



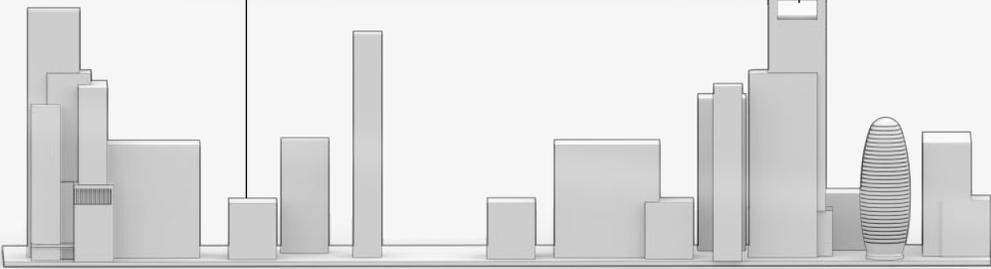
The most profitable facade solution  
to make buildings energy efficient & more comfortable

# EU Energy Directive: Nearly Zero-Energy Buildings Required

Buildings consume 40% of the global energy production



The EU enforces energy efficiency directives on its member states by 2023

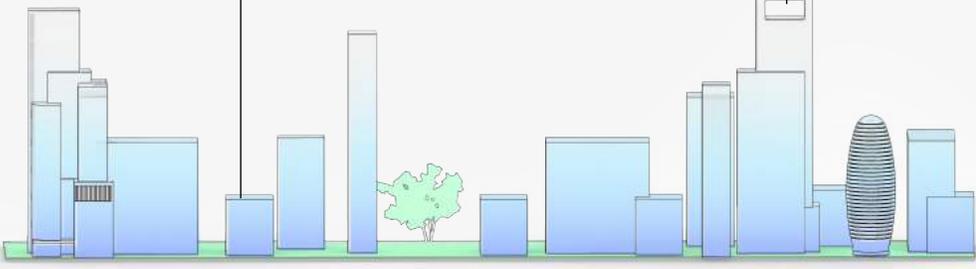


Current Situation

Buildings use the energy of the sun to produce enough energy to power our cities



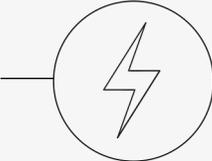
Generating profit by locally producing and saving energy with the building facades



Future Vision

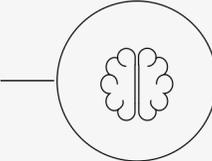
# SmartSkin makes today's buildings ready for tomorrow

1. Generate power with our patented solar technology from inside your windows



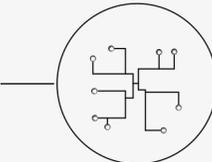
**Lower CAPEX**  
By leveraging the produced power with data your building needs less HVAC installations\*

