MITREX™

BUILDING-INTEGRATED SOLAR TECHNOLOGY

EMBODIED CARBON & LIFE CYCLE ANALYSIS Of Mitrex Solar Cladding

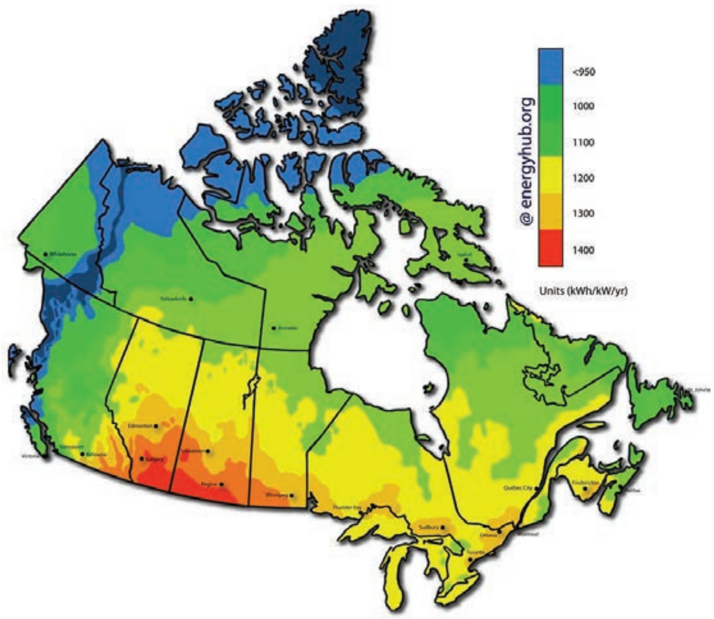
EMBODIED CARBON & LIFE CYCLE ANALYSIS

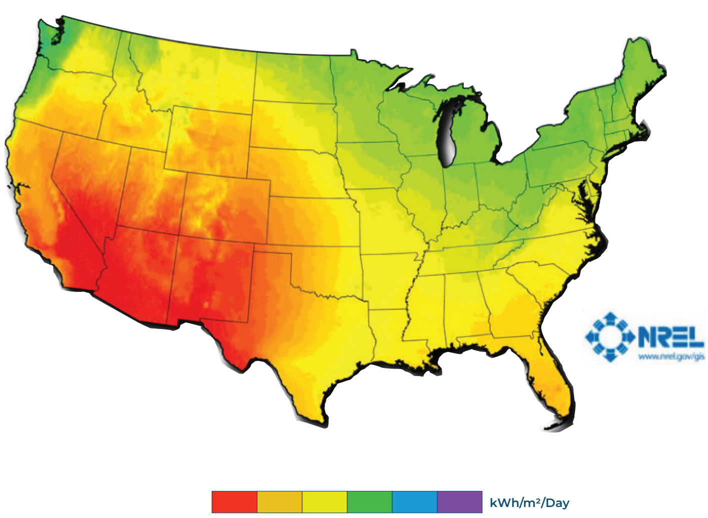
In the realm of sustainable architecture, Mitrex's BIPV panels seamlessly merge aesthetics, functionality, and environmental responsibility. This embodied carbon and lifecycle analysis showcases Mitrex as a carbon-negative product through Building-Integrated Photovoltaics (BIPV). These panels not only recoup their embodied carbon in under five years but also act as an ongoing carbon offset for the entire building.

Traditionally, construction material assessments for architectural cladding focused solely on the carbon footprint of materials. However, Mitrex BIPV acts as energy generators throughout the course of their life. Therefore, a lifecycle analysis provides a holistic analysis that incorporates energy production. The goal of this document is to provide stakeholders with the insights needed to make informed sustainable choices in architecture and construction.

