Glass Performance Days 2025

10 – 12 JUNE 2025 | NOKIA ARENA - TAMPERE, FINLAND

GLASS PERFORMANCE DAYS 2025

Soltint: High-Performance Aesthetic BIPV customization

A First Step Towards Energy-Producing Facades without architectural concessions.

SOL-R&D x CLIMAD TECHNOLOGY

Solar facades are great!

- Higher sustainability score
- Clean energy production on location
- ROI on your facade

SOL-R&D

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But...

- How does it work?
- What is the efficiency?
- How does it compare?

Hi, we are…

SOL-R&D

Aesthetic photovoltaics startup

Max van Dijken

ClimAd Technology

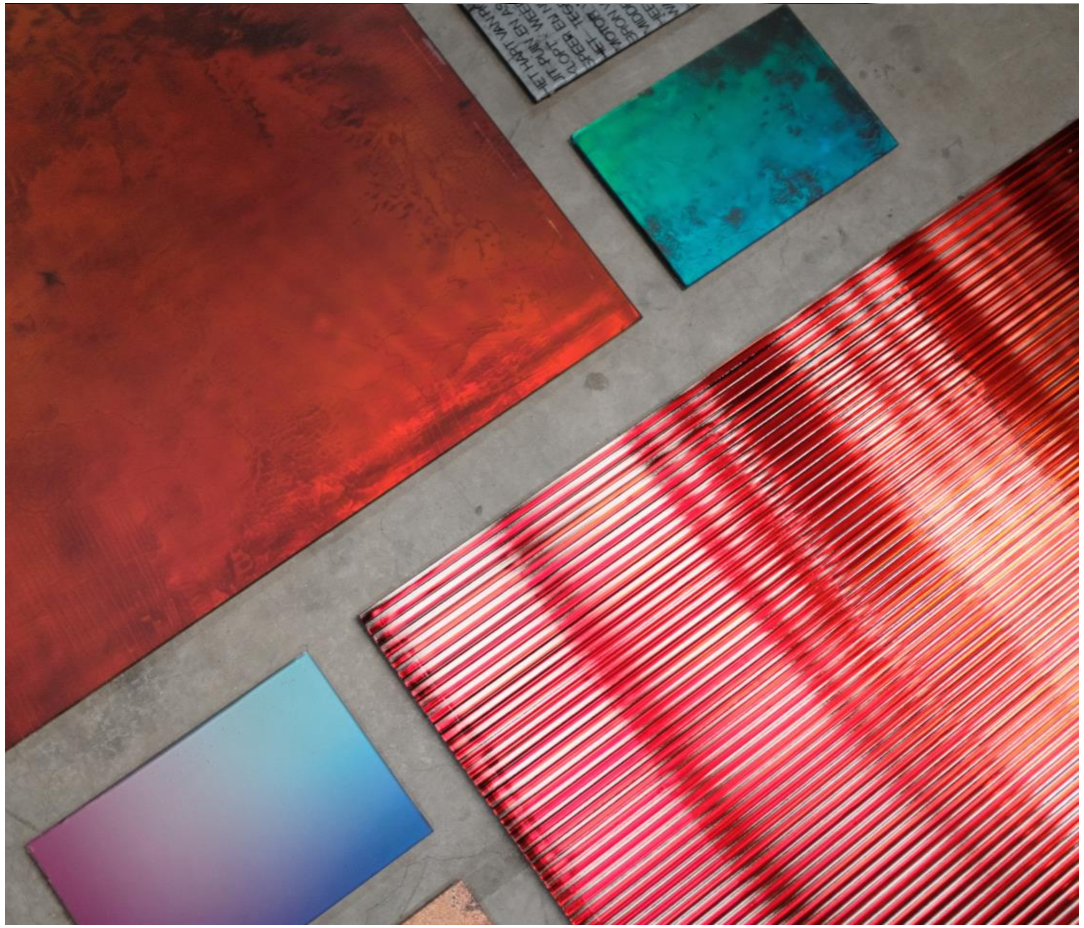
Smart glass coatings

Stijn Kragt

And we make...

