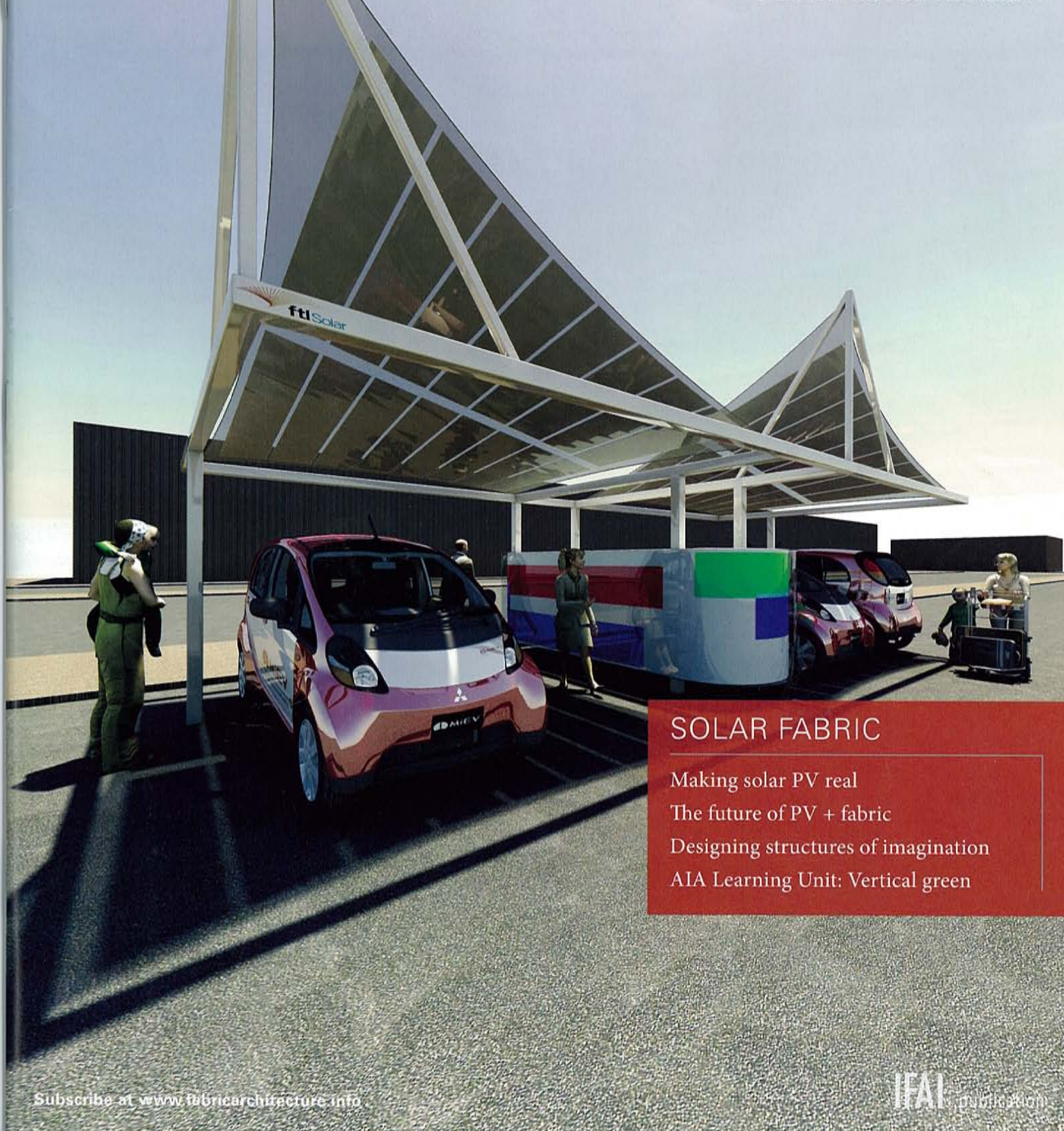


# *Fabric* **ARCHITECTURE**

DESIGN FOR SUSTAINABILITY



## SOLAR FABRIC

- Making solar PV real
- The future of PV + fabric
- Designing structures of imagination
- AIA Learning Unit: Vertical green



# Better living through PHOTOVOLTAICS



Above and on the cover:  
The PowerMod can be fitted out  
for numerous applications such  
as this recharging station for  
electric cars.



