

Existing Avenues to Encourage Building Integrated Photovoltaic Installations in New York City

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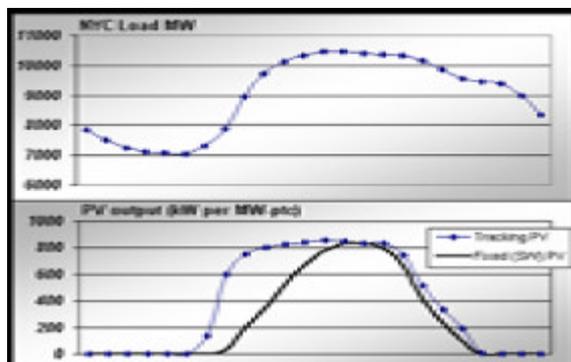
Purpose of Work:

New York City is experiencing an unprecedented construction boom and with additional projects in the pipeline such as rebuilding of the World Trade Center site and various projects proposed as part of the New York City's Olympic Bid, this is a unique time to look at how the use of Building Integrated Photovoltaic systems may have an impact on the City's future skyline. One of the main drivers attributed to the growing interest in BIPV systems is New York City's challenge to meet its growing peak electricity requirements. NYC is an electric load pocket. It is geographically isolated – consisting of 3 islands and a peninsula – yet it has a power demand of well over 10,000 MW on peak days. As a result, the New York Independent System Operator (NYISO), which manages NY State's bulk power transmission system and wholesale power markets, has determined that, if voltage support and reliability standards are to be maintained, NYC must be capable of generating 80% of its electric power requirements within the 5 boroughs that make up the city. However, power plant siting has generally become more difficult and this is especially true in NYC, where real estate options are constrained, real estate values are high and community values overlap. Added to the power supply concerns is the fact that New York City is consistently in violation of federal air quality regulations and of course concerns over security. As a result, forward-thinking planners have embraced the use of clean technology for on-site power generation, leading the way in this forum as been the incorporation of BIPV.

The focus of this paper is to describe the existing avenues that encourage Building Integrated Photovoltaics using experienced gained from the various projects altPOWER, Inc. has been involved with in NYC. Included in this portfolio of projects are 5 prominent buildings in Manhattan and 3 buildings in Brooklyn. Three of the Manhattan projects are in Battery Park City; The Solaire a 27 story residential tower, TriBeCa Green a 25 story residential tower and the new Goldman Sachs corporate headquarters, a proposed 65 story commercial office tower for the financial services company.

The Museum of Jewish Heritage an 82,000 square foot performance and exhibit space is located just south of Battery Park City on Manhattan's southern tip. Located on Manhattan's Upper West Side is The Helena a 40 story residential tower and across the East River, the two Greenpoint Manufacturing and Design Center (GMDC) projects at their facilities on Humboldt Street and Manhattan Ave in the Greenpoint neighborhood of Brooklyn and also the Rhinegold Gardens housing project in the Bushwick neighborhood of Brooklyn. We shall discuss the Battery Park City Authority's (BPCA) green guidelines and local code requirements, the various state and federal government tax credits and funding offered in the area, the interconnection laws and net-metering laws, and the resulting cost reductions, experience, and advancements in BIPV technology resulting from these and other projects.

Motivation for these projects comes from a greater understanding of the impact unrestricted Greenhouse Gas Emissions is having on our local and global environments as well as concerns over energy security but perhaps the greatest encouragement has come from the political leadership of New York State which has realized through research that one way New York City (NYC) can escape the economic and safety threats of interruptions in power supply is to build on the already reliable electric grid infrastructure by investing in distributed generation and more importantly renewable sources of generation which will not add to the already unhealthy air the City's residents have learned to live with. In particular photovoltaic generation sources have proven through research to be the most reliable source of power for New York City. The graph below illustrates the peak demand for NYC on July 6th 1999 when the Washington Heights neighborhood experienced a loss of power supply resulting in loss of life and massive economic losses while also showing the availability of PV power. Simply, enough PV generation within the 5 boroughs of NYC will help alleviate the strain on supply during the hottest sunniest days.



This type of information lead to increased funding through the New York State Energy Research and Development Authority and the establishment of Green Guidelines for the development of the Battery Park City neighborhood of Manhattan which is under direct control of New York State through the Battery Park City Authority. Battery Park City is located on a reclaimed section of the lower west side of Manhattan island, part of the fill comes from the excavation of the original World Trade Center development. Currently there are 3 sites under construction (site 2a, site 18b, site 19b) two sites in the final design phase (site 16/17 and site 26) and 3 additional sites awaiting proposals from developers. The Battery Park City Requirements state that each new building must incorporate BIPV to supply 5% of each new buildings base building electrical load as well as requiring a multitude of sustainable building practices.