Sun Catcher, Alcova, Milan

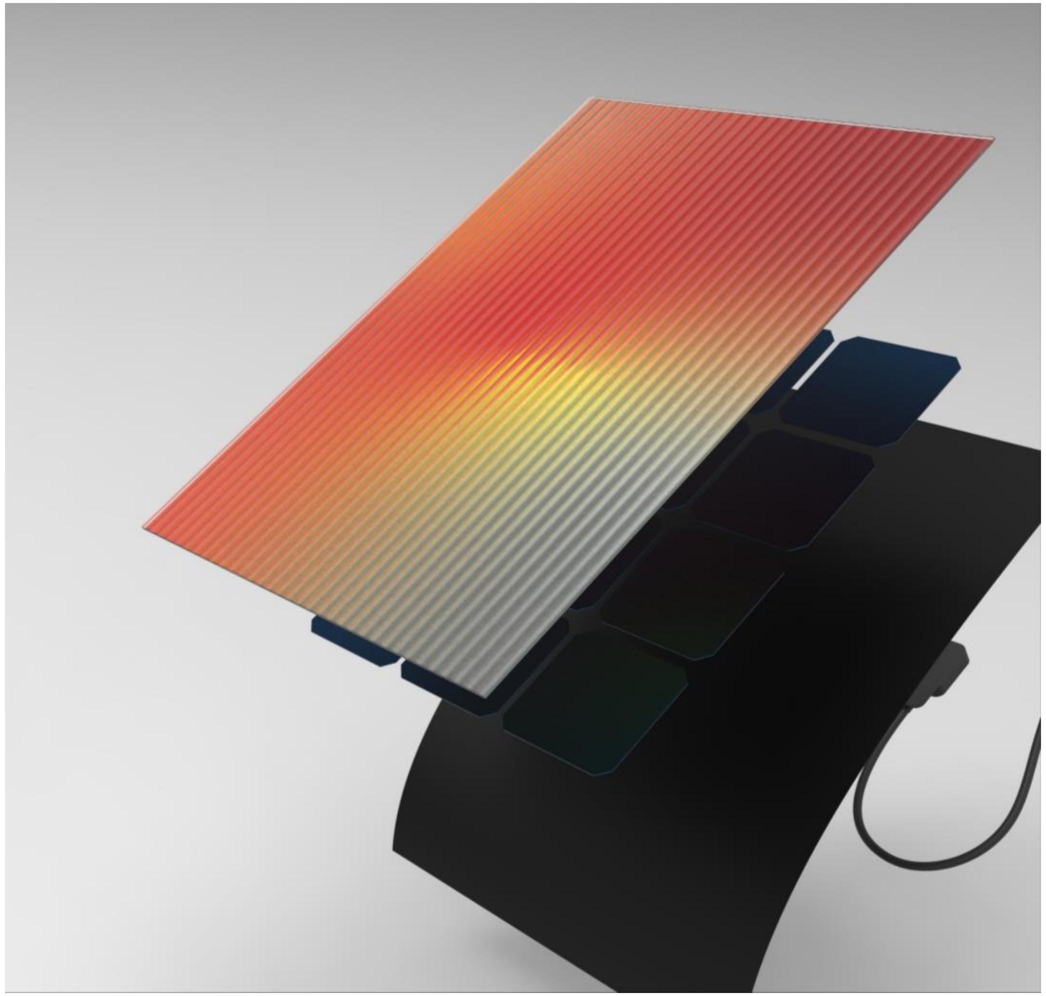
Corten, Future Facade



Corten en Colour Shift, Material District

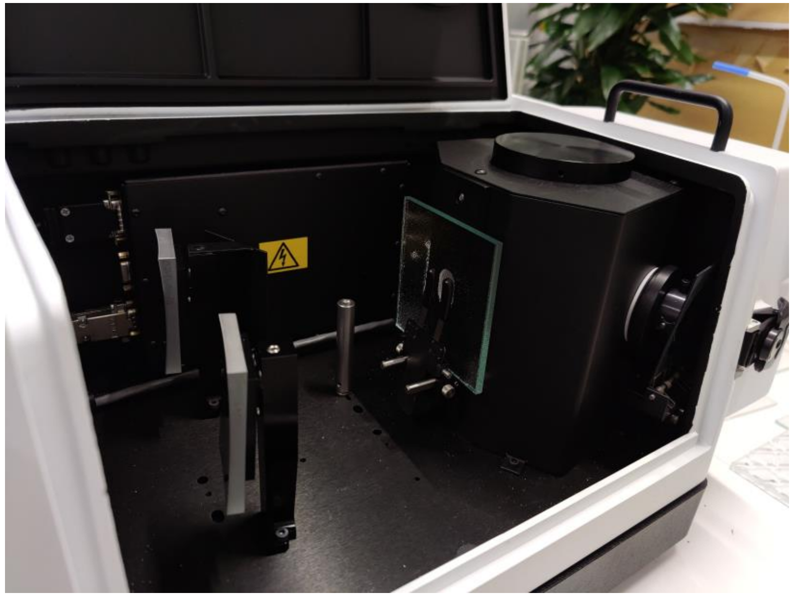
How it works

- Graphics are prepared in conventional design