

**IDEA**

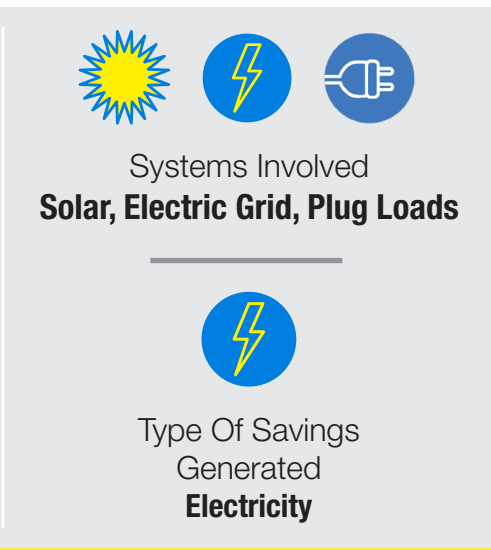
**Phase 4 Technology Demonstration Highlight**

**Company**  
Pvilion

**Technology**  
Solar-Powered Fabric Canopies

**Demonstration Site**  
New York Brooklyn Botanical Gardens  
2900 Southern Blvd, The Bronx, NY 10458

**Demonstration Period**  
July 2020 to December 2021



Vendor's Simulated Energy Production w/ Shading  
**3144.9 kilowatt-hours (kWh)**

Actual Energy Production In This Demonstration  
**2587.627 kWh**

**1. Overview**

Pvilion's Solar-Powered Fabric Canopies are a special photovoltaic fabric structure that doubles as both a canopy and a solar panel. With a design able to withstand harsh weather conditions and simple installation and removal, these canopies can generate electricity both grid-tied and off-grid — creating further amenities to users such as charging stations and lighting. The combination of amenities to the users and the occupied space, with the additional benefit of solar power generation, is a unique feature of the project.

**2. Demonstration Results & Discussion**

The New York Botanical Gardens (NYBG) implemented eight structures: seven of which are grid tied and one in an off-grid application, providing batteries, lighting, and an electrical device charging station. The seven grid-tied structures combine to provide a 6.72 kilowatt (kW) array, each structure being 960 Watts (W). The off-grid structure is a 600 W array. The site allowed for the canopies to be used as a festival tent by

vendors, as well as provide a shade and rest area to visitors. Both the structures and solar electric system have been performing well. The implementation was a success, providing both clean solar energy and comfort to its users. However, there were some shortcomings to the demonstration. The modeling tool used in this project underestimated the amount of shading at the project site. As a result, the analysis of the energy production and the insolation data demonstrated that the impact of shading was more significant than anticipated and negatively impacted the overall solar generation performance. Pvilion conducted a parallel study with increased shading effects to more realistically simulate the energy production of the canopies. They simulated that with shading, the canopies would generate 3144.9 kWh of electricity during the demonstration period. The collected data shows that the canopies generated 2587.627 kWh in this period (this measurement and the simulated model excludes months of partial energy data capture).

**3. Demonstration Results & Discussion**

- Areas with high sun exposure and limited shade
- Areas frequented by the public
  - Public parks, libraries, public and private gardens

**4. Demonstration Results & Discussion**

- Perform a solar analysis on potential sites before implementation.
- To ensure canopies are performing optimally, make sure to occasionally clean dirt, debris, and other objects from canopy fabric surfaces.
- Install multiple irradiance sensors along the array to more accurately record solar performance against actual solar exposure.
- Non-ground fault circuit interrupter works better than ground fault circuit interrupters.
- The product offers simple take-down procedures in case of severe weather or other circumstances.