The logo for 'solar visuals' is a square with a vertical gradient from yellow at the top to red at the bottom. The text 'solar' is in a smaller font above 'visuals', both in white lowercase letters. A white quarter-circle is in the top-left corner.

**solar  
visuals**

A red rectangular box containing white text.

**SOLAR VISUALS COMBINES RENEWABLE ENERGY WITH  
ENDLESS AESTHETIC POSSIBILITIES  
MARCH 2020**

## CLIMATE NEUTRAL IN 2030

### IMPLEMENTING CLEAN ENERGY IN FUTURE ARCHITECTURE AND LANDSCAPE

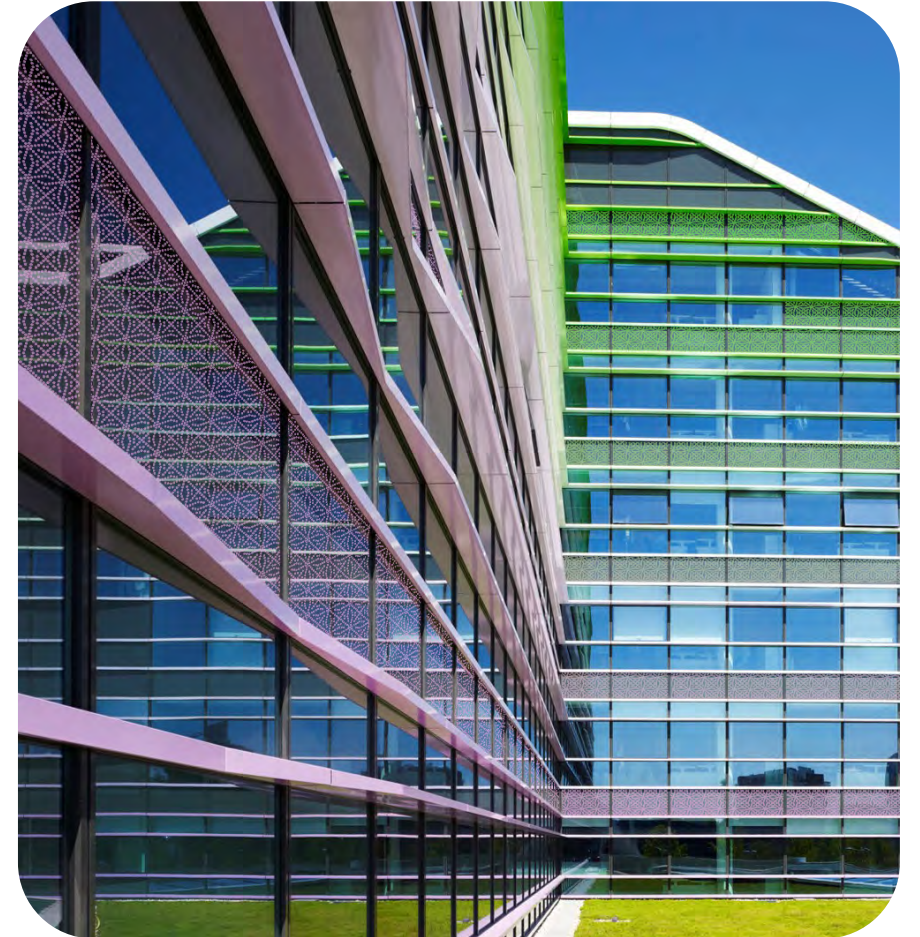
Solar Visuals introduces a new revolutionary façade material that combines maximum energy generation with high-quality aesthetic design quality.

The world is facing a major challenge in the coming decades, as formulated in the Paris Climate agreement:

Making the built environment more energy-neutral in 2030.

This will have a big visual impact on the built environment that requires new building integrated solutions.

Only than buildings and cities arise that are not only intelligent and efficient, but also visually attractive.



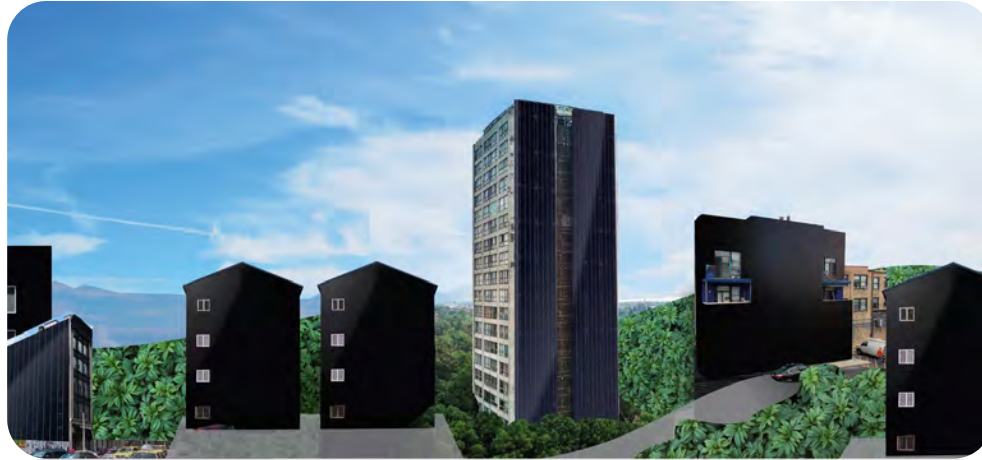
# HOW CAN WE USE THE POTENTIAL OF FAÇADE SURFACES FOR SUSTAINABLE ENERGY GENERATION

## SOLAR ENERGY SHOULD BE AN INTEGRATED PART OF A SUSTAINABLE ENERGY MIX

Climate change has a huge impact on the world at large and this needs to be addressed by the worldwide implementation of sustainable energy sources.

Integrating solar energy into the built environment is an important part of this sustainable energy mix, however the potential of roof surfaces is insufficient to achieve the ambitions.

Current solutions also create another problem: the world becomes ugly...



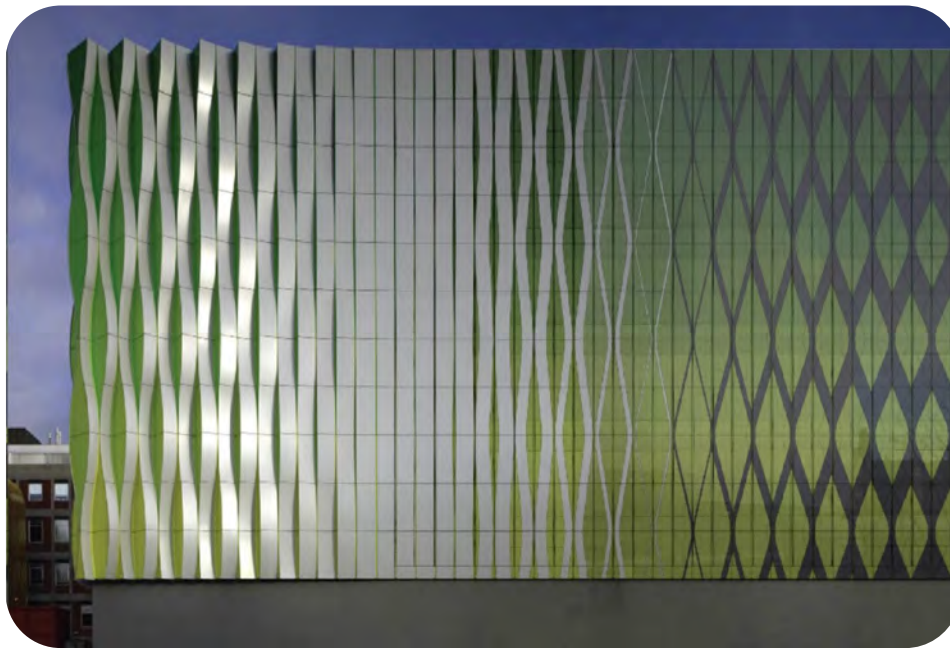
# THE SOLAR VISUALS SOLUTION

## A REVOLUTIONARY ENERGY PRODUCING FAÇADE PANEL THAT IS FULLY CUSTOMIZABLE AND VISUALLY ATTRACTIVE

Our products are designed in such a way that they can be integrated seamlessly into the façade surfaces of buildings.

