

EMPOWERING URBAN SUSTAINABILITY:

BIPV and Delivering Solar at Scale

Presented by: **Danial Hadizadeh,**
Mitrex CEO





TODAY'S AGENDA

1. Introduction to BIPV & local Law 97
2. Delivering Resource-efficient Decarbonization For Buildings
3. Delivering At Solar Scale
4. Decarbonization: Commercial Drivers & Challenges
5. About Mitrex & Cladify
6. Incorporating Innovations & Materials For Decarbonization
7. Financing Net-zero & Disruptive The Leasing Cycle
8. Why Is This A Good Alternative Material
9. Mitrex R-value & Solar Energy Generation In Different Locations
10. Case Studies
11. Conclusion
12. Q&A Session

INTRODUCTION TO BIPV & LOCAL LAW 97

The integration of solar technology within building design and retrofitting processes is not just a solution, but a necessity in our journey towards a sustainable future.

Local Law 97 mandates stringent carbon emissions reductions for buildings.



DELIVERING RESOURCE-EFFICIENT DE-CARBONIZATION FOR BUILDINGS

BIPV has the power to revolutionize our approach to decarbonization.

By seamlessly integrating solar panels into building materials, we can generate clean energy while minimizing our carbon footprint. Let's uncover how BIPV aligns with the goals of Local Law 97 and maximizes resource efficiency.



DELIVERING SOLAR AT SCALE



THE NECESSITY OF SCALING SOLAR:

- The urgency of addressing climate change and reducing carbon emissions.
- The role of renewable energy, particularly solar, in achieving sustainability goals.



THE SCALABILITY POTENTIAL OF BIPV:

- BIPV enables large scale solar adoption by utilizing building surfaces.
- Case studies of successful large scale BIPV installations.



IMPACT ON URBAN ENERGY LANDSCAPES:

- Widespread adoption of BIPV can transform urban energy landscapes.
- The potential reduction in grid dependency and enhancement of energy self-sufficiency.



CHALLENGES AND OPPORTUNITIES:

- Technical and regulatory challenges associated with scaling BIPV.
- Opportunities for innovation and collaboration to overcome these challenges.

DECARBONIZING: COMMERCIAL DRIVERS & CHALLENGES

DRIVERS

CORPORATE IMAGE: Enhancing corporate image by demonstrating commitment to sustainability and innovation.

REGULATORY INCENTIVES: Government incentives, subsidies, and regulations that encourage or mandate the use of renewable energy sources.

ENVIRONMENTAL COMMITMENT: Businesses are increasingly recognizing the importance of reducing their carbon footprint and contributing to global sustainability goals.

CHALLENGES

TECHNICAL CHALLENGES: Design and installation.

REGULATORY CHALLENGES: Compliance with building codes, regulations, and obtaining necessary permits.

ECONOMIC CHALLENGES: High upfront costs, return on investment concerns, and availability of financing options.

KNOWLEDGE AND SKILL CHALLENGES: Lack of knowledge and skilled workforce for design, installation, and maintenance of BIPV systems.

OVERCOMING THE CHALLENGES

COLLABORATIVE APPROACH: Collaborating with architects, engineers, & BIPV manufacturers from the design phase to ensure seamless integration.

GOVERNMENT SUPPORT: Advocating for more government incentives and subsidies to reduce the economic burden.

PUBLIC-PRIVATE PARTNERSHIPS: Encouraging public-private partnerships to facilitate knowledge sharing, innovation, and financing.

TRAINING AND EDUCATION: Investing in training and education to build a skilled workforce for BIPV implementation and maintenance.

WHO WE ARE



MITR = X™



Cladify™



The World's Largest
Sustainable Facade
Manufacturer



20 Years in
Construction Industry



A Proudly North
American Company

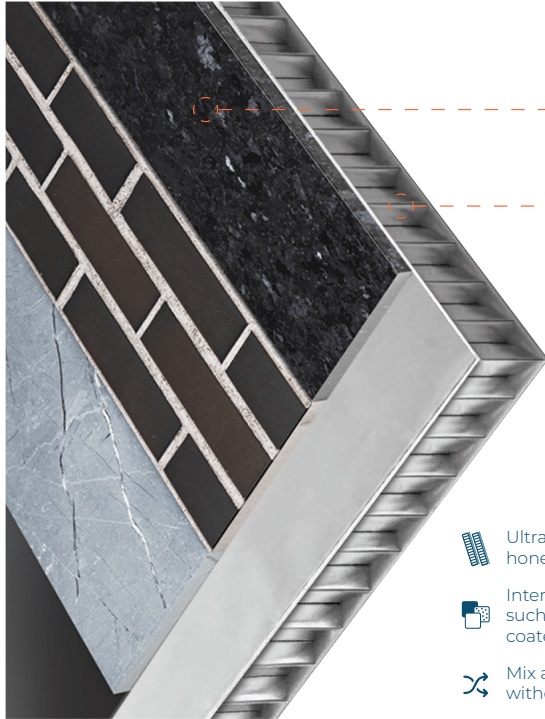





WHAT DO WE MANUFACTURE?



INCORPORATING INNOVATIONS & MATERIALS FOR DECARBONIZATION

NON-ACTIVE PANEL



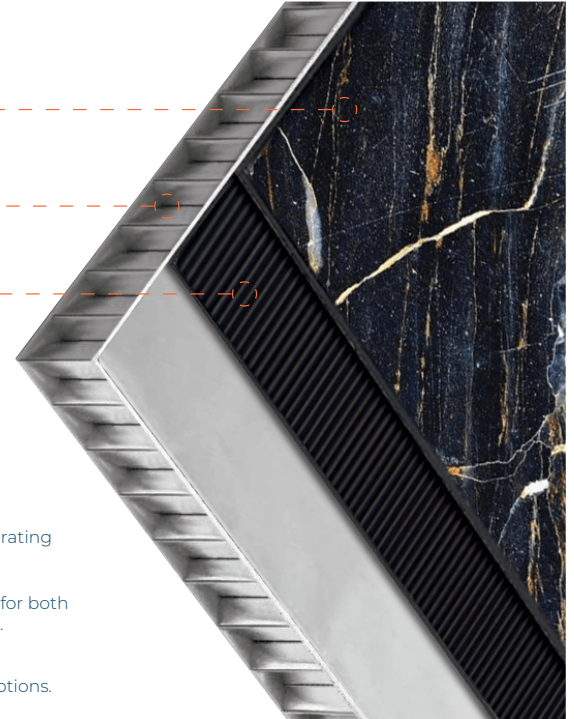
-  Ultra lightweight aluminum honeycomb core technology.
-  Interchangeable, multi-facing materials such as stone, porcelain, glass, brick, or coated aluminum surfaces.
-  Mix and match different facings without altering the installation.




Customizable Facing

Ultra Lightweight Advanced Backing Technology

⚡ Solar Cell

 ACTIVE PANEL



-  Sustainable, energy generating facades at no extra cost.
-  Energy-efficient solution for both existing and new facades.
-  Endless surface design options.



FINANCING NET ZERO & DISRUPTING THE LEASING CYCLE



THE NEED FOR FINANCIAL SUPPORT:

- The cost associated with the transition to net-zero buildings, including the implementation of BIPV systems.
- The need for financial support to overcome economic barriers and facilitate the transition.



INNOVATIVE FINANCING MODELS

- Green Bonds: Bonds issued to finance environmentally friendly projects.
- Power Purchase Agreements (P Pas): Long-term agreements to purchase electricity generated by the BIPV system at a fixed or predictable rate.
- Energy Service Companies (ESCOs): Companies that finance, design, install, and maintain energy-saving projects, and are paid from the savings generated.



DISRUPTING THE TRADITIONAL LEASING CYCLE:

- The role of the leasing cycle in the decarbonization process.
- Incorporating BIPV systems and energy efficiency measures into the leasing cycle can accelerate the decarbonization process.
- Benefits of disrupting the traditional leasing cycle, such as reduced energy costs, enhanced building value, and attracting environmentally conscious tenants.



BIPV

Building-Integrated Photovoltaics

⚡ Solar Facade

WHY IS THIS A GOOD ALTERNATIVE MATERIAL



ANY APPLICATION:

Suitable for retrofit and new build project.



EASY TO INTEGRATE:

Versatile systems that meet any project needs.



ITC TAX INCENTIVES:

Building owners can capitalize on a tax credit up to 30% for the solar building envelope.



HIGH ROI:

Tax incentives and free energy generation mean that the building pays for itself.



NO ADDITIONAL COST:

Product replaces traditional building envelope material.



GREEN ENERGY GENERATION

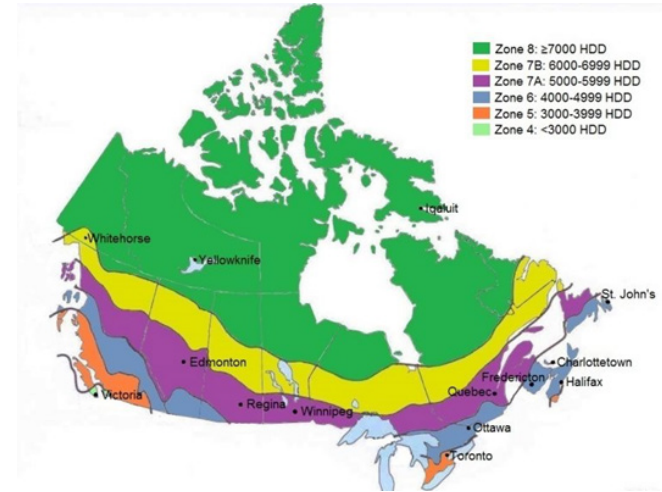
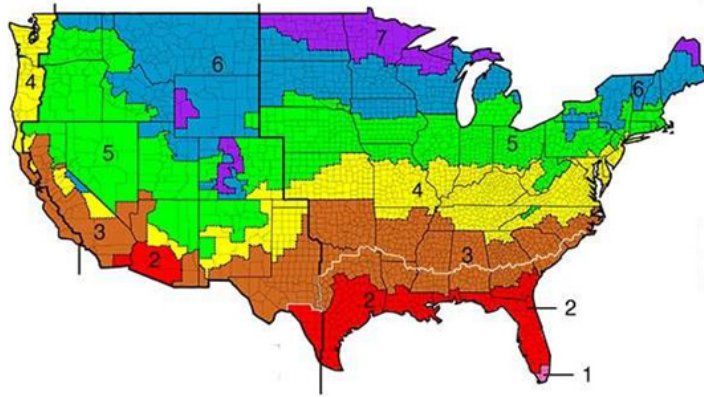
Create a more sustainable future for all.

