Embodied Carbon & Life Cycle Analysis:

Mitrex Solar Facade

MITREX™

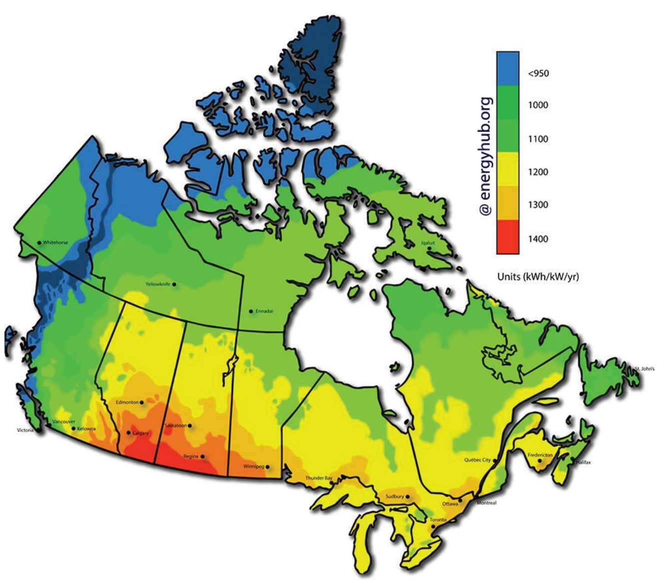
Embodied Carbon & Life Cycle Analysis

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 but also act as an ongoing carbon offset for the entire building.

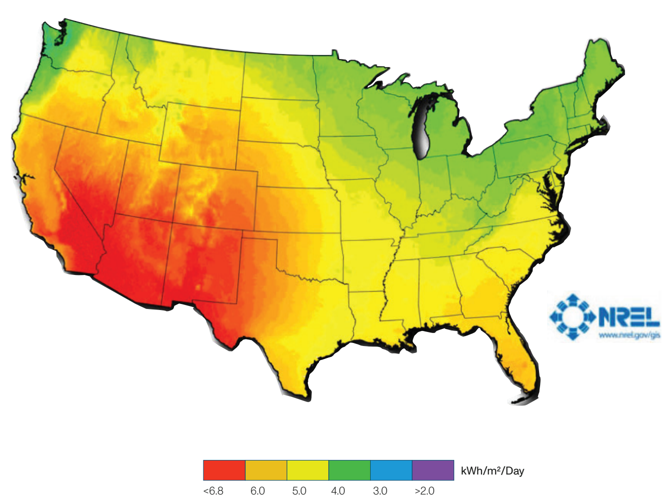
Traditionally, construction material assessments for architectural cladding focused solely on the carbon footprint of materials. However, Mitrex BIPV acts as energy generators throughout the course of their life. Therefore, a lifecycle analysis provides a holistic analysis that incorporates energy production. This document offers a comprehensive lifecycle analysis of Mitrex BIPV panels. 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 sunlight across North America varies significantly by region, impacting energy generation accordingly. As illustrated in the images below, this geographical diversity plays a crucial role in determining the feasibility and efficiency of solar energy production. Particularly, the southwest region of both the USA and Canada stands out for its abundance of sunlight, boasting longer and more intense periods of solar exposure. This region's favorable climatic conditions make it a prime location for solar energy projects, offering vast potential for harnessing renewable energy resources. However, it's essential to recognize that solar irradiance patterns differ across the continent, necessitating tailored approaches to maximize energy generation in each specific area.



•Canada's Amount Of Sunlight



•USA's Amount Of Sunlight

Energy To Make A Standard Solar Panel In Toronto

At our Toronto facility in Canada, we take pride in crafting each of our panels with meticulous care and attention to detail. Every panel that leaves our production line embodies the dedication to quality and sustainability that defines our brand. Below, we display the carbon footprint required to manufacture one of our 2×1m panels. The total carbon needed to make one panel is 87.45 kgCO2eq/kWh.

