Report Name

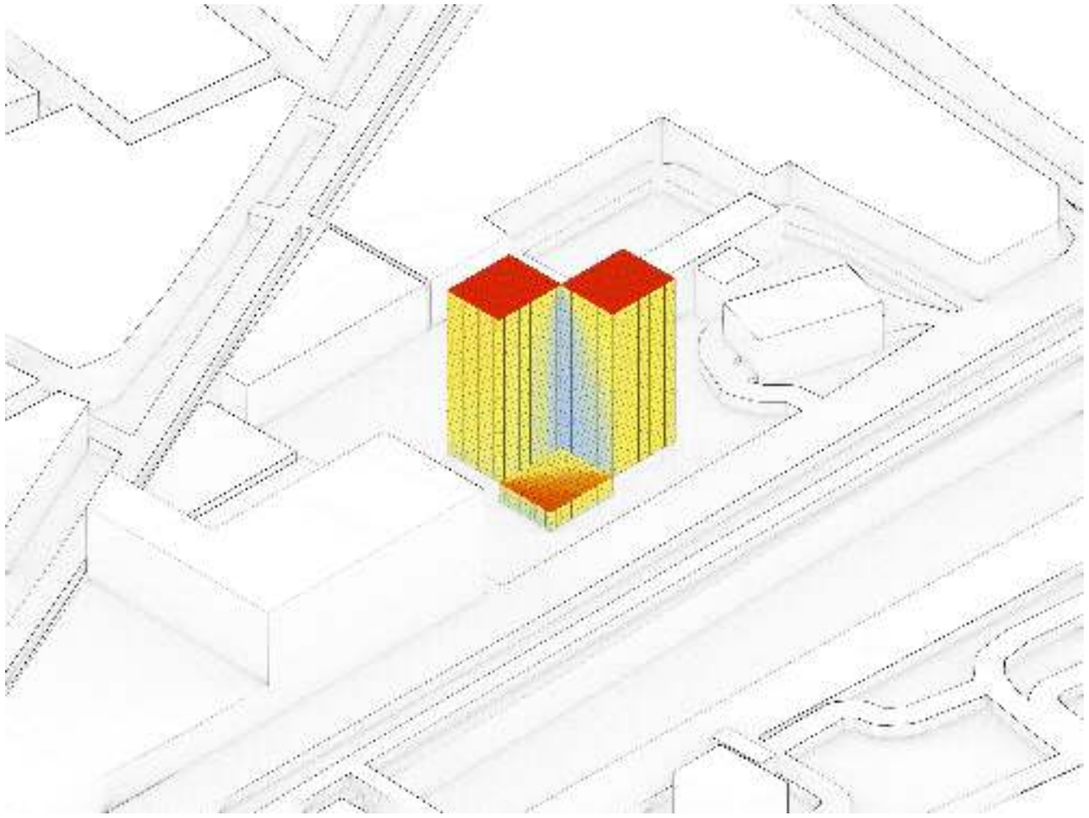
Submission Date	8/10/2024
Student Name (Nick Name) /Student Number/ Email Address	Napat Tangvessakul (Pam) 6538048325 napat.t@cuinda.com

PROTOTYPES

PROGRESSION OF PROTOTYPES

1

Kicking off with prototype building in the first iteration, I’m exploring the shape and how solar radiation passes through the buildings.By creating simple stacked blocks as an experiment.



