Climate-KIC

Urban Transitions

Building Technologies Accelerator flagship programme

Climate-KIC is supported by the EIT, a body of the European Union

Sybren Steensma

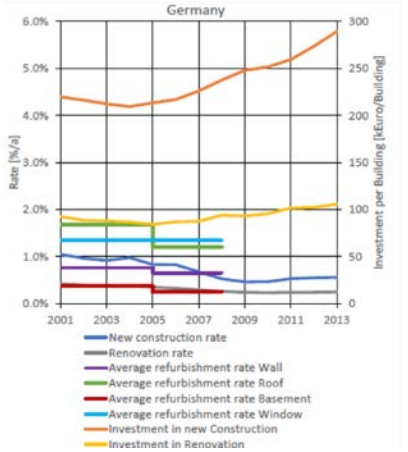
The Need for Deep Retrofit

- To reach the Paris goals, regular retrofit (business as usual) is not good enough
- Instead, cities and real estate owners need Deep Retrofit.
- Deep Retrofit means that you bring buildings to the “(near) zero energy level” with a scalable approach.
- Current market cannot deliver scalable Deep Retrofit at a reasonable price

For affordable, scalable Deep Retrofit projects, we need:

- **Supply side** to deliver integrated solutions instead of fragmented solutions. Specifically, they need to co-create with manufacturers
- **Demand side** needs to challenge the market to deliver integrated solutions instead of procuring individual technologies.

This is the market that BTA aims to bridge.



(Camarasa et al, 2015)
http://wsforum.org/conference/ifou/paper/2744

Non-technical barriers for Deep Retrofit:

- **Legal:** no clear legal/regulatory framework (European / national / local)
- **Industry structure:** building sector is fragmented and organised around one-off projects;
- **Cultural attitude**: risk averse attitude hinders fast entry and integration of innovations
- **Procurement**: procedures are rigid and too detailed and do not stimulate the supply side to bring in “best-for-purpose” solutions;
- **Contracts:** many forms are based on risk hedging, preventing cooperation;
- **District level**: deep renovation projects of houses neglect the level of neighbourhoods/districts thus preventing implementation of collective solutions
- **Financial**: current modes for financial arrangements are insufficiently based on longer term benefits for various stakeholders (split incentives dilemma)

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Barriers for Deep Retrofit: split incentives dilemma

- Investments into Deep Retrofit need to be earned back from energy bill savings
- Deep Retrofit is expensive, thus long payback periods (20, 30 years, depending on technical measures taken)
- In rental markets, the invester is not always the one who benefits from the investment
- Especially in social housing, rental rates are highly regulated in many European countries, making it difficult to earn back investment costs.

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Zero Energy Renovation:
A Case Study from the Netherlands

- National programme for **Zero Energy Renovation** (Energiesprong) 2013-2016, involving many building companies and housing corporations;
- Programs for all types of ownership;
- Social Housing: housing corporations would need to invest, but occupants would benefit from a lower energy bill (split incentives);
- Legally, housing corporations couldn't increase rent;
- Hence, introduction of the "Energieprestatievergoeding (EPV)" – Energy Performance Compensation;
- Now, housing corporations can legally charge for energy delivery, if the project was certified "Zero on the Meter";
- For the occupant, the financial nett effect is zero: energy bill drops, but they now pay the EPV instead (EUR 1,40/m2/month)
- However, quality of living is improved

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Demonstrator Project (built in 1955): Owner Waterweg Wonen, Vlaardingen, the Netherlands

Before renovation

2ndskin

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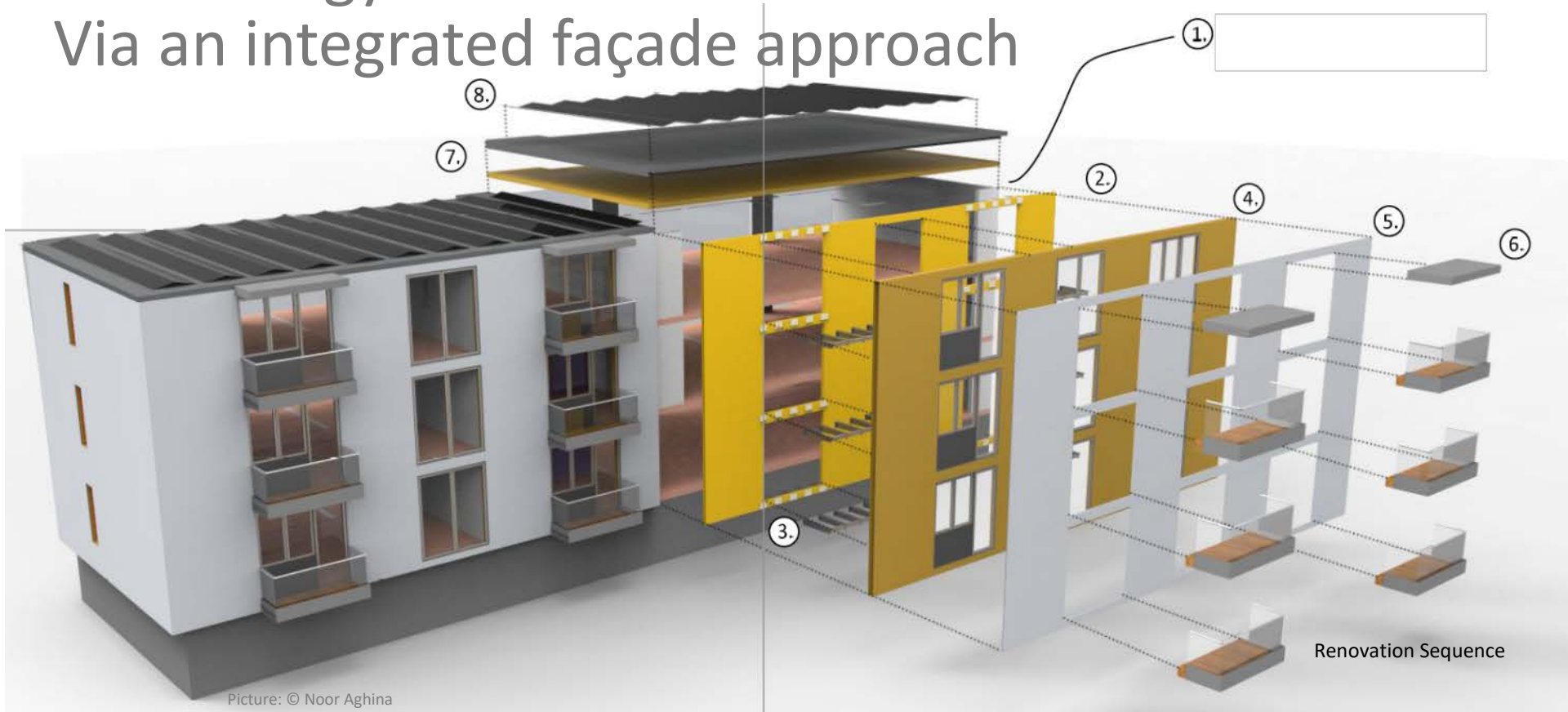
Zero Energy Renovation
Via an integrated façade approach