MITREX R-VALUE & SOLAR ENERGY GENERATION IN DIFFERENT LOCATIONS

NEW YORK	ANNUALLY PER SQFT			BIPV COMPENSATION FACTOR (EQUIVALENT) 400W			
R-Value	Winter Heating Loss (kWh)	Summer Cooling Loss (kWh)	Net Energy Loss (kWh)	South	West	East	North
1	31.03	9.18	40.21	102%	79%	82%	38%
10	3.10	0.92	4.02	1023%	791%	817%	380%
20	1.55	0.46	2.01	2047%	1583%	1633%	760%
30	1.03	0.31	1.34	3070%	2374%	2450%	1140%
40	0.78	0.23	1.01	4094%	3165%	3267%	1520%
50	0.62	0.18	0.80	5117%	3956%	4083%	1900%

Toronto	Annually per sqft			BIPV Compensation Factor (Equivalent) 400W			
R-Value	Winter Heating Loss (kWh)	Summer Cooling Loss (kWh)	Net Energy Loss (kWh)	South	West	East	North
1	46.50	5.50	52.04	27%	22%	22%	11%
10	4.65	0.55	5.20	273%	223%	221%	109%
20	2.33	0.27	2.60	546%	446%	443%	218%
30	1.55	0.18	1.73	819%	669%	664%	327%
40	1.16	0.14	1.30	1093%	893%	885%	436%
50	0.93	0.11	1.04	1366%	1116%	1107%	545%

CLIMATE VARIATIONS & INSULATION BY LOCATION



1. For Canadian cities, such as Toronto: <https://www.homedepot.ca/en/home/ideas-how-to/home-repair-and-maintenance/how-to-choose-insulation.html>

2. For cities in the United States: <https://codes.iccsafe.org/content/FEC2017/chapter-4-re-residential-energy-efficiency>

CITY	CLIMATE ZONE	INSULATION REQUIREMENTS
New York	4	20
Toronto	5	22
Los Angeles	3	20
Houston	2	13
Miami	2	13

When it comes to windows, a typical double-glazed window has an R-Value of 3.7, while a triple-glazed window has an R-Value of 4.3. With

CLIMATE VARIATIONS & INSULATION BY LOCATION

The compensation factor considers a smaller amount of BIPV as the window size increases. Please note that these calculations do not account for solar heat gain through a window.

CITY	Window Glazing	BIPV COMPENSATION FACTOR						
		0.2	0.3	0.4	0.5	0.6	0.7	0.8
New York	Double Pane	870.5%	617.2%	444.6%	319.6%	224.7%	150.4%	90.5%
	Triple Pane	946.4%	683.8%	499.1%	362.2%	256.6%	172.7%	104.4%
Toronto	Double Pane	241.7%	169.4%	121.1%	86.5%	60.6%	40.4%	24.2%
	Triple Pane	263.7%	188.2%	136.2%	98.3%	69.3%	46.4%	28.0%
Los Angeles	Double Pane	2220.7%	1574.5%	1134.3%	815.3%	573.3%	383.6%	230.8%
	Triple Pane	2414.5%	1744.5%	1273.4%	924.1%	654.7%	440.4%	266.4%
Houston	Double Pane	944.9%	708.3%	531.0%	393.2%	283.0%	193.0%	117.9%
	Triple Pane	10.0.8%	773.1%	588.6%	441.1%	320.7%	220.4%	135.6%
Miami	Double Pane	680.2%	509.9%	382.3%	283.1%	203.8%	138.9%	84.9%
	Triple Pane	727.7%	556.6%	423.7%	317.6%	230.8%	158.6%	97.6%

IMPLICATIONS FOR SUSTAINABLE DESIGN

BIPV, we can gain valuable insights into the overall energy dynamics.

The energy loss of a building can be significantly offset by the energy generation capabilities of BIPV systems.

BIPV can potentially offset the building's energy loss by up to a factor of 130X depending on the city.

The ability of BIPV systems to counterbalance energy loss in a building is of great importance in sustainable design.

By integrating BIPV into the building envelope, we can effectively reduce the reliance on external energy sources and minimize the overall environmental impact.

The integration of BIPV systems can contribute to the reduction of greenhouse gas emissions and foster a more sustainable and resilient built environment.



CASE STUDY

Saint Mary's University Retrofit

Halifax, NS, Canada

Presented by: **Danial Hadizadeh,**
Mitrex CEO



CLIENT GOALS



ST MARY'S UNIVERSITY
Owner



DSRA ARCHITECTURE
Architect



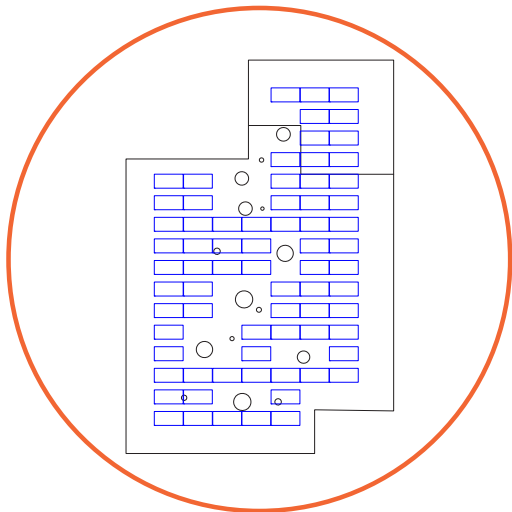
ELLISDON
Developer/Builder

GOAL: Develop a sustainable solution for St Mary's students housing project.

- Create a high performance building envelope that generates electricity.
- Retrofit existing structure with aesthetic facade.
- Code compliant.

IDEA #1

Solar Panels on the Roof



SYSTEM SIZE: **28 kW**

ESTIMATED ENERGY GENERATION: **32.3 MWh/y**

TYPE OF MODULE: **Standard 390W Solar Panels**

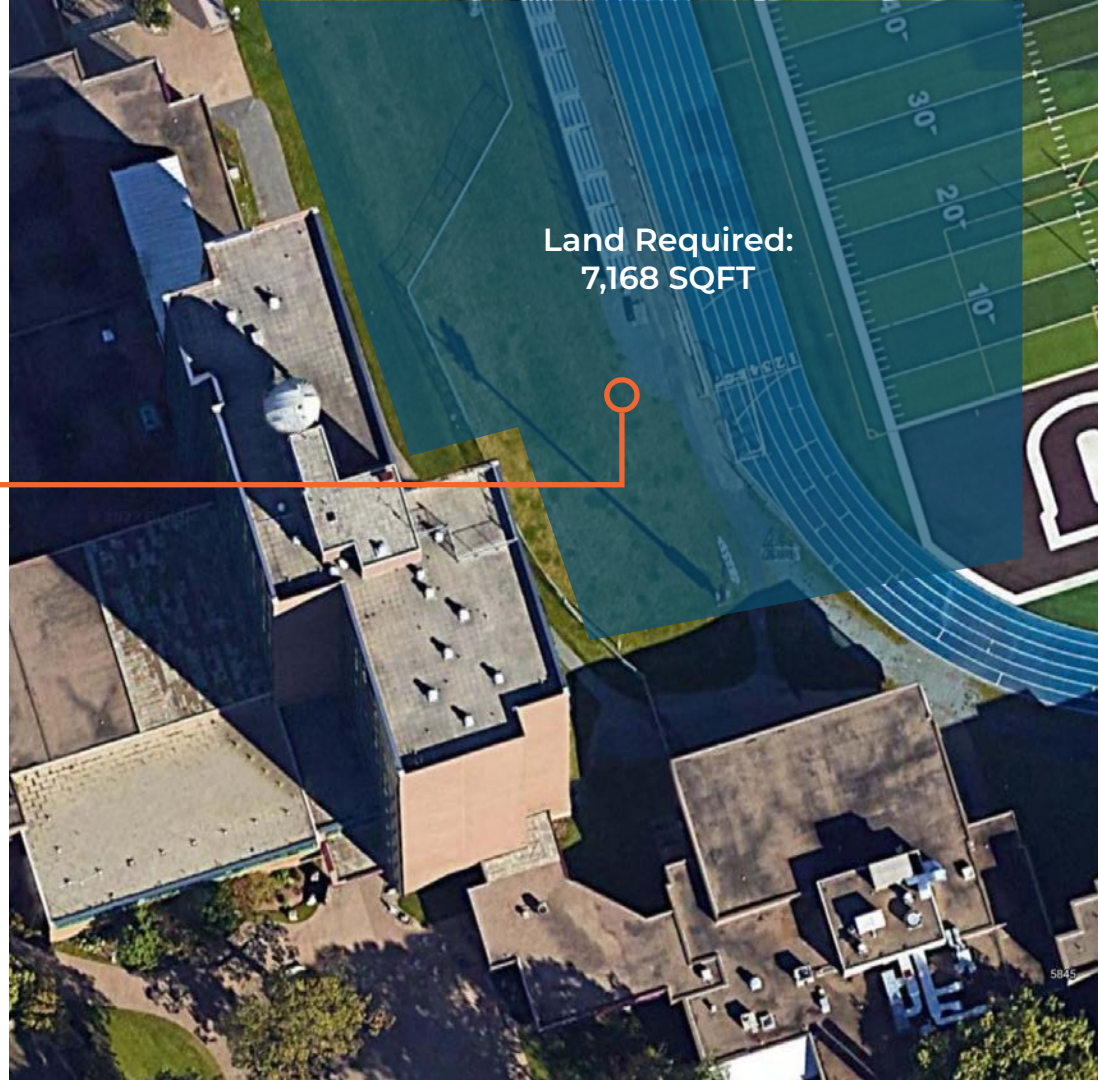


IDEA #2

Solar Panels on the Ground



SYSTEM SIZE: **54.6 kW**
ESTIMATED ENERGY GENERATION: **67.3 MWh/y**
TYPE OF MODULE: **Standard 390W Solar Panels**