The use of façades to generate energy means a major step forward. It offers opportunities to scale-up the energy production in the built environment in one go.

Buildings can now easily be transformed from energy consuming objects into energy-producing entities and yet be visually attractive.

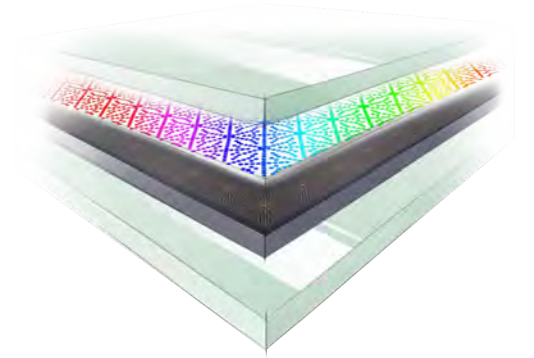


Examples of a Solar Visuals façade

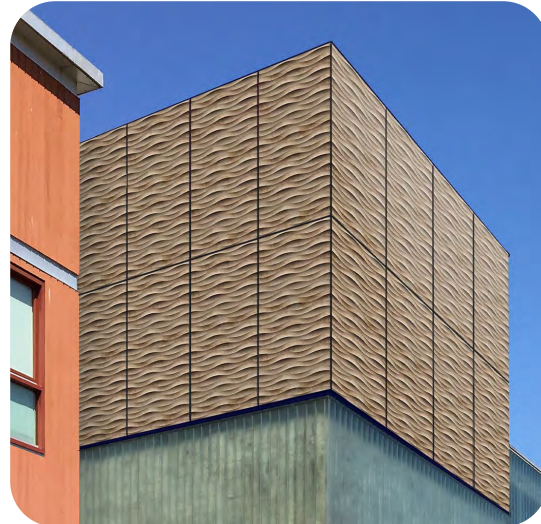
## OUR PRODUCT

**A SOLAR VISUALS ENERGY PRODUCING FAÇADE CONSISTS OF A BUILDING INTEGRATED PV ( BIPV ) MODULE WITH A SUSTAINABLE AND FULLY CUSTOMIZABLE INTEGRATED FULL-COLOUR VISUAL**

- A layer of photovoltaic material which generates energy
- A full-colour visual that can be designed by our architects and designers or by the client
- Our 'freedom of design' products are available in different sizes, patterns, colours and bespoke designs that can be fully customized.



“The Collection” of Solar Visuals has a wide choice of various standard patterns and standard colours that can be seamlessly repeated



For customers with specific ideas, designs can be customized. The full-colour print process allows any design to be supplied and processed in energy-generating façade modules

# THE HEART OF OUR PRODUCT

## A UNIQUE PATENTED RASTERISATION METHOD THAT COVERS THE SOLAR CELL

Once the design is chosen, this image is transformed into a pattern of dots.

The open spaces between the pattern allow the sunrays to penetrate to the photovoltaic layer, resulting in the optimum balance between energy yield and aesthetic quality.

The rasterisation process developed by Solar Visuals has three different patterns based on different algorithms:

The Orthogonal pattern, the Star pattern and the Radial pattern.

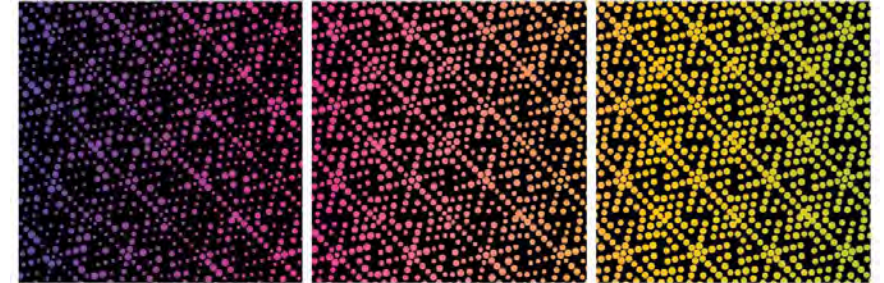
Each pattern has specific properties that connect to the selected solar cells and the visual quality of the façade.

Patent application filed august 2017, PCT phase November 2018  
Novelty research turns out excellent: novelty, innovative and industrial  
applicable on all 15 claims

### Orthogonal pattern

This pattern is developed for the best colour representation at greater distances.

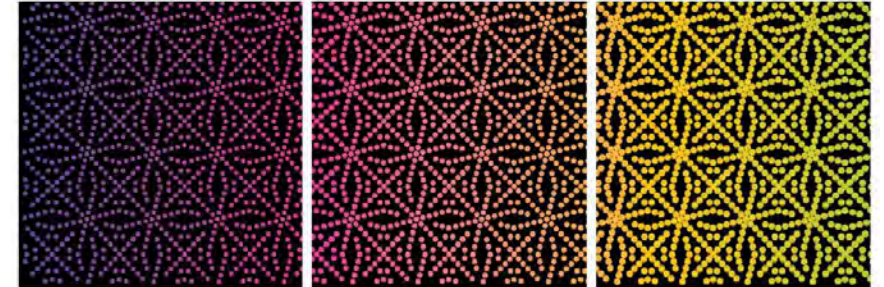
Visual range:  
Long distance  
(35 meters or more)



### Star pattern

This pattern is developed for the colour representation at both greater and medium distances.

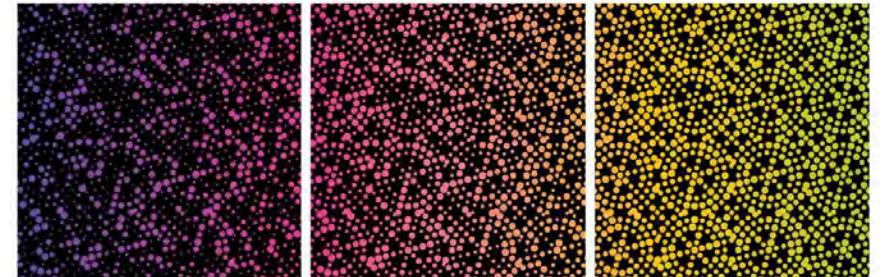
Visual range:  
Medium distance  
(25 meters or more)



### Radial pattern

This pattern is developed for the even colour representation at shorter distances and has the highest resolution when it comes to design.