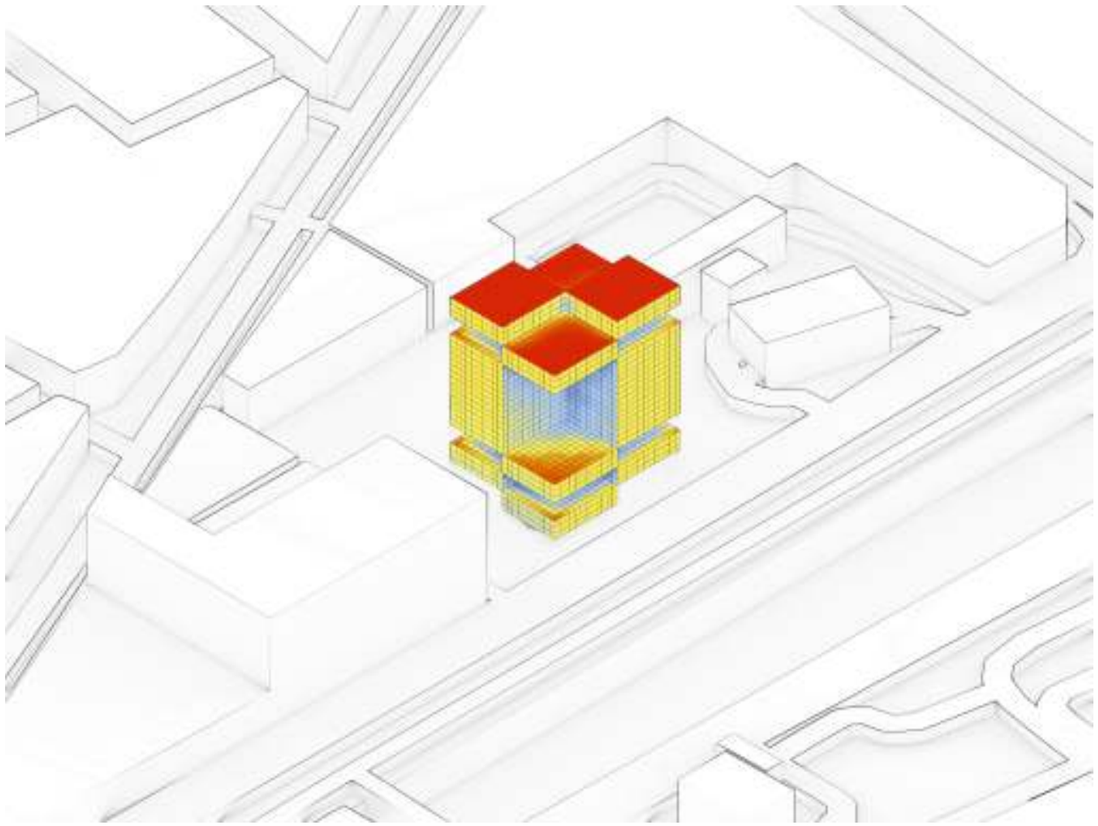
Design 1		
Total Building Surface Area	5,040	m2
Annual Solar Radiation	2,053,700	kWh/year
Averaged Total Solar Radiation	472	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

Design 1 has a total surface area of 5,040 m² and collects about 2,053,700 kWh of solar energy each year, averaging 472 kWh/m²/year. While that's a good amount, it’s still below the target of 600 kWh/m²/year, showing there’s room for improvement. Personally, even so the project is considered successful, likely because it meets other important goals. To boost efficiency, it might help to tweak the angles of surfaces, reduce shading, and choose materials that capture more energy. Keeping an eye on performance will also be key to see how any changes make a difference.

PROGRESSION OF PROTOTYPES

2

Turning to the second prototype, playing and rearranging the form of the building.



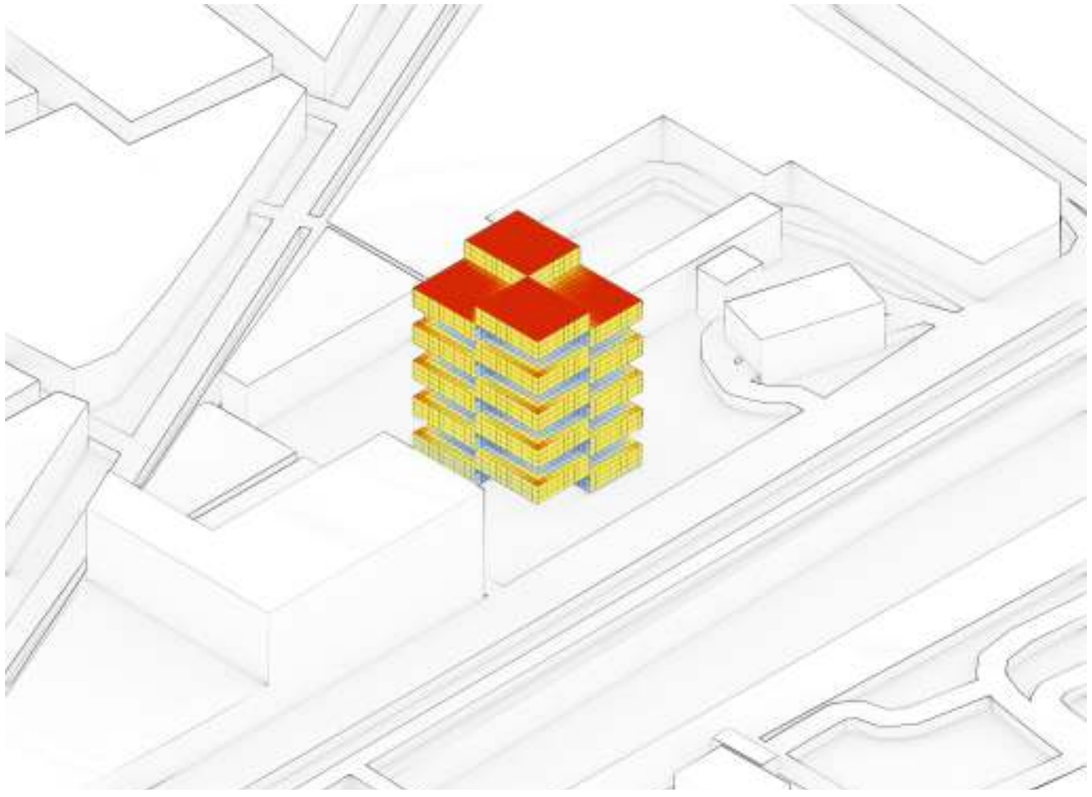
Design 2		
Total Building Surface Area	5,160	m2
Annual Solar Radiation	2,247,900	kWh/year
Averaged Total Solar Radiation	439	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