2. Leverage the produced power with our integrated sensors to have your windows save energy for you

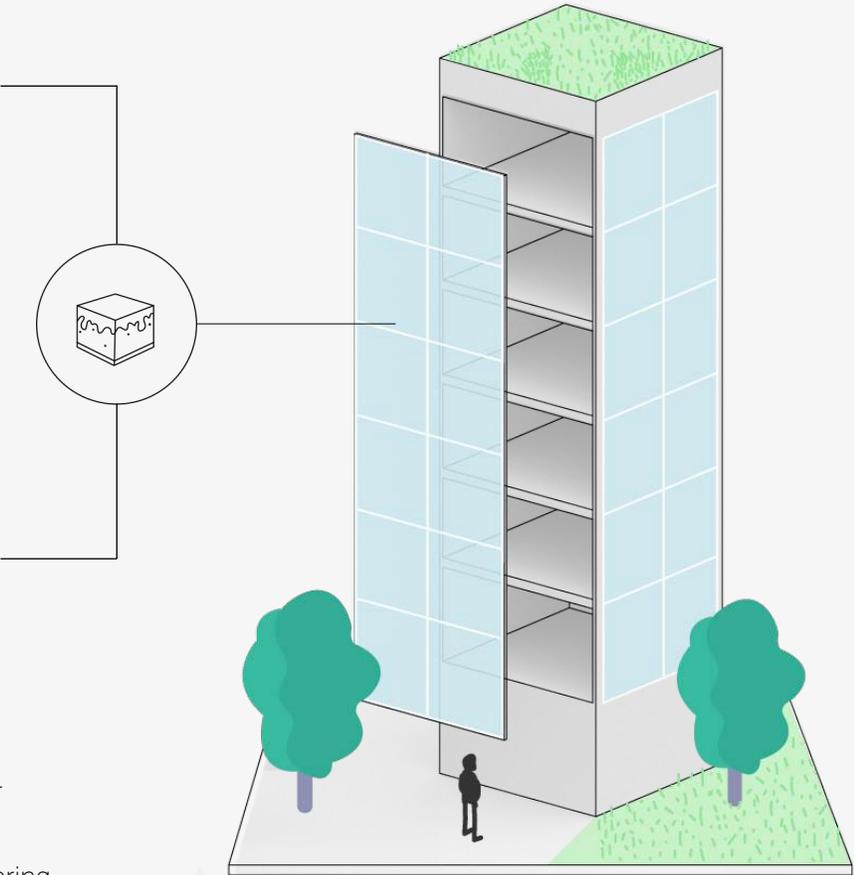


**Lower OPEX**  
The increased energy efficiency of your building results up to 20% lower energy consumption\*\*

3. Connect your facade, with our platform to your building applications and optimize your SmartSkin



**Increased Comfort**  
By optimizing SmartSkin for daylight and air quality users are 10% more healthy & productive

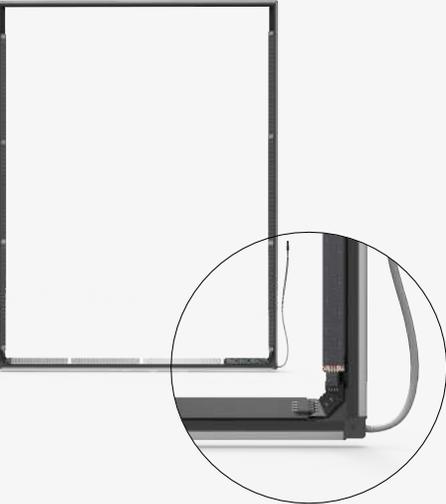


\*Arcadis is currently quantifying the reduction in size and costs we can make for cooling installations by our dynamic temperature control facade.

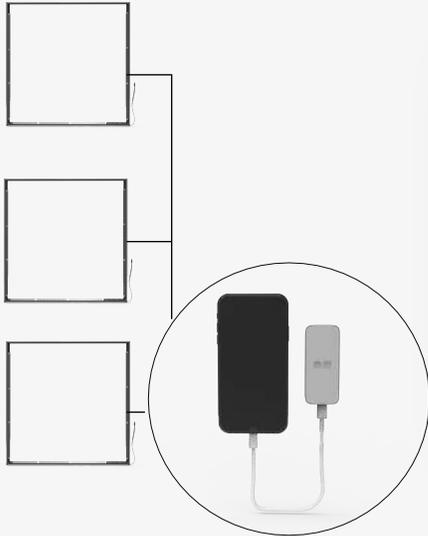
\*\*Tested and proven by DGMR that we can save 16% on energy consumption with our current product offering.

# SmartSkin the backbone of your smart façade

The 3 core building blocks of our SmartSkin proposition



**1. SmartWindows**  
Our windows generate power and data, the core product of the SmartSkin solution



**2. EESYgrid**  
An efficient energy system to connect all windows including our small powerhouse, EESYbox



**3. EESYapp**  
See the performance of your SmartSkin to optimize for your building

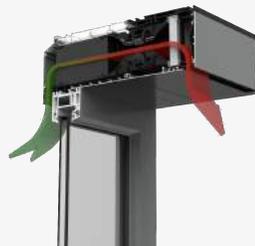
Connecting with other façade functionalities



**Automated sun blinds**  
Powered and controlled by SmartSkin to save energy and increase user happiness



**Climate control**  
SmartSkin can lower your utility bills with 15% by optimizing room temperature



**Ventilation**  
air quality inside can be 5 times worse than that of the outside, with even more CO2



**Lighting**  
Your lighting adapts to the time of day, your activities and also mood

# SmartSkin applied today as 'best in class'

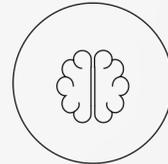
“SmartSkin contributes in an innovative and sustainable way to a higher comfort level and better energy label for the inhabitants of the Binck Kade apartments”

- *Louis van Loon,*  
*Sr. Project Manager at BPD*



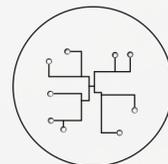
## 25% Cheaper

The best alternative to achieve the same impact on the energy consumption of Binck Kade were external blinds at €600k, our SmartSkin solution was €450k and offers additional smart controls and comfort



## 16% Energy Savings

The increased energy efficiency resulted in a reduction of 0.1 points on their EPC, and a 16% decrease on the BENG 1 ambition which is to consume a maximum of 24,5kWh/m<sup>2</sup>/year