Visual range:  
Short distance  
(5 meters or more)



Energy yield: **Optimal**  
(Ca. 155 Wp/m<sup>2</sup>)

Energy yield: **Medium**  
(Ca. 145 Wp/m<sup>2</sup>)

Energy yield: **Basic**  
(Ca. 126 Wp/m<sup>2</sup>)

# YIELD AND POWER

## ENERGY GENERATING PANELS

Solar Visuals panels are one of the few façade materials which generate energy. The yield of the panels depends on chosen color coverage, size and sun orientation.

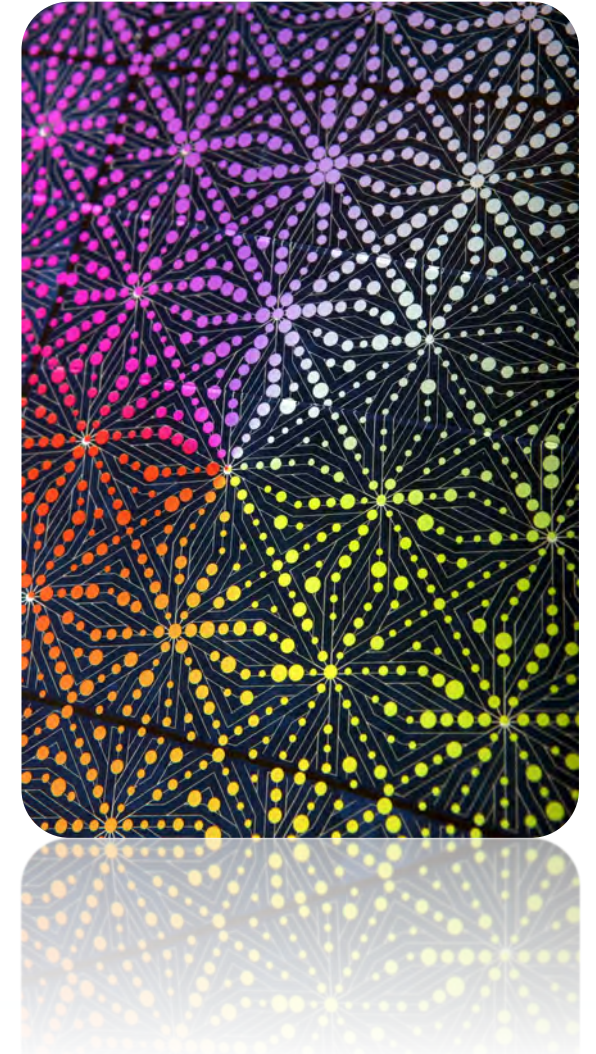
The table underneath shows the calculated power output, annual yield and compares the possibilities with a non-covered standard PV panel.

Type	Calculated Power output* [Wp/m <sup>2</sup> ]	Yield** [KWh/m <sup>2</sup> ]	Façade Yield*** [KWh/m <sup>2</sup> ]	Yield compared to Traditional panel [%]
Standard PV panel non-covered	180	168	117	100
Solar Visuals panel Optimal	155	145	101	87
Solar Visuals panel Medium	145	135	95	80
Solar Visuals panel Basic	126	118	82	72

\* Average calculated power output for standard panel (990 x 1650mm)

\*\* Average calculated yield at ideal sun-orientation (South at an angle of 35 degrees)

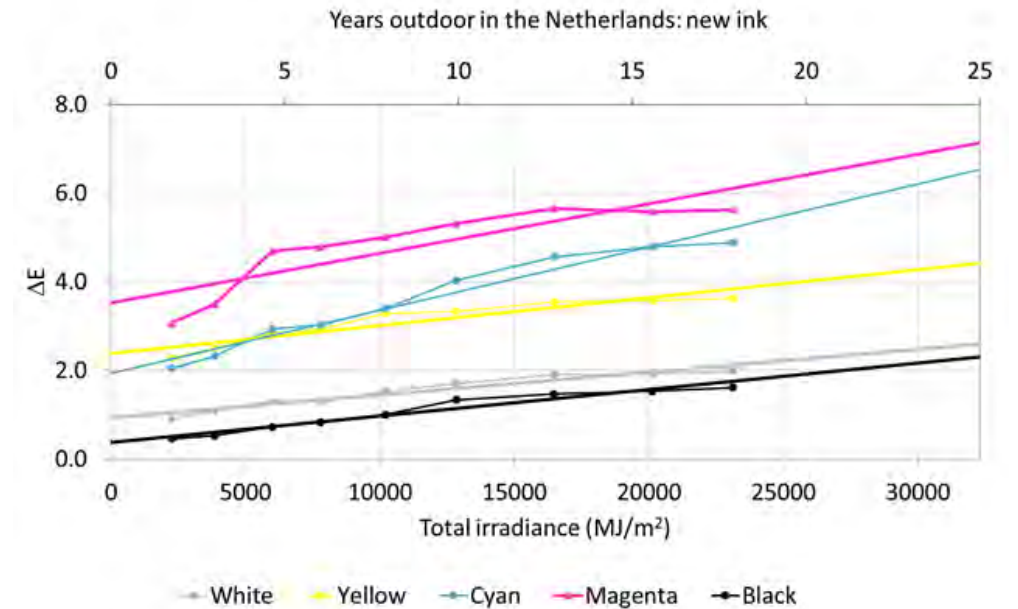
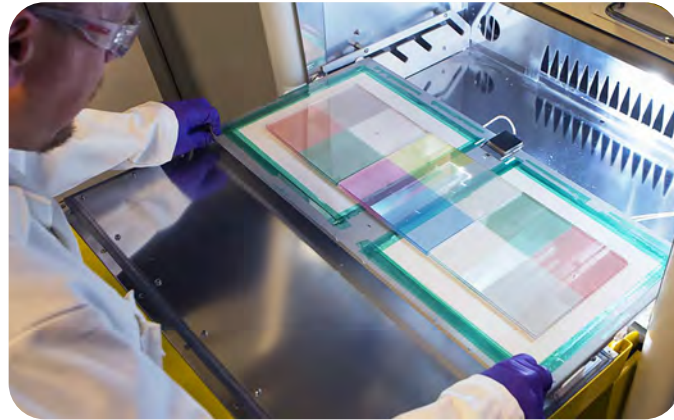
\*\*\* Average calculated yield at façade conditions (South at an angle of 90 degrees)



# PROVEN TECHNOLOGY

## EXTENSIVELY TESTED IN LAB AND EXTERIOR SETUPS

- Extensive testing in ECN.TNO lab ( damp heat test, thermo- cycling, UV degradation )
- Durability tests ( electrical and colour fastness ) in Arizona. Irradiance of 1 year Arizona Q-TRAC testing equals about 25 years of natural sunlight in the Netherlands



Delta E	Perception
$\leq 1.0$	Not perceptible by human eyes.
1 - 2	Perceptible through close observation.
2 - 10	Perceptible at a glance.
11 - 49	Colors are more similar than opposite
100	Colors are exact opposite



## RASTERIZATION OF IMAGES : EXAMPLE HEDERA PRINT

### MAXIMUM VISUAL IMPACT AND OPTIMAL EFFICIENCY

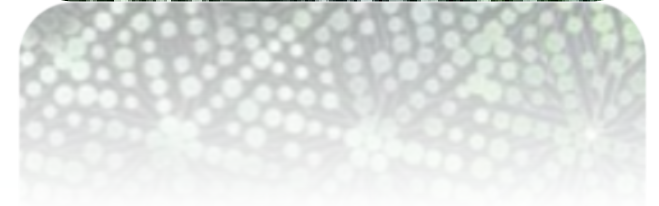
The patterns, each with a different geometric design, have specific properties that perfectly match with the chosen solar cells and the desired visual quality of the façade.