software (Illustrator/Photoshop).
- PET interlayer is treated with CLCs and a graphic treatment.
- Visually, the colors of graphics blend with CLC reflective color.



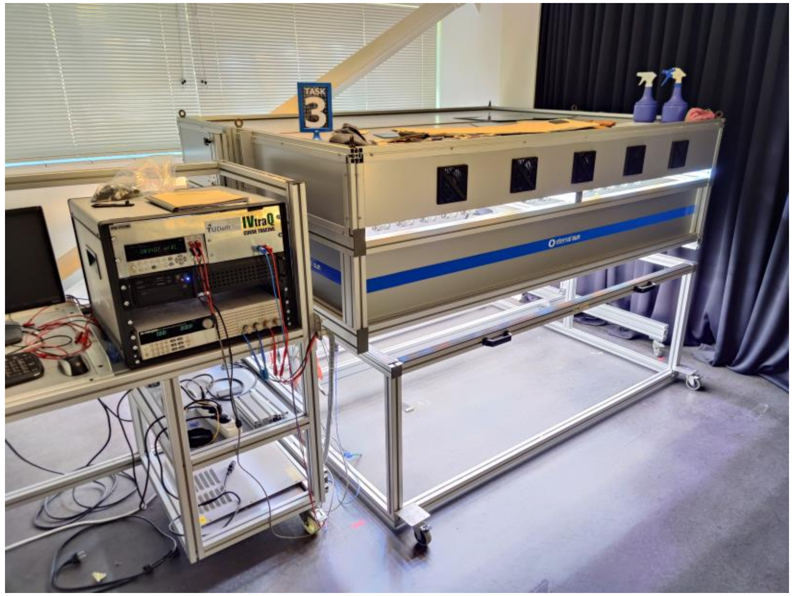
What is the efficiency?