## A New York design firm is defining the new frontier of building technology

By Joanna Baymiller

**B**etter Things for Better Living ... Through Chemistry" –Advertising slogan for DuPont, 1935–1982.

As it makes pioneering efforts in the green revolution, FTL Solar has made a heavy investment in lightweight fabrics. The company's founder and president, Todd Dalland, FAIA, started FTL Design Engineering Studio (with Nicolas Goldsmith, FAIA) and helped to lead it until 2007 when he created FTL Solar, an independent spin-off, with Robert Lerner, AIA, chief technology officer.

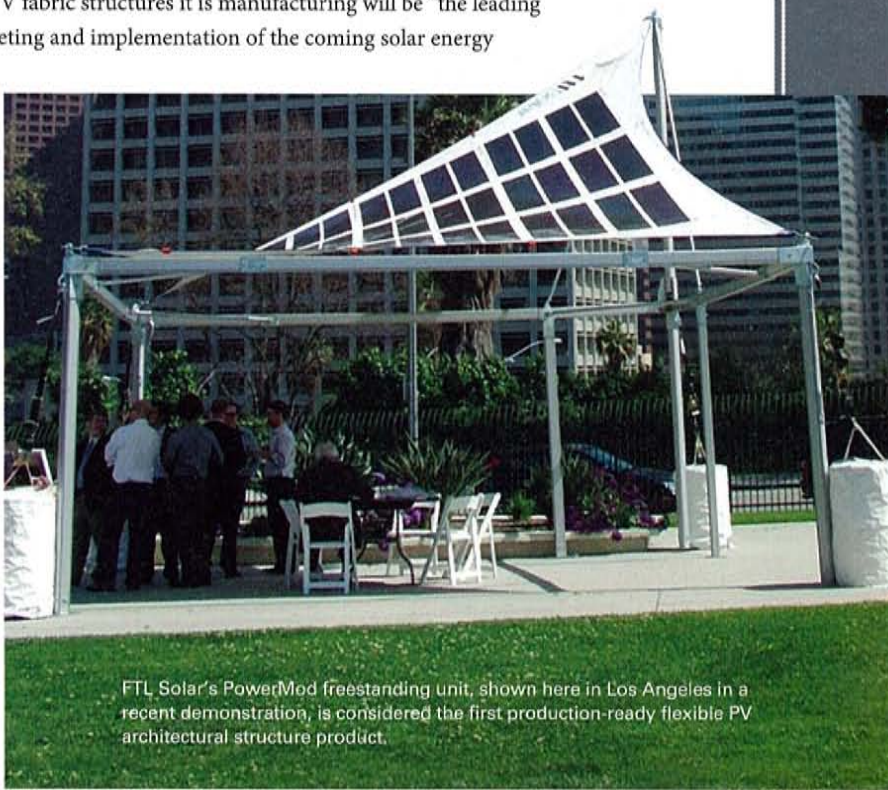
Both men have long been enthusiasts for lightweight, flexible fabric structures of an astonishing variety. Examples of FTL's work for the last 20 years run the global gamut from orchestra shells to Olympic pavilions, and projects for recreation, resort and retail use.\* Over the past two years, Dalland and Lerner have ardently pursued a green revolution in fabric.

At a cluttered desk strewn with two large boxes of colored pencils Dalland declares that FTL Solar intends to revolutionize the design, manufacturing and distribution of tents — tents that make electricity from sunlight. "In the future," he says, "tents and fabric structures will provide power as well as enclosure. FTL Solar is leading this movement ... producing fabric that makes electricity when exposed to sunlight, and making tents out of it that make electricity as well as provide shelter.

"And all of it is mass-produced," he continues. "Architecture-as-product ... that makes its own power — and eventually uses that power to purify its own water and air and recycle its own waste."

