solar design associates inc

Background and Capabilities:

Solar Design Associates is an interdisciplinary firm dedicated to the design, engineering and implementation of renewable energy for residential, commercial and institutional facilities.

Unlike other solar firms, we're architects as well as engineers. We understand building design and performance and, we engineer renewable energy systems to work together with the building as an integrated effort. This integrated approach is essential to creating a high-performance building, especially if it's to be energy-independent.

We offer architects, engineers and building owners a single-source of responsibility for all things renewable – including complete design and engineering services from feasibility and concept design through construction documents, code compliance, utility liaison along with technical support during bidding and construction as well as comprehensive system commissioning. On selected projects, we offer full design/build services, providing the client a single-source of responsibility for the entire project.

All of our work involves renewable energy. We specialize in the application of solar electricity, wind and solar thermal systems. Here are some examples of our completed projects:

Solar Electricity for the US Mission to the United Nations

SDA provided design and engineering services to the US State Department to field a new Building-integrated Photovoltaic (BIPV) "skin" at the US Mission to the United Nations in Geneva.

Our design response included façade-mounted arrays, roof-mounted arrays, sloped glazing and integrated sunshades on the southeast and southwest façades.

SDA worked with the local Swiss utility on interface with the utility distribution network and on matters of code compliance.

SDA also designed a data acquisition and monitoring system with a large lobby display and provided technical support during construction and full systems commissioning. The UN Mission is the first US Diplomatic Post to be powered by solar electricity.

Solar Pavilion for Oberlin College

The Chair of the Environmental Studies Department at Oberlin, Dr. David Orr, wanted his new academic facility to be powered completely by solar energy.

SDA was commissioned to provide design and engineering services for both a roof-top solar electric array and a solar electric pavilion which clear-spans the center's parking area.

SDA also provided procurement assistance, code and utility liaison and construction management as well as system commissioning to the College.

The Lewis Environmental Studies Center uses no fossil fuel and produces a surplus of solar electricity that is shared with the local community. The Lewis Center is the first university academic facility to obtain 100% of its energy needs from solar energy.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

Wind Electricity for the Massachusetts Maritime Academy

Part of the University of Massachusetts, the Massachusetts Maritime Academy is located at the western mouth of the Cape Cod Canal.

The campus is surrounded on three sides by water and enjoys very good wind resources.

SDA was commissioned to provide design and engineering services for a utility-scale wind turbine interfaced with the 4.5 kV campus electrical distribution network.

SDA also provided code and utility liaison, procurement assistance and construction oversight as well as commissioning services to the Academy.

The wind turbine displaces utility-supplied electricity at the retail rate providing a simple payback of less than 5 years. This is the first college or university campus in the US to obtain a major portion of their electricity from wind energy.

Solar Electric and Solar Thermal Systems for the White House

Solar Design Associates was selected by the National Parks Service to design and engineer three solar energy systems at the White House in Washington, DC.

SDA worked with the White House Architect to assess the opportunities for incorporating solar energy at the compound. The decision was made to install two solar thermal systems and a solar electric array.

One solar thermal system was designed integral to the roof of the pool cabana to heat the spa and the domestic water while also contributing to the pool. The other solar thermal system also heats domestic water. The roof-top solar electric system feeds solar-generated power into the White House electrical distribution network displacing utility-supplied power.

SDA developed initial schematic designs for review and approval, provided complete construction documents and component specifications, provided procurement assistance, qualification of installing tradesmen, on-site, hands-on technical support during construction and full system commissioning.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

Solar and Wind Electricity for the IBEW / NJATC Regional Training Center

The International Brotherhood of Electrical Workers' Local 103 campus is located on Boston harbor across from the Kennedy library site and enjoys good wind resources.

The IBEW wanted to power their regional training center with both solar and wind-generated electricity. SDA was commissioned to provide design and engineering services for a commercial-scale wind turbine and a façade-mounted solar electric array.

SDA also provided procurement assistance, code and utility liaison, community outreach, construction oversight and commissioning.

Both systems displace utility power at the retail rate while serving as real-time teaching tools for the IBEW training program providing apprentices and journeymen hands-on experience with renewable energy systems. The IBEW has committed to training programs that emphasize renewable energy so that every apprentice electrician has a background in these new technologies as they enter the field. SDA has fielded solar on a number of IBEW facilities but this is the first training center to be powered by both wind and solar energy.

