

INDU-ZERO

Integration in production process/digital factory

28-11-2018



**Smart
Renovation
Factory**
by INDU-ZERO

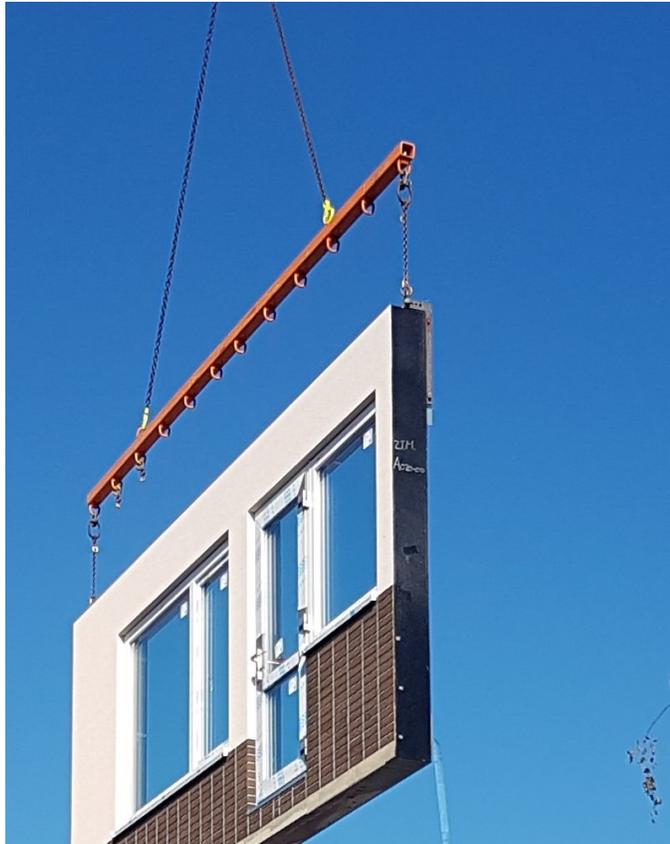
Interreg
North Sea Region
INDU-ZERO

European Regional Development Fund



EUROPEAN UNION

Welcome to meet Rc Panels



- ✓ Dutch market leader prefab facades
- ✓ For zero energy and 2050 readiness
- ✓ Hassle-free
- ✓ Great freedom of choice in looks
- ✓ Quality and affordability due to process automation

- ✓ Current location capacity
ca. 3000 houses



Lianda Sjerps-Koomen
Manager Business Development

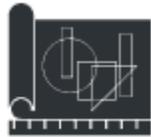
Buro de Haan



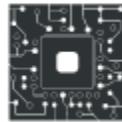
=



Architecture



Engineering



Information technology



Construction



Measurement



Arjan de Haan

How do we renovate 22 million houses towards energy-neutral?



