Whirlwind Solar Installs BIPV Solar Laminate System on First Certified "Passive House" on South, West Coasts

Whirlwind Solar, a division of Whirlwind Steel Buildings, Inc. in Houston, TX, announced today the installation of a building integrated photovoltaic (BIPV) solar laminate system on the first home on the South or West Coast to meet the stringent Passive House energy requirements. The Lafayette home of Corey Saft, an Architecture Professor at University of Louisiana at Lafayette, will serve as a cost effective urban prototype that demonstrates a remarkable 90% reduction in energy usage over traditional homes built to current codes.

(Vocus) July 13, 2010 -- Whirlwind Solar, a Division of Whirlwind Steel Buildings, Inc. a Houston, TX-based company announced today, in conjunction with Corey Saft, an Architecture Professor at University of Louisiana at Lafayette, the first application of Solar Laminates on a certified ‘Passive House’ home. It is the first such home across the South and West Coast. Keihly Moore, with the Illinois-based Passive House Institute US that gives the certification, says of Saft: “He is the first in the South. He’s blazing a trail.” The use of solar photovoltaics, along with the Passive House design criteria of 90% reduction in energy usage over traditional homes built to current codes, makes this an affordable zero-energy prototype for the extreme conditions in the hot and humid South as well as anywhere else.

The project incorporated many innovative thermal techniques to reduce energy consumption. Following the general Passive House strategy, the home is super-insulated and extremely well sealed, making the construction act more like a thermos to preserve the conditioned air inside and consequently requiring much less overall conditioning of air. As an analogy, think of plugging in your coffee maker to heat the water to make your coffee but then transferring the coffee to a thermos to maintain the temperature throughout the day. Once you cool or heat your house the most efficient way to maintain the temperature is not with additional electricity but through a well sealed and insulated container. In terms of energy consumption the results are obvious – and this is what the Passive House philosophy is all about. Combine this with the efficiency of Whirlwind's solar laminate panels and you quickly see how in the first month of operation this building was a zero-energy consumer.

The systems in the house are all standard and readily available but it is their integration into a whole house strategy that makes the final product so efficient and unique. The primary system is based on a a small (1 ton) mini-split air-conditioning system and the Ultimate Air RecoupAerator Energy Recovery Ventilator (ERV). With 95% energy recovery, MERV 12 filtration, and dehumidification the ERV is the black box in the system that makes it all possible. In conjunction with this primary strategy we also use an air-to-water heat pump to supplement cooling and dehumidification as well as provide hot water.

The wall assembly itself manages most of the thermal issues, as it is much thicker than normal and is made up of several parts that each play a different role in reducing the energy bill. Our wall is a wood stud assembly 24” o.c. laid out using advanced framing techniques. Half of the house is 2x6, but the other half throughout the double height space is 2x8 studs. On the inside, added mass from concrete counters, tile and extra thick drywall is used to store the cool in the summer and the warm in the winter. The space in between the studs is filled with open-cell spray foam for an extra air seal and the whole house is then wrapped with 1” of Polyisocyanurate insulation to eliminate thermal breaks throughout. There is then a radiant barrier and an air space that is used to back-ventilate the final exterior skin of fiber-cement siding. This rain-screen system also acts as a whole house sun-shading device ridding the building of much of the heat even before it gets to our insulated wall.

As well as reduced energy consumption, the design of the home focuses on a richly developed living experience. The home is a modern open plan with a full half of the house boasting a sixteen+ foot double height space. The kitchen, the mezzanine and the stairs hanging off of it create a dynamic spatial experience. Feeding this large open volume is a twelve foot bank of high north facing clerestory windows that fill almost the whole home with artist quality natural light. When artificial light is required in the evening, there is a mixture of LED and CFL lights to keep the energy draw to a minimum and allow the small solar array to balance all its needs.

This house was an experiment on many fronts. As well as being the first home anywhere on the South or West Coast to meet the stringent energy requirements of the Passive House standard, it is also designed to be a cost effective urban prototype. With a footprint of less than 800 sq ft and a total livable square footage of 1200 sq ft, it is a 3 bedroom 2 bath designed for great density. Its long, thin and tall form allows it to be easily converted to a row house or flats above a commercial base on any downtown street. The rich spatial and experiential qualities could easily be maintained in any dense urban situation while the energy requirements would be reduced because of the shared party-walls and reduced number of exterior walls. With these efficiencies and a larger roof area to strategically group the solar array, we could easily develop this project into a net-energy producing urban block.

The construction of this project was a collaboration between Saft and one of his former students, Jaron Young. Young's company, H.J. Construction, oversaw the building process and also understood it as a unique experiment. Beyond Passive House certification this home is in the final stages of attaining the first LEED platinum rating in Acadiana from the U.S. Green Building Council.

One of the main difficulties in building a project like this is the financing. The appraisal that the underwriting of a traditional construction loan requires rarely takes into account any of the innovative efficiencies present in our home because there are no 'comparables' with which to judge how much a consumer might pay for them. The result is that they are just not factored in and the home is severely undervalued. It is a system set up to resist change. This, says Saft, is probably the most significant impediment to a large scale transformation of our building stock.

The solar array, which is laminated to the Whirlwind Weather Snap metal system, is sized at 3.264 kW. The solar laminate system enabled some of Corey Saft's students to more fully understand photovoltaic's and at the same time be involved with some cutting edge technology.

The “Made in USA” BIPV system is manufactured by United Solar Ovonic LLC, based Rochester Hills, MI, and is sold through their authorized distributor, Whirlwind Solar, a division of Whirlwind Steel Buildings, Inc. with corporate headquarters in Houston, TX.

A comprehensive video documentation of the installation is available here:
http://www.youtube.com/watch?v=48BBOLEF4gs.

The Solar laminate system is comprised of approximately 24 photovoltaic laminates each 16” wide and 18’ - 0" long, and approximately ¼” thick. Each panel fits between the ridges of the building’s standing seam metal roofing system and face south for maximum efficiency. The solar laminate technology is lightweight (less than one pound per square foot). The combined weight of the panels is approximately 576 lbs. and covers an area of approximately 576 SF. The solar laminate technology is better at capturing off angle light than traditional crystalline solar panels. Therefore, the photovoltaic laminate array does not need to be at the perfect Tilt Angle (Slope) or Azimuth Angle (perfectly oriented South) to create a great deal of electricity. The solar laminate utilizes unique triple-junction amorphous silicon solar cells, where the blue, green and red light of the sun is absorbed in different layers of the cell. This technology results in better performance in low and diffuse light conditions. Solar Laminates demonstrate superior energy production in high temperatures, low light levels, cloudy conditions, and shading.

Corey Saft avoided adding 3 to 6 lbs. per SF to the structure which can be the case when using framing systems and heavy traditional crystalline solar panels. Additional foundation and heavy framing costs were unnecessary because of the lightweight solar laminate materials. Traditional solar arrays require multiple penetrations which can lead to water leaks and air infiltration in the building. The solar laminate system is a "penetration free system" which is another reason why Professor Saft selected to use the solar laminate technology.

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