Panel Size	Glass Size	Aluminum Honeycomb Size	Total Thickness	Number Of Cells
6.5' x 3.25' (1.98 × 0.99m)	6.5' x 3.25' x 1/8" (1.98 × 0.99×0.003m)	6.5' x 3.25' x 3/4" (1.98 × 0.99 × 0.02m)	1" (0.03m)	72

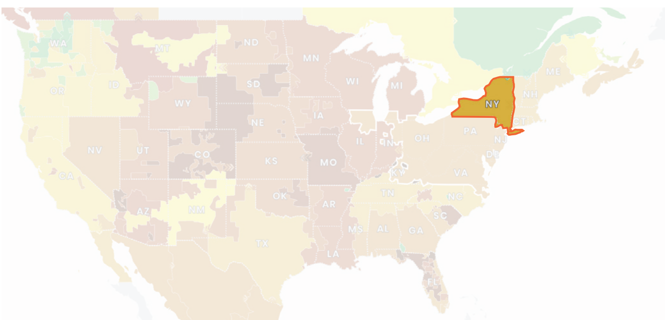
Item	Weight (kg)	% Weight	MJ/kg	kWh	% Energy	Carbon (kgCO₂eq/kWh)
Glass	14.92	52%	35.00	145.02	13%	11.02
Aluminum	9.58	33%	150.00	399.29	35%	30.35
EVA	1.47	5%	157.50	64.40	6%	4.89
Backsheet	0.74	3%	125.00	25.56	2%	1.94
Cells	0.72	3%	2000.00	500.04	43%	38.00
Interconnections	0.72	3%	60.00	12.00	1%	0.91
Junction Box	0.50	2%	4.37	4.29	0%	0.33
			TOTAL	1,150.60		87.45

**To calculate the carbon needed to make a panel in Toronto it is 76g per kWh (in this case, 87.45 kgCO² to produce 1 panel) | *MJ/kg #s found from 2023 | Retrieved From: https://app.electricitymaps.com/zone/CA-ON

Case #1: New York

Understanding energy consumption patterns in New York serves as a pivotal foundation for assessing the state's energy landscape and sustainability initiatives. Currently, New York draws 50% of its energy from low carbon sources, marking a significant stride towards reducing carbon emissions and mitigating environmental impact. Specifically, 27% of the state's energy derives from renewable sources, showcasing a commitment to fostering a cleaner and more sustainable energy infrastructure.

The following charts provide insightful data on the carbon emissions saved through the installation of solar facade panels in New York. These panels not only contribute to the state's renewable energy goals but also play a crucial role in advancing its efforts to combat climate change and promote a greener future for generations to come.