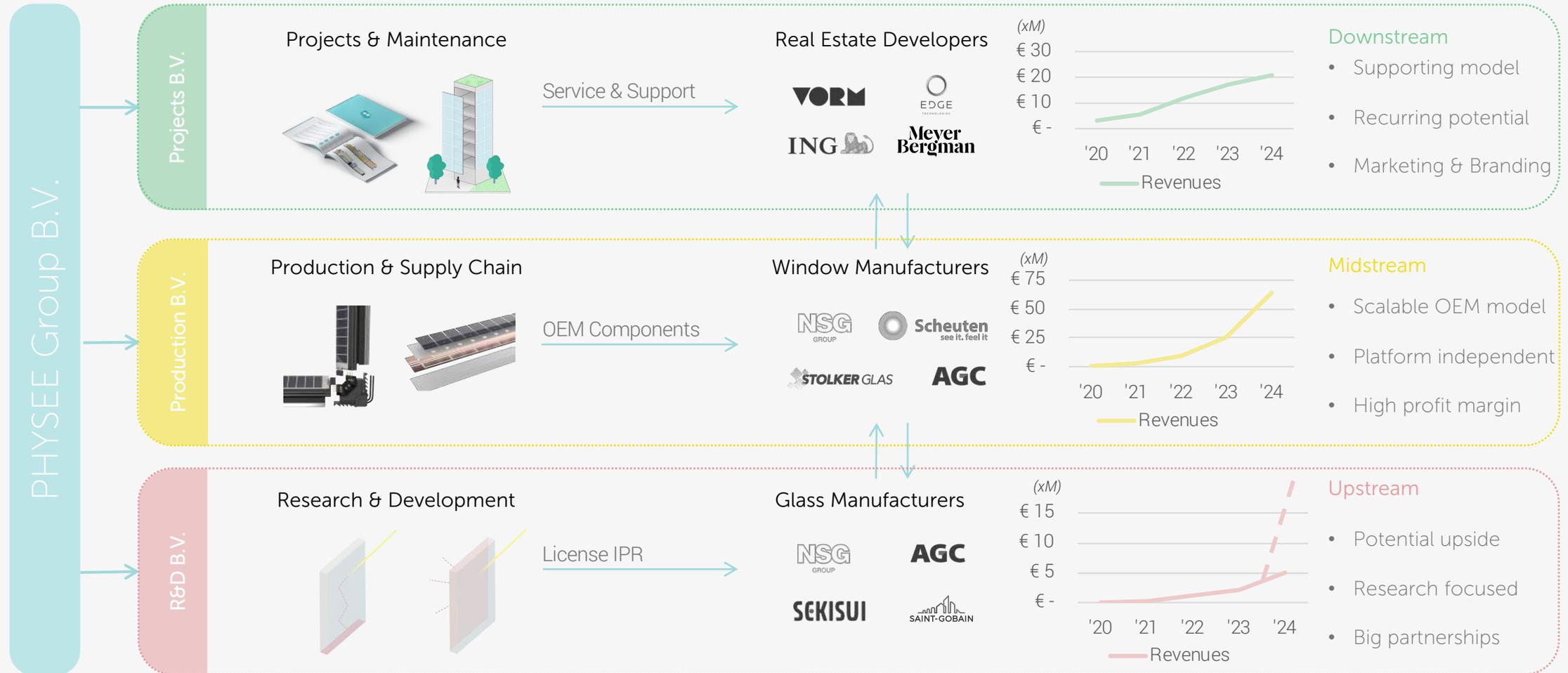


## 7% Increased Window Ratio

By optimizing for daylight & indoor climate without compromising on energy efficiency, we realized a window ratio of 80% in the façade hugely increasing the aesthetics and user experience



# PHYSEE Group Operating Model & Growth Strategy



# Summary

## Value Proposition



We offer real estate developers the engineering, the software and the hardware to install glass façades which reduce the energy consumption by 20%

= 29 projects sold to date

## Clients and Partners

Clients are developers and investors of metropolitan real estate. Partners are façade builders, glass manufacturers and technology suppliers for our SmartSkin solution

= 7 signed partnerships (incl UbiQD)



## Growth Model



This project based business model educates the market, creates brand awareness and is used to roll out to new markets. This base case is a self-sustaining business unit

Pipeline = EUR 10M

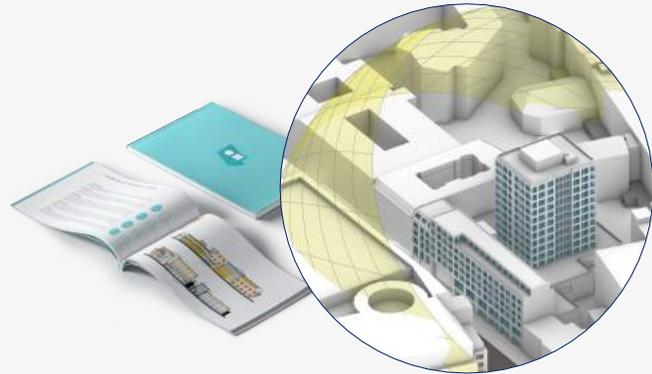
## Traction

Our average project size has grown from 100m<sup>2</sup> to 1500m<sup>2</sup>, we have sold our first international projects (UK and GER) and we've been break-even for two years on a row at project level