Land Required:
7,168 SQFT

IDEA #3

Mitrex BIPV

Potential Cladding System Area
A= 6,157 SQFT

Potential IGU & Spandrel System Area
A= 367 SQFT

CATEGORY:

Student Residence

BUILDING HEIGHT:

22 FLOORS

SCOPE OF WORK:

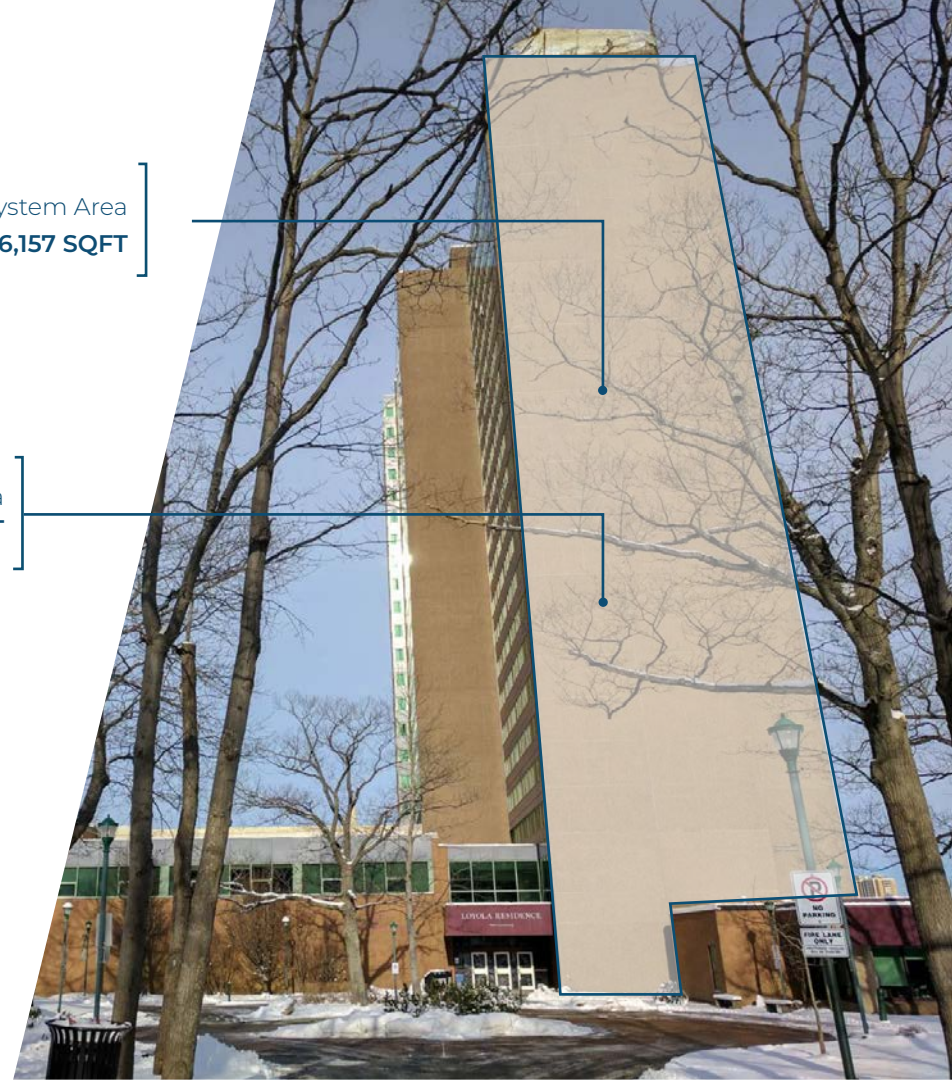
6,524 SQFT

SYSTEM SIZE:

82.5 kW

ESTIMATED ENERGY GENERATION:

67.3 MWh/y



INSTALLATION SYSTEM ANALYSIS

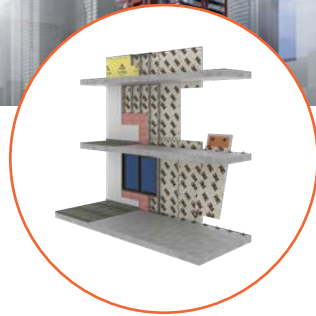
CLADISHIELD SYSTEM

Rainscreen System



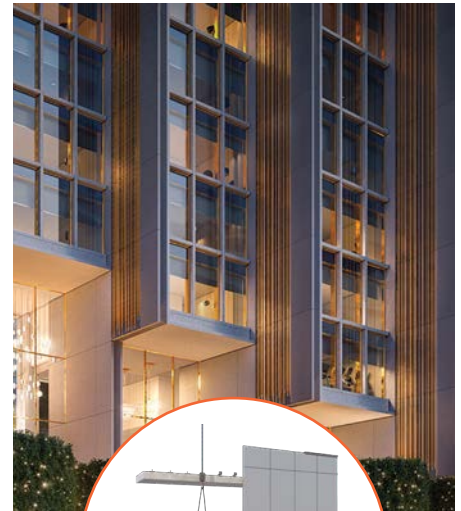
CLADICAST SYSTEM

Precast Wall System



CLADIFAB SYSTEM

Prefab Wall System

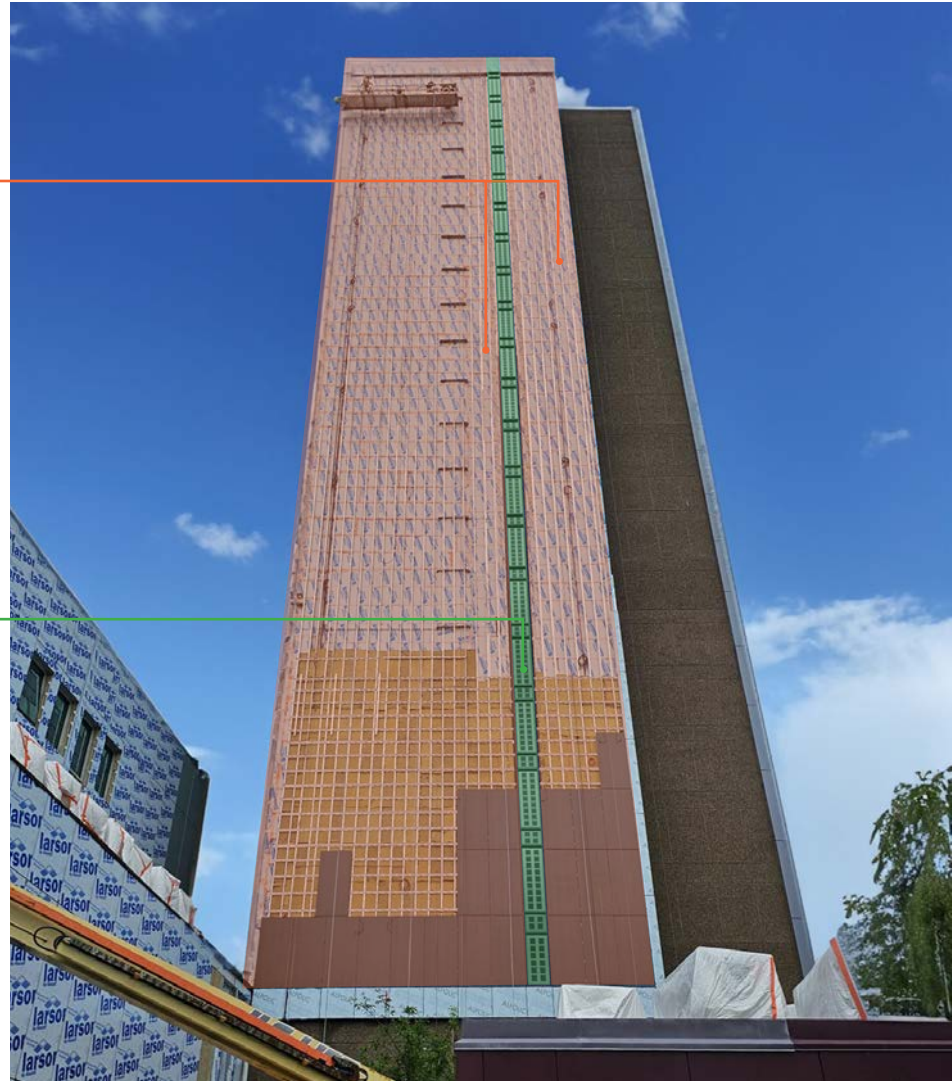
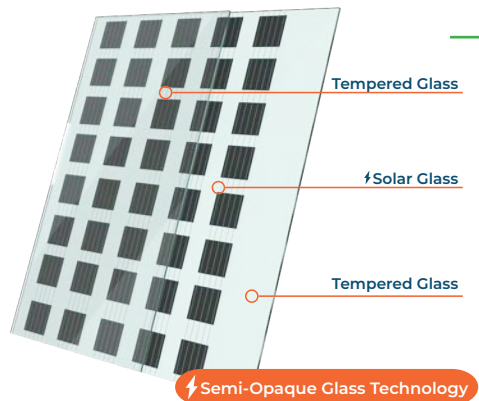
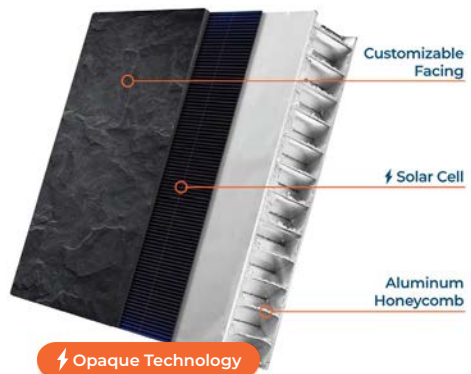


PROJECT CHALLENGES

- Retrofit of existing building.
- For ground mounted solar 7,168 SQFT of land is required.
- Meeting architects vision for design and aesthetics of the facade.
- Maximizing energy generation based on colour and shading.
- Utilizing an installation system that is ideal for the retrofit project.
- Providing a cost effective solution.
- Ensuring testing and certifications are met (wind load, fire test, etc).