Solar Thermal and Solar Electricity for Multi-unit Housing Complex

Planners wanted to incorporate solar energy into this 286-unit, moderate-income housing complex near Boston. SDA recommended solar domestic water heating as the most cost-effective approach.

Starting early in the design phase, SDA worked with the architects to incorporate a single-loaded corridor on the top floor, creating a recess in the south side of the building to help receive the large array of solar thermal collectors.

SDA provided design and engineering services, assisted with code compliance and procurement and provided a pre-bid conference and an initial training session for the installation contractor, on-site technical support during construction as well as full system commissioning.

This project also features the first grid-connected solar electric system in the US which is visible on the center wing of the complex. When completed, this 7,500 ft^2 SDHW system was the largest in New England. It supplies approximately 80% of the annual domestic hot water requirements of the complex.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

1st Solar-powered Olympics

SDA provided design and engineering support to the Olympic Village architects to field large-scale solar electric and solar thermal systems at the Summer Games in Atlanta.

Located on Georgia Institute of Technology's campus, the Olympic Natatorium's main roof features a large PV array and a large solar thermal system to warm the competition pools.

SDA also designed a custom, arched-glass PV canopy as the entrance to the Olympic venue to showcase the solar technology. The canopy features custom, large-area PV modules with a clear backskin to allow sunlight between the individual solar cells.

The PV modules are integrated in a custom, arched support structure where the PV forms the finished weathering skin. This was the first US application of large-area PV modules as overhead architectural glazing.

A central DC-to-AC inverter feeds the 3-phase solar-generated power into the campus distribution network. This was the first Olympic games to be solar-powered and, the Olympic PV array was the largest roof-top solar system in the world when completed,

Giant Solar Cube

The Discovery Center in Santa Ana, CA wanted to create an "Icon of the Future" to showcase the new, life-affirming technologies that will transform our lives.

SDA collaborated with design architects Arquitectonica, to field a giant, 150' tall solar cube.

This 12-story high, custom geodesic space-frame cube towers over Main Street with a highly visible display of renewable energy in use at the Discovery Center.

SDA provided design, CD's, permitting, procurement, construction and commissioning on a turn-key basis providing the owner with a single-source of responsibility for the entire project.

When complete, the Giant Solar Cube was the largest application of Building-integrated Photovoltaics in the US.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

Solar for the University of Oregon

The University of Oregon wanted a green, forward-thinking building for their new Business School facility.

The University retained SRG Partnership, an Oregon architectural firm well known for Green Design. The team set LEED Silver as their goal for the complex and also sought to incorporate solar electricity into the design.

SDA collaborated with the design team to define the most attractive options and specified a five-story building-integrated (BIPV) curtain wall for the south façade.

The "electric glass" was designed with a varying density of solar cells to limit unwanted solar glare and gain in the upper areas while preserving transparency at the floor level.

Electric glass was also employed in the skylights to reduce glare while generating electricity. In addition, all available roof area is harvesting solar power.

The University of Oregon solar wall is the largest vertical Building-integrated PV application of electric glass in the US.

Martin Residence, Charlotte, NC

With backgrounds in high tech, Jeff Martin and his wife Bron wanted their new home to incorporate the latest in clean, green technologies.

SDA designed a solar-powered residence which obtains its heat, hot water and electricity from the sun that shines upon the integral solar roof.

The house features passive solar and "aggressive" energy efficiency measure to reduce the basic load to ~35% of a similar-sized "conventional' house.

The Charlotte area is a cooling-dominated climate. Radiant barriers and passive solar cooling reduce unwanted gain. Air-conditioning, dehumidification and back-up space heating are delivered via a ground-coupled, geothermal heat pump.

An air-to-air heat exchanger ensures fresh ventilation with heat / cool energy recovery. The Martins export their surplus solar power to the local utility as part of the North Carolina Green Power program. They receive a premium of about 200% for sharing their surplus harvest with the community. The Martin residence is typical of the all-solar residences SDA designs in all geographic / climate zones.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

Tiger Woods Center

Although Tiger Woods won 10 major championships in his first decade on the PGA Tour, he says his most important legacy is his solar-powered Learning Center in Anaheim, CA, not far from where he grew up.

The high-tech, 35,000 ft^2 educational center offers grade 4-12 educational programs in a building that houses 100 computer stations, a totally wireless environment, a 200-seat auditorium and a multimedia center.

