

SOLAR BILLBOARD

A new apartment building in Brooklyn models urban design with renewable energy

The Delta, a smallish building next to the expressway in Brooklyn's Carroll Gardens, stands out for more than just its odd triangular shape: it boasts a rooftop solar array, a wind turbine and a thin-film solar skin – the first of its kind on a residential building in New York City. Electricity from these systems will meet or exceed annual demand at the Delta. More importantly, the building is meant to be just the start for something much bigger.

It's a sunny morning in Brooklyn, New York, and Ron Faia cuts across traffic on Court Street, leading his companions toward a dingy fast-food restaurant. He lifts his hand to let approaching drivers know they had better stop because he is not slowing down. Semi trucks rattle by overhead on the Gowanus Expressway, an elevated beast of porous asphalt and oxidized metal that draws a line between the less-affluent neighborhood of Red Hook to the southwest and the rapidly gentrifying Carroll Gardens to the northeast, where every other building seems to be undergoing some kind of renovation.

Faia, a developer turned renewable energy proselytizer, walks straight to a

table at the far end of the restaurant. His meeting is just a few blocks away from an apartment building he and his business partners designed and built. Recently completed after 4 years of construction, it is supposed to be a showcase for the net-zero concept, generating at least as much electricity as it takes from the grid. Unfortunately, the local utility – Consolidated Edison Inc., which only recently settled a 3-week union strike – had not yet connected the new building to the grid when we visited. Otherwise, the meeting would be there.

The Delta – named in reference to its triangular footprint – is a project that Faia and his colleagues believe they have unveiled at a very good time.

Architecture





Mission accomplished: Ron Faia (left) and Carlos Berger stand below the rooftop PV system on their newly completed building.



New York City still lags behind places like San Francisco and Los Angeles in realizing its massive solar potential, but the city has taken a turn toward renewable energy in the last few years. Faia is touting the Delta as a groundbreaking project that – if things go according to his plans – will be the first of many.

Big plans, big potential

Faia and his business partner, Mark Robinson, have been working as developers in Brooklyn for 16 years and jointly own 25 buildings and a construction company. When they started work on the Delta, they brought in electrician Carlos Berger to run the solar company Voltaic Solaire LLC, the newest of their ventures. Their plan is to turn all of their buildings net zero, and there is plenty of room to expand. In 2011, the NYC Solar America City Partnership team created a 3-D map of the solar potential in the five boroughs, mapping out the contours of a million roofs. New York's existing buildings could accommodate many gigawatts of photovoltaic (PV) arrays, and that only accounts for the rooftops. Faia, Robinson and Berger would like to cover the city's facades as well.

As for the Delta itself, the building's odd shape and location make it a mediocre place to live, but an excellent showroom to advertise its developers' ideas. Faia says a major reason they chose this site, whose first floor will also host an upscale fried-food restaurant called »Bite This,« is the high amount of foot traffic. Before he and his partners started work on the building, they had people stand outside and count the passing commuters. The tally came out to roughly 10,000 people per day. Now, after most of the work is finished, the five-story, 186 m² building is wrapped in a solar hot water system and 7.8 kW of thin-film solar modules on its facades. Another 2.4 kW of PV modules share the roof with a 600 W wind turbine. Finally, Faia is installing lights under the rooftop PV array so that it will be visible to the expressway at night, serving as his own solar billboard.

Architecture



Emphasis on the accents:
The Delta features (from left)
floor tiles rummaged from a
dumpster, wood recovered
from another building, and
recycled glass in the floors as
a bonding agent.

Inside, the Delta consists of two residential units, which will go on the market as short-term rentals as soon as the electricity and water are connected. The lower unit is a 37 m² »micro-studio« with a full kitchen – albeit with smaller-than-usual appliances – tucked under the stairwell. Its LED lighting runs on a total of 65 W, which is about the equivalent load of a single incandescent light bulb. The upper unit contains a kitchen, bedroom and bathroom on three tiny floors. The bed in each unit folds up into the wall.

The designer paid a lot of attention to details, both inside and out. The »bricks« on the building's facade are made of recovered materials, the cement floors use recycled glass as a bonding agent, the wood accents throughout are recovered from another building the company is renovating nearby, and Faia and his crew found the floor tiles in a dumpster.

