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FEATURE ARTICLE

Solar at the White House

by Mark C. Fitzgerald

After more than two decades, solar equipment is back at the White House, quietly heating water and generating electricity and serving as a symbol of real energy security.

Every President since Richard Nixon has acknowledged that America is at risk in its dependency on foreign sources of energy. And, in the aftermath of the first world oil embargo, every President has attempted—in his own way—to try to correct this situation with a new program emphasizing American energy independence.

Perhaps it was President Carter who first fully understood the dimensions of the problem. Under his leadership, American energy efficiency improved dramatically and renewable energy technologies began to enter the marketplace as major U.S. companies made significant investments in research, product development and commercialization.

Steven Strong was with President Carter when he dedicated the first solar energy application at the White House in June 1979. The system, which provided domestic hot water for the West Wing, worked fine until President Reagan removed it shortly after he took office. The Carter-era solar collectors wound up in government surplus and were subsequently acquired by Unity College in Maine, where they still heat the water for the school's cafeteria.

Over the intervening 25 years, Strong has advocated tirelessly for solar energy. His firm, Solar Design Associates of Harvard, Massachusetts, has earned an international reputation for the pioneering design of energy-autonomous buildings and the engineering and integration of the renewable energy systems to power them.

It was fitting, then, that Strong should be invited back when solar energy returned to the White House. Last spring, the National Park Service retained Solar Design Associates to design and install three solar energy systems at the Presidential compound. These systems demonstrate the most popular solar applications in use today. Two of the systems deliver thermal energy for hot water and pool heating and one produces electricity directly from the sun with photovoltaics.

The National Park Service, which is responsible for all work done at the White House, had decided that any refurbishment of its facilities should include environmentally friendly design wherever possible. Architect James Doherty, the National Park Service liaison for the White House, proposed the solar systems as part of a larger program of upgrades at the Presidential compound. "We felt if we were able to reduce our energy consumption, that would be a positive step forward," Mr. Doherty said.

Solar Electricity

It was time to upgrade the roof on what is affectionately called the "Pony Shed," a maintenance building on the southwest corner of the White House compound. The building occupies the site of the stable that once housed Macaroni, the pony given to President John F. Kennedy's daughter Caroline by then Vice President, Lyndon Johnson. Doherty saw this as a good opportunity to install a rooftop solar electric system.

The White House photovoltaic (PV) system consists of 167 "Cedar Series" solar modules from Evergreen Solar in Marlboro, Massachusetts, using cells manufactured with the company's string ribbon process. Evergreen's Vice President for Sales and Marketing, Rex D'Agostino, said their modules met several key criteria set out by the White House including using an American-made product manufactured in an ecologically friendly process. He said the company—from management to production—was excited about the opportunity to work on the project.

"Evergreen Solar is the classic, homegrown American success story, where a small group of dedicated individuals, starting from modest beginnings in a 'garage,' proved the commercial viability of a new and innovative technology," remarked Strong.

"This company literally rallied around that flag," D'Agostino said. "Everybody not only did what they had to do but went above and beyond the call of duty. It provided some significant internal morale escalation."

"We are very pleased to see this kind of governmental support for solar electricity. Evergreen Solar's panels were chosen for this installation by Steven Strong, one of the world's most respected solar designers and a true pioneer in the industry," said Mark A. Farber, President and Chief Executive Officer of Evergreen Solar. "We hope the success of this project will spur future applications of highly reliable, pollution-free solar power. Whether it is on a single residence or a commercial building, solar electricity is an important option in the quest for energy independence."

The 9-kilowatt (kW) (peak) PV system covers the roof of the grounds maintenance facility and directly feeds solar-generated power into the White House distribution system, providing electricity wherever it is needed. The DCAC inverters were provided by SMA-America and consist of a bank of Sunny Boy 2500 inverter modules. The project represents a step in the right direction, according to the company. "I think it is important to the public to see the government embracing clean energy," said Sam Vanderhoof of SMA-America. "SMA is proud to be a partner of the greening of the White House."

Solar Design Associates worked with Jason Fisher of Aurora Energy, a local PV installer in Annapolis, Maryland, to install the system. The entire system installation was completed over a three-day period late last August and includes a data acquisition system for monitoring the performance of the array and its ancillary electronic components.

"We appreciated the opportunity to work with Jason," said Craig Munger, the SDA Project Engineer on the PV system. "He's capable, effective and professional, and got the job done in the tight time frame we had."

Solar Thermal

The White House solar installations include two separate solar thermal systems.