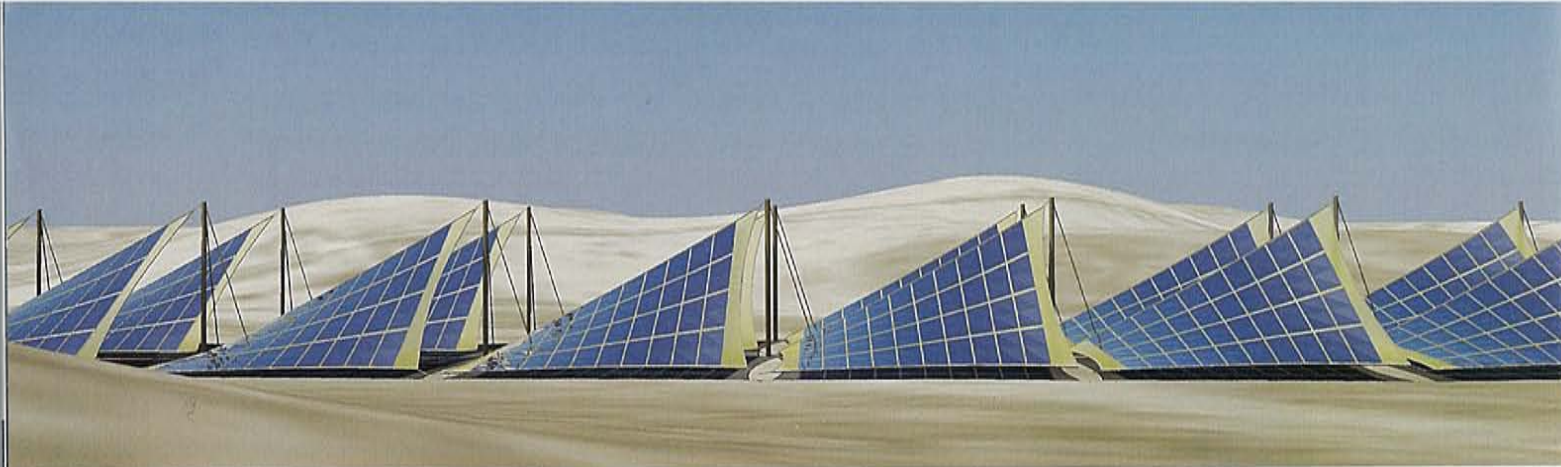
In a marketplace with an increasing appetite for solar products and applications, FTL Solar believes the flexible and portable PV fabric structures it is manufacturing will be "the leading photovoltaic products in the marketing and implementation of the coming solar energy global restructuring."

It's a big claim but there's both money and manpower behind it. FTL Solar has reorganized into two major divisions to meet these goals. While the company's product development team (Dalland; Lerner; solar pioneers Dr. Gay Canough and Richard Schoen, FAIA; and Joe Schedlbauer, PE, 17-year veteran of long-span tensile structure manufacturer, conceives of new ways to make structures with flexible composite membranes, a corporate management team led by Tony Saxton, the company's CEO and first investor, develops strategic partnerships and seeks funding for critical research.



FTL Solar's PowerMod freestanding unit, shown here in Los Angeles in a recent demonstration, is considered the first production-ready flexible PV architectural structure product.





The basic module for FTL Solar's designs is the PowerMod, here set up in linked multiples as a desert energy field. The simple structure is a square frame at the base and a single pole that lifts one corner to slope the flexible PV field to optimize efficiency. The designers claim it is the "world's fastest solar array system" going from packed to powered up in 20 minutes.

A year ago, Saxton led FTL Solar through the first round of a proposed \$50 million capital acquisition initiative. Revenue from that round and subsequent funding — including more than \$450,000 in grants Lerner obtained from the New York State Energy Research and Development Authority — is expanding FTL Solar's domestic and international development initiatives: new products, new materials and new market segments. As it looks to realize those goals, the company can tap an advisory board that includes retired army and marine corps generals and the former director (pre-Katrina) of the Federal Emergency Management Agency (FEMA), as well as a number of heavy hitters in the fields of green marketing, private equity and strategic investments.

All this brainpower is devoted to structures utilizing photovoltaic fabric. FTL's structures eschew the more familiar rectangular, windowlike rigid panels most of us think of when we think of solar energy production. Today, these represent 95% of the market for solar technology in the building trades, but they're huge, heavy, expensive and hard to install — not to mention that many find them unattractive. FTL Solar has made use of the enormous growth potential in thin film solar cells, which are easier to transport and install and more flexible in their application to fabric structures. In 1998, FTL Design Engineering Studio created and produced the world's first tensile structure featuring thin film solar cell technologies. Now, FTL Solar is the world's first creator of flexible, tensile structures integrated with thin film solar cells, which not only create shelter, but generate their own energy from the sun. In these structures, you get in, sit down, and plug in your iPod' ... and lights, and refrigerators and cars.

The company touts these as "the most advanced, portable, modular, lightweight and flexible solar products of their kind" and is developing multiple markets for commercial, residential and cultural applications, and — in a notable, innovative and potentially significant area of research and development — for the military.