The Delta's developers say that the biggest challenge was dealing with the shape and size of the building. Throughout the whole process, only one person could work on each floor at a time. Figuring out how to fit two apartments into this strange building took time as well, and the solar system caused additional delays. Faia flew to

China to find the right semitransparent solar modules for use in the facade, and once he had talked Baoding Tianwei Solarfilms Co. Ltd. into shipping his small order of frameless glass-glass amorphous silicon modules, Voltaic Solaire LLC ran into more trouble finding a racking system. The company was only able to find one provider – Schletter Inc. – that could produce facade mounting for frameless modules, and it had to get the custom products shipped from Germany. However, Faia hopes that doing everything the hard way on this first project will pay off in the long run, since future projects will use similar technologies. »You have to imagine what you want and go backwards,« he says.

Rules and egos

There are still bureaucratic hurdles to going solar in New York City. The numbers tell part of the tale: PV rates per watt installed hover a couple of dollars higher than in nearby Long Island. Faia says this is not just a reflection of the industry there. He adds that building anything in the city is hard, but that there were also challenges the developers faced specifically because of the solar systems. In late 2008, when they started working on the Delta building, »solar was challenging in

that it hadn't caught on enough that the plan examiners and the building inspectors were really up to speed,« Robinson says. »I think that now is a better time.«

Faia does not think his years of experience as a developer in Brooklyn made it any easier to cut through all the red tape involved with building the Delta. »It never gets better,« he says, »because it's not always about the rules and regulations. Sometimes it's about someone's ego.« As Faia says this, he is standing on the ground floor of a gutted building on 5th Avenue in Park Slope. Site foreman Victor Pop is on the floor below, in a deep pit that smells of wet earth, where he and his crew are burrowing out a huge sub-cellar. The site will soon hold solar hot water equipment, the likes of which the building's plan examiners had never seen until these developers presented it – and Faia still got the go-ahead. This 1,115 m² apartment building will feature a restaurant, a music venue and enough solar power to make the Delta building's systems look dollhouse-sized. To make it happen, the construction crew has a special protocol for dealing with inspectors who may show up unannounced: keep the front door closed and if anyone knocks, call Faia. He knows how to talk to them.



Dirk Esterbroek / photon-pictures.com (33)

Faia wears a Bluetooth headset on a lanyard around his neck and often breaks mid-sentence to take a call. »I've been a workaholic since I was 11,« he says. Robinson claims to suffer from the same affliction. This afternoon, Faia is pacing the stairwell of the Delta, giving tips to a colleague for a meeting with another developer that wants to go green. »Don't give away any secrets,« he says, »and try to sell them on the solar part.«

Barriers from within

That is the third arm of Voltaic Solaire's efforts as a company. In addition to retrofitting buildings that Faia and Robinson already own and selling solar systems, it shows other developers how to build, Delta-style. »Fortunately for us, and unfortunately for the industry, architects and engineers are not educated in energy and efficiency,« Faia says. The meeting was called because the developers read about the Delta in the paper. »The response to this building has been phenomenal,« Faia says.