Renovation Sequence

Picture: © Noor Aghina

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Demonstrator Project (built in 1955):
Owner Waterweg Wonen, Vlaardingen, the Netherlands
Artist's impression after renovation

1. Energy efficient façade (R_c = 6 m^2K/W).
2. Airtight doors and high performing triple glazing (U – value = 0.9 W/m^2K).
3. Integrated PV in rooftop skin (14 panels/dwelling at 300 Wp).
4. New larger balconies.
5. Integrated heating, cooling, and ventilation units on balcony.

Pictures: © KAW Architects

Sacha Silvester / s.silvester@tudelft.nl

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Sybren Steensma

The Urban Challenge

Cities have climate challenges that are too complex for currently available solutions

On the demand side, cities lack capacity and skills to structure and integrate available solutions into meaningful systems projects

On the supply side, available solutions only solve parts of the puzzle and are often too costly

Key elements for Deep Retrofit

1. High performing **envelope** solutions
2. Smart **interfacing** of technological (HVAC) systems
3. Integrated **supply chains**, benefitting from the scale, prefabrication and offsite manufacturing
4. Acceptance of users by taking a user-centric approach, balancing occupant **health and wellbeing** with optimal energy efficiency
5. A **business model** that facilitates the necessary investments that deep retrofit solution providers need to make to overcome market barriers

Technology
Organisational governance
Skills
Market Structure
Policy
Finance
Behaviour

Intermediary drivers impacting on outcome (Theory of Change)

BTA: Accelerating Deep Retrofit

- **Providing data:** with the Building Market Briefs, we provide the missing business data for investors and project developers;
- **Bringing stakeholders together:** In events such as the Energy Efficiency in Building (EEB) Labs, we mobilise the market across the entire value chain (w/WBCSD);
- **Demonstrating solutions:** We demonstrate, promote and test deep retrofit solutions;
- **Stimulating demand for deep retrofit:** setting up brokerage events and open innovation projects for cities and real estate owners.

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Building Market Briefs (BMBs) & Energy Efficiency in Buildings (EEB) Lab

Building Market Briefs (BMB)

BMBs provide in-depth knowledge into:

- Key national framing conditions and major trends (e.g. carbon targets, legal frameworks and investment rates);
- Market size and building stock morphology;
- Industry perceived market barriers, based on surveys;
- Business opportunities;

Key findings and targeted recommendations are summarised in a quantitative Indicator Factsheet and a qualitative Executive Market Summary.

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The Building Market Briefs provide essential input for the Energy Efficiency Labs (co-organised with the WBCSD)

Energy Efficiency in Buildings (EEB) Lab

- Two to three day workshop gathering local building market stakeholders;
- Opening up the dialogue between key players from the supply & demand side of Deep Retrofit;
- Leading to concrete action plans, including new business models;
- Based on Building Market Briefs
- Co-organised with the World Business Council for Sustainable Development (WBCSD).

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Demonstrator Projects & Living Labs Network