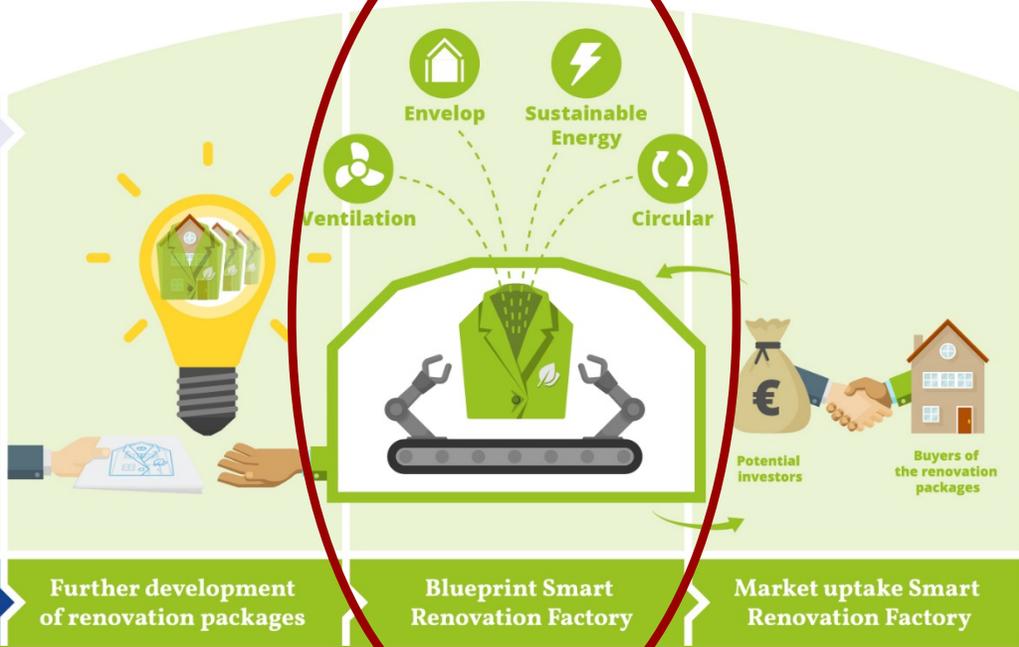
Smart Renovation
Factory
by INDU-ZERO

THE SOLUTION WITH INDU-ZERO

Problem



Sustainable housing
too slow, too expensive



Further development
of renovation packages

Blueprint Smart
Renovation Factory

Market uptake Smart
Renovation Factory

Future perspective



Factory building in NSR



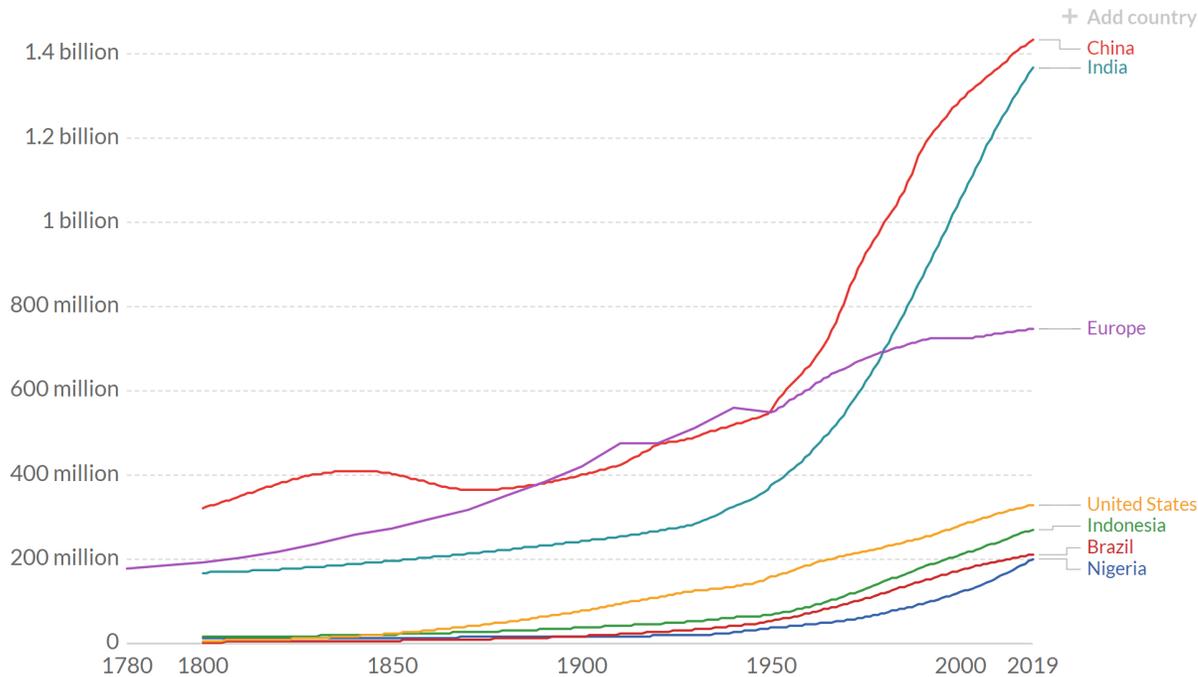
Renovation houses



Future proof houses

Increase CO₂

Population



Source: Gapminder; HYDE & UN Population Division (2019)

CC BY

Who has contributed most to global CO₂ emissions?

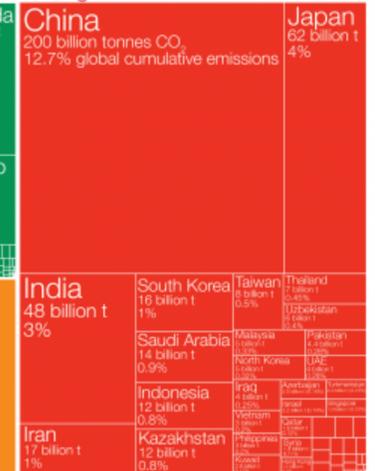
Our World in Data

Cumulative carbon dioxide (CO₂) emissions over the period from 1751 to 2017. Figures are based on production-based emissions which measure CO₂ produced domestically from fossil fuel combustion and cement, and do not correct for emissions embedded in trade (i.e. consumption-based). Emissions from international travel are not included.