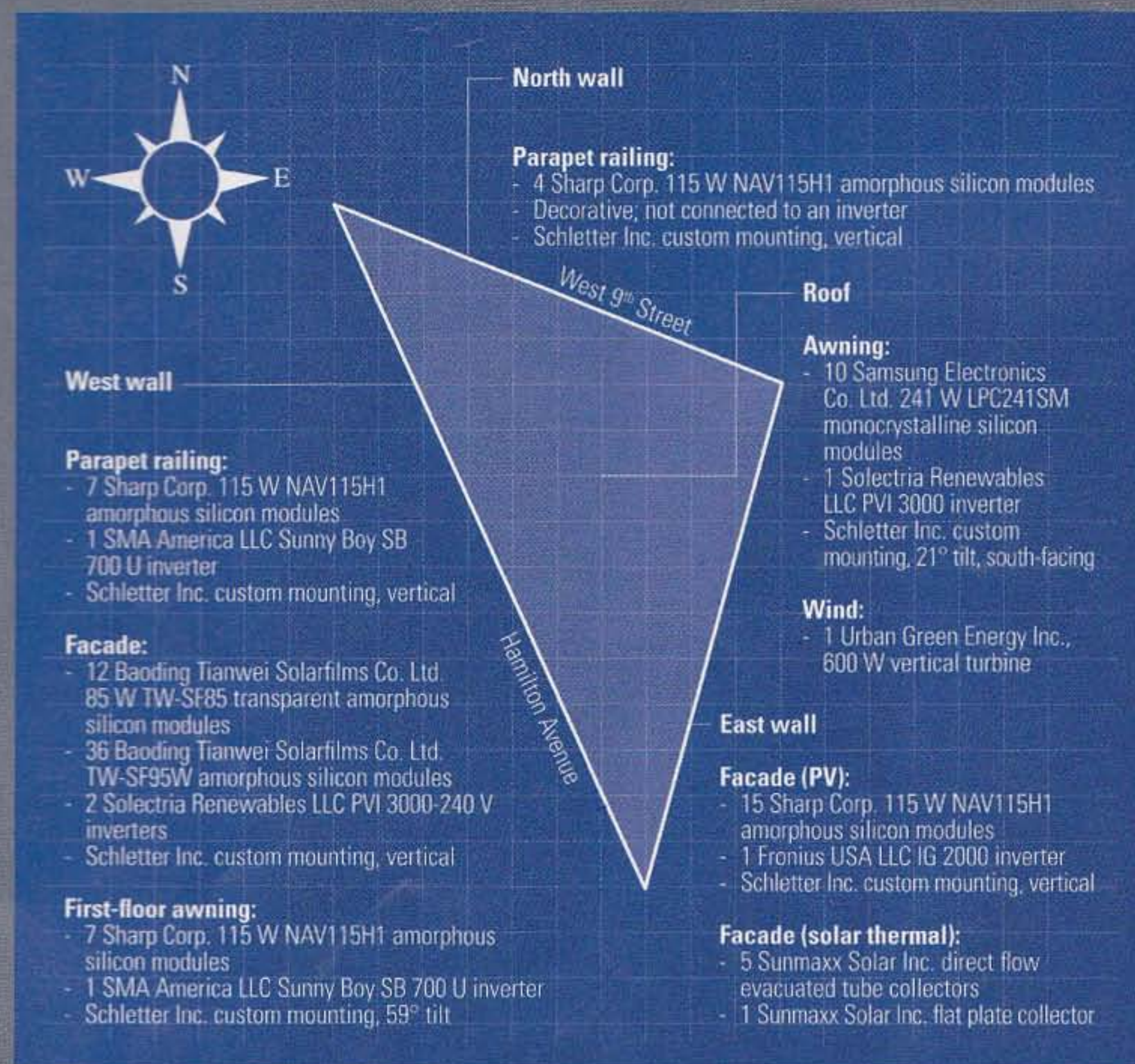
While government incentives were helpful in making solar more affordable for the project – Voltaic Solaire got \$33,900 in federal tax credits, \$5,000

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Fully loaded: Energy systems on the Delta

The Delta's developers put it together to showcase technology. To that end, they added as many renewable energy systems as they could fit on its three walls and rooftop: a wind turbine, two kinds of solar hot water panels, and four kinds of solar

modules. They even added four modules just for decorative effect on the front of the building, facing West 9th Street. The solar hot water collectors are supposed to cover approximately 80 percent of the building's water heating needs. *mb*





Everything is included: The building designers fit full kitchens into both rental units.



Amber-colored glass:
Semitransparent solar
modules lend a softer look to
the highway that thunders by
outside the Delta's fourth floor.

Getting down to net zero

When the Delta's developers call it a net-zero building, they do not mean that it can operate off the electric grid. Net zero is shorthand to describe a house that produces at least as much energy as it consumes. So the total of the kilowatt hours consumed minus the kilowatt hours fed into the grid should equal zero or less. There is also no defined time span for the calculation. Generally, however, solar systems in the US have annualized net metering. As a result, excess electricity generated in the summer months can be credited against electricity consumed in winter, when photovoltaic (PV) systems produce considerably less power.