OUR SOLUTION

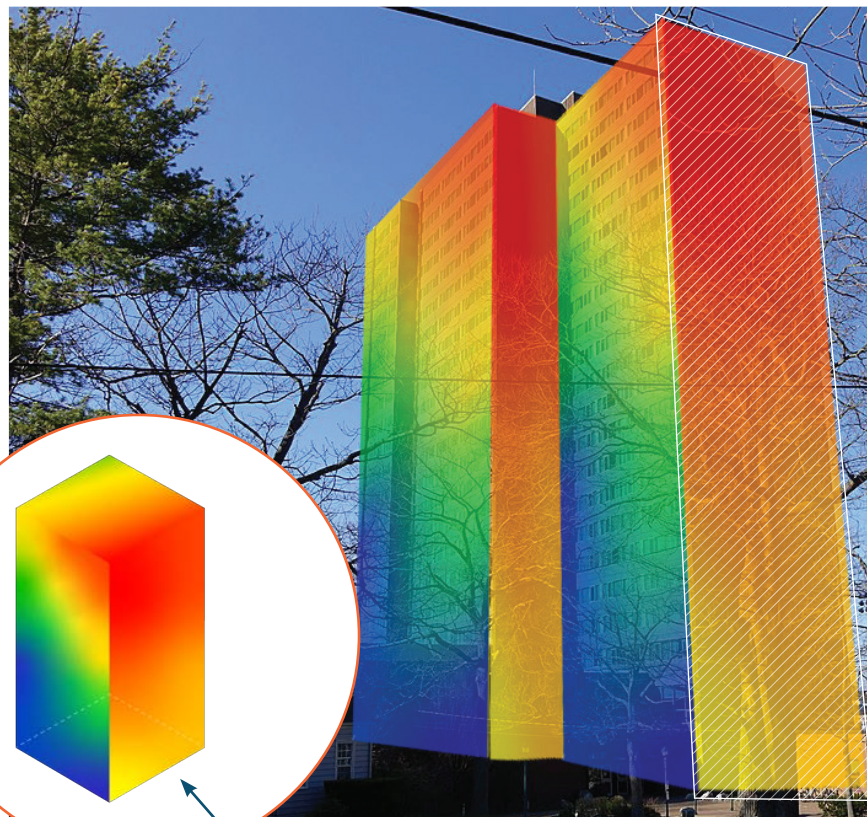


SHADING ANALYSIS



HALIFAX, NS

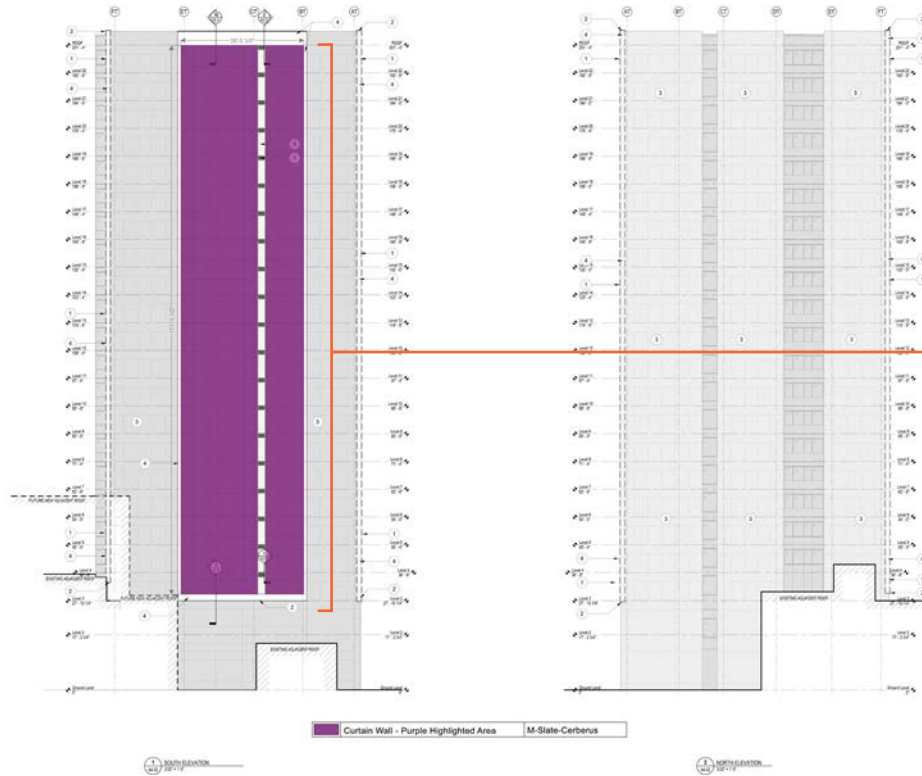
South elevation of building produces the highest amount of energy.



South Elevation
OPTIMAL POWER

SOLUTION + SYSTEM

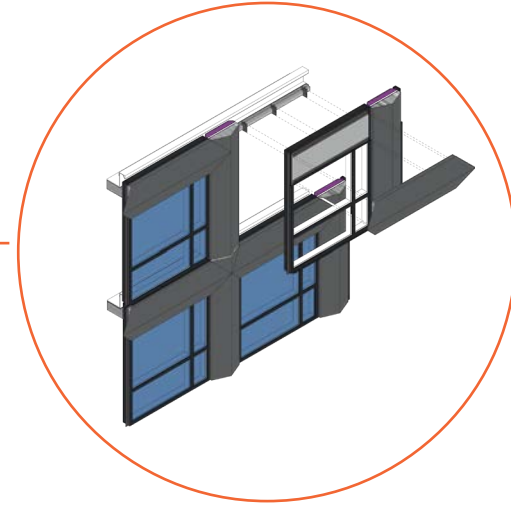
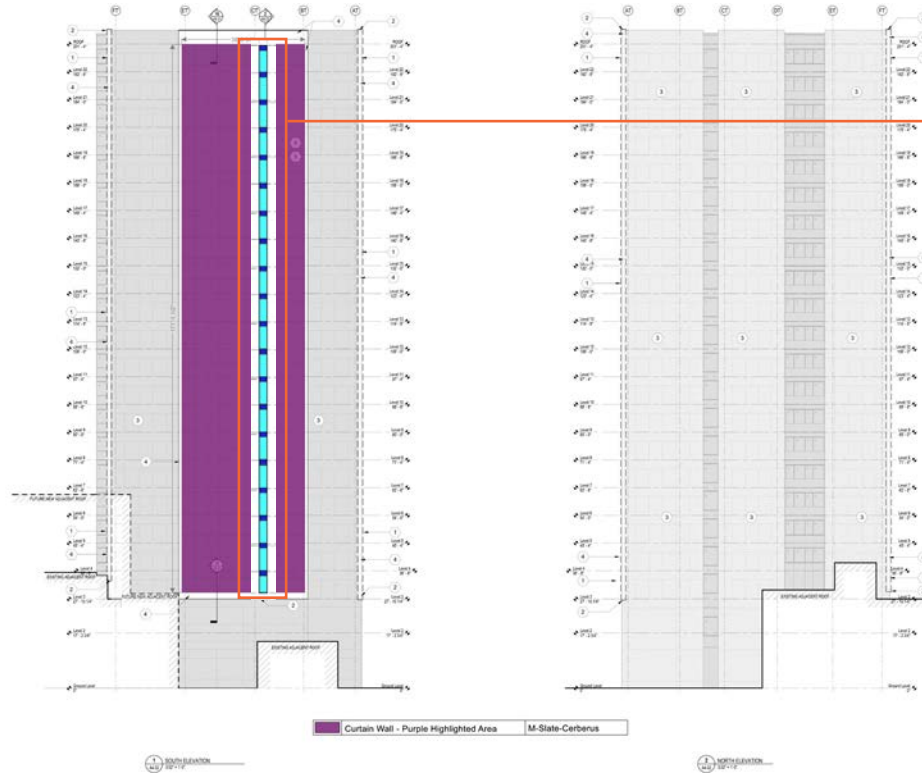
Solar Integrated Cladding