AMOUNT OF SUNLIGHT RECEIVED IN NORTH AMERICA

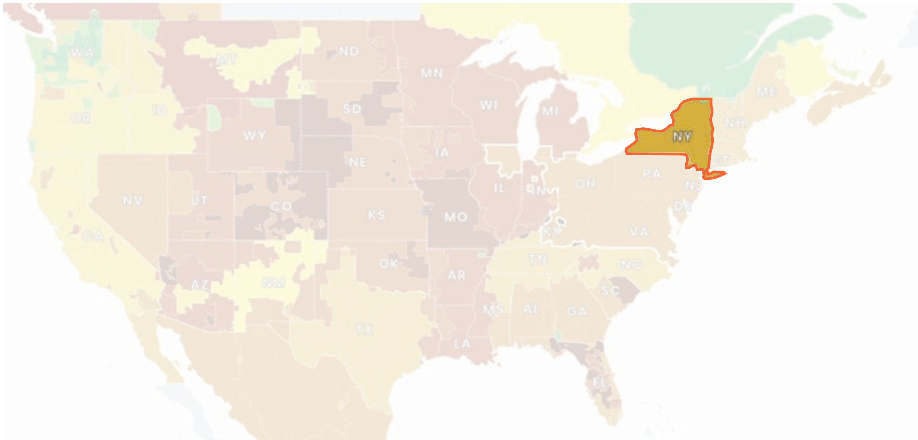
The amount of energy produced by the module depends on the location and orientation of the panel.





CASE 1: NEW YORK

ENERGY NEEDED TO MANUFACTURE A STANDARD SIZE SOLAR CLADDING PANEL IN NEW YORK



An important consideration in the process of solar cladding manufacturing is the energy required for producing these panels, which directly contributes to their carbon embodiment. In New York, where the energy mix includes a combination of renewable and non-renewable sources, the carbon footprint of this energy consumption varies. The embodied carbon in a solar cladding panel is a cumulative measure of all the greenhouse gases emitted throughout these production stages. This measure is crucial in assessing the overall environmental impact of the solar panels, and in determining the time it takes for the panel to offset its own carbon footprint through clean energy generation.

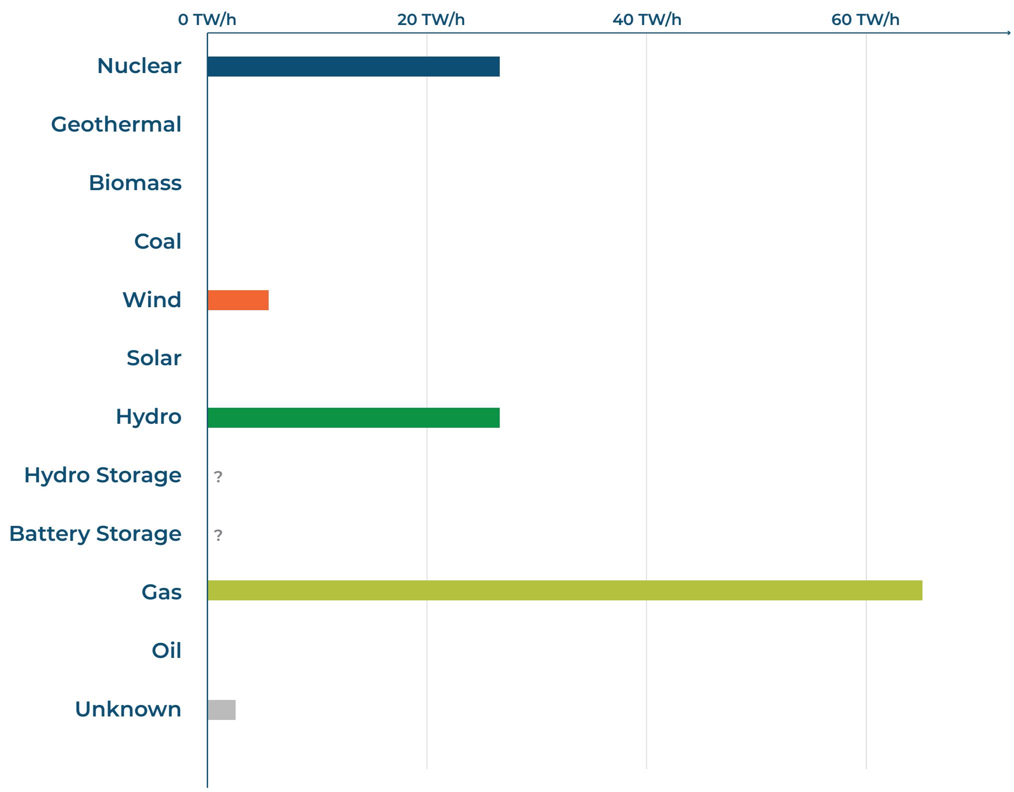
PANEL SIZE	GLASS SIZE	ALUMINUM HONEYCOMB SIZE	TOTAL THICKNESS	NUMBER OF CELLS
6.5' x 3.25' (1.98 x 0.99m)	6.5' x 3.25' x 1/8" (1.98 x 0.99x0.003m)	6.5' x 3.25' x 3/4" (1.98 x 0.99 x 0.02m)	1" (0.03m)	72