2ndskin

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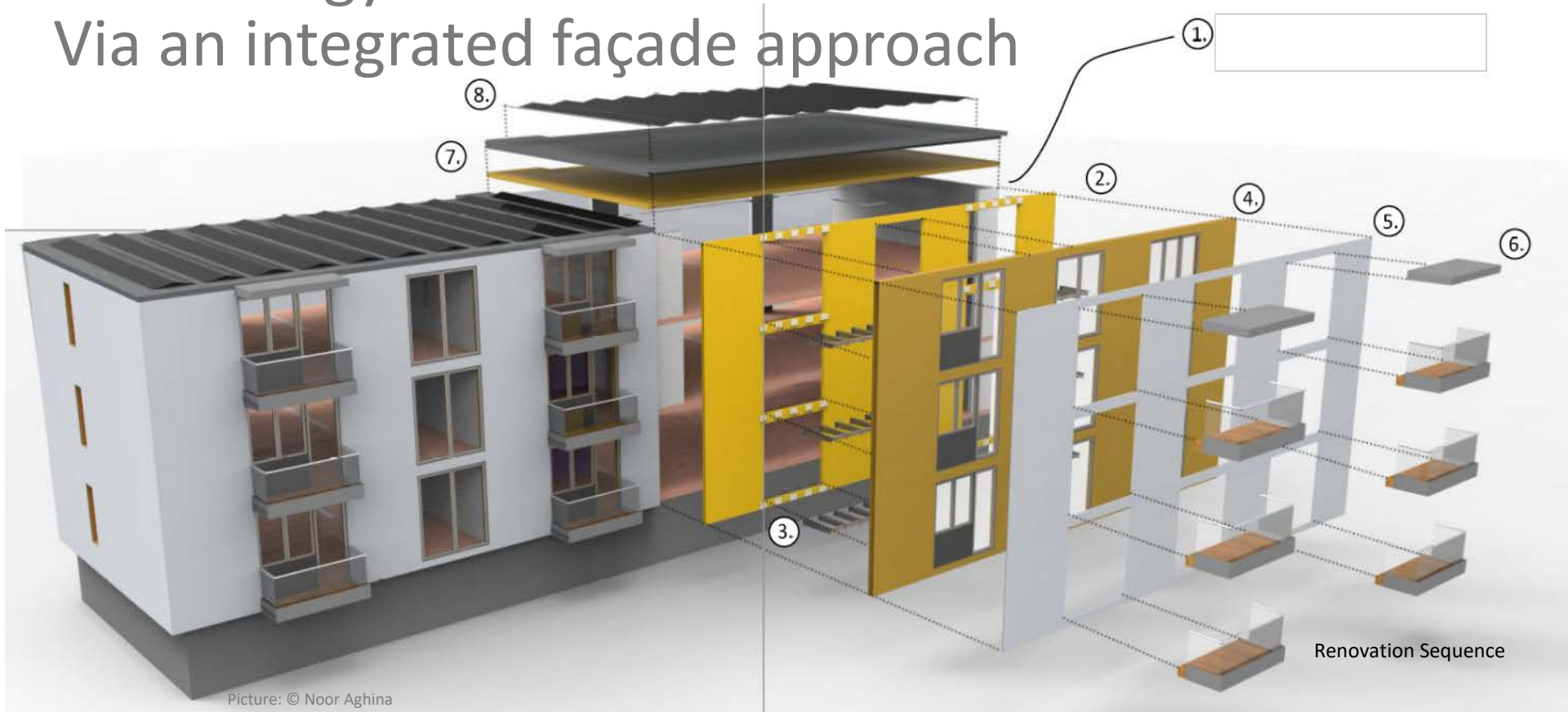
Zero Energy Renovation
Via an integrated façade approach



Renovation Sequence

Picture: © Noor Aghina

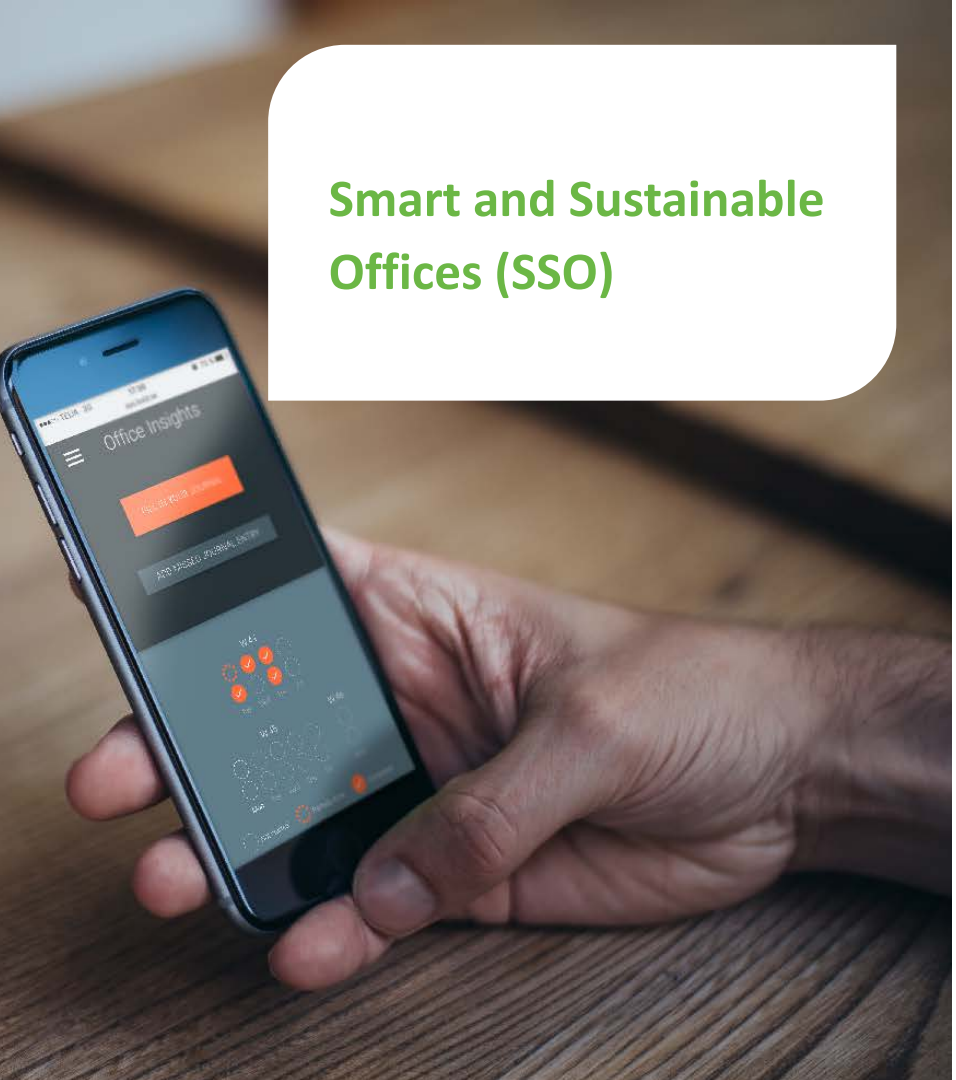
Deep Retrofit – Innovative business models