CLADISHIELD SYSTEM
Rainscreen System

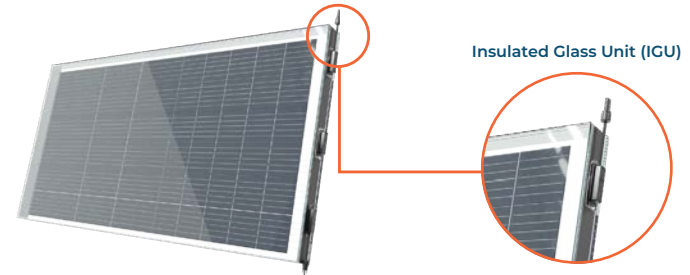
SOLUTION + SYSTEM

Solar Integrated IGU & Spandrel

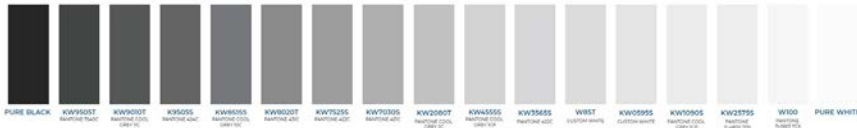
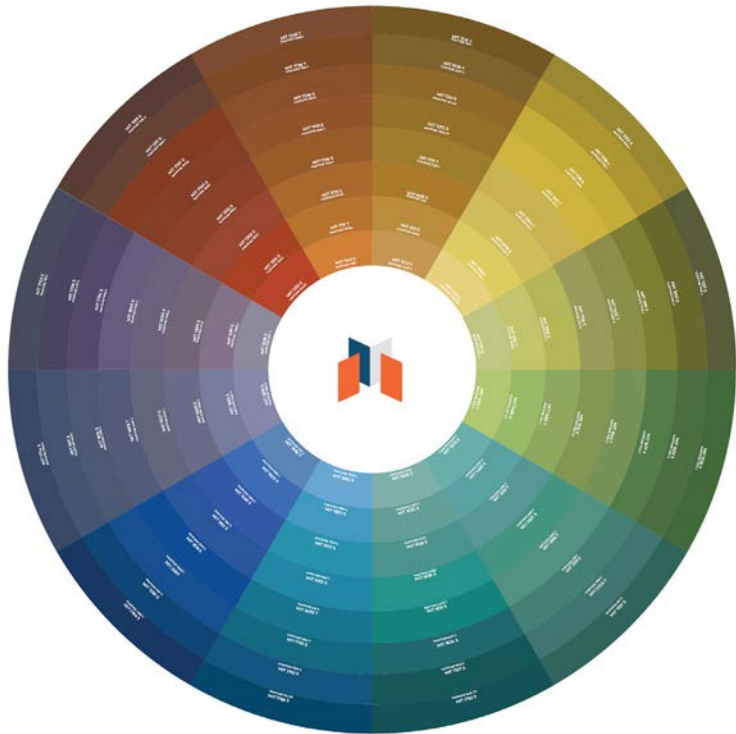
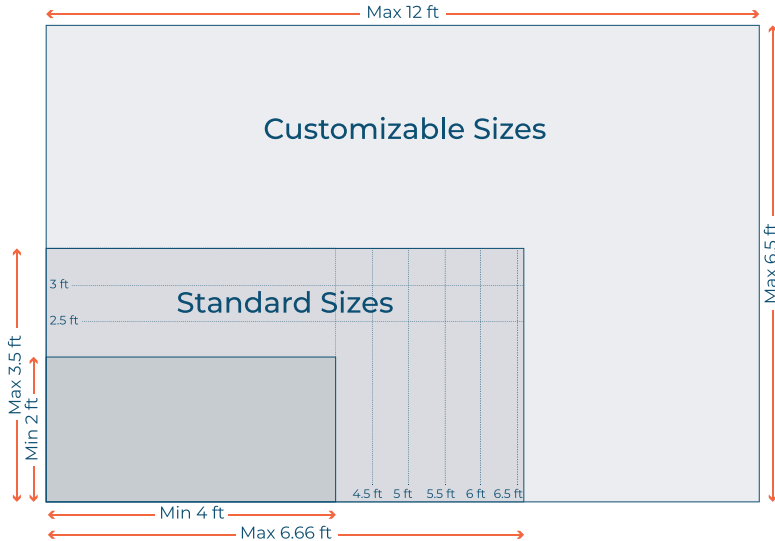


UNITIZED FACADE SYSTEM

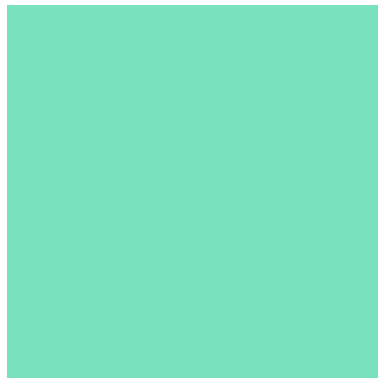
Integration to Other Assemblies



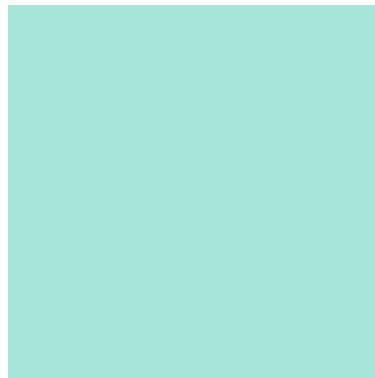
SIZE & COLOUR CAPABILITIES



MATCHING THE ARCHITECTS VISION

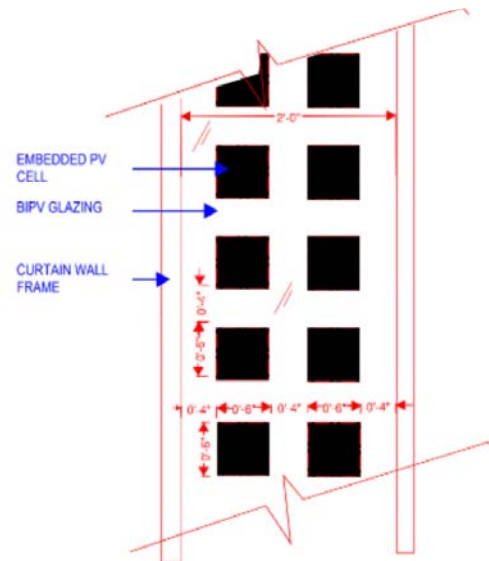


PANTONE®
PMS 3375 C
7AE1BF



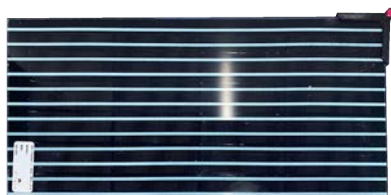
PANTONE®
331 C

Cladding Colour



Glass Cell Arrangement

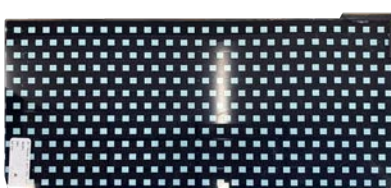
DESIGN OPTIMIZATION



Pantone 331C - Lines



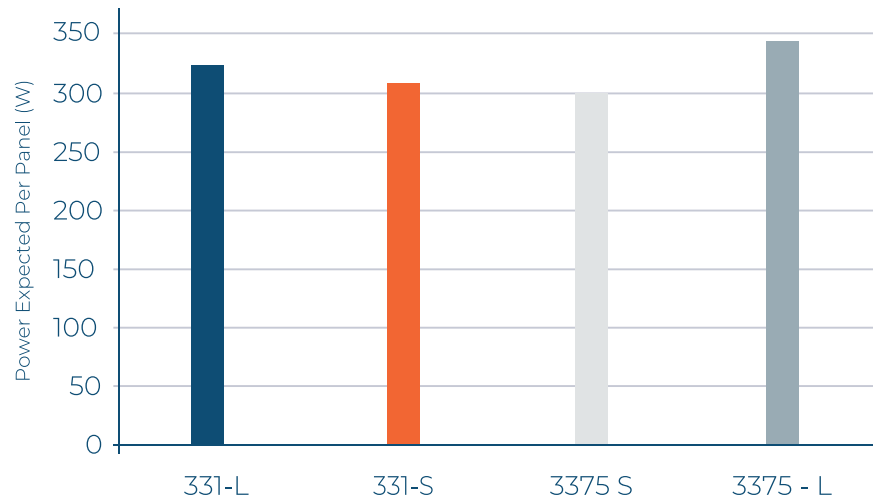
Pantone 3375C - Lines



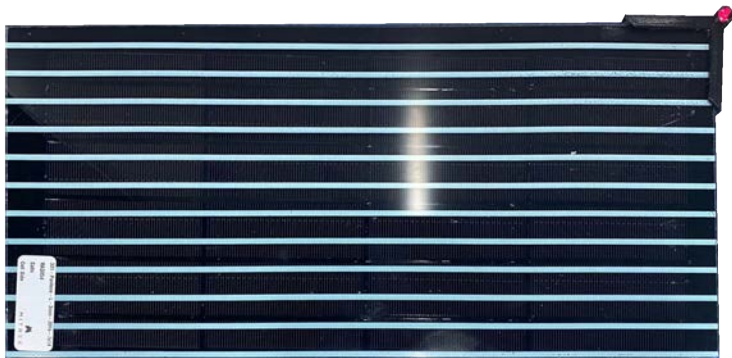
Pantone 331C - Squares



Pantone 3375C - Squares

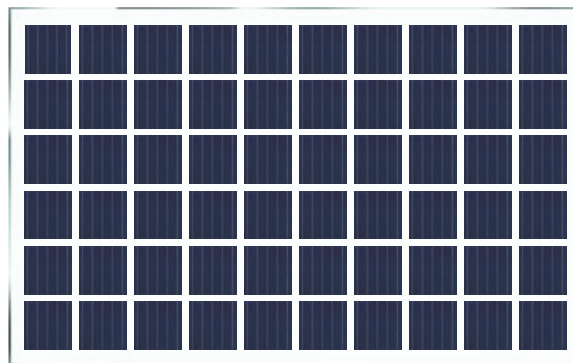


ARCHITECT FINAL DECISION



Pantone 331C - Lines

This option provides optimal power outcome while matching the architects aesthetic view



Semi-Opaque

Allows for visibility and energy generation

COST COMPARISON

	COST					SYSTEM SIZE	ESTIMATED ENERGY GENERATION
	LAND (7,168 SQFT)	SOLAR	CLADDING	TOTAL	TOTAL AFTER TAX CREDIT		
IDEA 1: GROUND MOUNTED	\$\$\$	\$200,000	\$390,000	\$590,000 + Land \$\$\$	\$413,000 + Land \$\$\$	54.6kW	67.3MWh/y
IDEA 2: ROOF PANELS	\$0	\$56,160	\$390,000	\$446,160	\$312,312	28kW	32.3MWh/y
IDEA 3: MITREX BIPV	\$0	\$0	\$520,000	\$520,000	\$364,000	82.5kW	67.3MWh/y