From lab to factory



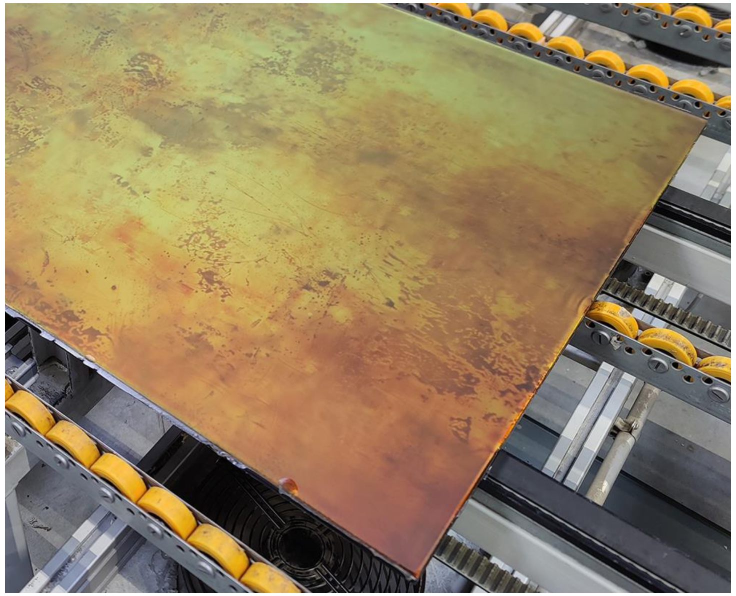
Transmission measurements

theoretical calculations



Lab scale prototype

IV measured



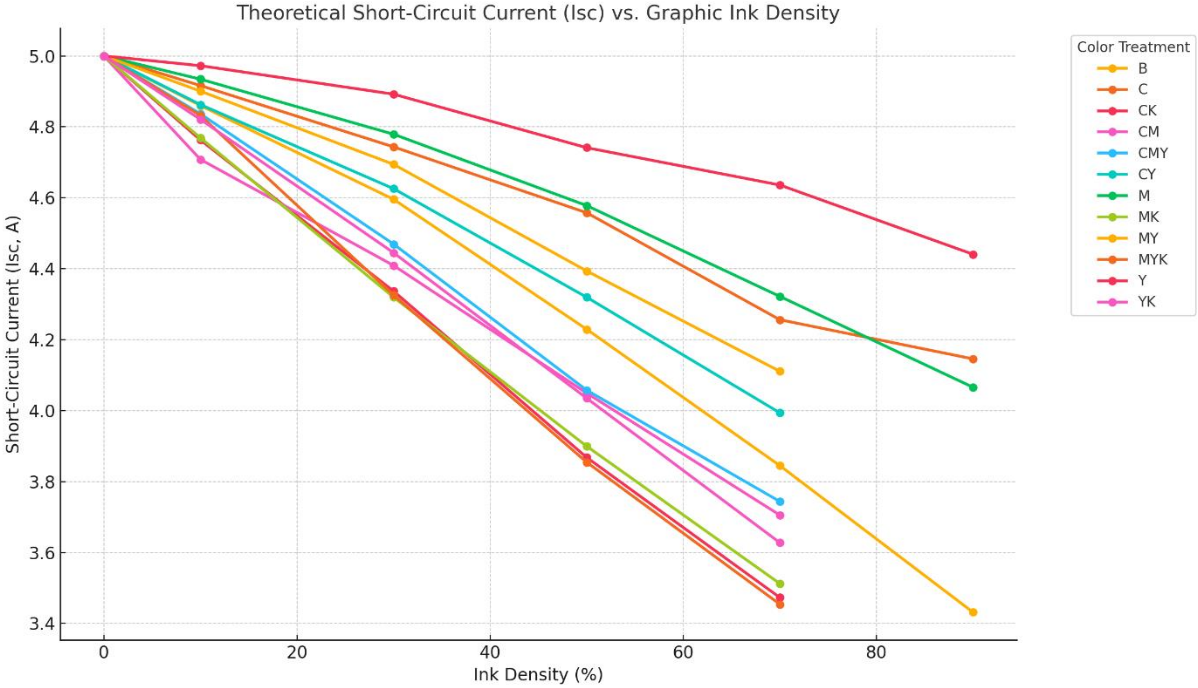
Factory made prototype

STC characterized

Transmission measurements

Quantification of optical performance

- $Isc = \int T(\lambda) * SR(\lambda) * E(\lambda) * A\, dx$
- $SR(\lambda) = (EQE(\lambda) * \lambda)/1239.9$



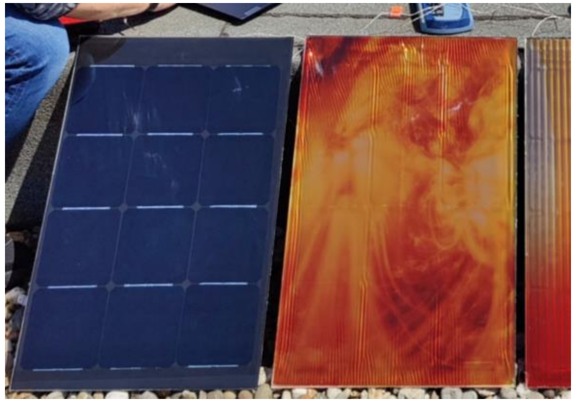
- Direct link between optical properties and ink density/pigment choice
- Light primary colors caused T loss of 10-15%.
- Dark, high-density pigments combinations caused T loss up to 35%.