The rasterization process makes it possible to create a balance between showing design on the façade and optimal energy yield.

The chosen image can be converted into different coverage levels.

Up close this is readable in the form of the coloured dots, from a viewing distance the intended image becomes visible.

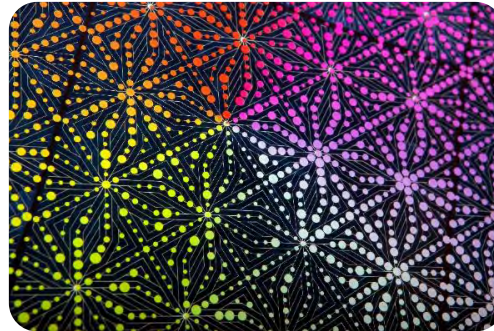
For the human eye, the printed design can be seen from a few meters away as a normal full colour print with great visual impact.



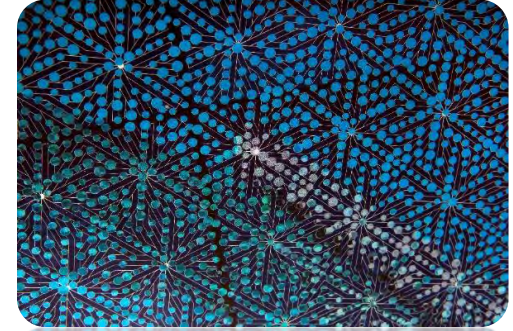
## CREATING OPTIMAL BALANCE BETWEEN AESTHETIC APPEARANCE AND ENERGY YIELD



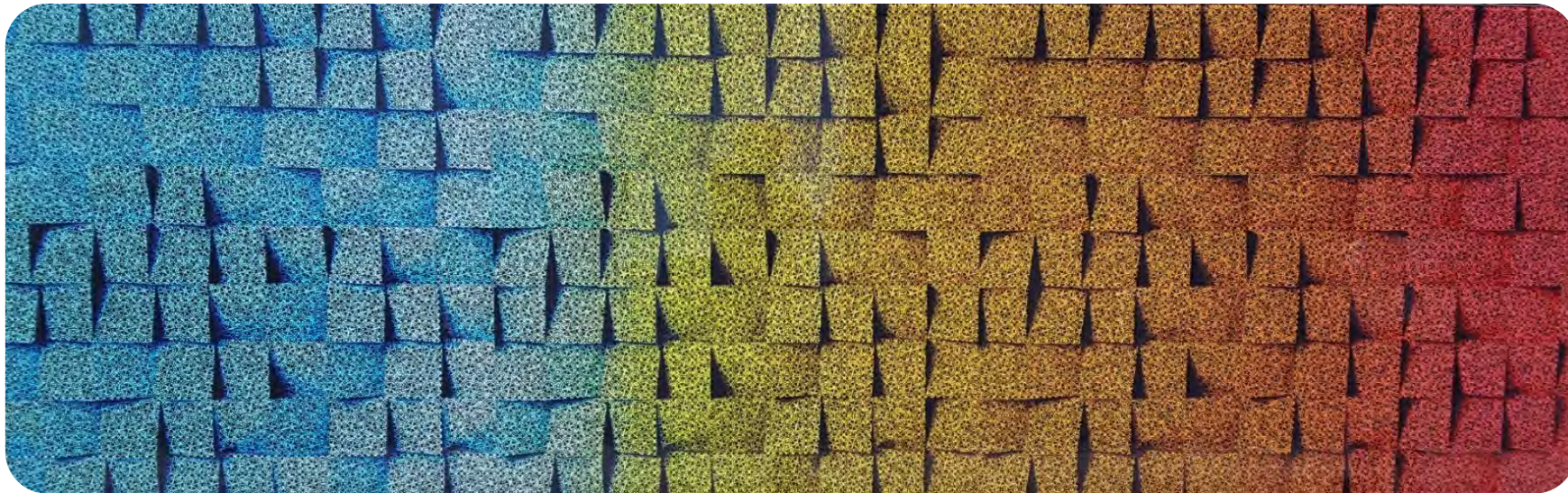
Optimal pattern : 10% print coverage



Medium pattern : 20% print coverage



Basic pattern : 30% print coverage

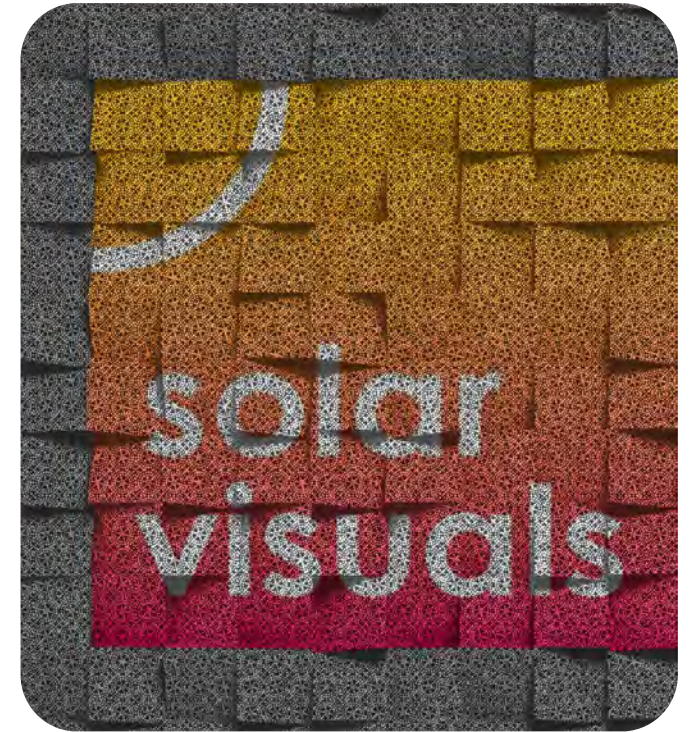


Solar Visuals XXL 114 cells module –tempered glass 6-6 powered by AGC, size 3250 x 1025 mm

## SOLAR VISUALS – CUSTOMIZED PROJECTS

**A FLEXIBLE, AESTHETIC, EFFICIENT AND COST-EFFECTIVE BUILDING MATERIAL THAT MAKES SOLAR ENERGY SOLUTIONS AVAILABLE TO ARCHITECTS, ENGINEERS AND PROJECT DEVELOPERS ON A MUCH LARGER SCALE**