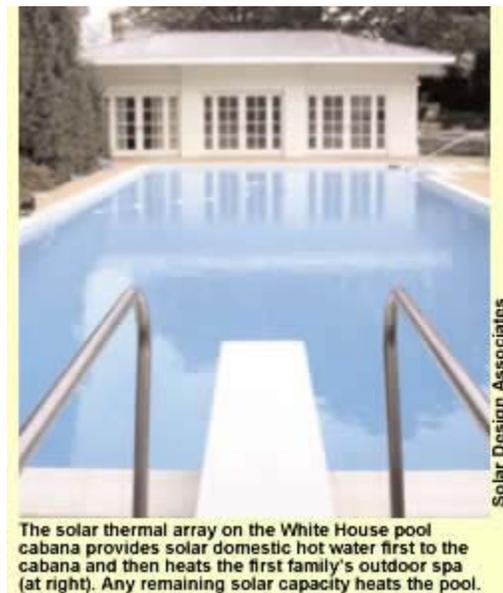
The first is installed on the grounds maintenance facility and employs standard 4 foot by 8 foot factory collectors in a drainback configuration to provide domestic hot water for use by maintenance personnel. The second is a roof-integrated thermal array built into the new roof of the First Family's pool cabana and provides domestic hot water for the cabana, heats the outdoor presidential spa and also helps heat the outdoor pool.

The pool cabana was scheduled for a major renovation, and First Lady Laura Bush had considerable input into what was to be accomplished and how it was to be done. It was decided that the existing flat, built-up roof, which was in need of replacement, should be replaced with a new, sloping copper-clad, standing-seam, hipped roof that would be more in keeping with the rest of the architecture.

Architect James Doherty asked Solar Design Associates if they could integrate a solar thermal array into the new roof to be flush with the new standing-seam roofing and harmonize the aesthetic impact. "Can you make the solar look like a large skylight?" he asked.

Strong worked with Doherty to develop the design for the solar array to be recessed into the new cabana roof such that the collector glazing would be in the plane of the finished roof and become the weathering skin. This is one of Solar Design Associates' signature design elements, and many of the buildings they design feature fully integrated solar thermal and photovoltaic arrays as their roofs.

Strong specified selective-surfaced, all-copper solar absorber plates from SunEarth, Inc., of Ontario, California, for the array. These were also installed in a drain-back configuration serving a small drain-back tank in the basement of the cabana, which, in turn, serves the



The solar thermal array on the White House pool cabana provides solar domestic hot water first to the cabana and then heats the first family's outdoor spa (at right). Any remaining solar capacity heats the pool.

domestic hot water, spa and pool by means of heat exchangers. Both solar thermal systems use water as a transfer medium.

"We have always preferred water as a working fluid for our solar space and water heating systems," said Strong. "It provides a much better rate of thermal transfer, requires less pumping energy, needs no maintenance or attention and is nearly free."

Rick Reed, President of SunEarth remarked, "We are very pleased to work with Solar Design Associates and have our hardware incorporated on this special project." He added, "Our premium all-copper solar absorbers will last at least as long as the copper roof on the building."

Solar Design Associates' personnel worked on-site closely with Dan Lunceford of Daystar Energy Service, a local solar thermal specialist in Silver Spring, Maryland, to install the solar thermal systems.

"Dan was great to work with," said Robert Erb, SDA Project Manager. "He's a good craftsman, quickly got up the learning curve and was willing to work the long days necessary to meet the tight schedule. Everything went as planned."

Logistical Challenges

The logistics of installing anything at the White House are rather complex, especially with the increased emphasis on security imposed as a result of the war on terrorism. Everyone working on the project, including the SDA design team, had to pass an extensive background security check and obtain White House Secret Service clearance.

All of the materials and components for the systems had to be specially packaged and shipped to a Secret Service warehouse well in advance of installation for detailed inspection. They were then held there until they were delivered by secure shipment to the White House.

All installers' tools and equipment were thoroughly inspected and, of course, everyone involved had to go through a security screening each time they came onto the White House property. Any vehicles that were to enter the property were inspected and searched. This caused a number of the trades to proactively clean out their trucks—perhaps for the first time ever—to make the inspections go easier.

The month of August has traditionally been the First Family's vacation period, and it is the only time during the year when "serious" maintenance efforts can go on without everyone being overly concerned about intruding on the nation's business or the First Family's privacy.

This results in a rush of activity on all areas of the property, as White House maintenance staff, Park Service employees and outside contractors all pitch in to accomplish 12 months of maintenance in about 4 weeks. Coordination is essential and—as a veteran of many years of the "August work frenzy"—the Park Service was a tough taskmaster.

Working with the Park Service went very smoothly, according to Strong. "They set up a brisk schedule involving many different operations and kept things moving. They helped greatly in coordinating the delivery of our materials and equipment with the Secret Service. Despite the logistical challenges, we were done early."

"We believe in these technologies, and they've been working for us very successfully," James Doherty said. "The National Park Service as a whole has long been interested in both sustainable design and renewable energy sources. We also have a mission to lower our energy consumption at all our sites, and we saw an opportunity to do both at the White House."