The Center features two solar electric systems -- a rooftop array and a custom, curved BIPV curtain wall. SDA worked closely with project architects, Langdon Wilson of Irvine, to ensure that the BIPV application met the architect's design intent.

The BIPV curtain wall is both curved and sloped, requiring modules of differing size and shape which vary in light transmission from 5% to 30% top-to-bottom -- like the tinted band on your car windshield -- and transitions to clear at the vision area.

The City of Anaheim helped sponsor the solar electric systems. Other project sponsors include Intel, Microsoft, Nike, Dell, AT&T Accenture, American Express, Boeing, PGA, and Deutsche Bank. The center cost $25 million to complete.

Solar-powered Gas Stations

When BP wanted to employ solar electricity to power their gas stations, they retained SDA to provide design, engineering, code and utility compliance, construction oversight and acceptance testing.

Existing flat-panel canopies received a series of low-profile crystalline arrays. For the new stations, SDA worked with the BP design team to develop a shallow, barrel-vaulted BIPV canopy glazed with transparent PV elements to daylight the service islands.

SDA worked with the architectural aluminum manufacturer to define the wiring methods and guide the design through the approval process and obtain Underwriters Laboratories (UL) listing. SDA also defined solar-powered charge ports for electric and plug-in electric / hybrid vehicles at a number of the stations.

SDA provided pre-bid conferences and initial on-site training sessions for the installing contractors. Once the program was underway, BP asked SDA to also power stations of their recently acquired ARCO and Amoco subsidiaries with solar electricity. In all, some 250 retail sites were involved stretching from coast to coast across the US. BP's overall program involved 16 countries worldwide and, when completed, was the largest deployment of photovoltaics ever undertaken.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

BIPV for the Ballard Library

Seattle's Ballard library wanted a modern facility with the latest technology that also reflected the materials and heritage of the Pacific Northwest.

Design architects Bohlin, Cywinski, Jackson developed an expressive timber structure with generous use of exposed wood inside and out. Natural lighting was also a high priority.

SDA collaborated with the design team to specify a light-transmitting, thin-film BIPV glazing system that wraps around the south and west façades.

The custom BIPV façades allowed the designers to employ extensive glazing while avoiding unwanted thermal gain and glare. The BIPV also keeps direct sunlight off the library's collection.

Additional solar electric generation is accommodated on the structure's green roof which also features a number of skylights to further distribute daylight within the building.

Solar Electricity for the MITRE Center

The MITRE Center is a high-technology R, D & D facility on Boston's Route 128 that with its origins at MIT. When they needed additional space, they sought to create a new facility that would communicate the high-tech, future-oriented nature of their work.

Their design architect, the Stubbins Associates, wanted to explore solar electricity and retained SDA to help develop a custom BIPV main entry canopy that would express future oriented technology in a highly visible manner.

SDA specified custom structural "electric glass" BIPV elements with structural silicon joints and cantilevered outer edges. The individual crystalline solar cells are spaced apart to allow sunlight to filter though purposefully creating a contrasting shadow pattern to draw attention to the PV.

SDA also designed additional solar electric capacity for "bulk power" generation which is deployed on the facility's main roof.

The combination of a highly visible BIPV design element coupled with a larger, roof-top PV system is frequently a desired solution to show off the technology while also providing substantial solar power generation.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

New York's 1st Solar High Rise

Developers competing for the highly desirable parcels in Battery Park City on New York's lower west side were encouraged to incorporate green technologies and environmentally responsive design into their proposals.

SDA was retained to support design architect Cesar Pelli & Associates in creating New York's first solar-powered, high-rise residential tower.

SDA proposed a building-integrated PV façade looking southwest over the Hudson River. The custom crystalline BIPV elements displace traditional spandrel materials to create a signature solar electric skin.

A custom architectural glass BIPV canopy was specified above the main entry to showcase the technology. "Bulk-power" harvest was incorporated on the building's roof where the 2-story equipment screen (left) was wrapped with conventional PV modules. A custom mounting configuration was employed to create shadow lines while enhancing solar harvest.

The developers received so much attention during construction that they decided to name their new building the Solarie and build their entire marketing program around green city living. The facility also features a roof garden, rain-water harvest, gray-water recycling, low-VOC materials and a computer-driven energy management system.

Electric Sunflowers

A private client wanted to power their country residence and vineyard in the hilly wine country above the Napa Valley in northern California with solar energy.