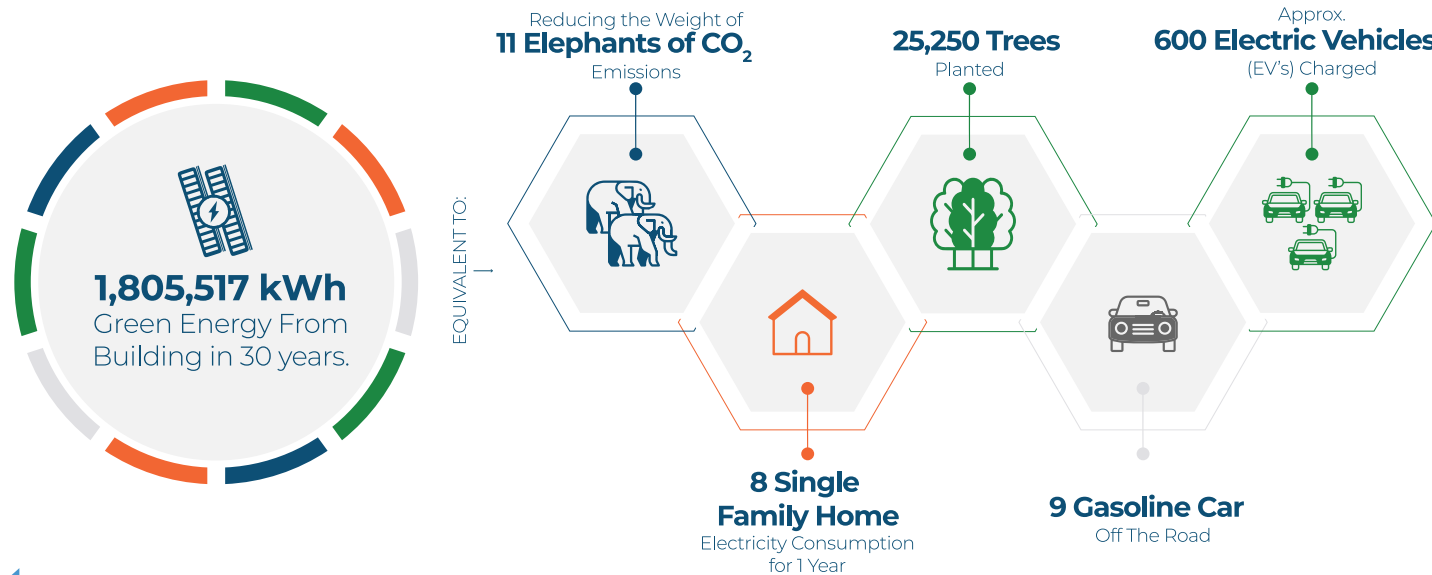

Solar Integrated
Cladding System


Solar Integrated
IGU & Spandrel System





ENVIRONMENTAL IMPACT





CASE STUDY

University Building - New Build

 **MITREX**
BUILDING-INTEGRATED SOLAR TECHNOLOGY

 **Cladify**
Solar's Cladding Technology

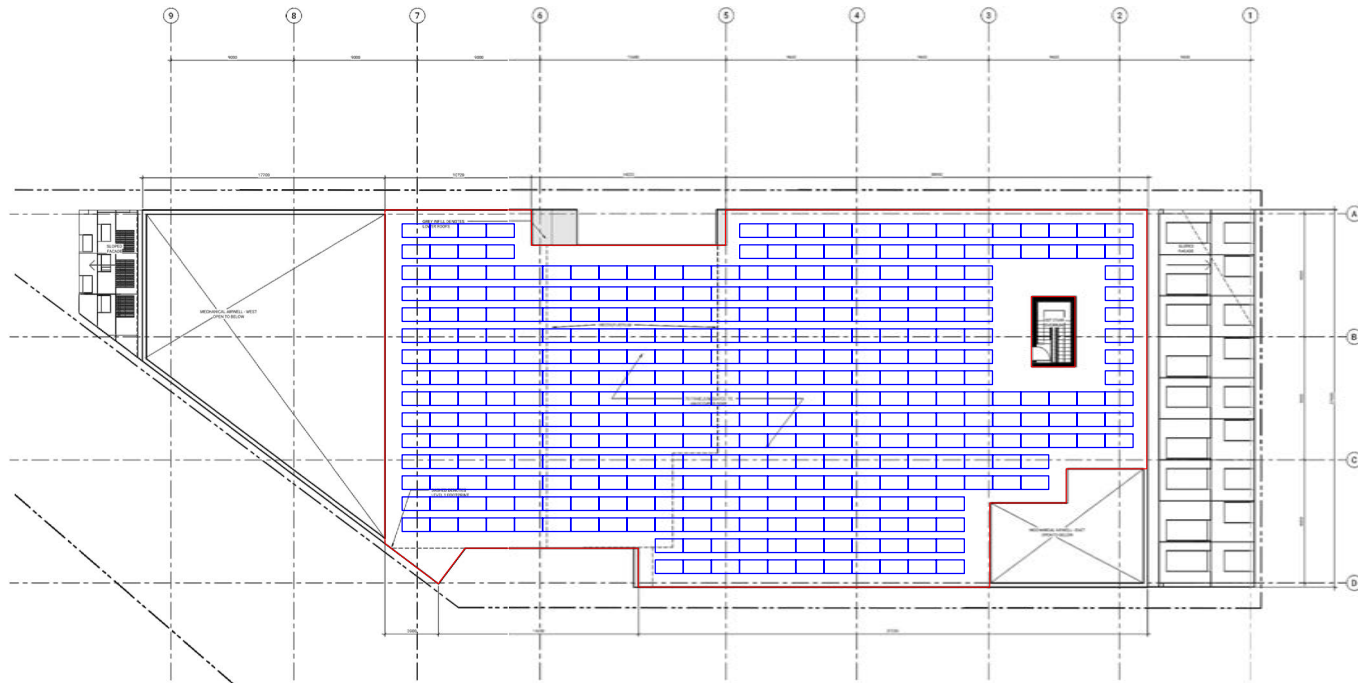
PROJECT CHALLENGES

- Align this new building construction with the university green and sustainable goals.
- Offset part of the energy demand consumption of the building.
- Meeting architects vision for design and aesthetics of the building facade.
- Providing a cost effective solution.
- Ensuring testing and certifications are met (wind load, fire test, etc).



IDEA #1

Solar Panels on the Roof



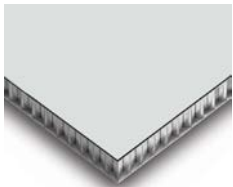
SYSTEM SIZE: **138kW**

ESTIMATED ENERGY GENERATION: **156,866 MWh/y**

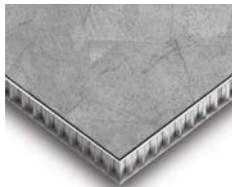
TYPE OF MODULE: **Standard 390W Solar Panels**

IDEA #2

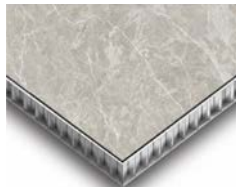
Solar Integrated Cladding



Polaris



Snowfall



Rocksalt

SYSTEM SIZE: **509.6 kW**

ESTIMATED ENERGY GENERATION: **313,708.7 MWh/y**

TYPE OF MODULE: **Solar Facade Panels**



IDEA #2

Solar Integrated Cladding

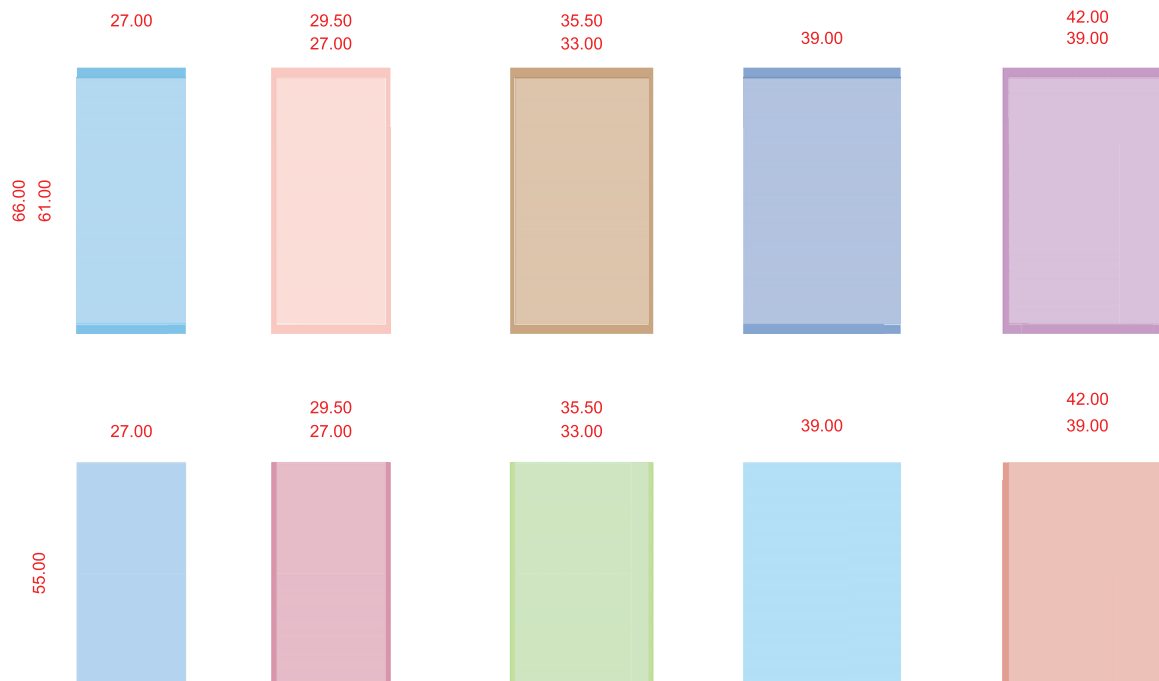
	OTHER	MITREX			
ELEVATION	ACM / METAL / ALU PLATE	NON-ACTIVE CLADISHIELD	ACTIVE CLADISHIELD	SYSTEM SIZE	ESTIMATED ENERGY GENERATION
NORTH	22,523 SQFT	7,141 SQFT	15,382 SQFT	200.0 kW	85,984.8 kWh
SOUTH	18,373 SQFT	8,730 SQFT	9,642 SQFT	125.4 kW	100,280.1 kWh
SOUTH-WEST	8,526 SQFT	2,292 SQFT	6,233 SQFT	81.0 kW	58,344.7 kWh
EAST	10,494 SQFT	3,857 SQFT	6,637 SQFT	86.3 kW	57,804.1 kWh
WEST	2,834 SQFT	1,538 SQFT	1,297 SQFT	16.9 kW	11,295.0 kWh
TOTAL	62,750 SQFT	23,559 SQFT	39,191 SQFT	509.6 kW	313,708.7 kWh

Calculations based on EllisDon quantities of approximately 44,767 ft2 of possible PV wall panel.
Pricing is based on a full turnkey solution that includes supply and installation of panels, mounting systems and all electrical components including inverters, transformers, monitoring system etc.