In the case of the Delta, the rooftop system guarantees the bulk of the power and is best suited for the summer months, when the sun is high in the sky. The developers estimate that the building's PV systems generate a combined 12,360 kWh annually. The wind turbine should experience the most wind between fall and spring, but with about

720 kWh of estimated annual generation, it makes up only a small portion of the total energy yield.

While some off-grid system designers use hybrid systems – combining wind and solar, which produce best in different seasons – to ensure a minimum amount of generation throughout the year in order to meet a building's load, this calculation is not needed for net-metered houses like the Delta. It receives whatever extra power it needs from the grid, effectively using it as a giant battery. *mb*

Net metering by the numbers

Estimated yearly use:

Residential units: 4,500 to 5,500 kWh

Restaurant: 5,000 to 7,000 kWh

Total: 9,000 to 12,500 kWh

Estimated yearly production:

PV: 12,360 kWh

Wind: 720 kWh

Total: 13,080 kWh

Electricity savings:

Residential rate: 24¢ per kWh

Commercial rate: 27¢ per kWh

Maximum savings in the first year: \$3,210

Costs:

Building: \$550,000

Research and Development: \$25,000

PV system: \$113,000

(\$67,800 materials, \$45,200 labor)

Wind system: \$8,000

Solar thermal system: \$22,000

Grand total: \$718,000

Rebates and tax credits

NYSERDA rebate of \$1.75 per W (AC) for 5,172 W: \$9,051

Note:

The Tianwei modules were not yet NYSERDA listed and therefore not eligible

State tax credit: \$5,000

Federal 30 percent tax credit: \$33,900

Grand total: \$47,951



Moving right along: Victor Pop, who was site foreman during the Delta's construction, is leading a team in renovating the next project on 5th Avenue.

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in state tax credits, and a \$9,051 rebate from the New York State Energy Research and Development Authority (NYSERDA) – ultimately, the company's owners believe that the building industry is going to have to drive the market. The power, they say, lies in the hands of architects, engineers, tradespeople and developers. Voltaic Solaire's agenda is to educate as many of them as possible and, hopefully, to make some money as well.

But while the Delta may be a great showroom for technologies, it does not make a convincing case for affordable solar power. The PV component came out to \$113,000, or \$11.09 per W, before incentives. Once they are deducted, the developers are in with \$65,049. They estimate that the PV systems together will generate about 12,360 kWh per year. Even with net metering, which will save between 24¢ and 27¢ per kWh, it is going to take at least 15 years to pay off, assuming electricity rates go up by 5 percent per year.

Regardless, Faia does not expect to charge more than market rates to rent the apartments. He thinks the Delta will go for about \$185 per night for the smaller unit, and about \$300 per night for the larger one. A two-bedroom apartment in the 5th Avenue building, he says, should rent for about \$2,000 to \$3,000 per month. In order to show that building-integrated renewable energy is a good investment in New York City, and probably also to survive in this venture, Voltaic Solaire is going to have to bring down costs.

Better with practice

The Delta's developers expect their future projects to run more smoothly, with experience and easier materials sourcing. They also point out that a prime solar location is not why this system was installed. »It's a triangle-shaped building next to the highway with shadowing,« says Faia. »There are issues.« The yields, therefore, do not reflect the maximum potential of the

modules. »The Delta building has been a wise investment in ideas,« Robinson says. »There's this tiny little building in Brooklyn in an industrial area with a highway over it, and it's also a residential area. How are you going to make a difference there? And we did.«

While the Delta took more than 3 years to complete, its developers think they can finish their 5th Avenue property in just a year. »I would be wrong if I said that we really knew, totally, what we were doing,« Robinson says of work on the Delta building. »We figured the process out as we went, and did the research and hired the right people, the right professionals to help get through that. And, ultimately, each time you do that, you learn.« Faia and his partners have already lined up the next object for renovation after the building on 5th Avenue is finished. It's just five blocks away. »I've got projects for 30 years,« he says. If his plan works, by that time, building Delta-style should be the rule, not the exception.

Melissa Bosworth