When asked why there hasn't been a bigger splash made about these installations, Doherty replied that the Park Service doesn't like to advertise what it does at the White House. "We call it 'silent stewardship,'" he said. "We have always sought to stay in the background and not compete with what the White House does."

"The Park Service is supporting the use of clean, renewable energy from the sun with these systems at the White House. It's an important milestone in building awareness for solar energy usage in residential and commercial buildings, and a step in the right direction in promoting energy independence," said Strong.

Strong considers it a privilege to be invited to design and install solar systems at the White House. He expressed appreciation for Scott Sklar and Steve Kalland, whose early advocacy at the Solar Energy Industries Association (SEIA) had set the stage. "Each solar roof is another small but important step toward greater energy selfreliance," he said. "I would hope that these installations will lead to a broader acceptance of solar energy as a way to reduce our dependence on foreign oil."

Looking Ahead

In April of 2002, President Bush appointed John Howard as the Federal Environmental Executive. Among other things, the mission of the Office of the Federal Environmental Executive includes "promoting sustainable environmental stewardship throughout the federal government." Speaking of the solar systems at the White House, Mr. Howard said, "Installing solar panels at the White House is yet another example of President Bush's personal stewardship commitment."

As the Texas Environment and Natural Resources Policy Director for then-Governor Bush, Mr. Howard helped to sign up the Governor's Mansion in Austin as one of the first to receive renewable electricity from the City of Austin's municipal utility. Austin's utility has invested heavily in west Texas wind farms and also supports the installation of solar electricity on city- and state-owned facilities within its service territory.

According to Mr. Howard, the President and Mrs. Bush are very supportive of renewable energy and sustainable design and have incorporated a number of measures at their ranch in Crawford, Texas. "The Bush family has installed a 25,000-gallon rainwater cistern for irrigation and planted native plants. The President is also busy removing invasive trees. The family's geothermal heating and cooling system sends water 300 feet into the ground to keep it at a constant 67 degree. The system uses 75 percent less electricity than traditional heating and air-conditioning systems, and it heats the outdoor pool so efficiently that the Bushes shelved their plans to install solar panels," he said. The Bush ranch also features passive solar heating and cooling, daylighting and enhanced insulation.

In an address on energy that he gave February 6, 2003, President Bush said, "It's important for our country to understand that by being bold and innovative, we can change the way we do business here in America. We can change our dependence upon foreign sources of energy; we can help with the quality of the air; we can make a fundamental difference for the future of our children.

"By what we do today, we can make a tremendous difference for the future of this country. How we invest taxpayers' monies today can help change the world." He added, "We've got some responsibilities in our nation. We've got a responsibility to our environment.

"It's important for our country to understand—I think most Americans do—that we import over half of our crude oil from abroad. And sometimes we import that oil from countries that don't particularly like us. It jeopardizes our national security to be dependent on sources of energy from countries that don't care for America, what we stand for, what we love. It's also a matter of economic security, to be dependent on energy from volatile regions of the world. Our economy becomes subject to price shocks or shortages or disruptions or cartels.

"We can make the world more peaceful, and we will; we can promote freedom, and we will. Those will be wonderful legacies. But also think about a legacy here at home, about making investments today that will make future citizens of our great country less dependent on foreign sources of energy."

The President delivered these encouraging comments as he unveiled his major new initiative for hydrogen fuel. Renewables advocates along with the majority of "mainstream" energy specialists see hydrogen as the essential common denominator in the next generation energy system, and many see it as the only logical choice for a longterm energy solution.

The President also said: "Hydrogen power is also clean to use. Hydrogen power will dramatically reduce greenhouse gas emissions, helping this nation take the lead when it comes to tackling the long-term challenges of global climate change."

Unfortunately, the way the new hydrogen initiative is currently being defined, electricity needed for the bulk production of hydrogen as a fuel is envisioned as coming from fossil fuel and nuclear sources—including major investments in "clean coal" and nuclear fusion. There is no mention of solar or wind energy—the two fastest growing sources of new electricity in the world today.

Even the most zealous advocates of nuclear fusion agree that it is 30 to 50 years away and uncertain at best. The president acknowledged this uncertainty, saying, "We've spent quite a bit of money, as the senators here will tell you, on whether or not fusion works. And we're not sure if it will be able to produce affordable energy for everyday use."

How can we be so close to understanding the problems before us and yet so far from the right solution?

As the President has said, "It won't be easy to get there because there are obstacles. It's important for the American people to know. There are obstacles to overcome."

I recall the words of Winston Churchill when, clustered with his inner circle and deeply despondent with the U.S. over deep differences in foreign policy, he mustered enough

optimism to postulate, "The Americans can always be counted upon to do the right thing—after they have tried everything else."

Renewable technologies are here. They are clean, safe, secure, proven and reliable. And we have tried everything else.

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