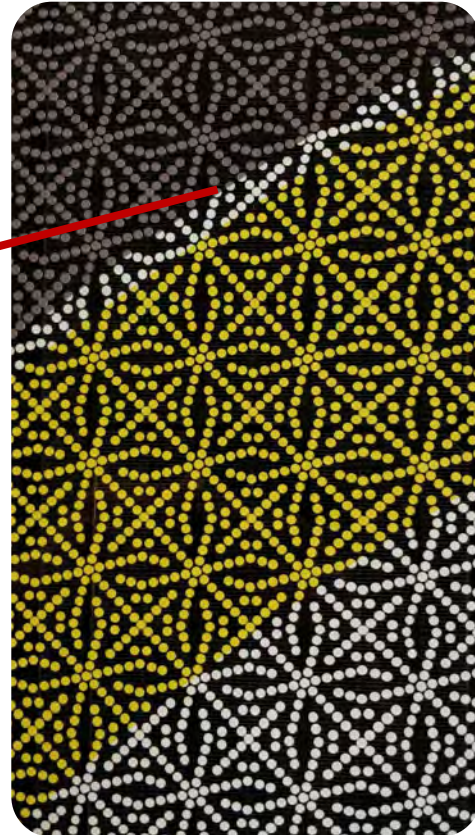
For architects and developers with a specific design or idea, customization is possible. This can be a repetitive pattern, or one image divided into multiple modules on one façade. The full-colour printing process allows any possible design to be incorporated into the energy-generating façade modules.



## SOLAR VISUALS CUSTOMIZED MODULES – SHELL PROJECT AMSTERDAM

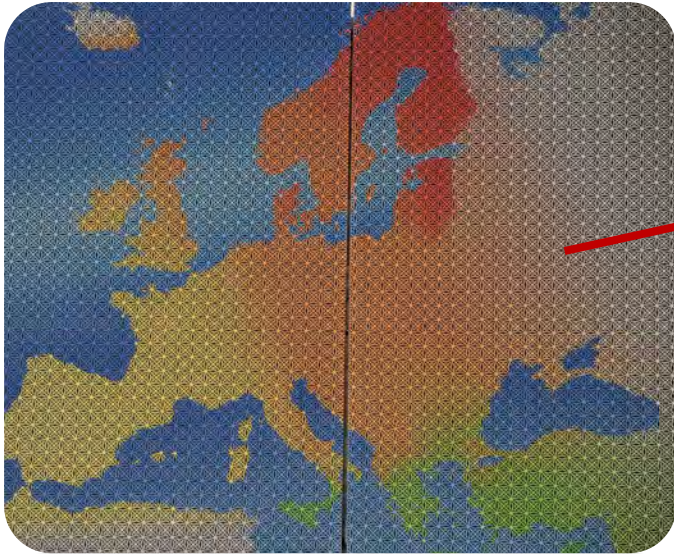


Shell design based on Star pattern Basic  
print coverage 30 %  
Energy yield 126 Wp/m<sup>2</sup>



Impression Solar Visuals panels divided into 10 compartments.  
Each compartment is divided into 2 rows of 8 panels, size 680 x 1335 mm.  
Each modules contains 32 solar cells.

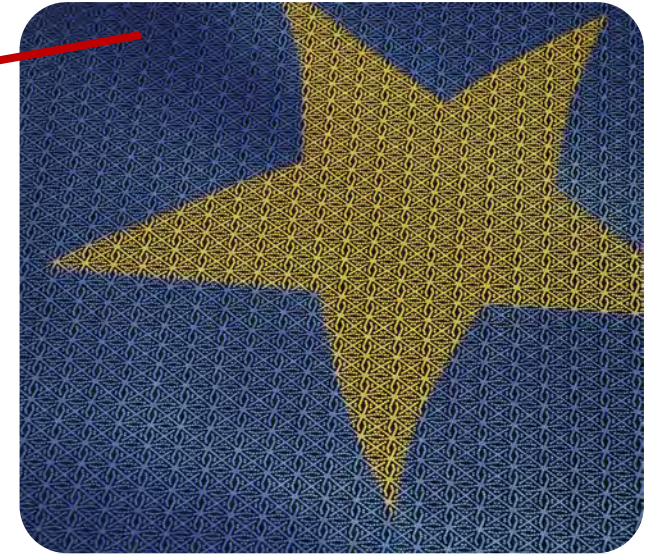
## SOLAR VISUALS CUSTOMIZED MODULES – JOINT RESEARCH CENTER ( JRC ) – PETTEN - THE NETHERLANDS



JRC design based on Star pattern Basic  
print coverage 30 %  
Energy yield 126 Wp/m<sup>2</sup>



This is the façade of the Joint Research Center in Petten - the EU science hub that advises the European Commission in the field of technology and innovation.  
The Solar Visuals façade consists of two visuals divided into 3 glass-glass PV panel modules (995 x 1650 mm).  
Each module contains 60 solar cells.



## FREEDOM OF DESIGN ON ANY BUILDING

### VISUAL DESIGN BY TOP ARCHITECTS AND DESIGNERS



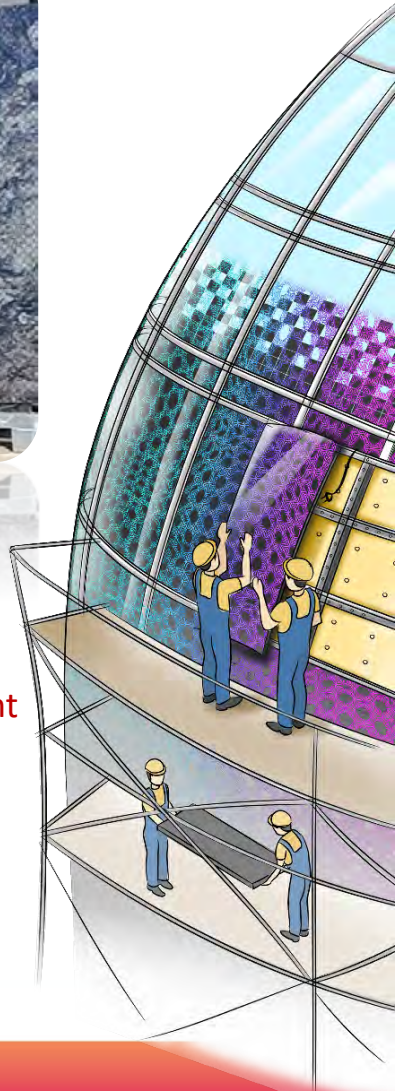
For architects or project developers with their own design, the bespoke service is extremely suitable. We work with supplied designs but we can also design an image in close consultation with the customer. The size, shape and material structure of panels can vary according to the customers wishes.

The printing possibilities are endless: images can vary in size from one panel to a façade-wide image covering multiple panels.

From monochrome in any desired RAL or PMS colour to abstract patterns or photographic prints.

The printed panels are available with ( PV ) and without energy-generating solar cells ( non-PV ) – an interesting solution for a design where parts of the façade are located in the shade or are oriented on the north side of a building or object.