ITEM	WEIGHT (kg)	% WEIGHT	MJ/kg	kWh	% ENERGY	CARBON (kgCO$_2$eq/kWh)
GLASS	14.92	52%	35.00	145.02	13%	41.33
ALUMINUM	9.58	33%	150.00	399.29	35%	113.80
EVA	1.47	5%	157.50	64.40	6%	18.35
BACKSHEET	0.74	3%	125.00	25.56	2%	7.28
CELLS	0.72	3%	2000.00	500.04	43%	142.51
INTERCONNECTIONS	0.72	3%	60.00	12.00	1%	3.42
JBOX	0.50	2%	4.37.00	4.29	0%	1.22
			TOTAL	1,150.60		327.92

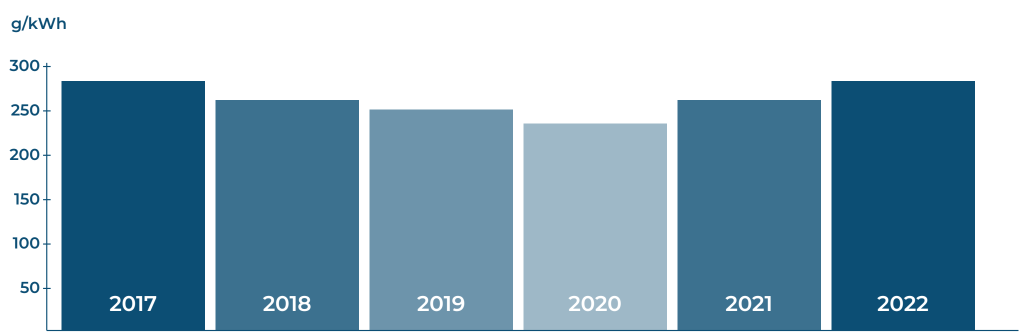
*To calculate carbon, in New York it is ~285g per kWh (in this case, 327.92 kgCO$_2$) | *MJ/kg numbers found the last 6 years average | Retrieved From: https://app.electricitymaps.com/zone/US-NY-NYIS | * Assumption: The panel is made in New York.