= 5 projects in execution simultaneously

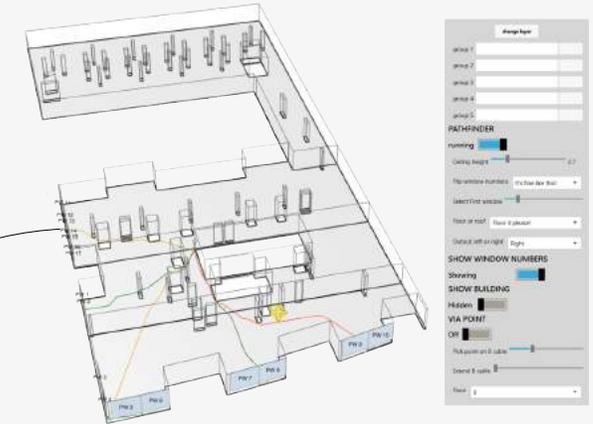


# Technology



**PHYSEEbility check**  
PHYSEE's 1 stop shop. Our 3D building analysis shows the advantages of SmartSkin, Solar panels and BIPV for each project

- Solar Study & Façade Analysis
- Climate Research & Comfort Study
- Detailed Report & Energy Potential



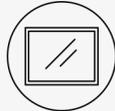
**Pre-engineering service**  
Innovative, in-house developed parametric engineering tools ensure efficient and complete project management

- Planning & Engineering Drawings
- Procurement & Project Management
- Maintenance & Service Contracts

# Traction previous projects executed successfully



**Fellenoord Rabobank Eindhoven**



10 PowerWindows installed



2016 The first pilot project of PHYSEE

“The PowerWindow Pilot is a prime example of how Rabobank stimulates sustainability. Once successful, this pilot shows an important contribution of PowerWindows in making commercial real estate energy efficient”

- Coen van Oostrom, CEO EDGE Technologies and OVG Real Estate



**Goeden Doelen Loterij Amsterdam**



30 PowerWindows in South facade



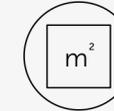
Highest BREEAM level achieved

“PHYSEE Technologies enable our employees with a high tech, sustainable and healthy workplace, in line with our company vision”

- Esther Wubben, Project Lead at Goede Doelen Loterij



**BOLD Amsterdam**



1500 m2 sold in residential tower



- 0,02 Impact on EPC calculation

“PHYSEE and VORM established an innovative collaboration, resulting in the installation of PowerWindows in the BOLD residential tower”

- Daan van der Vorm, founder VORM Holding

# Traction current projects in execution



Grafton place Dublin



1100 m2 in commercial building



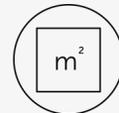
€100/m2 saved on overall costs

“We are excited to implement SmartSkin in Dublin, providing heightened comfort and best-in-class sustainability for our tenants”

- Marcus Meijer, CEO at MeyerBergman



Pharos Amsterdam



30 PowerWindows in South facade



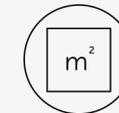
ROI of 3 years on SmartSkin

“SmartSkin is providing PHAROS with sustainable energy and a healthy, comfortable work environment”

- Gyula Öry, Development Director at Cairn Real Estate



Havencity Frankfurt



850 m2 sold in residential tower



23% Reduced energy consumption

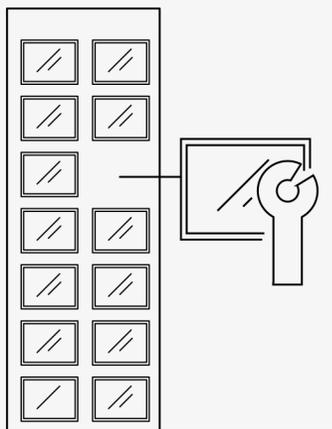
“We value our partnership with PHYSEE because we believe in this technology. It’s an important part of our strategy”

- Coen van Oostrom, CEO at EDGE Technologies

# Partners

“We see the future in smart facades integrated with sustainable energy supply, for smart and autonomous buildings”

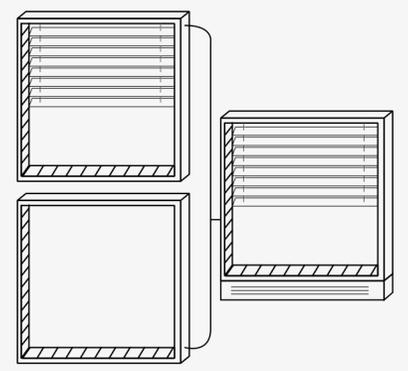
- Alkondor, façade contractor



Technology

“Dynamic facades are key for buildings with regards to comfort. Kawneer is excited to collaborate with PHYSEE to make SmartSkin a success”

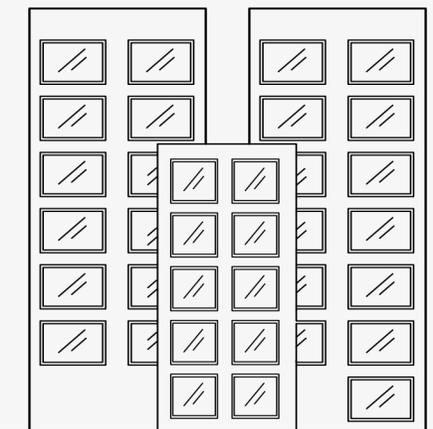
- Kawneer, architectural system provider



SmartSkin

“Using the PHYSEEBility Check as starting point, PHYSEE helps to make the buildings of our 10.000 clients more sustainable”

- ING real estate finance, Bank.