- Solar Visuals pv
- Solar Visuals non-pv
- Solar Visuals transparent



## SOLAR VISUALS – ‘THE COLLECTION’

### THE COLLECTION HAS A WIDE CHOICE OF VARIOUS STANDARD PRINTS AND COLOURS

The Solar Visuals Collection is an accessible way for property developers, architects, builders, housing corporations, governments and other end users to create energy neutral buildings with energy-generating façade panels that also add aesthetic value to the built environment.

A balanced and seamless repetition is created by means of one pattern per panel.

The Collection consists of ready-made modules that can be delivered in two standard sizes:

Size A: 995 x 1995 mm

Size B: 995 x 1650 mm

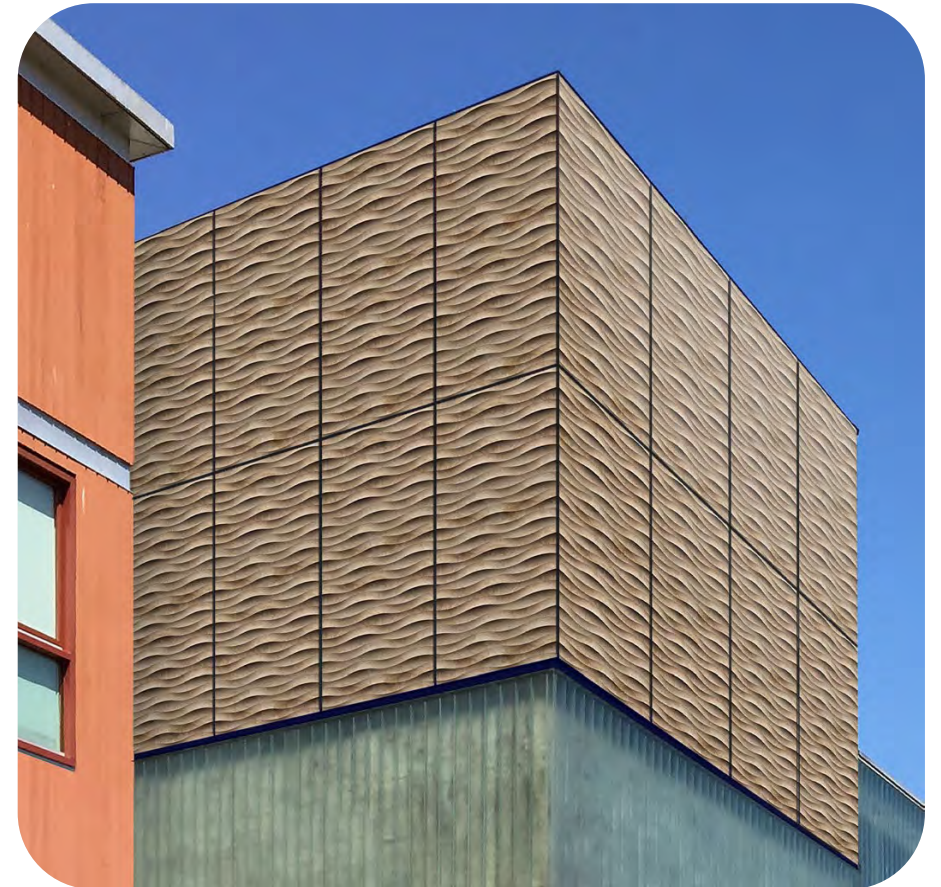
Panels from ‘The Collection’ are suitable for new architectural projects and for making existing buildings more sustainable.

The patterns in the collection are designed in such a way that the content blends seamlessly across the different panels in the façade, creating one powerful image from a viewing distance.

In addition to the standard sized PV façade panels, non-PV panels in the same design can be supplied as well.

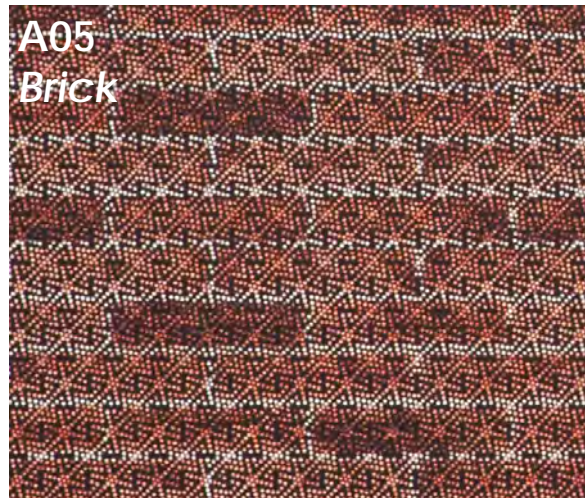
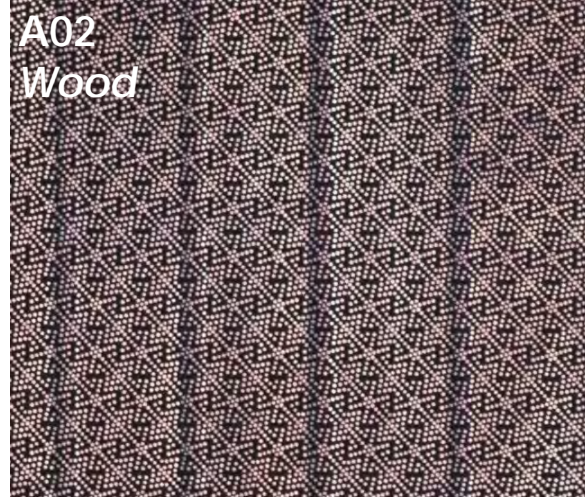
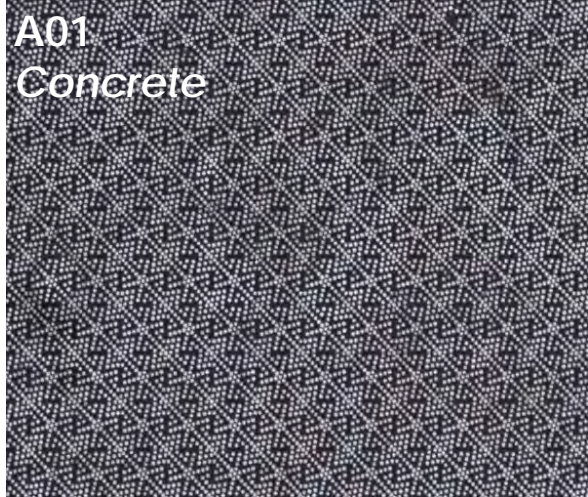
These so-called dummy panels have the same look as the standard panels due to the full-colour print, but can contribute to a cost-efficient solution.

The Collection is divided into four subcategories : Architectural Materials, Nature, Art and Spot Colours ( different RAL / PMS colours ).