Martha Shaw, CEO of Earth Advertising, serves on the firm's eight-member board of advisors. "FTL Solar was the biggest splash at the recent Association of the United States Army (AUSA) conference," she says. There, the company demonstrated a 5m-by-7m, PowerSquad tent with an advanced aluminum folding frame, a main tent made of sand-colored army fabric, with a PV fly designed for solar orientation and optimized electricity generation. The fly weighs about 40kg and folds into its own carrying case. Potentially, multiple Power Squad structures can be transported to active locations around the globe using fewer vehicles and less fuel. (Shaw calls it "the fastest kilowatt in the world.")

Shaw explained that FTL Design Engineering Studio "had a long history of 'now mainstream' lightweight fabric architecture projects, tensile structure product licensing contracts, military tent contracts, NASA R&D contracts and lightweight structure research grants, and that FTL Solar is now focused exclusively on manufacturing PV tents for disaster relief, medical tents for groups like Doctors Without Borders, portable tents for UN relief workers and for humanitarian aid and sustainable development, as well as commercial and military products."



FTL Solar founders Todd Dalland, FAIA, and Robert Lerner, AIA, (right), started the company in 2006 to utilize photovoltaic fabrics.



What else are they up to? And why should you have their phone number in your BlackBerry? Dalland describes the PowerSquad as an updated "Airstream trailer." "The walls fold down and an engineered PV tent pops up enclosing a space with a 3 to 1 expansion ratio (the floor plan of the structure when fully deployed is three times the size of the folded one when it first arrives on-site). It has a bathroom and kitchenette and sleeps a family of six."

### Think disaster relief

The firm is also working on laminating onto the fabric a layer of thin flexible material that becomes luminous when electrically stimulated. One lamination makes electricity, and another makes light. Think cultural and retail pavilions, trade fairs, artists' palettes or innovative residential applications such as porch and carport roofs.

Expanded in multiples, FTL's "PowerPark" — a lightweight, asymmetrical, permanent PV fabric tent module on a steel, wide-flange structure — becomes an environmentally conscious carport or electric vehicle charging station, expandable as needed to turn a parking lot into a power plant and, not incidentally, a revenue stream. In addition to being able to be ordered "off the shelf," reducing design and construction schedules, these tents are fossil-fuel free, constructible in numerous sizes, a great deal more attractive than a parking garage, and generate electricity.

The firm has also invented "PowerShelters," self-contained tents that can house a family of four or (in multiples) a small platoon. These zero-carbon structures can be "pitched and plugged" virtually anywhere, vastly reducing the logistics of transporting much larger permanent structures for either military applications or for rapid deployment for disaster relief and greatly reducing the need for fuel supply lines for gasoline-powered generators that would otherwise be necessary.

The roadblocks facing this new industry include both technological and psychological hurdles. "The sunlight's there, it's free," says Lerner, "but if we are not sending the electricity from the sun directly into the grid, we must store it in batteries. And current lead-acid battery technology, though tried and proven, consists of heavy batteries with modest storage capacity. Lighter weight lithium ion batteries are available, but are currently much more expensive. In the future, we're looking at using other battery technologies which are much lighter and have greater storage capacity."

The psychological hurdle is public awareness and understanding. Cree Crawford, FTL Solar's vice president of marketing, points out that efficiency starts with "using less energy and using it more efficiently. We're using less energy, but currently the appliances on the market

aren't all as efficient." Some of FTL Solar's products are self-contained permanent power plants. The average American household could be powered by six to eight 2m-by-2m FTL Solar structures in the backyard, but this requires a conscious awareness of resource consumption and energy efficient appliances. "We have all got to get to the next level of awareness," says Crawford.

Armed and aware, FTL Solar's corporate management and product development team are confident that solar energy can meet a large percentage of our nation's energy demands, and the technology exists to harness that energy economically and efficiently. They're out to prove it.

"We want to make solar energy accessible to everyone," Dalland says. "Together, we can meet the world's energy needs without sacrificing the future." The future would seem to be waiting with open arms. *FA*

*Joanna Baymiller is a contributing editor of Fabric Architecture.*

\* Among FTL's more recognizable projects were the Boston Harbour Lights Pavilion, a 3,500 seat permanent, fabric tensile structure music pavilion on Baltimore's Inner Harbour and the Anchor Century Tent, a modular system which has been a mainstay of the tent rental industry.

A utilitarian application of FTL Solar's flexible PV is their PowerPark, a lightweight, asymmetrical permanent PV system on steel frame to form a car port or electric vehicle charging station. In addition to collecting free energy from the sun, the system shades vehicles to help reduce the need for air conditioning when drivers pull away.