The first project finished under the BPCA Green Guidelines was Site 18a or The Solaire. This project incorporates 4 BIPV systems, a 11 kWp BIPV façade system, a 650 Wp glass/glass laminate canopy system and a 6.5 kWp south wall and 16.5 kWp west wall weather screen at the top of the building. The building developer, The Albanese Organization used all available funds including NSYERDA funding from the PV on Buildings program PON 449-99 and the New York State Green Building Tax Credit as well as all available Federal Income Tax credits and Accelerated Depreciation. The Solaire is a United States Green Building Council (USGBC) – Leadership in Energy and Environmental Design (LEED®) certified building achieving Gold status.



The Solaire

TriBeCa Green is using New Construction Program through NSYERDA PON 593 as well as all available Federal Income Tax credits and Accelerated Depreciation. Located at BPCA Site 19b, it is currently under construction is a 27.3 kWp PV system using standard UL Listed modules, the SunPower SPR-210 which utilize the high efficiency PV cell, the A-300. The developer for the project, The Related Companies is pursuing USGBC LEED® certification for this project as well.

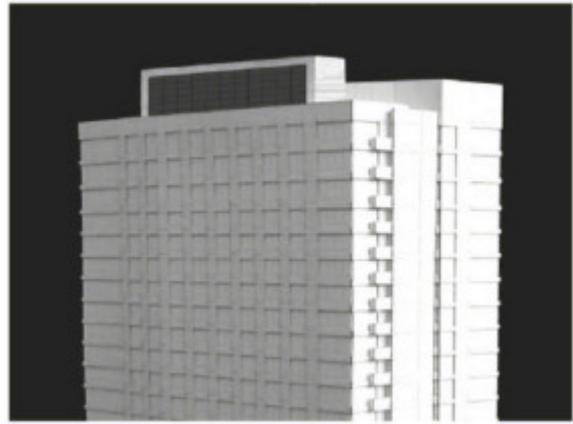
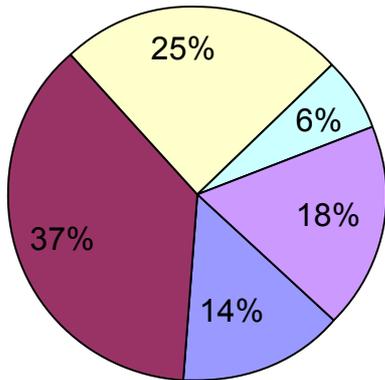


TriBeCa Green under construction

Millennium Partners development on BPCA Site 2a will also utilize the SunPower A-300 solar cell but used in a custom laminate as part of a façade wall at the mechanical bulkhead. The developers are pursuing all available funding. The goal of the developer is to achieve a USGBC LEED® gold certification. The pie chart below illustrates how the BIPV portion of the project is being funded and reinforces the multitude of available funding from various sources for such a project.

Millennium Tower, BPCA - Site 2

- Millennium Partners \$45,295
- NYSERDA \$117,450
- Green Building Tax Credit \$78,300
- Federal Tax Credit \$20,005
- Federal Accelerated Depreciation \$56,450



View Facing Northeast
(photomontage of physical model and computer rendered PV system)

Millenium Tower BPCA Site 2a

The Goldman Sachs tower to be constructed on BPCA Site 26 (adjacent to the World Trade Center site) will also try to attain a USGBC LEED® Gold rating and will be amongst the ‘Greenest’ and most secure office towers in the world. The 65 story building will include as one of its architectural features a 75 kWp BIPV system at the upper stories of the buildings southwestern façade. The BIPV system will feature a glass/glass laminate BIPV module acting as a louver system for mechanical air flow. The developers, Tishman-Speyer Real Estate will be pursuing all available funding through the NYSERDA New Construction program, which offers \$4.50/Wp as well as the New York State Green Building Tax Credit and the available Federal Income Tax Credits and Accelerated Depreciation.