# SOLAR VISUALS – ‘THE COLLECTION’

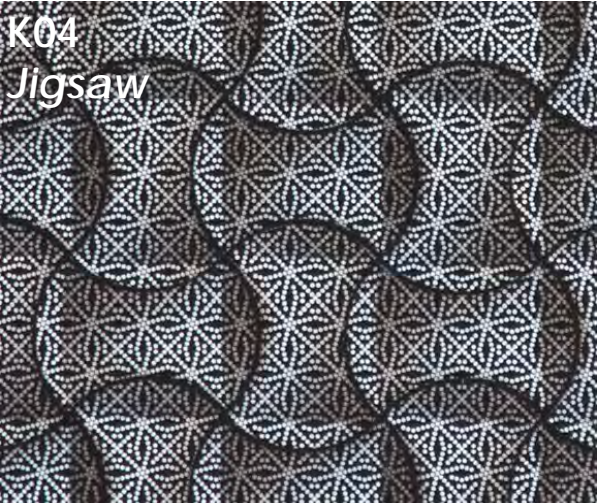
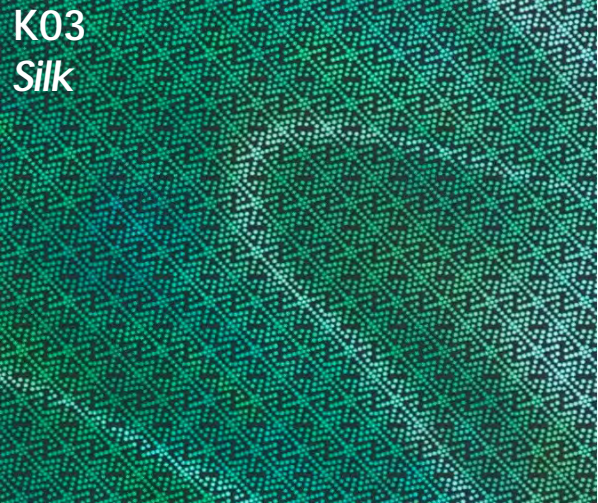
## ARCHITECTURAL MATERIALS





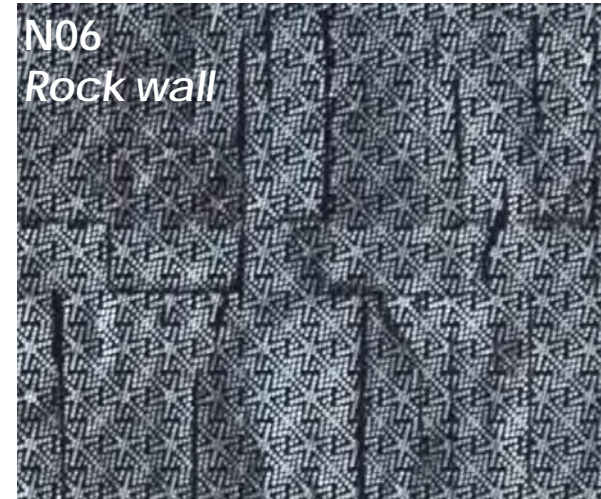
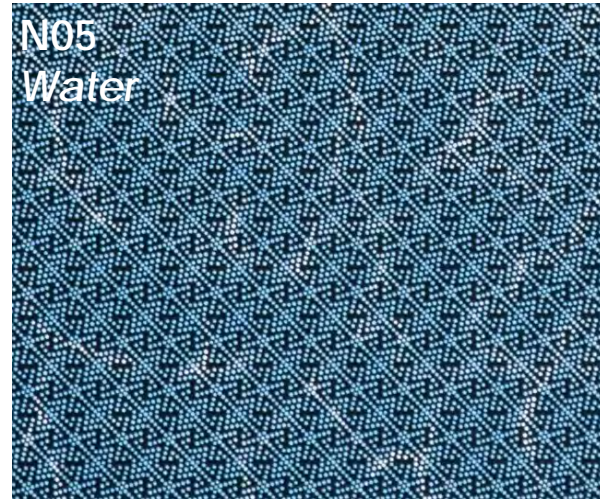
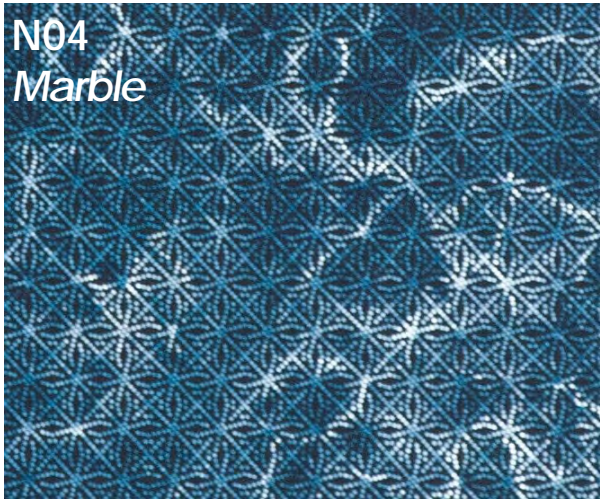
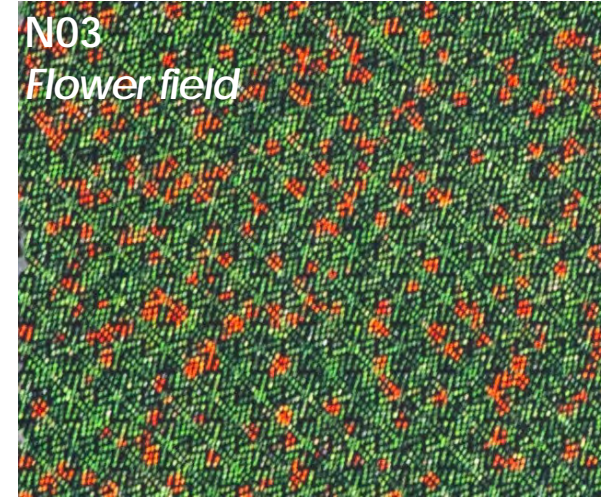
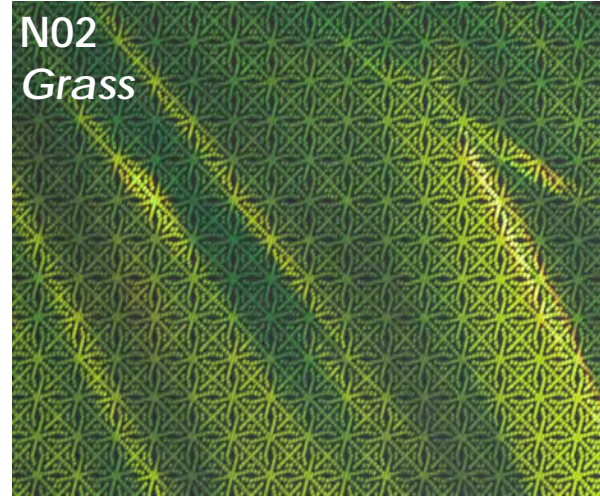
# SOLAR VISUALS – ‘THE COLLECTION’

## ART



# SOLAR VISUALS – 'THE COLLECTION'

## NATURE



## SUNEWAT PARTNERSHIP WITH AGC EUROPE

### MULTIPLE TYPES OF ENERGY-GENERATING GLASS SOLUTIONS

AGC, worlds largest glass producer will include the Solar Visuals program in their SunEwat Active Glass product line branded Artlite Active.

This makes AGC the most important representatives of Solar Visuals in Europe.

The new SunEwat range is the first real ONE STOP SHOP for energy generating buildings.

The partnership with AGC enables Solar Visuals to grow and produce large volumes as well as production of custom sized solutions.