The solar energy project design, with a total building surface area of 5,160 m², collected 2,247,900 kWh/year of solar radiation, averaging 439 kWh/m²/year. While this is okay, because still it doesn't meet the target of 600 kWh/m²/year, suggesting there’s room for improvement. Maybe if developed by utilizing more efficient solar panels, adjusting their orientation, and adding reflective surfaces could help. Overall, the project shows potential, but some adjustments can reach the desired performance levels.

PROGRESSION OF PROTOTYPES

3

The last building I selected for further development shows potential in terms of solar radiation, light, shape, and form.



Design 3		
Total Building Surface Area	5,160	m2
Annual Solar Radiation	2,028,009	kWh/year
Averaged Total Solar Radiation	393	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

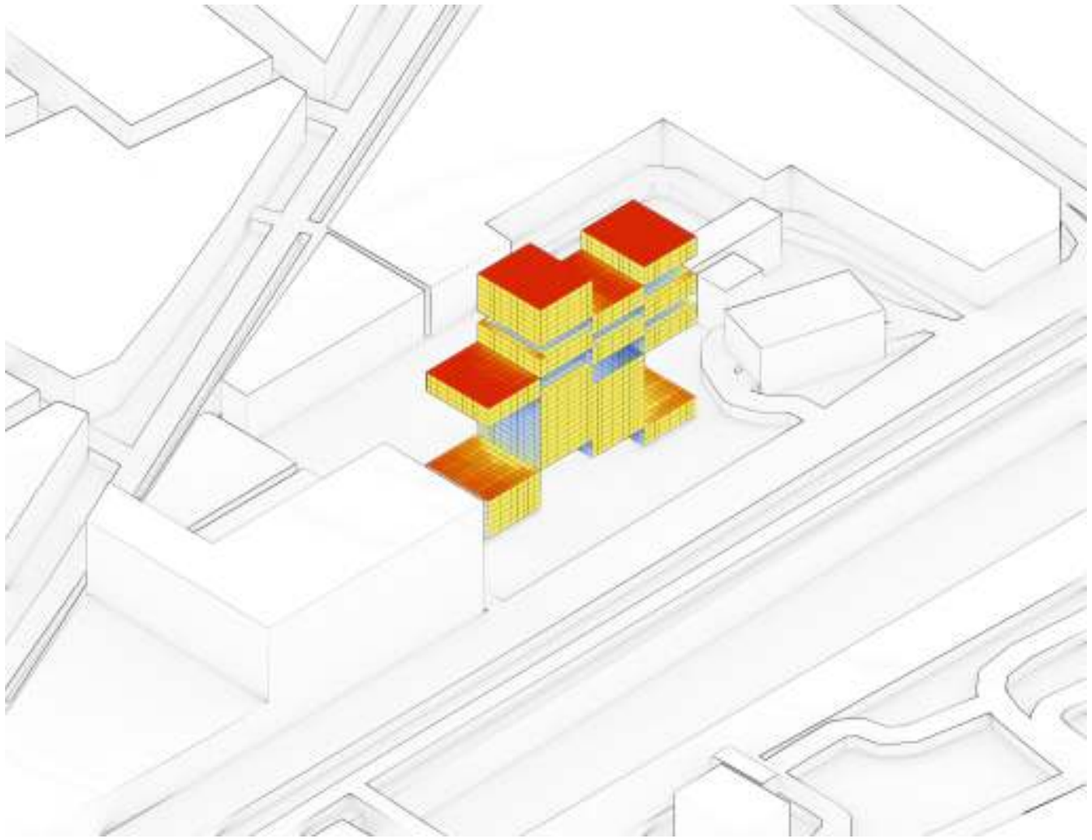
I chose to develop this solar energy project because it has a solid foundation and shows successful results, even though it doesn't meet the target solar radiation. Still, the annual collection of 2,028,009 kWh/year offers room for improvement, this allows for exploring better solar panels and positioning. This project is a great opportunity to enhance performance and support renewable energy goals.