They retained SDA with a few key requirements: the system had to be efficient, reliable and enjoyable to look at. If it could also be "fun" – so much the better!

SDA proposed a large array of "Electric Sunflowers" on the steep, south-sloping, hillside at the north end of their property.

The sunflowers track the sun from sunrise to sunset and then, return in unison to await the dawn. Tracking enhances the solar harvest while creating what the clients refer to as a "hillside of kinetic art". The necessary power electronic components are located in "Power Kiosks" (shown in the lower left insert) which are sprinkled throughout the multi-acre array field.

SDA was responsible for design, engineering and construction on a turn-key, design/build basis to provide the clients a single-source of responsibility for their entire project.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com

solar design associates inc

MegaWatt Solar Roof

When senior management at River Terminal Corporation realized the sun falling on the roof tops of their multi-acre complex in New Jersey was an under-utilized resource, they asked Solar Design Associates to help them harvest that energy.

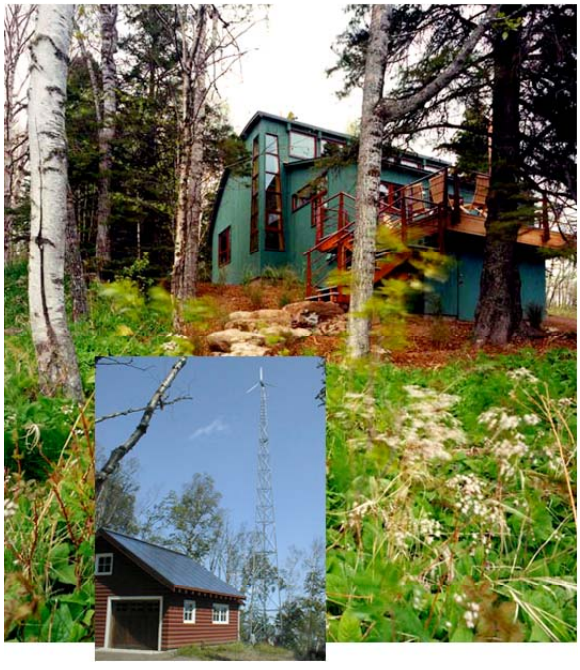
SDA performed a full assessment of the River Terminal facilities and proposed a two-phase plan to harvest over 1.25 MegaWatts of solar electricity from roofs of their buildings.

River Terminal then contracted with SDA on a design/build basis to deliver a complete, turn-key installation, providing a single-source of responsibility for the entire project.

The first phase of the project, shown above, was completed in the summer of 2006 and has a rated capacity of 620 kiloWatts. The power conversion equipment to interface the system with the campus electrical distribution is shown in the insert. Phase 2 has a rated capacity of 660 kiloWatts.

SDA furnished technical and financial feasibility assessments, full system design and engineering and complete construction documents, obtained all approvals, procured all materials, managed construction and performed a full system's commissioning prior to turning the system over to the Owner. With the combination of state and federal incentives available and the high local electric rates, River Terminal's investment will deliver a simple payback of under six years without any factor for future rate escalation.

Rural Renewable Retreat



A professional woman in Minneapolis wanted a rural retreat to balance her busy work schedule. She acquired a stunning piece of waterfront property on the north shore of Lake Superior about 100 miles from the Canadian boarder. She wanted a simple, yet elegant retreat with minimal impact on the site and the environment. No fossil fuels would be used. Her retreat would be completely powered by renewable energy without restriction. Minneapolis architect Sarah Nettleton retained SDA to help and, together, we designed an energy-autonomous retreat that actually produces a surplus of energy.

SDA specified a solar / wind hybrid energy system as the best response to the very challenging northern Minnesota climate. The client wanted to use an abandoned foundation on the property that placed the cabin amidst a stand of tall conifers making solar harvest difficult. Fortunately, there was an existing outbuilding with a perfectly oriented roof surface. SDA refit this building with an integral solar electric array and fielded a wind turbine nearby. The two technologies provide a synergistic response to the climate challenge: when the sun is not available, the wind is often strong and when the wind is calm, the sun is often shining. A geothermal heat pump provides heating, cooling and domestic hot water.

The project was awarded a Top Ten Environmental Design Award by the American Institute of Architects.

box 242, harvard, massachusetts 01451-0242
(978) 456-6855 • www.solardesign.com