Business Model Repository

- Case studies of innovative business models

Example: Façade Leasing

- Product-service business model
- New façade technologies



Smart and Sustainable Offices (SSO)

officevitae

Office Vitae

- Health and wellbeing
- Improved job satisfaction
- Real-time insights and diagnosis

Living Labs

Green Village
Delft, NL

Concept House Village
Rotterdam Heijplaat, NL

CIES Living Lab
Castellón, Spain

HSB Living Lab
Gothenburg, Sweden

ETH House of Natural Resources
ETH Zurich

Next Generation Living Labs

- Capturing lessons-learned across all living labs;
- Development of Next Generation Living Lab methodology;
- Making the methodology available to the market;
- Integrating, testing, and showcasing solutions to both supply and demand side

Cities as testbeds for global transformation

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Matchmaking and brokerage

Stimulating demand for deep retrofit

DLIB Case Study Rotterdam

Goal: Deep Retrofit of 330 apartments.

Three-step approach:

1) Engaging with the demand side, articulating their needs, formulating the challenge.
2) Bringing the challenge to the supply side, and facilitating consortia to offer an integrated approach.
3) Home owners select and implement the most suitable approach.

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Innovation brokerage – how can we help you deliver?

What is it? Climate-KIC Innovation Brokerage is a process for identifying and assessing innovations which meet specific business needs whilst also delivering climate change mitigation impacts

Who uses it and why? Relevant business needs often relate to reducing resource consumption or improving operational efficiency in areas like physical infrastructure, manufacture processes or product design, leading to cost saving or competitive advantage. Other drivers include specific corporate sustainability goals or identifying a pipeline of innovative companies for investment or acquisition.

What sort of innovations does it identify? Depending on the project, innovations may take the form of technologies, SMEs, products, services, business models or expertise

What is the process? The process involves three key steps;

1. **Articulating the need** including success criteria to enable a tailoring approach
2. **Identification and assessment** of innovations which meet the criteria
3. **Reporting and recommendation** to communicate insights and key findings

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Innovation brokerage – Climate-KIC

Step 1. Articulate the need

- Setup a workshop to understand needs
- Rule out what is known, and highlight promising avenues to pursue
- Tailor robust criteria to ensure appropriate search strategy

Generates understanding of needs and context

Step 2. Identify and Assess Innovations

- Tailored searches of specialist databases
- Promote challenge to crowd source solutions with outreach to appropriate networks
- Leverage experts for search and assessment

Identifies and filters innovations

Step 3. Report and Recommend

- Report documenting insights and findings
- Closed or open pitch events connecting solution providers to customers

Consolidates insights and recommends best options

Climate-KIC

BTA Open Innovation

Solutions network

Annex: the BTA solutions network

- BTA scoutes and promotes promising Deep Retrofit solutions providers
- Special focus on **startups –** but rather the mentality rather than formal constitution
- We actively approach cities and real estate owners, introducing this network
- We are open for business – get in touch with us if you want to become a part of the network

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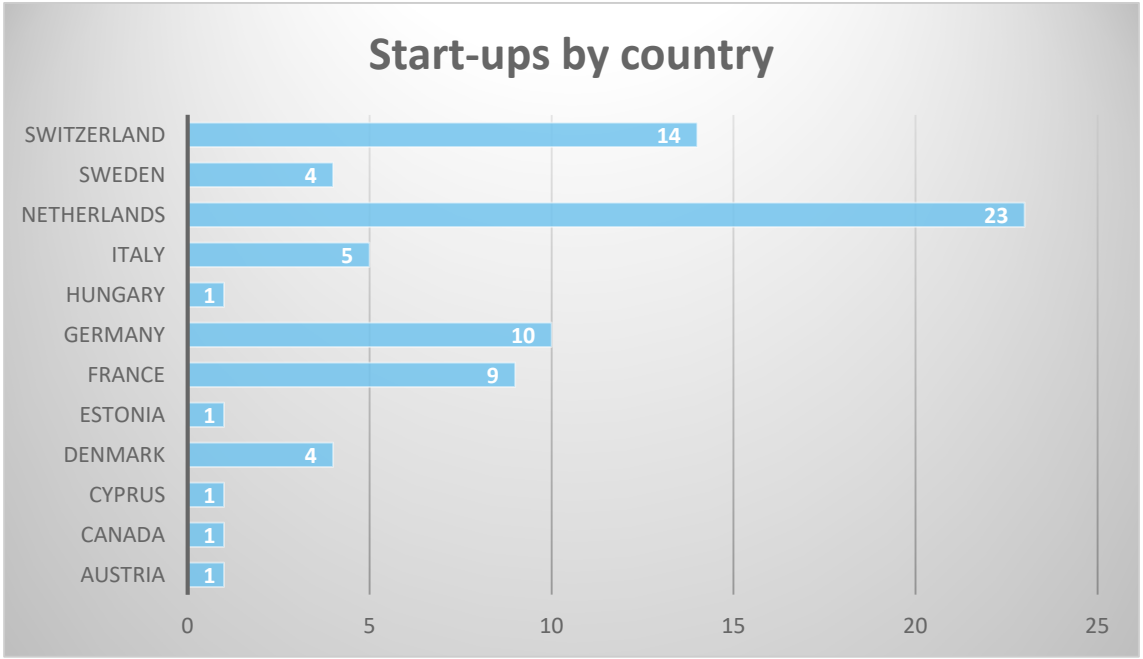