BUILDING MASS

PROGRESSION OF BUILDING MASS

1

Developing from the third prototype in the previous phase involves repositioning the building mass on the site. This adjustment will affect the solar radiation captured by the building.



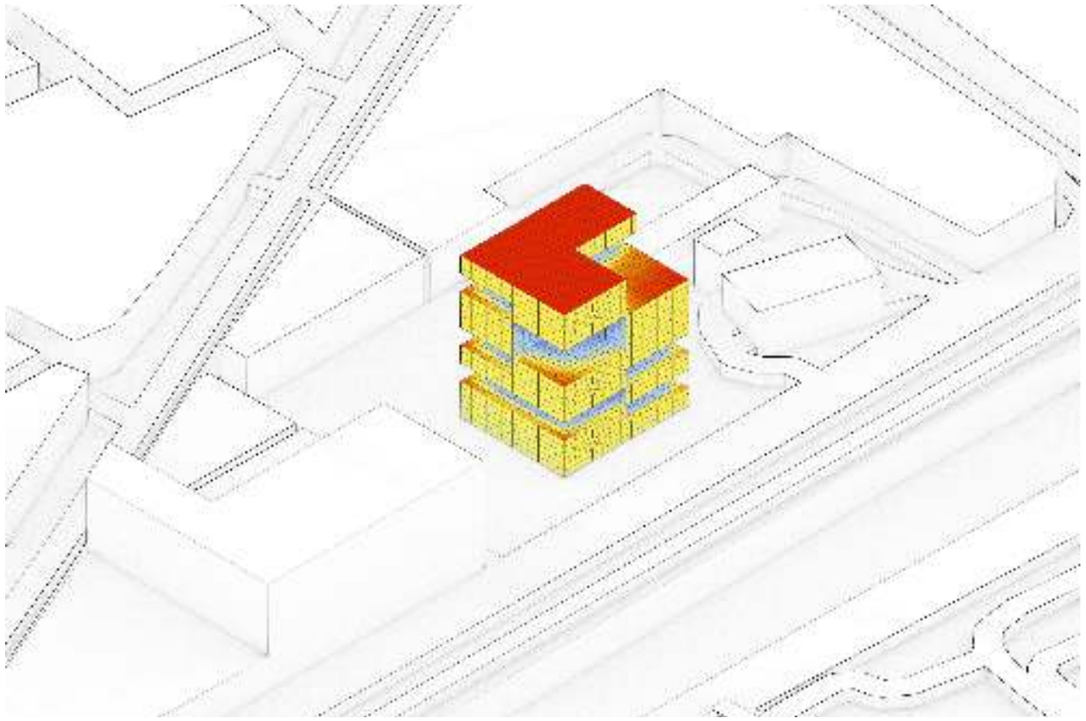
Design 1		
Total Building Surface Area	6,836	m2
Annual Solar Radiation	3,247,800	kWh/year
Averaged Total Solar Radiation	475	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

The solar energy project design, with a total building surface area of 6,836 m², successfully collected 3,247,800 kWh/year of solar radiation, averaging 475 kWh/m²/year. While this is a solid result, it doesn't meet the target of 600 kWh/m²/year,

PROGRESSION OF BUILDING MASS

2

The second building mass is renewed positioning to get the least amount of sunlight .