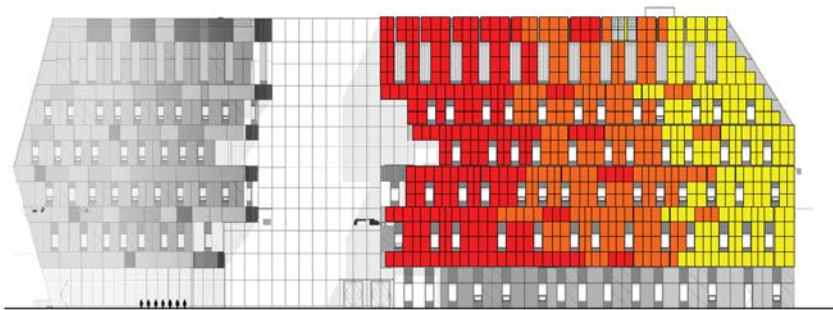
IDEA #3

Solar Integrated Cladding

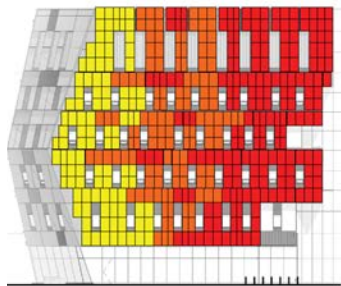


IDEA #3

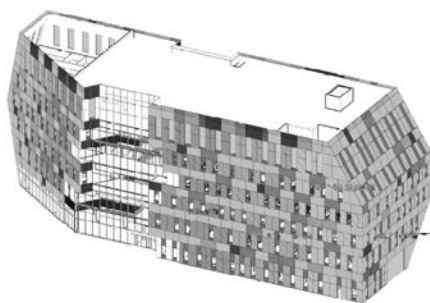
Solar Facade Modules Sizes



South Elevation



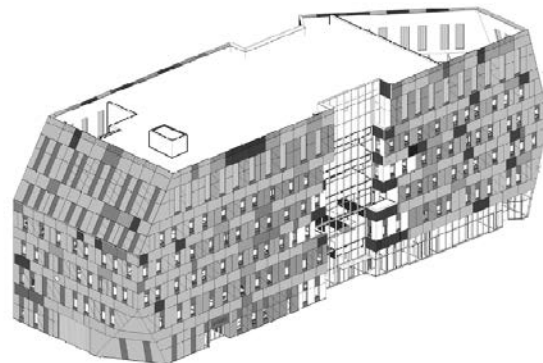
Southwest Elevation



East Elevation

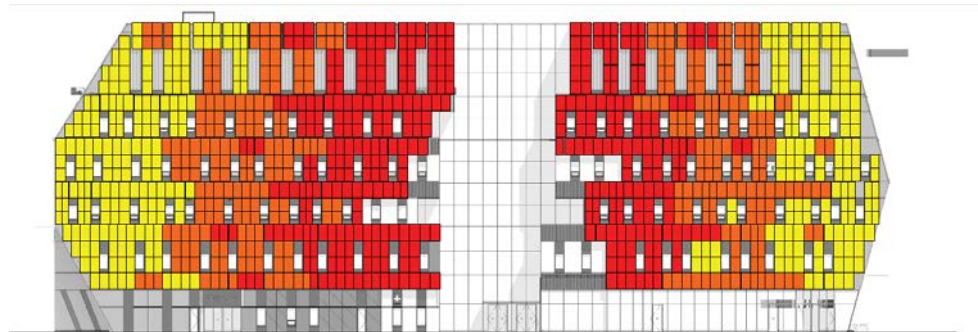


Nord East corner Elevation

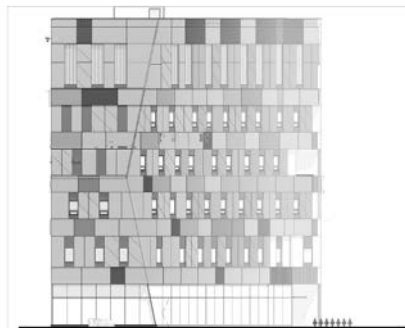


IDEA #3

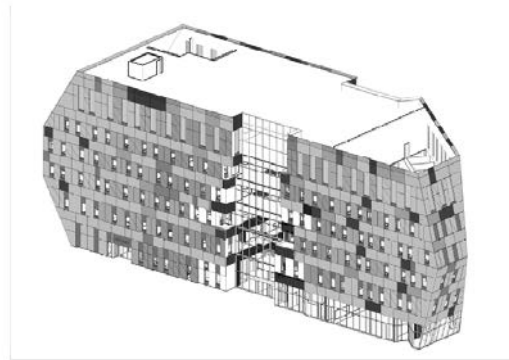
Solar Facade Modules Sizes



North Elevation



Northeast Elevation



IDEA #3

Solar Facade Modules Sizes



KW9505T
PANTONE 7540C

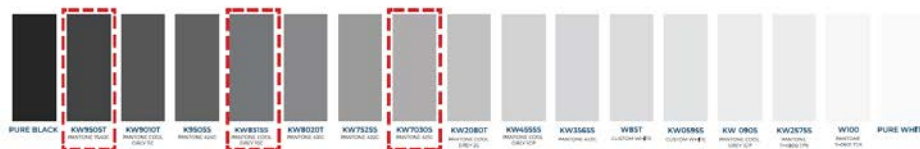


KW8515S
PANTONE COOL
GREY 10C



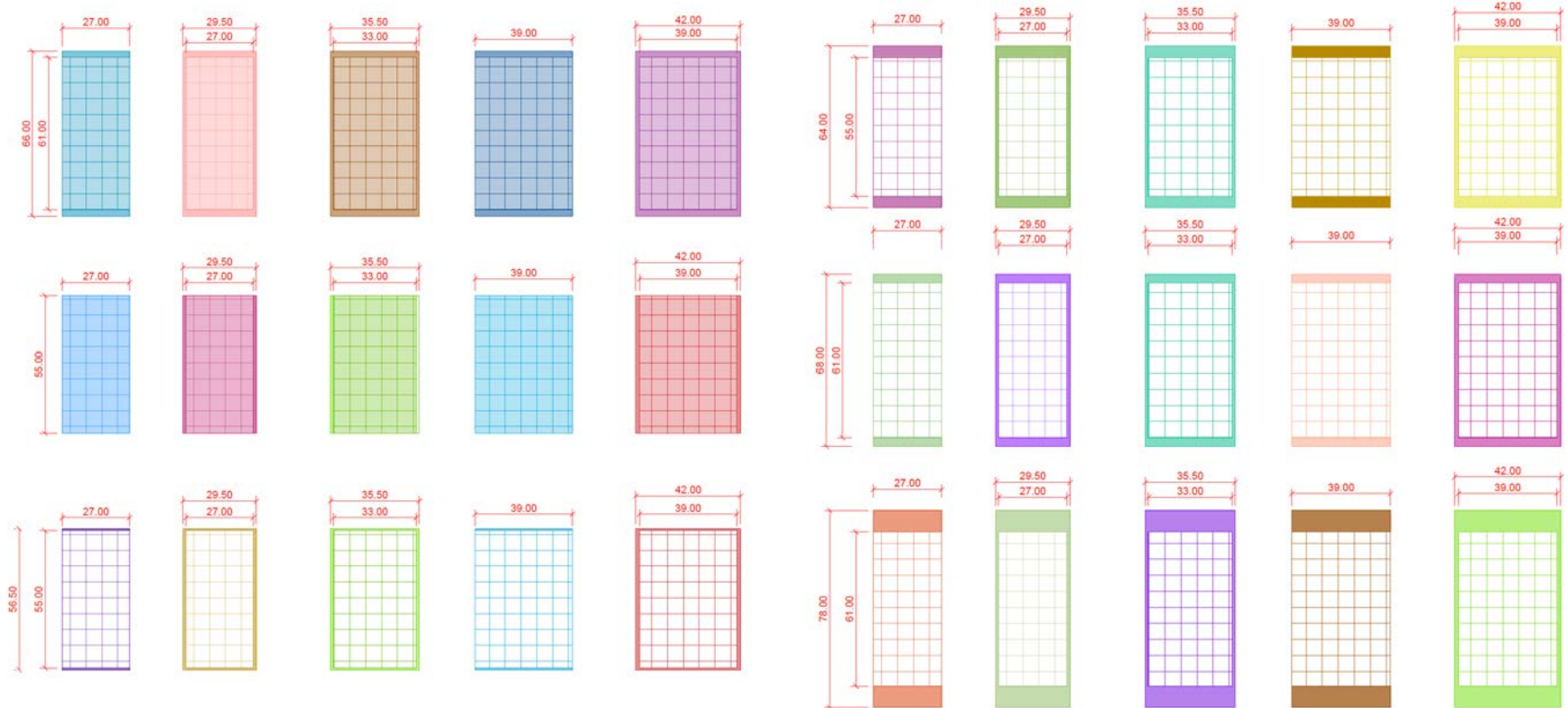
KW7030S
PANTONE 421C

MITREX			
	Active - Rainscreen (Sqft)	System Size (kW)	BIPV kWh
North	15240	224	70,344
South	9828	144	113,416
Southwest	6458	95	74,524
West	1279	19	11,943
East	7133	105	67,216
Roof	306 Panels	119	129,000
Total	46569	587	466,443
			BIPV