Commercial

# Summary

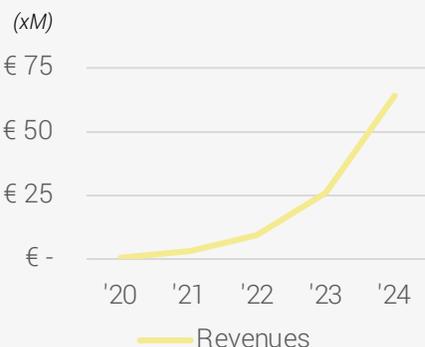


## Value proposition

All the required hardware components inside the windows of our SmartSkin façade are fully integrable in existing window production lines. Window manufacturers can simply buy our OEM Components and produce PowerWindows and SmartWindows themselves

## Main stakeholders

We developed strong partnerships with both global and local glass and window manufactures. In this way we can quickly scale our technologies not only with our own projects, but also the project of our partners, who then start selling for us



## Growth strategy

The unit economics of our OEM Components model will achieve a 70% profit margin at scale. As we would be able to make our FlatPacks for less than €10/m<sup>2</sup> of SmartSkin, and could sell this for approximately €35/m<sup>2</sup>. We currently sell our technologies for €100/m<sup>2</sup> of hardware components

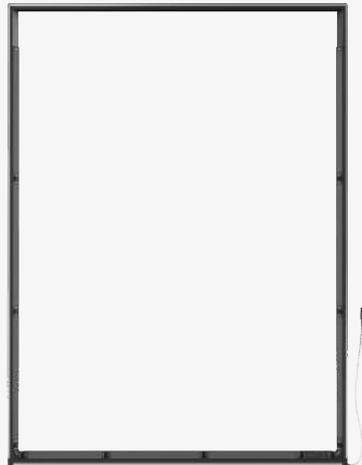
## Status quo

As our OEM Components are platform independent, this business unit can become highly scalable really fast. As over time our partners won't only buy our components for our own won projects, but also for projects of their own and in that way becoming a very profitable sales channel for us.



# Technology

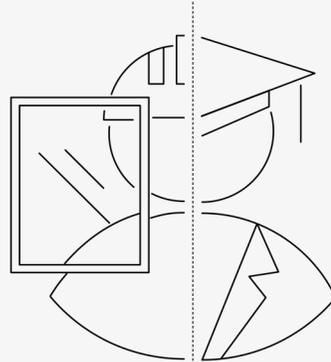
PHYSEE FlatPacks



## Flatpack

Any IGU manufacturer can build a SmartWindow in 2 min. A flatpack has 3 powerbars, 2 powercorners and 2 regular corners and is shipped in a carton box

Midstream  
—  
Manufacturing Industry



IGU Manufacturers    Other Industries

OEM Components



## PowerModule

Highly efficient, modular designed module that fits wide range of lengths



## SensorModule

Senses LUX, humidity, temperature, air quality and pressure. Powerline communication



## Optimizer Module

Realtime optimization of energy yield, developed with TUE (Patented technology)