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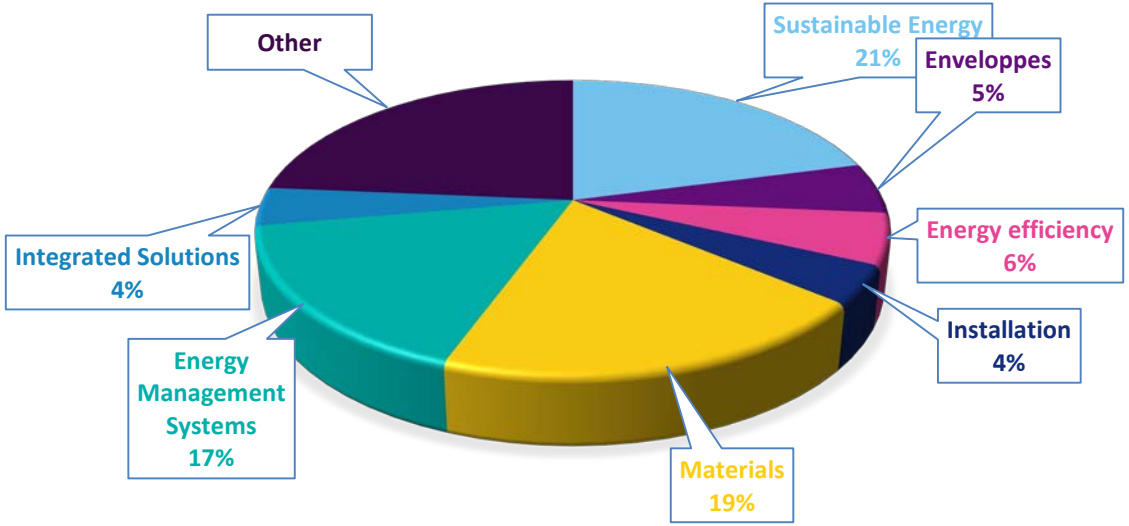
CATEGORIES



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officevitae

Our mission is creating healthy offices, restoring vitality

Our ambition is to work internationally and have offices in London, New York and Delhi

OfficeVitae is a digital platform that can be installed to any office to measure Indoor Air Quality to international standards measuring CO2, VOC's and Energy and it provides the user with real time improvement.

- From 'simple' comfort measurements to complete vitality packages to benchmarks
- High quality partner network
- Minimal energy savings: 10 – 15%
- Average return on investments: 6 – 9 months
- Founded in 2016, The Netherlands

Category: Sustainable Energy

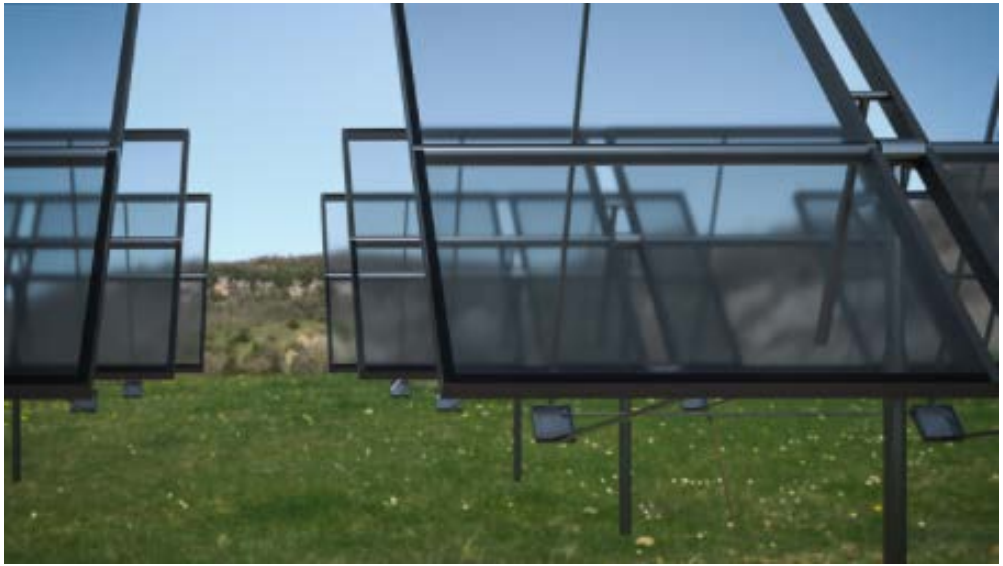
eit Climate-KIC

HELIAC

Our mission is revolutionizing the field of concentrated solar power

Heliac produces and sells polymer foil based solar concentrators for utility-scale installations. Our focus is Concentrated Solar Power (CSP) for medium-to-large-scale automated installations (for solar thermal and combined heat and power plants).