NEW YORK ENERGY CONSUMPTION

TOTAL ELECTRICITY CONSUMPTION BY SOURCE



CARBON INTENSITY IN THE LAST 6 YEARS



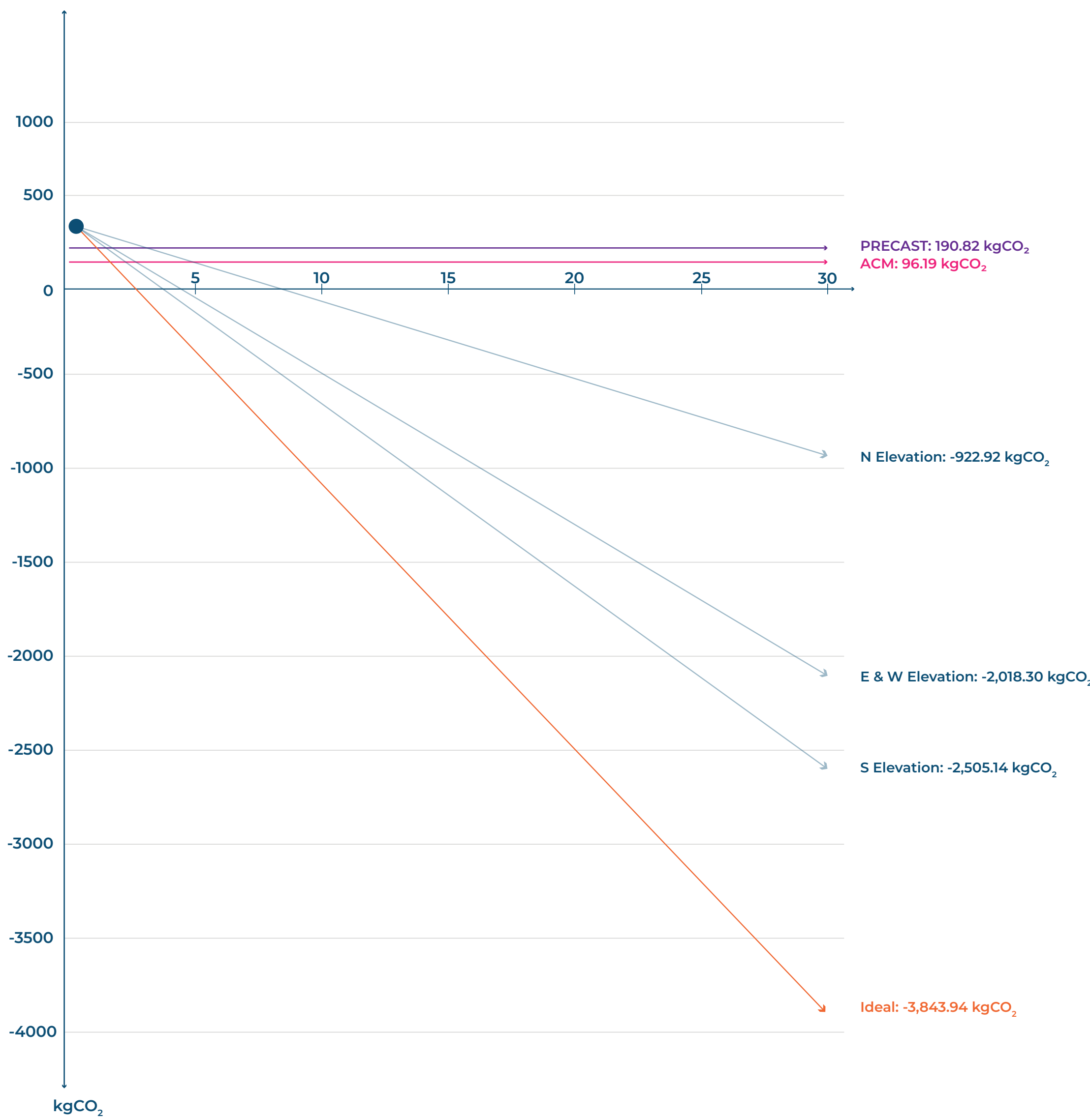
Retrieved From: https://app.electricitymaps.com/zone/US-NY-NYIS

AVERAGE HOURS OF SUN PER DAY (IN NEW YORK) FOR 390W PANEL

	HOURS OF SUN PER DAY	kWh / DAY	kWh / YEAR	PAYBACK TIME (YEARS)	CARBON SAVED PER YEAR ($kgCO_2$)	CARBON SAVED AFTER 30 YEARS ($kgCO_2eq$)
IDEAL	3.25	1.27	462.64	2.49	131.85	-3,843.94
SOUTH	2.15	0.84	306.05	3.76	87.22	-2,505.14
EAST / WEST	1.75	0.68	249.11	4.62	71.00	-2,018.30
NORTH	0.85	0.33	121.00	9.51	34.48	-922.92

*Direction of panels is vertical | *Hours taken from PVsyst (and rounded.)