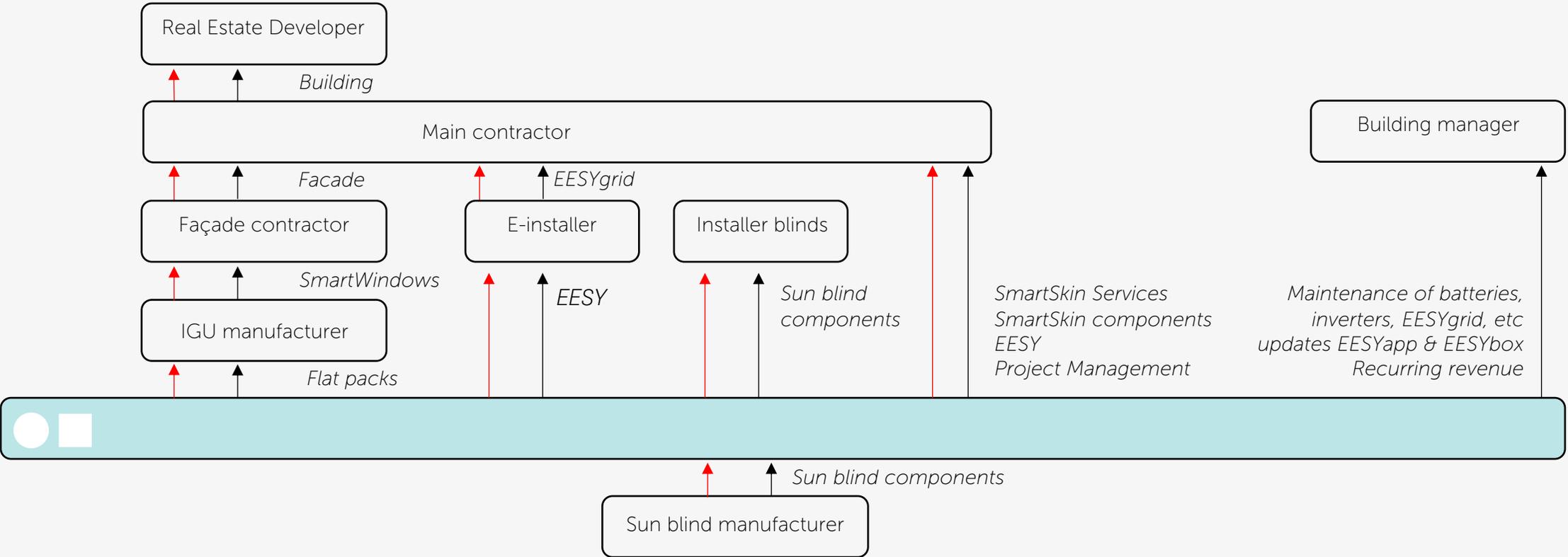


## PowerCorner

Injection molded corner piece with 2 wire exit applicable for all 'value add' IGU technologies EN1279-3 certified

# Supply Chain – Split Delivery

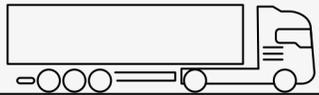
Streams  
 ———> Components & Services  
 ———> Guarantee



# Partners

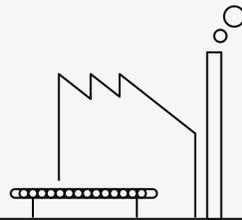
An incredibly broad portfolio brings a unique vantage over the entire technology landscape

**ANW** TECHNOFORM



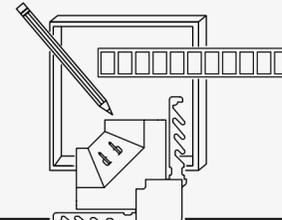
Suppliers

Accelerating concepts from prototype to volume production with extreme flexibility



Manufacturing

Extensive time and cost reduction on R&D projects, pre-production and small-scale test setups, by full access to laboratories



Developing

Internationally accredited EN ISO/IEC 17025 institutes ensure integral industry compliance