Lab scale prototype IV measurement

- Lab-scale prototypes (IBC cells, Maxeon E66S) tested under standard conditions.
- Colored module's short-circuit current (Isc) was ~21% lower than black reference.
- Maximum power (Pmax) of the colored module dropped by ~16%.
- Open-circuit voltage showed minimal loss (1.5%), confirming no major electrical degradation.

Parameter	Colored Prototype	Black Reference	Relative Loss (%)
Isc (A)	4.43	5.60	20.8%
Voc (V)	8.55	8.68	1.46%
Pmax (W)	28.96	34.43	15.9%
Fill Factor (%)	76.4	70.9	-7.8% (gain)

Results of the IV measurement of the handmade prototypes



The prototypes

Factory made panels & characterization

- N=7, 18-cell monocrystalline modules were produced using standard lamination.
- Consistent performance across modules, st. dev (±2.9% for power, ±0.95% for voltage).
- Avg. power output (Pmax) was 65.32 W—about 21.3% lower than the theoretical black reference module.
- Power loss mainly due to a 14.9% drop in short-circuit current (Isc), confirming optical-based reduction.
- Voltage loss (1.8%) and fill factor drop (5.6%) were modest, indicating no significant electrical degradation.

Parameter	Colored Modules (Mean)	Theoretical Black Module	Relative Loss (%)
Pmax (W)	65.32	83.00	21.3%
Voc (V)	12.04	12.26	1.76%
Isc (A)	7.40	8.70	14.9%
Fill Factor (%)	73.3	77.6	5.6%