- As efficient as legacy CSP solutions at a fraction of their cost.
- Using micro-and nanostructured foils, ensuring low cost and high throughput
- Founded in 2014, Denmark



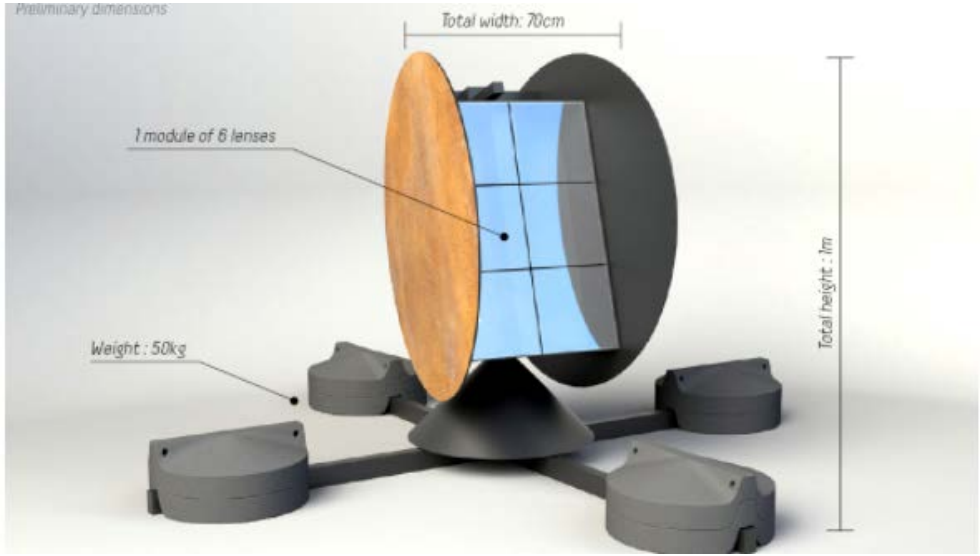
ECHY

Our mission is to bring sunlight indoors

Our ambition is to to revolutionise the world of lighting

Echy technology helps sunlight to be diffused within buildings, using solar panels and fibre optics cables.

- The quality of light is similar to that of the sun: clean, natural and without transferring heat and ultraviolet rays
- A boost for productivity whilst reducing energy costs
- Winner of prestigious prizes & awards
- Customers: SETEC, Carrefour, La Poste, ENPC etc
- Founded in 2012, France



SUNMAPPER

Our mission is to increase transparency in the solar cell market

Sunmapper is an interactive platform for prospective residential solar purchasers. Sunmapper gives access to specialised knowledge and measures prior to getting an estimate of potential solar production.

- Founded in 2015, Denmark

PHYSEE

The first sustainable innovation of Physee is the PowerWindow; patented and transparent double-paned windows that convert light into electricity.

- SmartWindows control inside systems based on information about the outside conditions around your building
- It provides 50W per square meter, which can compensate up to 75% of the energy consumption of buildings
- Founded 2014, The Netherlands

Category: Envelopes

Climate-KIC

Our mission is re-setting the zero-energy renovation market

Our ambition is to become an international leader renovations and new buildings by shifting from a ‘general contractor-projectbased-approach’ towards a ‘product-oriented approach’ with an integrated supply chain.

2nd Skin is a lightweight, prefabricated ‘envelope’ system that is attached to the exterior of a building, acting as its second skin.

- Keeps the refurbishment costs to an acceptable level because of the industrial, scalable approach
- Gives little hassle for the occupants;
- Saves roughly 68 kg CO2 e/m2/year compared to regular renovations
- Alternative business model
- Founded in 2015, The Netherlands

Category: Energy Efficiency

eit Climate-KIC

ChillServices

Our mission is a warranty for cool spaces to supermarkets against the lowest possible costs.

Our ambition is upscaling in turnover, profits, countries and team members

ChillServices makes SensorHolds that reduce the energy consumption of supermarkets by better controlling of the temperature.

- CO_2 savings: 4-5 t CO_2 eq. per market per year
- Return of Investment within 2 years
- 30-40% efficiency improvement is possible by providing add-on services and products
- First customer: REWE Group (8,000 supermarkets)
- Founded in 2016, Sweden

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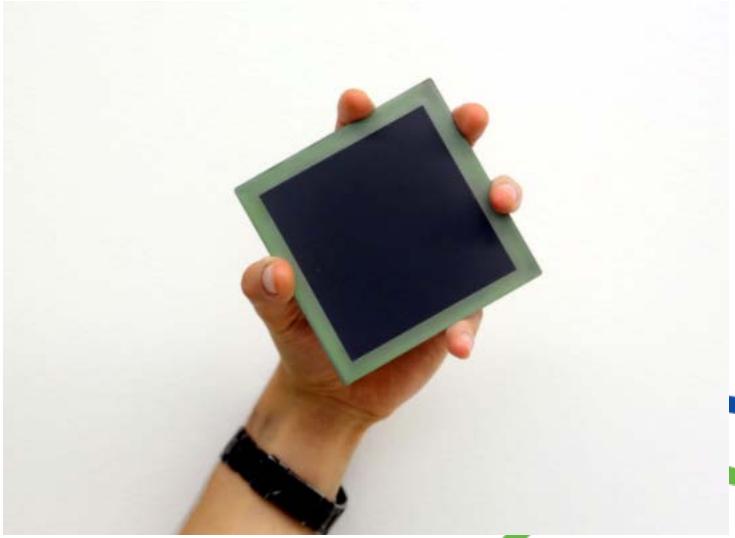
Category: Installation

Climate-KIC

Our mission is a no-combustian revolution

Egg1 is an advanced power generator that produces power, heating and cooling and makes your house independent of the power grid.