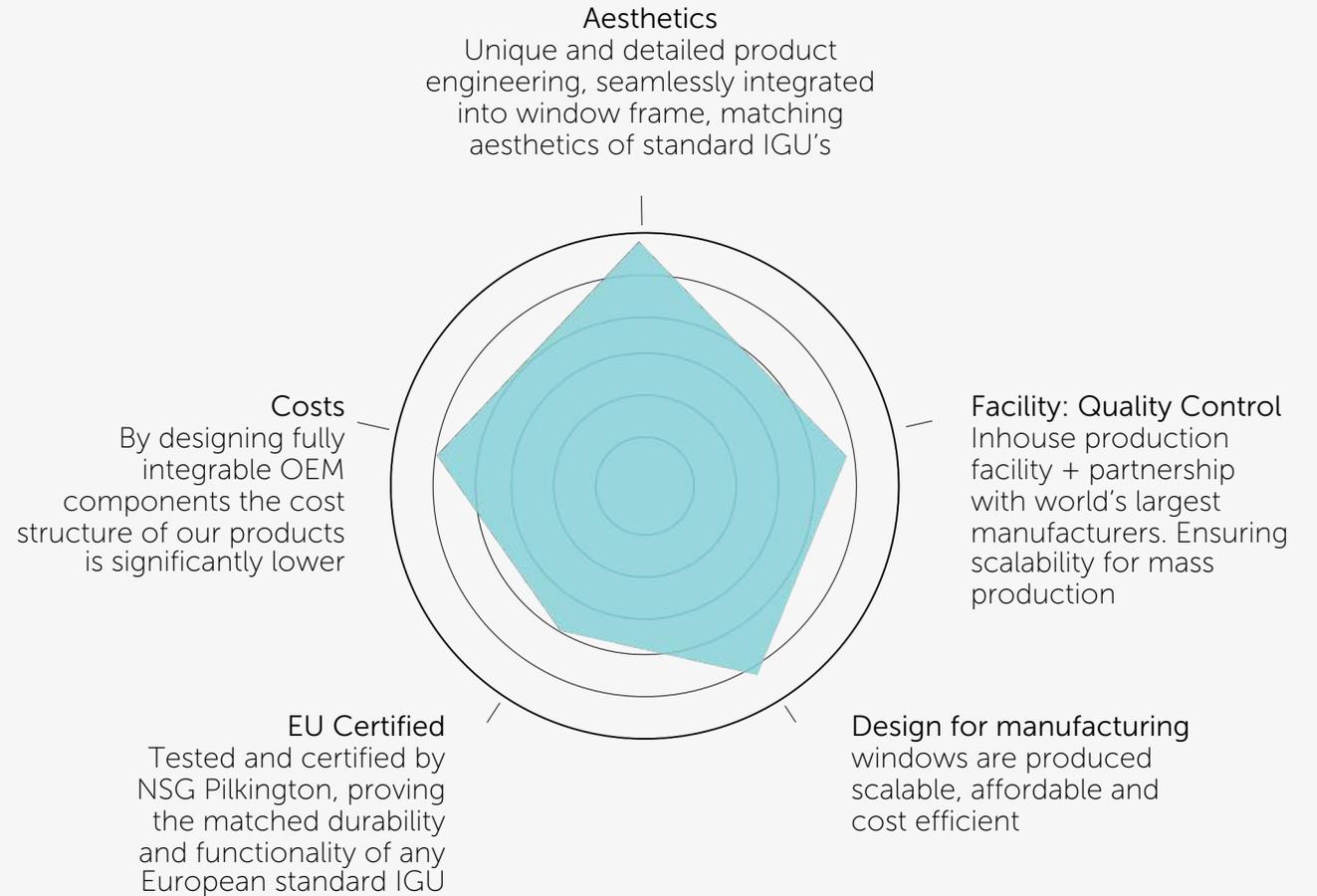
Testing

# Outlook

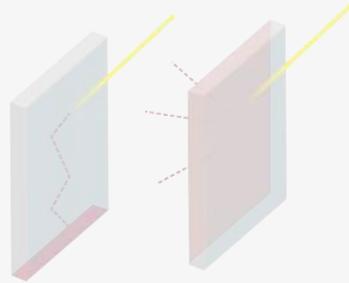


**Production B.V.**  
**COGS decrease 1.5M**  
**Component standardization 1M**

Growth	Goal	2020	2021
Facilities	Expansion capacity	€250k	€250k
Machinery	Roll2Roll Solar	€400k	€400k
Supply Chain	Up- & downstream	€100k	€100k
Operations	Lean six sigma method	€150k	€150k
Certification	CE and Quality Control	€100k	€100k



# Summary – action title required



### Value proposition

Our research is based on our patents of light conversion coatings of inorganic luminescent metal particles. Resulting in an inert, stable and fully transparent Low-E coating, that can redirect the energy of the sun to the sides of the window where our OEM Components can convert this energy into additional electricity

### Main stakeholders

The recipe of these coatings is currently further developed at larger scale with industrial partners in the glass and coating industry. This technology will eventually be licensed to these industrial partners that apply these types of coatings on glass for various industries such as architectural glass, green houses, and automotive



### Growth strategy

With support of our shareholder Delft University of Technology we're continuously strengthening our IP position and setting up a business unit for the successful roll-out of our License IPR model. The potential upside of this business is highly lucrative, so we are very excited for the future of this technology

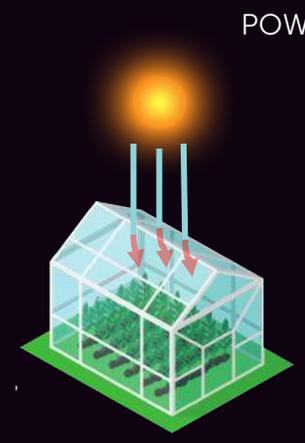
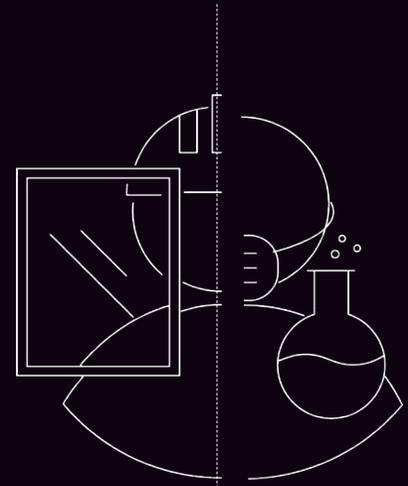
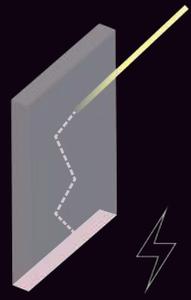
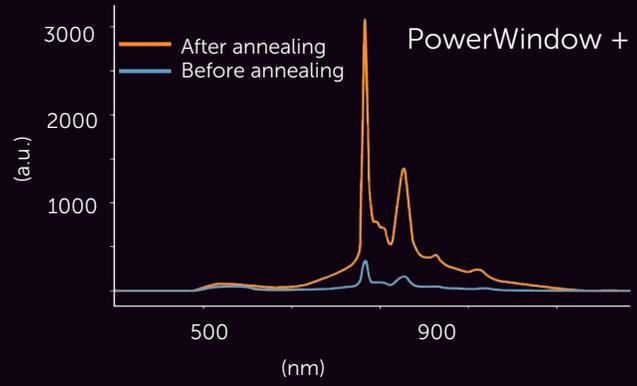
### Status quo

