Efficiency Standards for residential buildings for meeting state mandates regarding building energy efficiency. This (\$100k) contract took place between the summer of 1991 and the spring of 1993. Provided contract work statement & budget development as well as contract management.

Regulation and Policy Experience:**1992 Standards Update**

Organized meetings and worked cooperatively with the Air Diffusion Council in order to establish a new and consistent R-Value rating method and standards for

flexible air ducts. Also researched and proposed new language for sections of the Standards addressing a number of topics including, but not limited to, air infiltration barriers, moisture barriers and insulation product standards.

1992 Standards Alternative Calculations Method (ACM) Approval Manual

Organized meetings and worked cooperatively with the vendors of compliance software on an update to the Residential Alternative Calculation Methods approval manual guidelines, the guide to the rules required of computer programs used for residential building energy analysis.

**January 1985 -
November 1990**

Principal Mechanical Engineer and sole proprietor of Darby Energy Engineering. Responsible for management and the technical direction of residential and commercial mechanical system design and California State Title-24 calculations. Mechanical engineering design services included HVAC, plumbing, and alternative energy systems design and construction supervision. Worked closely with other design and construction professionals, establishing long term working relationships to achieve field-sensible engineering solutions. Specialized in providing solutions based on the energy & economic analysis of energy efficiency and renewable energy systems for custom homes and small commercial buildings.

**December 1979 -
December 1985**

David Wright Associates (Environmental Architecture), Nevada City CA; Developed and administered in-house Mechanical Engineering service. Same responsibilities as above. California State Title-24 work also involved significant assistance to local building departments in understanding the regulations during implementation periods. Served as the energy consultant on projects spread across the U.S. and abroad.

**Summer 1978 -
November 1979**

Research project sponsored by the California Energy Commission's Solar Office entitled "Passive Solar Handbook For California." Provided technical assistance to Philip W. B. Niles, the developer of the "CALPAS" computer simulation program, in formulating performance charts for the handbook. Technical assistance involved thousands of computer simulation "sensitivity" analyses, data reduction and generation of camera ready performance charts for all generic passive solar system types.

LICENSING:

Licensed Mechanical Engineer #21982 in California (since 1983). Previously licensed Mechanical Engineer #23071 in Arizona (1989), Mechanical Engineer #14663 in Oregon (1989).

PROFESSIONAL

MEMBERSHIPS: Currently a member of the Union of Concerned Scientists (UCS) and the Sustainable Buildings Industries Council (SBIC).

National Solar Rating and Certification Corporation (SRCC): served a two year term from 1994-1996 and a one year term from 1996-1997 as one of nine board members as well as Chairman of the Standards Committee.

Past member of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and the International Solar Energy Society (ISES).

Served a term as Vice President and a second term as President of the Foothill Solar Exchange, an advocacy group of foothill-area solar building professionals.