- Nominal electric power can vary from 5 kW for residential applications and up to 100 kW for SMEs
- In a combination of micro CHPs (Cell) and other devices, more than 50% greenhouse gas emissions, 95% of NOx and 100% of smog can be saved
- Up to 60% energy savings for family households
- Technology can also be applied in net-zero energy buildings
- Founded in 2016, Italy



Enjay Filtration has developed the first energy recovery unit that works for commercial kitchen ventilation.

- A net saving of 300,000 kWh of heating and 200,000 kWh of cooling, by utilizing the energy in the exhaust air from a midsized restaurant
- Only in Sweden there are 25,000 restaurants. With only 1 per cent of Swedish restaurants equipped with Enjay's energy unit, the total savings in fossil CO2 would be up to 12,5 million tonnes.
- Founded in 2015, Sweden

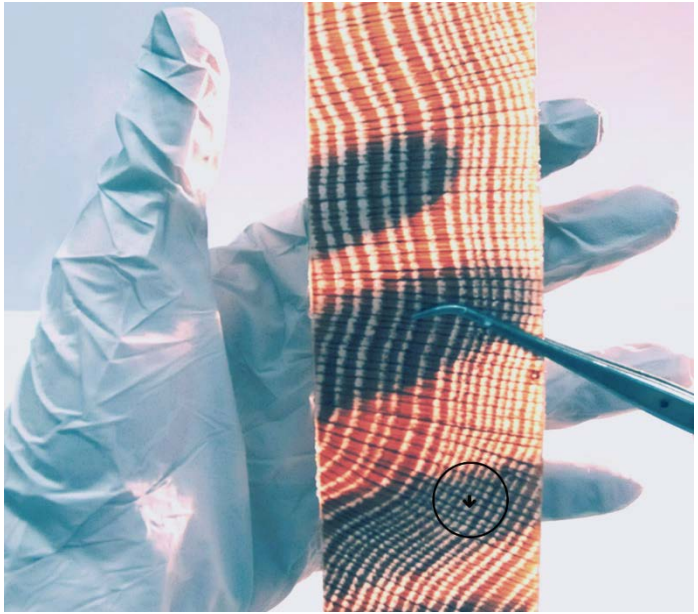
Category: Materials

By anticipating a zero net carbon society, Woodoo rebuilds wood at the molecular level to make it the most performative material of the 21st century.

- Three times more performative mechanically than native wood
- A carbon footprint twice lower than concrete and 130 times lower than steel
- Stiffer, cost-efficient, eco-designed, weatherproof and fire-resistant
- Suitable for the design and construction industries
- Founded in 2016, France

Our mission is tackling tomorrow’s zero net carbon cities.

Our ambition is to offer a second life to low-grade wood by transforming it through green processes into a highly performative material, opening-up entirely new perspectives.



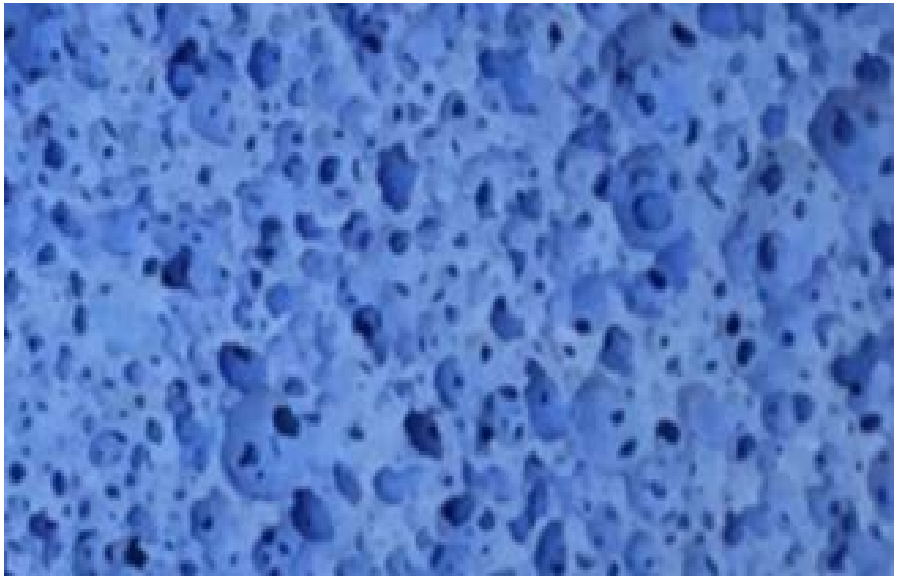
Our mission is to provide an insulating material that is able to protect buildings in a sustainable way.

Enerpaper is a natural product – composed out of stabilized cellulose - that isolates buildings.

- Energy savings: 35%
- Very light material
- Has a reduced intake of chemical additives (lowest in the market)
- Founded 2016, Italy

IPSIIS has developed a range of fireproof and insulation solutions. The first in the market that offers both fireproof and high temperature resistant solutions.

- The products are 100% natural or made out of recycled materials
- In the Top 100 Techno Start-Ups of 2016
- Founded in 2014, France



CemGreen

Our mission is to help reduce the energy requirements for the production of cement, while at the same time lowering the overall cost.