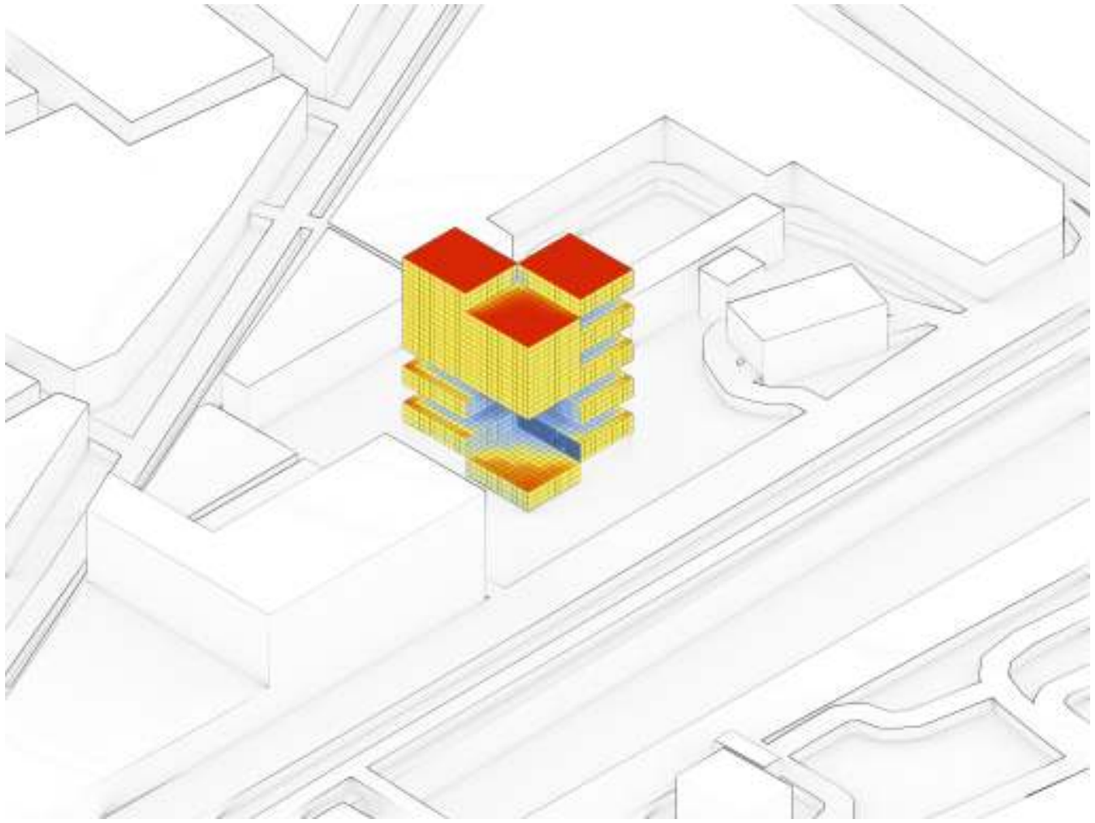
Design 2		
Total Building Surface Area	5,160	m2
Annual Solar Radiation	2,371,000	kWh/year
Averaged Total Solar Radiation	459	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

The solar energy project design, covering a total building surface area of 5,160 m², collected 2,371,000 kWh/year of solar radiation, averaging 459 kWh/m²/year. While this result is commendable, it falls short of the target of 600 kWh/m²/year. Additionally, the stacking form of the building can reduce solar radiation due to the shading it creates. Upon closer inspection, you can see a slight overlap in each floor, which may also contribute to this shading effect. Addressing these factors could enhance solar energy capture.

PROGRESSION OF BUILDING MASS

3

The last building mass has some transformation in terms of lapping form.