AGC and Solar Visuals are setting up a viable and long term strategy and will start the mass integration of energy generating and smart façades in construction projects.



## WINNER CLEAN ENERGY CHALLENGE - AMSTERDAM



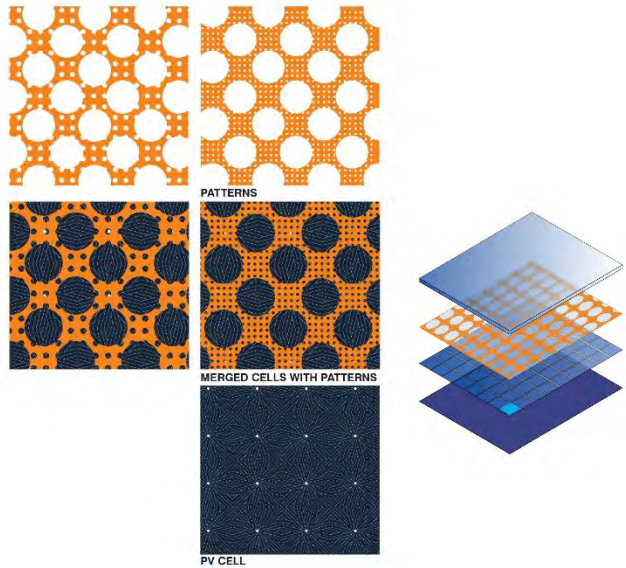
## CASE STUDIES

### EXAMPLE : BRICK DESIGN ADAPTS TO PRINTED PV FAÇADE APPLICATION



# CASE STUDIES

## BLENDING WITH OTHER FACADES. LELYSTAD THEATER



## CASE STUDIES

**POWERHOUSE HARLINGEN FOR PRORAIL NETHERLANDS  
COMBINING A PHOTO WITH ARTIFICIAL GREEN AND REAL GREEN**



## CASE STUDIES

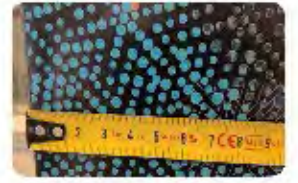
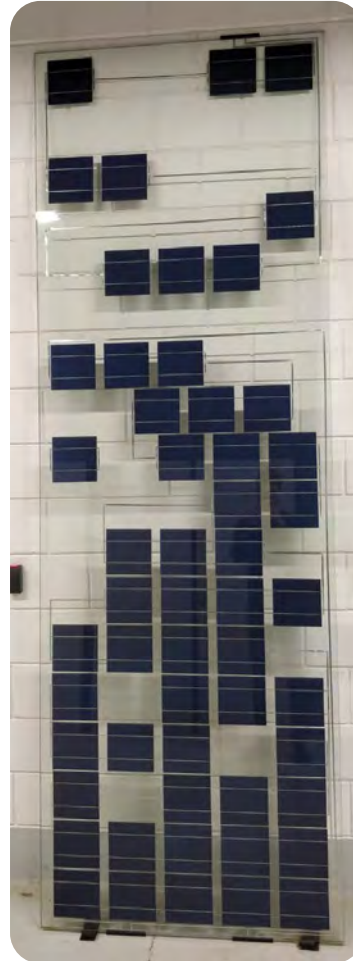
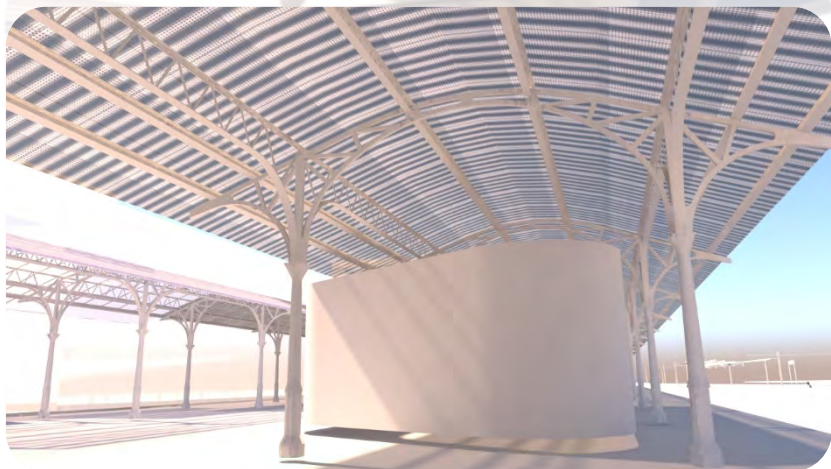
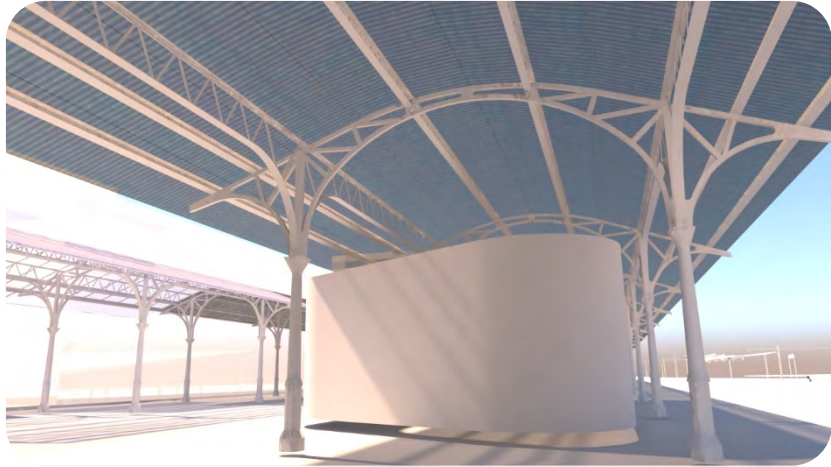
### BRICK FAÇADE MODERN CONSTRUCTION HOUSE





## CASE STUDIES

### RAILWAY PLATFORM ROOF COMBINING LIGHT TRANSMISSION, ENERGY GENERATION AND DESIGN, SEEN FROM BELOW



## FUTURE DEVELOPMENT

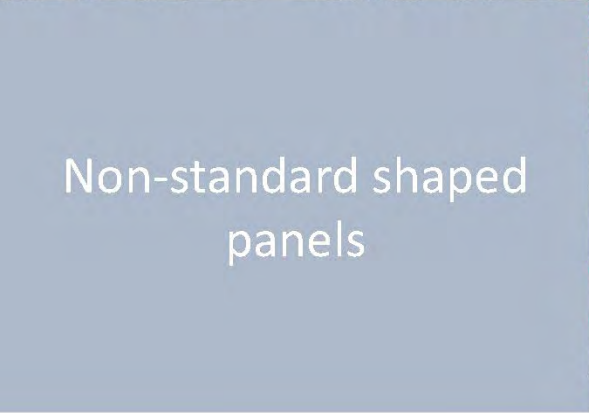
CONTINUOUS PRODUCT DEVELOPMENT IS THE KEY FOCUS OF SOLAR VISUALS



Circular bio-composite panels



Adaptive panels with sensors



Non-standard shaped panels



Aluminium panels



IMAGINE A FUTURE...  
where buildings become power plants



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