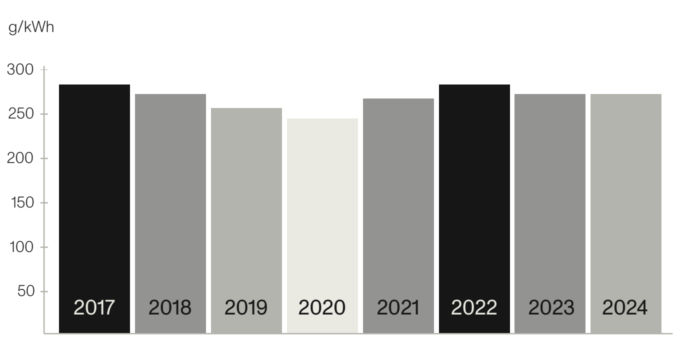
Energy Consumption

281g
Carbon Intensity gCO_2eq/kWh

50%
Low-Carbon Energy

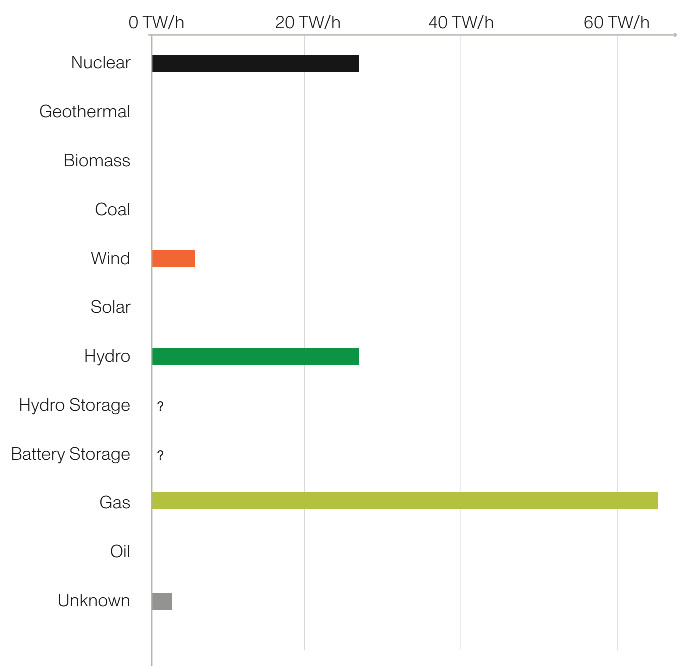
27%
Renewable Energy

Carbon Intensity In The Last 8 Years



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

Total Electricity Consumption By Source

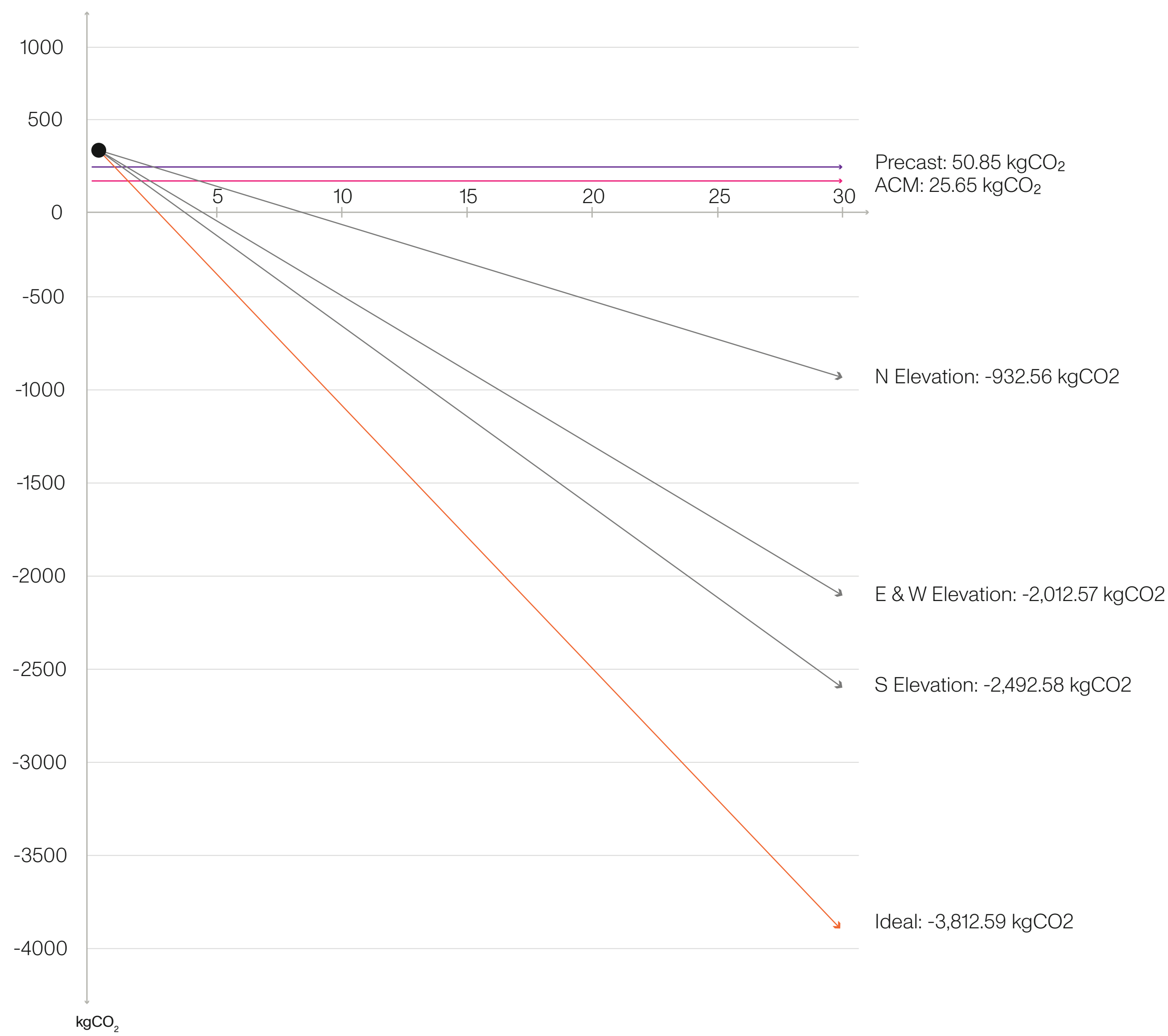


Average Hours Of Sun Per Day (In New York) For 390W Panel

	Hours Of Sun Per Day	kWh / Day	kWh / Year	Payback Time (Years)	Carbon Saved Per Year (kgCO₂)	Carbon Saved After 30 Years (kgCO₂eq)
Ideal	3.25	1.27	462.64	2.49	130.00	-3,812.59
South	2.15	0.84	306.05	3.76	86.00	-2,492.58
East / West	1.75	0.68	249.11	4.62	70.00	-2,012.57
North	0.85	0.33	121.00	9.51	34.00	-932.56

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

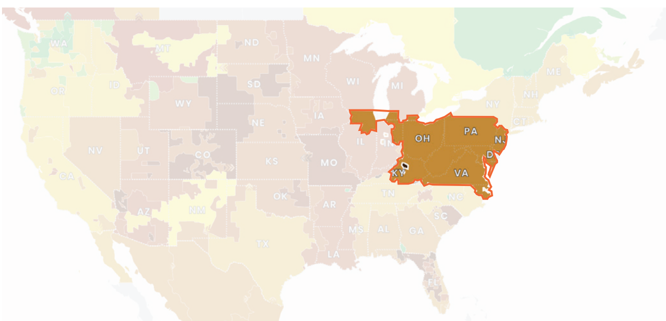
Amount Of Carbon Saved Over 30 Years For a 390W Panel



*Carbon - ACM: 25.65 kg CO_2, and 2m² and 5/32" thick. | *Carbon - Precast: 50.85 kg CO_2, and 2m² and 5/32" thick.

Case #2: Eastern USA

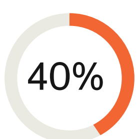
Examining energy consumption trends in the Eastern USA provides valuable insights into the region's energy sourcing and sustainability practices. Currently, the Eastern USA relies on low carbon energy sources for 40% of its energy needs, highlighting a concerted effort to reduce carbon emissions and promote cleaner energy alternatives. However, renewable energy accounts for only 7% of the region's energy mix, indicating potential for further growth in renewable energy adoption. The following charts offer a detailed analysis of the carbon emissions saved through the implementation of solar facade panels in the Eastern USA. By harnessing solar energy, this initiative not only contributes to reducing carbon footprints but also underscores the importance of expanding renewable energy infrastructure to meet the region's growing energy demands sustainably.