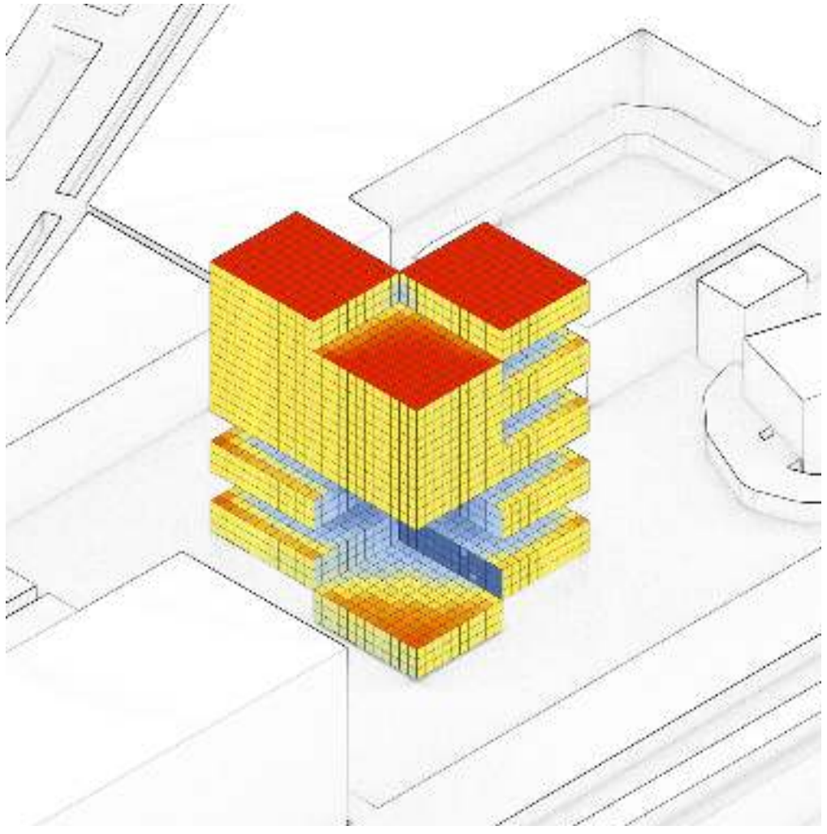


Design 3		
Total Building Surface Area	5,280	m2
Annual Solar Radiation	2,162,300	kWh/year
Averaged Total Solar Radiation	410	kWh/m2/year
Target Solar Radiation	600	kWh/m2/year
Result	Successful!	

The solar energy project design, covering a total building surface area of 5,280 m², collected 2,162,300 kWh/year of solar radiation, averaging 410 kWh/m²/year. While this is a successful outcome, it does not meet the target of 600 kWh/m²/year. Notably, the design features a large gap between the buildings that creates a communal space for people to exercise both indoors and outdoors. However, there are still elements of overlapping floors in this iteration, which may contribute to shading and reduce solar energy capture. Addressing these aspects could further enhance the project's performance.

FACADE AND SHADING

By incorporating facades while retaining the form of the previous building mass, we can address the issue of lower solar radiation. This approach is especially important since the last building mass recorded the least average solar radiation among all the designs. The facades can help enhance energy capture while maintaining the benefits of the existing form, potentially improving overall performance in future iterations.



Regarding the facades, the residential unit design features two key facade types: a slatted facade and a solid facade. The slatted facade offers controlled light penetration and allows natural ventilation, creating a breathable, semi-open space that softens direct sunlight while maintaining a connection to the outdoors. In contrast, the solid facade is strategically placed on the south and west sides to block the harshest sunlight, minimizing solar heat gain and reducing the building's cooling needs.

The integration of plants around the building further enhances this design by providing natural shading, cooling the air through evapotranspiration, and improving the microclimate. The plants act as a buffer, filtering sunlight and reducing glare, while also absorbing carbon dioxide, promoting sustainability. Together, the facades and greenery improve energy efficiency, enhance indoor comfort, and contribute to the building's ecological footprint, creating a healthier and more sustainable living environment.

Focusing on Facades

There are two types of facades being considered for the project: a slatted facade and a solid facade. The slatted facade is designed to allow for partial light penetration and airflow, providing softer shading while creating a more open and inviting atmosphere. This design not only enhances natural lighting within the space but also promotes ventilation, which can contribute to energy efficiency and occupant comfort.

In contrast, the solid facade is strategically placed on the south and west sides of the building, where the sun's intensity is greatest. This placement is crucial for maximizing protection from the harshest sunlight, effectively reducing heat gain during the hottest parts of the day. By blocking more sunlight, the solid facade helps maintain cooler indoor temperatures and improves overall energy performance. This thoughtful combination of facades allows for a balanced approach, optimizing natural light and airflow while minimizing unwanted heat, ultimately enhancing the building's sustainability and comfort for its occupants.

EAST

WEST

SOUTH

SOLAR STUDY OF FACADE

Design 1		
Total Building Surface Area	16,226	m2
Annual Solar Radiation	1,516,277	kWh/year
Averaged Total Solar Radiation	93	kWh/m2/year
Target Solar Radiation	500	kWh/m2/year
Result	Successful!	

The addition of the facade has made a significant impact on the solar energy project design, even though the average solar radiation collected is 93 kWh/m²/year, which is below the target of 500 kWh/m²/year. The facade has provided essential shading and protection, helping to reduce heat gain and improve indoor comfort. This strategic design choice has likely played a key role in mitigating the effects of intense sunlight, enabling more efficient energy usage within the building.