As we recently filed our 3 patent on these type of coatings, and as we are currently scaling up our research activities and prototypes with our partners, we predict a potential upside on this business unit within the coming years, that will boost the power efficiency of our SmartSkin with 300%

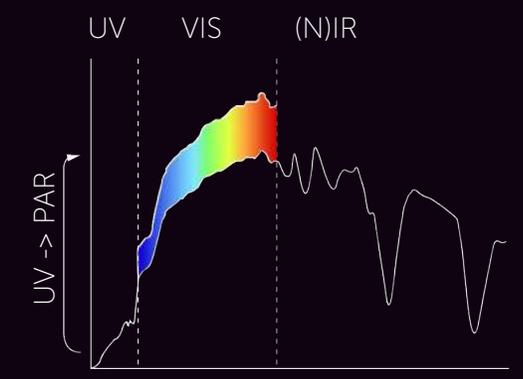


# Technology

Downstream  
-  
Production Industry

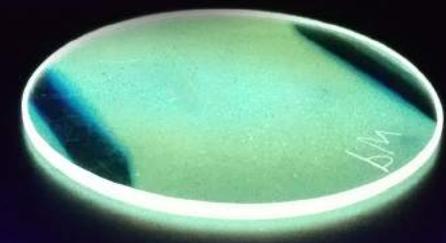
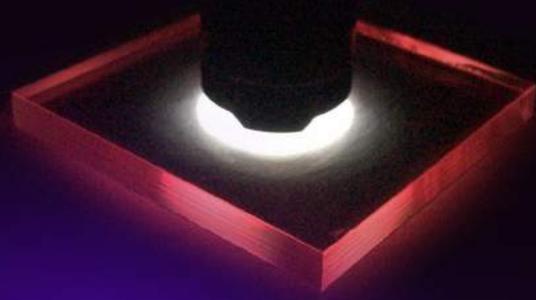


POWERthePLANT



Glass Producers

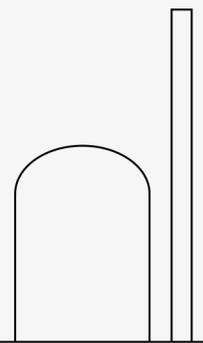
Greenhouse Coaters



# Partners

DE VRIES & METMAN  
OCTROOIEGMACHTIGDEN / EUROPEAN PATENT ATTORNEYS

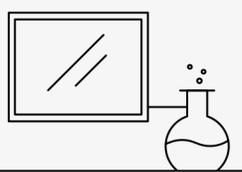
TU Delft



Fundamental research

UbIQD  
UBIQUITOUS QUANTUM DOTS

Fraunhofer

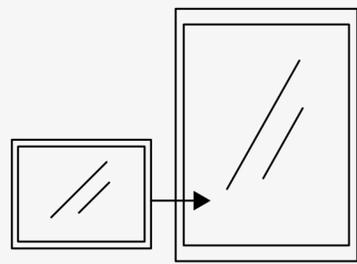


Prototyping & External research

WAGENINGEN  
UNIVERSITY & RESEARCH

LUSOCO 3M  
HARVEST DAYLIGHT, SHINE AT NIGHT

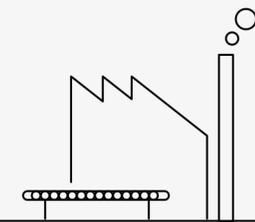
nanoComposix



Scaling up

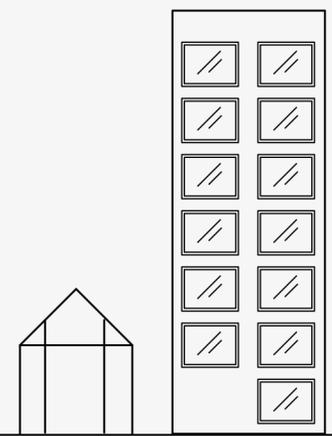
SEKISUI

mardenkro



Development & Production

Bom Group  
Greenhouses · Screening · Climate · Turnkey



Application

# PHYSEE became a strong & scalable business in 5 years



Our diverse team of 35 PHYSEOnairs with 8 different nationalities & a strong company culture is based in Delft (NL)



PHYSEE has access to the most advanced research labs & staff from the Delft University of Technology



Inside our headquarters at the heart of the Delft University Campus we have our workshop to test & validate prototypes



We produce components at our FlatPack factory that seamlessly integrate in the existing value chain



In our LivingLab facility our products & the products of our partners (NSG, AGC, St. Gobain, etc.) are tested in the field



With over 7000m<sup>2</sup> SmartSkin sold and >15000m<sup>2</sup> in our pipeline in NL, GER, & UK we validated our scalable value proposition

“We are looking forward to the day that buildings  
are human centered PowerPlants”

- Ferdinand Grapperhaus, CEO of PHYSEE

Thank you

[www.physee.eu](http://www.physee.eu)