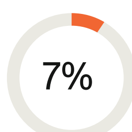
Energy Consumption

396g

Carbon Intensity gCO_2eq/kWh

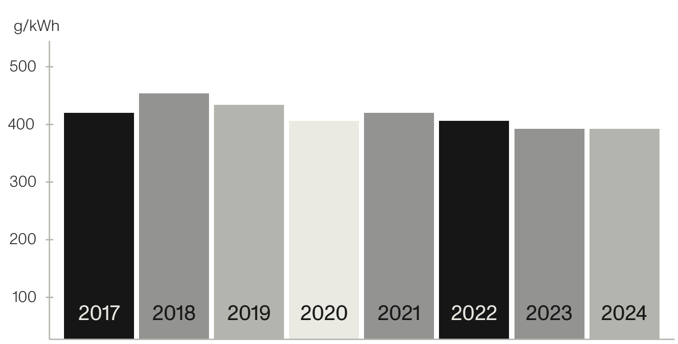


Low-Carbon Energy



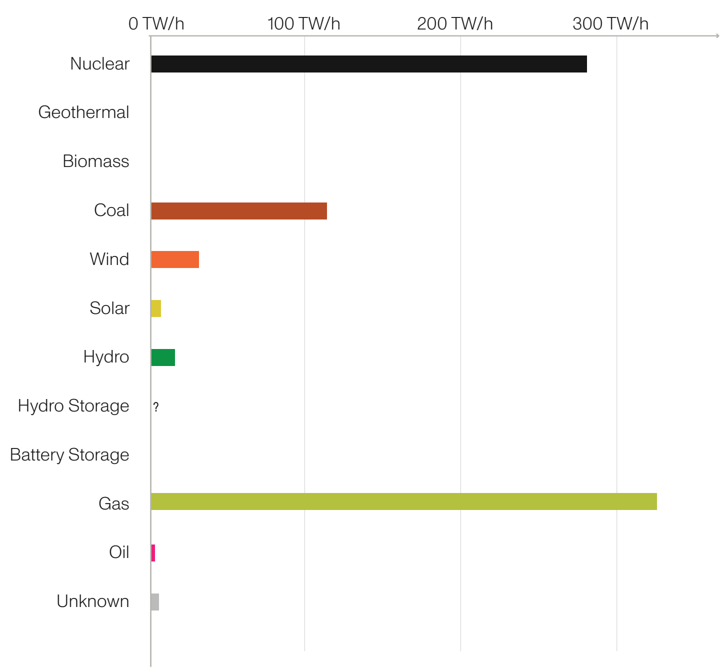
Renewable Energy

Carbon Intensity In The Last 8 Years



Retrieved From: https://app.electricitymaps.com/zone/US-MIDA-PJM

Total Electricity Consumption By Source

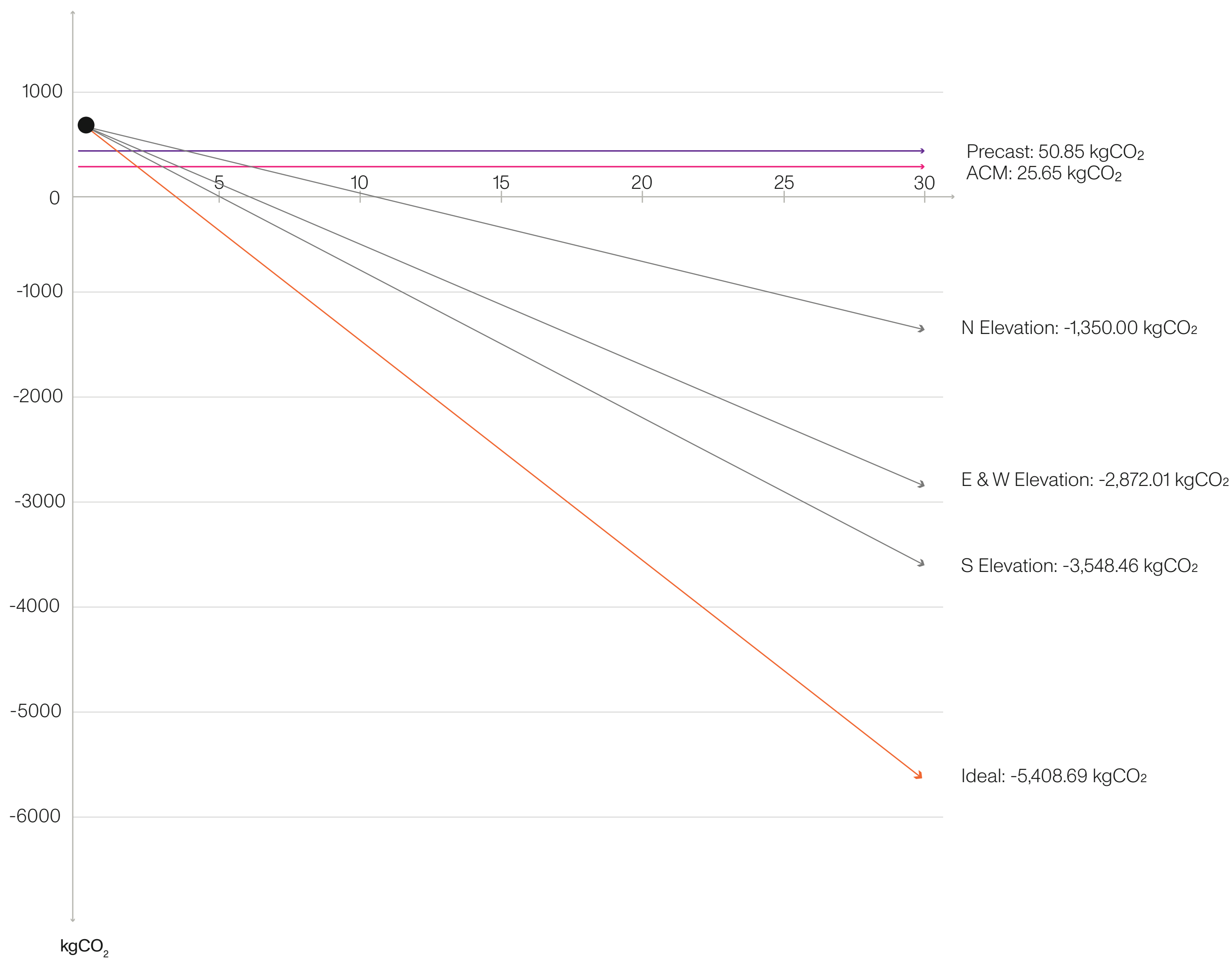


Average Hours Of Sun Per Day (Eastern USA) For 390W Panel

	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	183.20	-5,408.69
South	2.15	0.84	306.05	3.76	121.20	-3,548.46
East / West	1.75	0.68	249.11	4.62	98.65	-2,872.01
North	0.85	0.33	121.00	9.51	47.92	-1,350.00

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

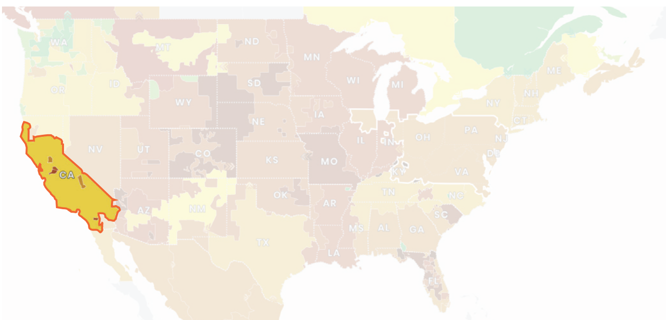
Amount Of Carbon Saved Over 30 Years For a 390W Panel



*Carbon - ACM: 25.65 kg CO_2, and 2m² and 5/32'' thick. | *Carbon - Precast: 50.85 kg CO_2, and 2m² and 5/32'' thick.