North America
457 billion tonnes CO₂
29% global cumulative emissions



Asia
457 billion tonnes CO₂
29% global cumulative emissions



EU-28
353 billion tonnes CO₂
22% global cumulative emissions



Russia
101 billion tonnes
6% global emissions



Europe
514 billion tonnes CO₂
33% global cumulative emissions

Africa
43 billion tonnes CO₂
3% global emissions

South America
40 billion tonnes CO₂
3% global emissions

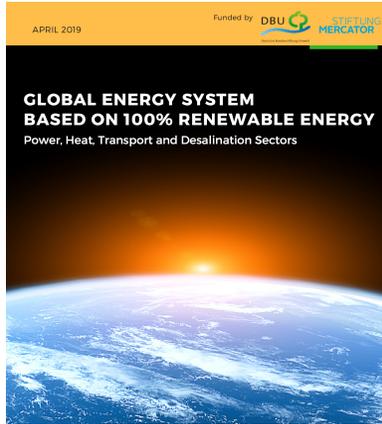
Interreg
North Sea Region
INDU-ZERO

European Regional Development Fund



EUROPEAN UNION

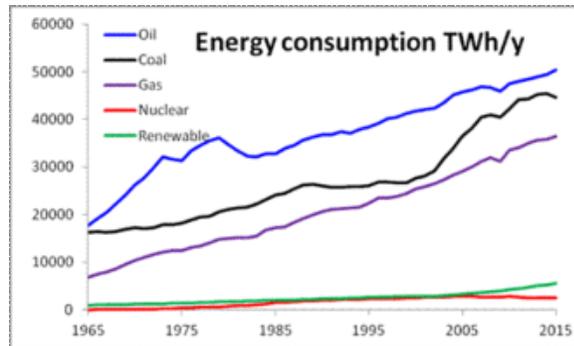
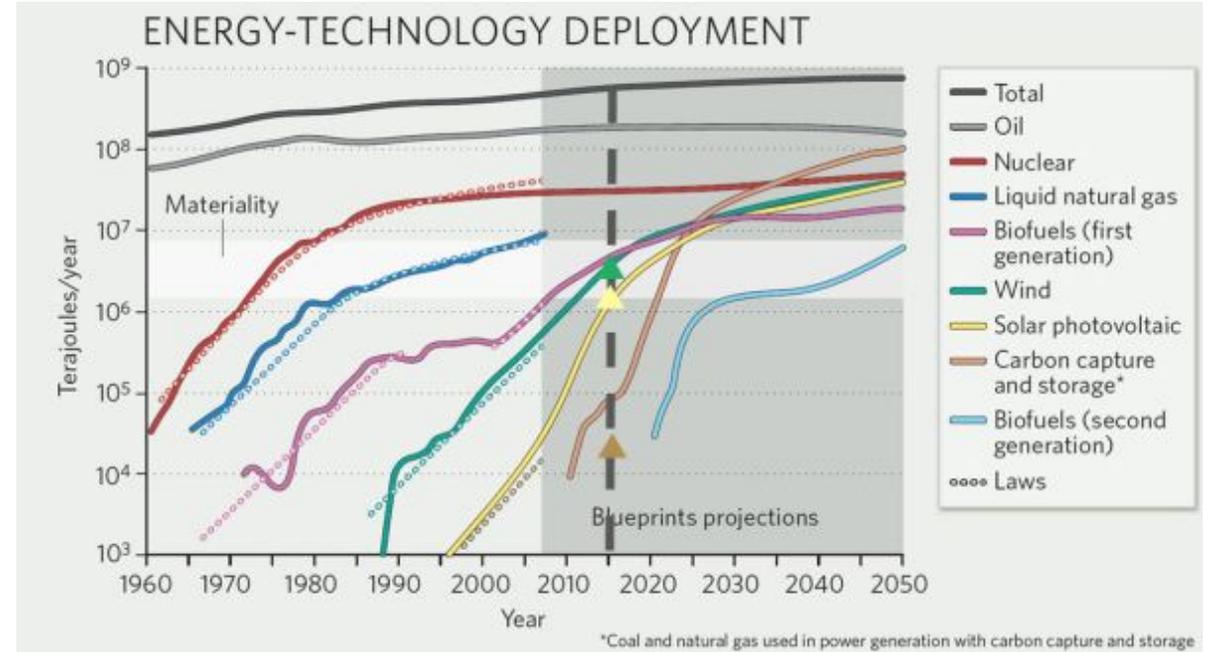
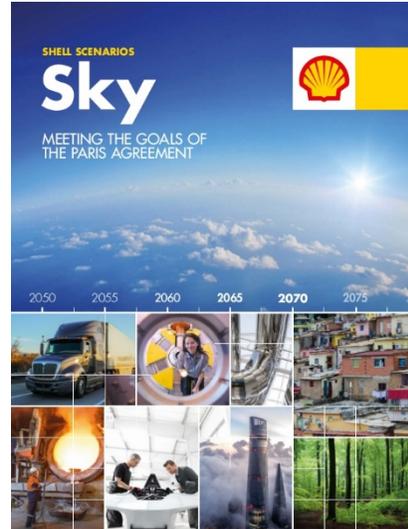
Need for energy