CemGreen develops alternative cement products.

- CemGreen uses certain raw materials based on their significantly lower energy consumption during production. These raw materials are globally available
- Production costs are up to 40 % lower than conventional cement products together with a reduction of CO_2 emissions by 35%
- Founded in 2016, Denmark

Our mission is to add value to every operations concerned with protective coating of metal. By applying quartz coating we want to improve industrial processes.

Our ambition is to be the global provider of the new NANOmel quartz coating technology.

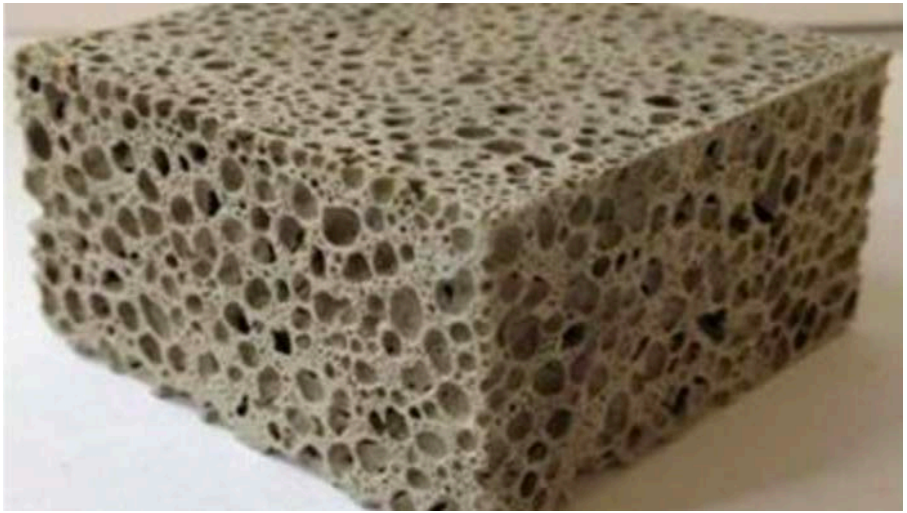
SiOx has developed a technology that has made glass-on-metal flexible coating possible, effectively protecting metal from corrosion and fouling.

- SiOx's NANOmel silica coating reduces fouling by more than 50%
- Without reducing the thermal efficiency of the heat exchanger
- The coating provides surface optimization like better polishing, hardness and wearability
- Founded 2013, Denmark

STONE-BRICK

The Stone-Brick project recycles the waste produced during the cutting of stone. This waste is commercialized into high performance blocks and constructive elements.

- With a low impact energy process, the sludges of stone muds are transformed in an active constituent raw material to produce dense and light-weight elements which substitutes cement
- A particular reference to the prefabrication sector
- Founded in 2016, Italy



Category: Integrated Solutions

Climate-KIC

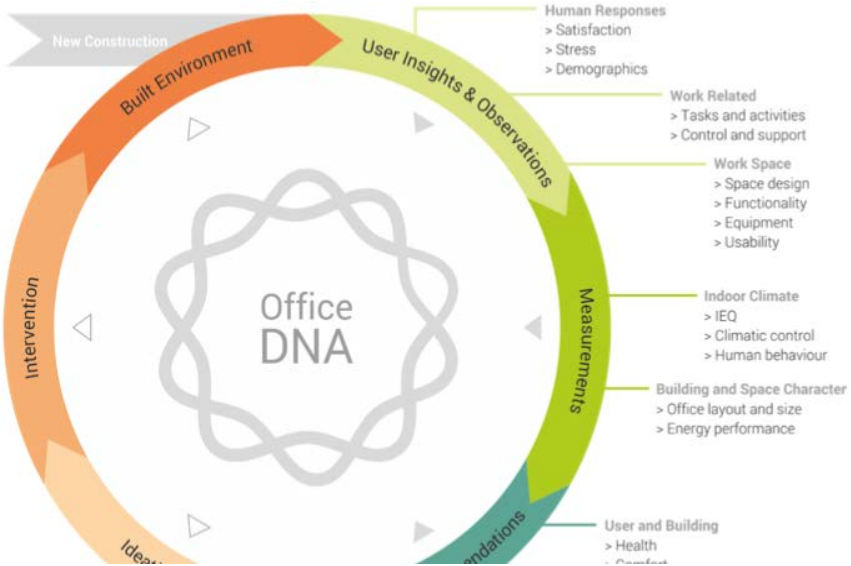
furbish™

Our mission is to help clients to evolve and grow through our human-centred approach into smart sustainable offices.

Our ambition is to work all over the world.

Furbish offers a new paradigm of user-oriented, low carbon footprint and resilient office design solutions to form the next generation smart sustainable offices.

- Holistic approach
- This saves up to 50% energy
- Incorporation of solid qualitative usage analysis with innovative building solutions and systems
- Access to a unique world-class database, based on scientific research
- Founded in 2017, Sweden



Category: Other

MICROWASTE

Our mission is an asbestos-free future.

Microwaste develops, produces and sells movable reactors to convert asbestos into inert material.

- The carcinogenicity of asbestos is eliminated and the reactor generates a secondary raw material that is 100% safe and reusable
- The output is not harmful for human health and the environment
- Founded in 2016, Italy

Giunku has developed the Junker App, to help citizens to recycle their waste.

- It recognizes over 1 million products
- App has been adopted by the largest Italian utility company
- Founded in Italy