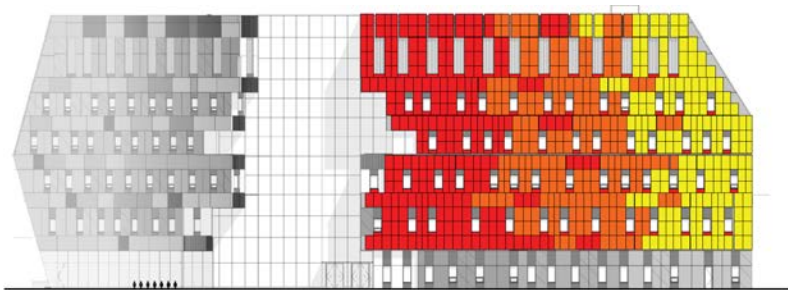
IDEA #4

Solar Integrated Cladding

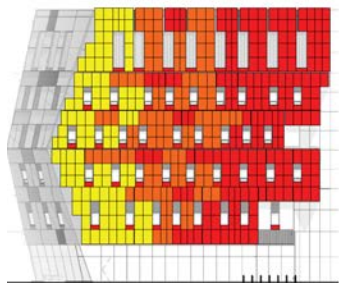


IDEA #3

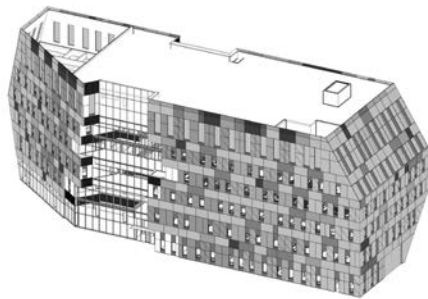
Solar Facade Modules Sizes



South Elevation



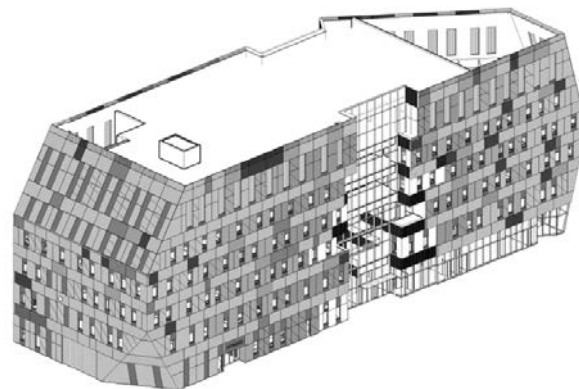
Southwest Elevation



East Elevation

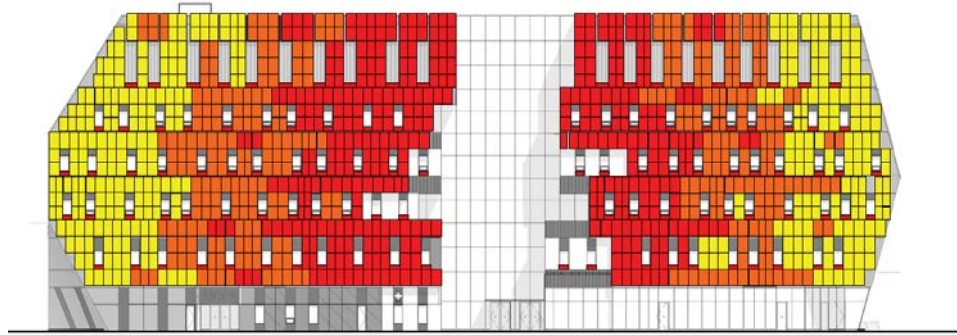


Nord East corner Elevation

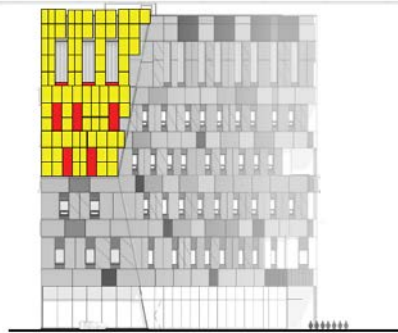


IDEA #3

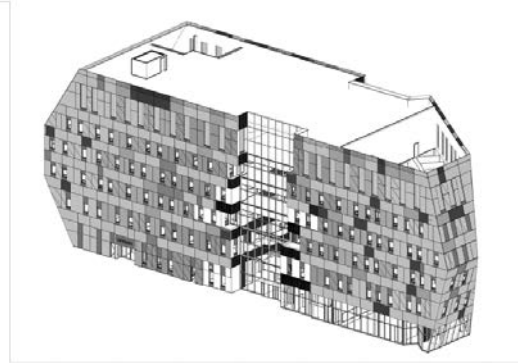
Solar Facade Modules Sizes



North Elevation



Northeast Elevation



IDEA #3

Solar Facade Modules Sizes



KW8515S
PANTONE COOL
GREY 10C

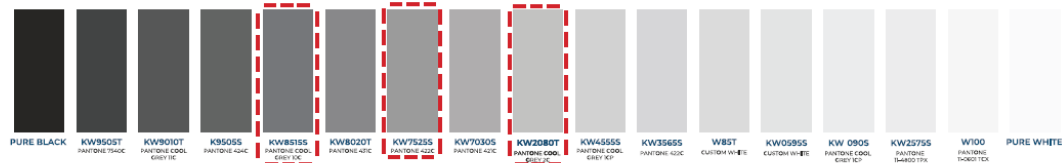


KW7525S
PANTONE 422C



KW2080T
PANTONE COOL

	MITREX		
	Active - Rainscreen (Sqft)	System Size (kW)	BIPV kWh
North	14529	209	65,696
South	9404	135	106,300
Southwest	6172	89	69,773
West	1279	18	11,699
East	6955	100	64,193
Roof	306 Panels	119	129,000
Total	44970	552	446,662
			BIPV



DESIGN APPROACHES



AQUABELLA



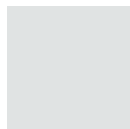
BIANCO BEIGE
Porcelain



CLOSIUM CREAM
Porcelain



PUNTI MARRONI
Porcelain

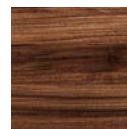


PURE WHITE
Porcelain

DEVELOPER:
Tridel, Hines
ARCHITECT:
3XN, Kirkor Architects & Planners
BUILDING TYPE:
Condo, Retail



MIDLAND COURTHOUSE



NOCCIOLA
⚡ Solar Wood



CUSTOM COLOUR
⚡ Solar Solid Colour

PROJECT SIZE:
10,000 SQFT
POWER OUTCOME:
280kW
BUILDING TYPE:
Government

DESIGN APPROACHES

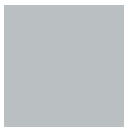


THE SEE INSTITUTE, DUBAI



CUSTOM DESIGN **POLARIS**

⚡Solar Metal

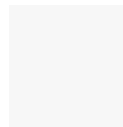


⚡Solar Solid Colour

PROJECT SIZE:
1,500 SQFT
POWER OUTCOME:
20kW
BUILDING TYPE:
Institutional



INDUSTRIAL WALL



WHITE

⚡Solar Solid Colour



QUILL GREY

⚡Solar Solid Colour



GREY

⚡Solar Solid Colour



DAVY GREY

⚡Solar Solid Colour

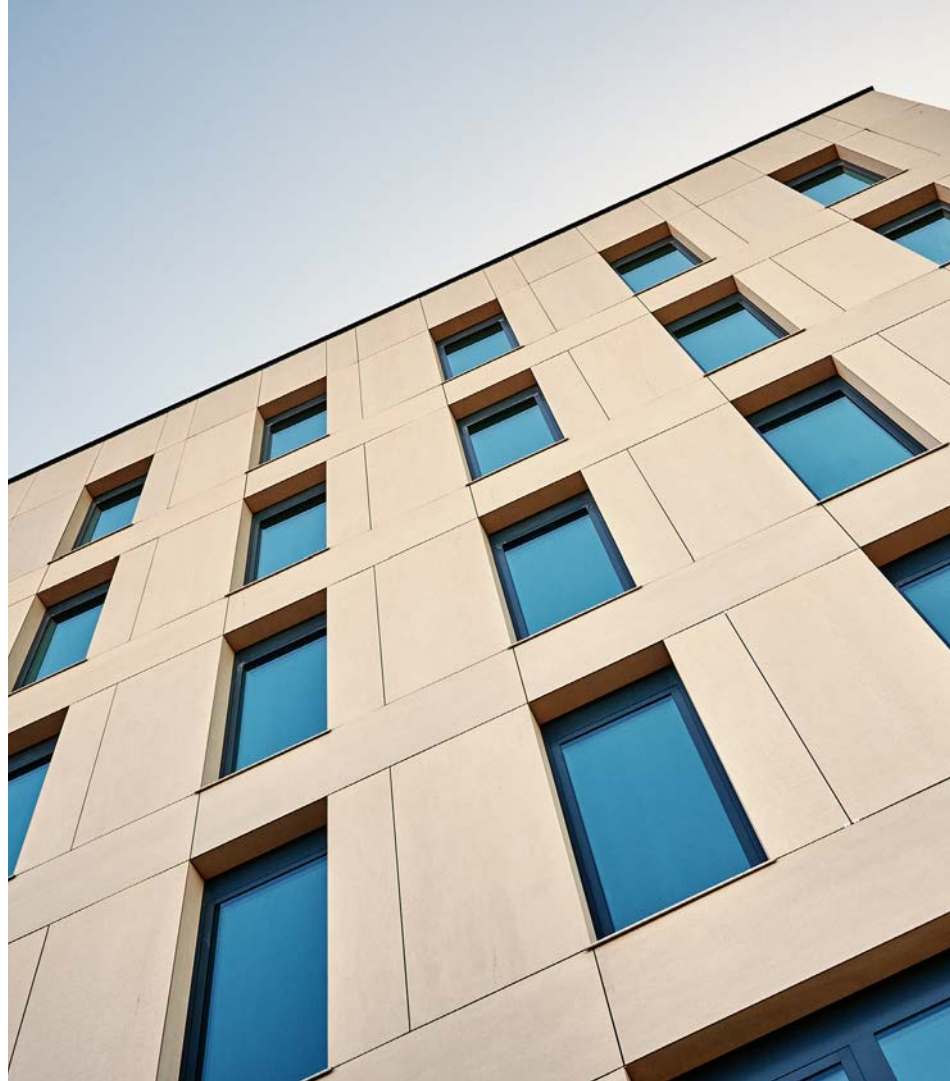
PROJECT SIZE:
10,000 SQFT
POWER OUTCOME:
110 kW System
BUILDING TYPE:
Industrial

CONCLUSION

- The importance of scaling up solar adoption and the role of BIPV in this process.
- The commercial drivers and challenges associated with BIPV adoption.
- The innovative materials and technologies propelling BIPV forward.
- The financial models and strategies to facilitate the transition to net-zero buildings.

THE WAY FORWARD:

- Continued innovation and collaboration among stakeholders, including architects, engineers, property owners, and policymakers.
- Leveraging opportunities presented by legislation, such as Local Law 97 in New York, which mandates a reduction in carbon emissions for buildings.
- Promoting public awareness and education on the benefits of BIPV and net-zero buildings.






Q&A SESSION

THANK YOU FOR YOUR ATTENTION.


Let's work together to shape our cities into models of sustainability and resilience. The journey towards a greener and brighter future begins with each one of us taking proactive steps to embrace innovative solutions like BIPV and drive sustainable development. Together, we can make a difference.


Learn More :

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