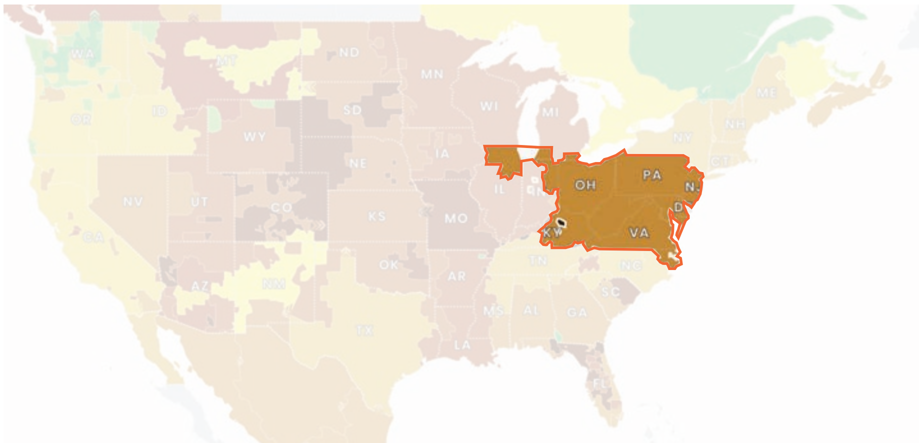
AMOUNT OF CARBON SAVED OVER 30 YEARS FOR A 390W PANEL



*Carbon - ACM: 96.19 kg CO_2, 2m² and 5/32'' thick. | *Carbon - Precast: 190.82 kg CO_2, 2m² and 6'' thick.

CASE 2: EASTERN USA

ENERGY NEEDED TO MANUFACTURE A STANDARD SIZE SOLAR CLADDING PANEL IN EASTERN USA



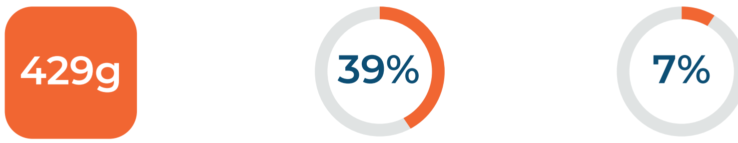
In the Eastern United States, the production of solar cladding panels is a key element in the shift towards more sustainable building practices. This region's approach to solar panel manufacturing must consider the energy required at each stage of production, which significantly influences the panels' carbon embodiment. The energy mix in the Eastern USA, which typically involves a blend of both renewable and fossil fuel-based sources, plays a crucial role in determining the carbon footprint associated with this energy use. Understanding this embodied carbon is essential for evaluating the overall environmental impact of the panels and for calculating the period required for them to neutralize their carbon footprint through the generation of renewable energy.

PANEL SIZE	GLASS SIZE	ALUMINUM HONEYCOMB SIZE	TOTAL THICKNESS	NUMBER OF CELLS
6.5' x 3.25' (1.98 x 0.99m)	6.5' x 3.25' x 1/8" (1.98 x 0.99x0.003m)	6.5' x 3.25' x 3/4" (1.98 x 0.99 x 0.02m)	1" (0.03m)	72

ITEM	WEIGHT (kg)	% WEIGHT	MJ/kg	kWh	% ENERGY	CARBON (kgCO_2eq/kWh)
GLASS	14.92	52%	35.00	145.02	13%	62.21
ALUMINUM	9.58	33%	150.00	399.29	35%	171.30
EVA	1.47	5%	157.50	64.40	6%	27.63
BACKSHEET	0.74	3%	125.00	25.56	2%	10.97
CELLS	0.72	3%	2000.00	500.04	43%	214.52
INTERCONNECTIONS	0.72	3%	60.00	12.00	1%	5.15
JBOX	0.50	2%	4.37	4.29	0%	1.84
			TOTAL	1,150.60		493.61