Case #3: Los Angeles

Analyzing energy consumption patterns in Los Angeles serves as a crucial indicator of the city's commitment to sustainable energy practices. Currently, Los Angeles relies on low carbon energy sources for 55% of its energy supply, showcasing a proactive approach to reducing carbon emissions. Impressively, renewable energy accounts for a significant 45% of the city's energy mix, reflecting substantial investments in clean and renewable energy infrastructure. The following charts provide a comprehensive breakdown of the carbon emissions saved through the deployment of solar facade panels in Los Angeles. This demonstrates the tangible impact of leveraging renewable energy solutions to create a more sustainable and resilient future for California.



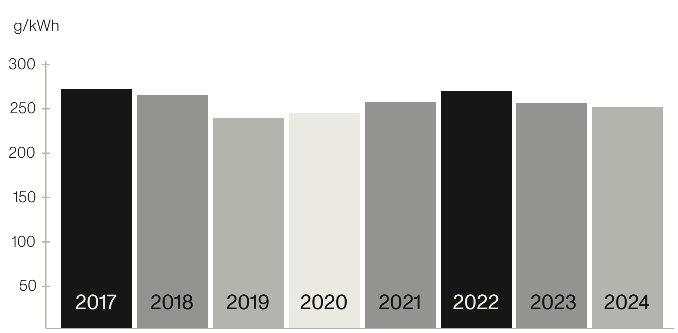
Energy Consumption

262g
Carbon Intensity
gCO_2eq/kWh

55%
Low-Carbon Energy