Results of the IV measurement of the factory made prototypes

Benchmark BIPV customization

Interference coating

Morphocolor by Fraunhofer

Interference coating

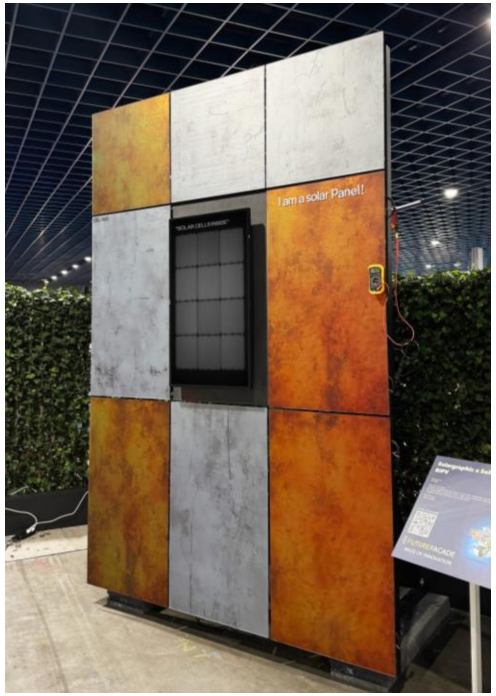
Colorquant by Wolbring

Ceramic print

Colorblast by Kameleon

Colored encapsulant

Solaxess

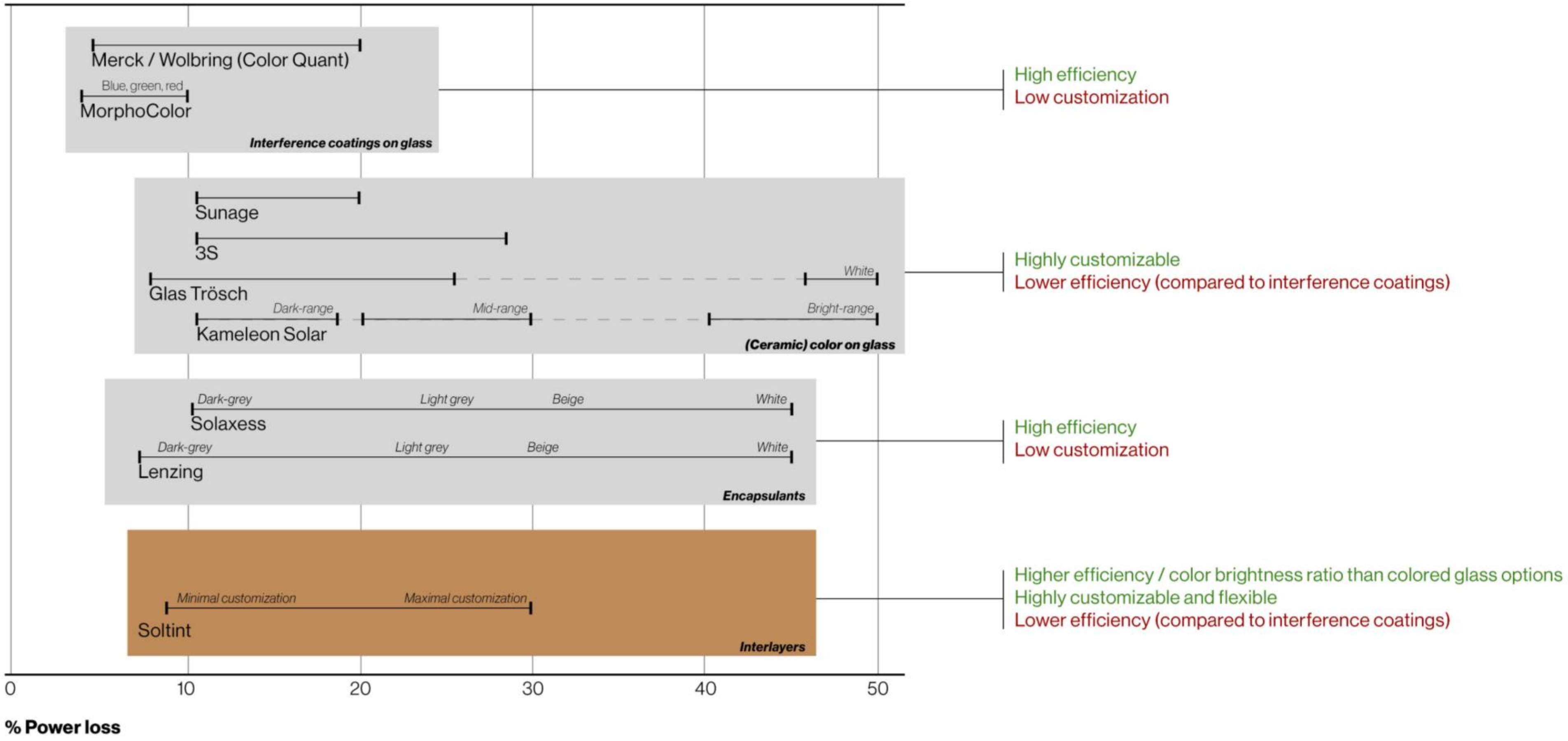


Colored interlayer

Soltint by SOL-R&D

SOL-R&D

Benchmark BIPV customization



A balance of aesthetics & efficiency

- Soltint modules combine high design freedom with moderate optical losses
  - ~10–15% for light colors, up to 35% for denser CMYK combinations.
- Lab prototype showed a ~16% power reduction with minimal voltage and fill factor impact.
  - Optical losses as the main driver.
- Factory modules confirmed these findings.
  - Consistent performance (±2.9% SD) and average power reduction of 21.3%.

- Key takeaway: Trade-offs are predictable and quantifiable, giving architects a toolkit for creative solar design that balances aesthetics and energy.
- Acknowledged limitations: small sample size, no direct factory black reference, no durability data
- Next steps focus on real-world pilots and long-term stability.

Thanks!

Let’s collaborate on your next project!

SOL-R&D

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