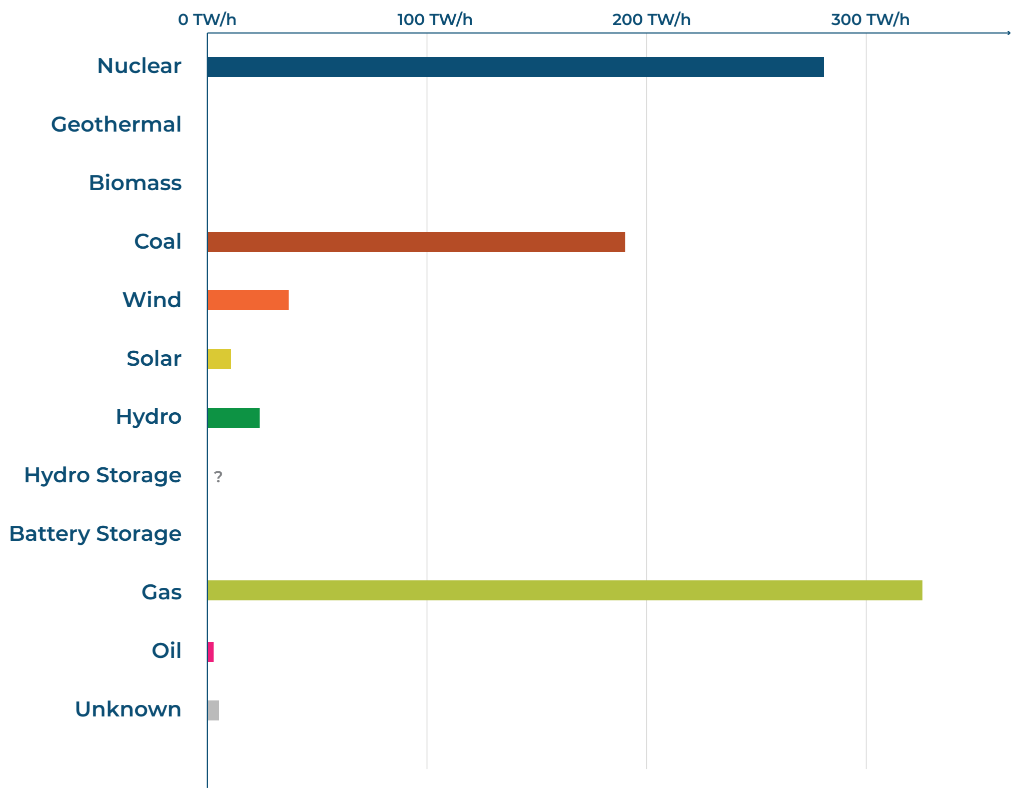
*To calculate carbon, in Eastern USA it is ~429g per kWh (in this case, 493.61 kgCO_2) | *MJ/kg numbers found the last 6 years average | Retrieved From: https://app.electricitymaps.com/zone/US-MIDA-PJM | * Assumption: The panel is made in Eastern USA.

EASTERN USA ENERGY CONSUMPTION

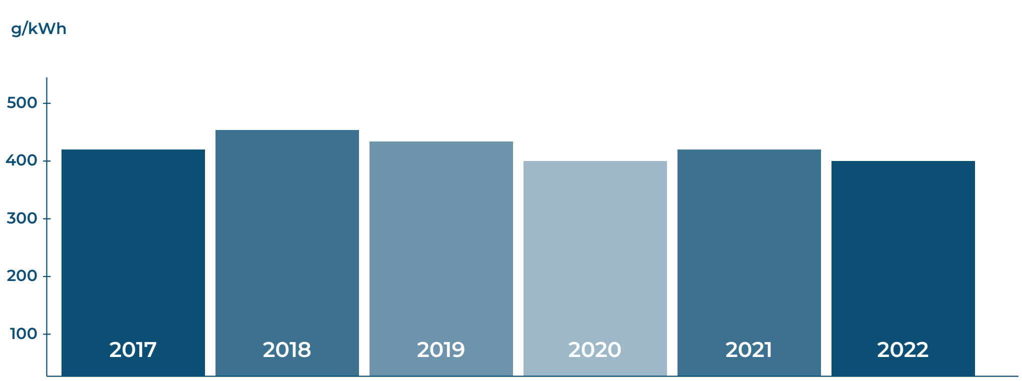


Carbon Intensity gCO_2eq/kWh | Low-Carbon Energy (Renewable & Nuclear) | Renewable Energy