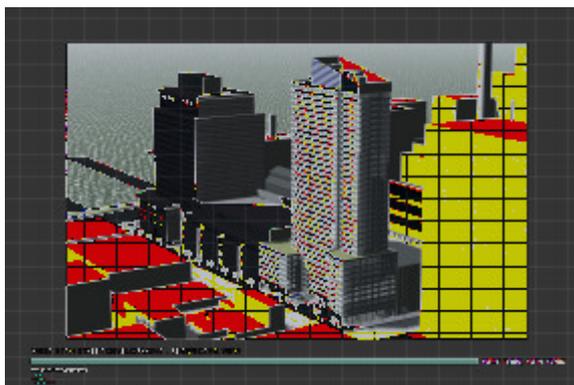
Just south of BPCA is the Museum of Jewish Heritage a Living Memorial to the Holocaust which recently completed its new East Wing. This building is outside of the BPCA jurisdiction but all the ‘Green’ construction in BPCA had an influence on the NYC Department of Cultural Affairs decision to require that certain energy efficiency measures be taken and that a PV system be included in the design.



The Museum of Jewish Heritage

The building incorporates a 36.6 kWp BIPV screen element used to disguise the mechanical equipment on the roof of the building. No funding from outside agencies was used on this project and since the museum is a not-for-profit organization they were not eligible for any federal or local tax credits.

Located at the corner of West 57th Street and 11th Avenue, The Helena is taking advantage of NYSERDA, the NYS Green Building Tax Credit and the available Federal Income Tax Credits and Accelerated Depreciation. Developed by The Durst Organization, a green building pioneer, along with Rose Associates, the building features a 14.5 kWp vertical wall PV system at the 39th through 40th floors of the buildings mechanical bulkhead using standard UL listed PV modules from General Electric along with a custom laminated 2.5 kWp entrance canopy.



The Helena

Special permission from the NYC Bureau of Electrical Control is required for the entrance canopy since it is custom and will not be delivered to the site with the UL mark. NYC, with all of its codes and requirements does have the infrastructure in place to make such projects possible when national standards cannot be realized.

Over in Brooklyn, GMDC is using funding from NYSERDA, Clean Air Communities (CAC) and special grants from the US DOE to fund it's unique projects. With Phase one completed in 2004, Phase 2 is slated for completion in the spring of 2005. Phase 1 incorporated a 65 kWp flat roof BIPV insulating roof system manufactured by the PowerLight Corp. funded in total through NYSERDA and CAC. Two unique 25 kW Zinc Bromine battery banks were installed as part of the system to increase the peak shaving potential for the facility. This portion of the project was funded by the US Dept. of Energy. Phase 2 will incorporate another 45 kWp PowerLight flat roof system funded in total by NYSERDA and CAC



GMDC Humboldt Street, Phase 1

Finally the Rheingold Gardens affordable Housing project will have a 20.2 kWp standard rooftop PV system but is mentioned here because of its unique situation. The housing project was built under budget and the developer approached altPOWER to see what was possible with regard to PV systems. We found that the New York State Division of Housing and Community Renewal was excited by the concept of using PV at the site to help the building reduce operations expenditures and through a grant for approximately 38% of the systems cost from NYSERDA this project became a reality. The owner of the building is also a not-for-profit organization and therefore will not be eligible for any tax credit incentives. The owners were simply motivated by the fact that the NYS DHCR would have recovered the unused funds for the project unless they could be used to help reduce building operating costs. The NYSERDA funding made the PV option a better one for the building rather than investing in other emerging building technologies which had longer paybacks.

In conclusion, the BPCA mandate is the main driver to the use of BIPV in NYC, hence the fact that most of the BIPV projects in NYC are occurring there. However the availability of NYSERDA funding and the various tax credits enabled BPCA to require BIPV. The Museum of Jewish Heritage pV project was unfunded and is an example of the vision of local agencies to act aggressively to meet certain goals set by political leaders in New York State in reducing Greenhouse Gases. The Durst Organization, a family run business has personal motivation to be a green developer and that organization envisions itself as leaders in such development worldwide. GMDC is self motivated but took full advantage of all funds to make their projects a reality without such funding these projects would have not occurred. The Rheingold Gardens PV project is an example of the flexibility of government agencies to adopt new technologies under the proper circumstances. All these projects are the beginning of a new phase in development in NYC which is building momentum and the experience gathered by the multitude of developers, contractors, designers, engineers, government officials, building department officials and the residents/occupiers of the structures is certainly going to enable the local PV industry to grow. The early signs are positive but subsidies and mandates are the driver currently and without price reductions for PV systems and especially BIPV systems future projects will be far and few between.

References:

NYC Load and PV output Peak demand day July 6, 1999 *Perez et al., ASRC*