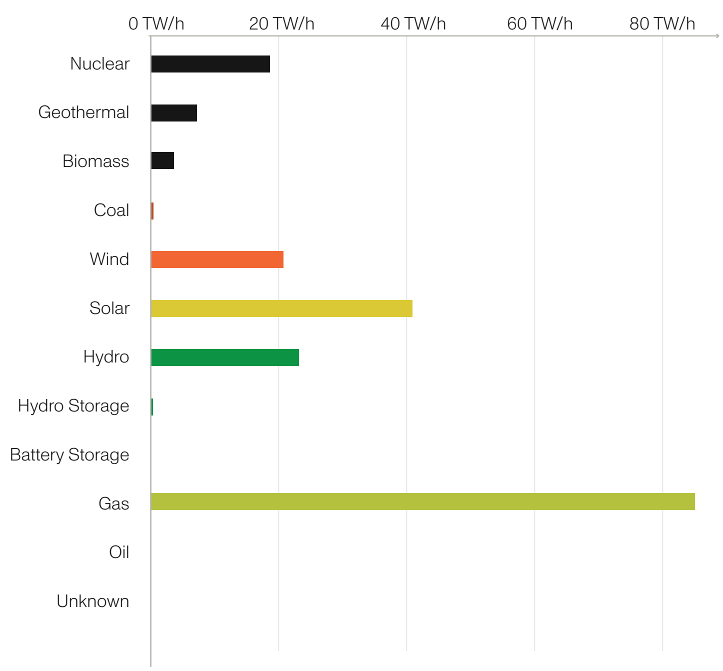
45%
Renewable Energy

Carbon Intensity In The Last 8 Years



Retrieved From: https://app.electricitymaps.com/zone/US-CAL-CISO

Total Electricity Consumption By Source

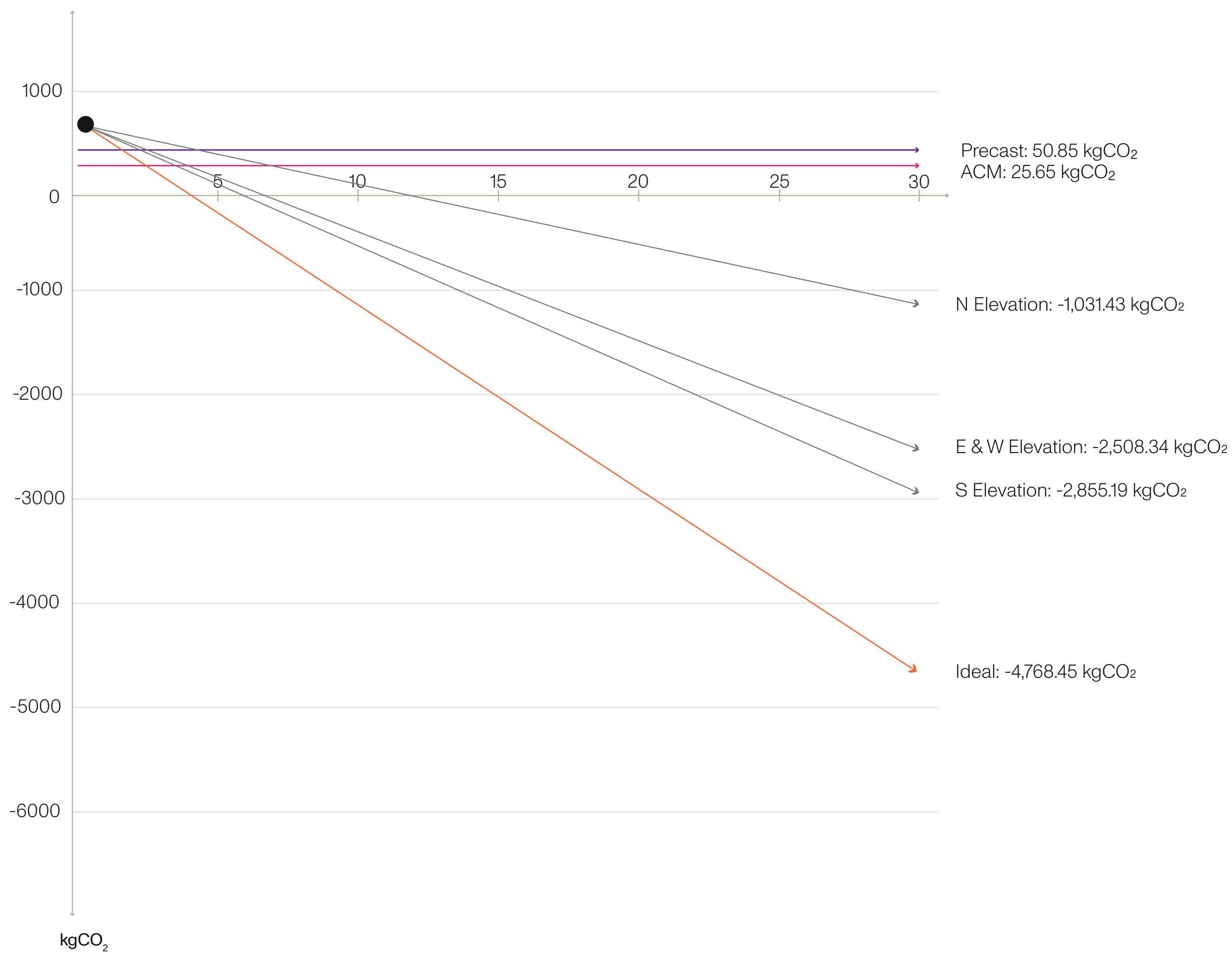


Average Hours Of Sun Per Day (Los Angeles) For 390W Panel

	Hours Of Sun Per Day	kWh / Day	kWh / Year	Payback Time (Years)	Carbon Saved Per Year (kgCO2)	Carbon Saved After 30 Years (kgCO2eq)
Ideal	4.34	1.69	617.80	1.86	161.86	-4,768.45
South	2.63	1.03	374.38	3.07	98.09	-2,855.19
East / West	2.32	0.90	330.25	3.48	86.53	-2,508.34
North	1.00	0.39	142.35	8.08	37.30	-1,031.43

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

Amount Of Carbon Saved Over 30 Years For a 390W Panel



*Carbon - ACM: 25.65 kg CO_2, and 2m² and 5/32" thick. | *Carbon - Precast: 50.85 kg CO_2, and 2m² and 5/32" thick.

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