TOTAL ELECTRICITY CONSUMPTION BY SOURCE



CARBON INTENSITY IN THE LAST 6 YEARS



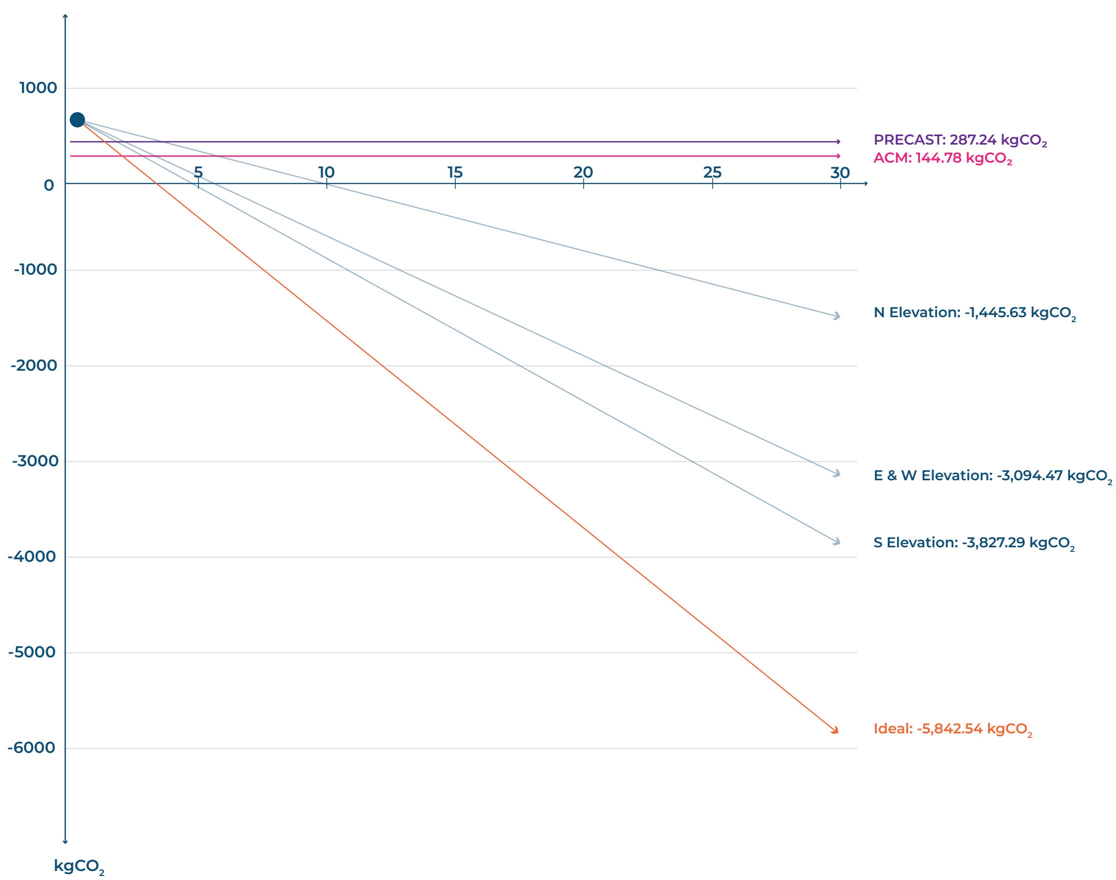
Retrieved From: https://app.electricitymaps.com/zone/US-NY-NYIS

AVERAGE HOURS OF SUN PER DAY (EASTERN USA) FOR 390W PANEL

	HOURS OF SUN PER DAY	kWh / DAY	kWh / YEAR	PAYBACK TIME (YEARS)	CARBON SAVED PER YEAR ($kgCO_2$)	CARBON SAVED AFTER 30 YEARS ($kgCO_2eq$)
IDEAL	3.25	1.27	462.64	2.49	198.47	-5,842.54
SOUTH	2.15	0.84	306.05	3.76	131.30	-3,827.29
EAST / WEST	1.75	0.68	249.11	4.62	106.87	-3,094.47
NORTH	0.85	0.33	121.00	9.51	51.91	-1,445.63

*Direction of panels is vertical | *Hours taken from PVsyst (and rounded.)

AMOUNT OF CARBON SAVED OVER 30 YEARS FOR A 390W PANEL



*Carbon - ACM: 144.78 kg CO_2, and 2m² and 5/32'' thick. | *Carbon - Precast: 287.24 kg CO_2, and 2m² and 5/32'' thick.

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