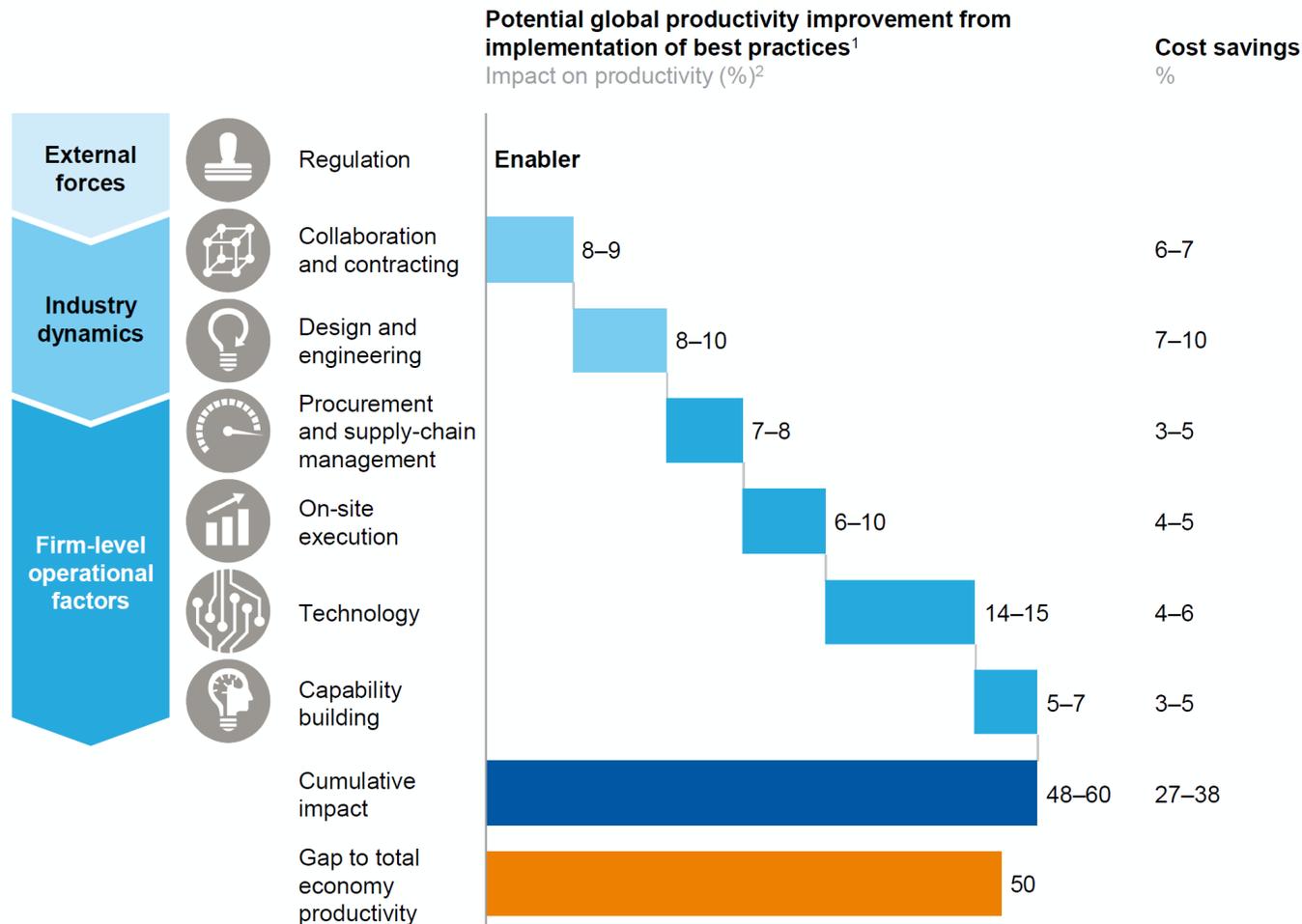
Study by

LUT University
ENERGYWATCHGROUP

PO Box 20
00201 Oulu
Finland
Email: energywatch@lut.fi
www.energywatchgroup.com



Renovation challenge



Envelope = use less
Net zero = self support

Bron: McKinsey & Company

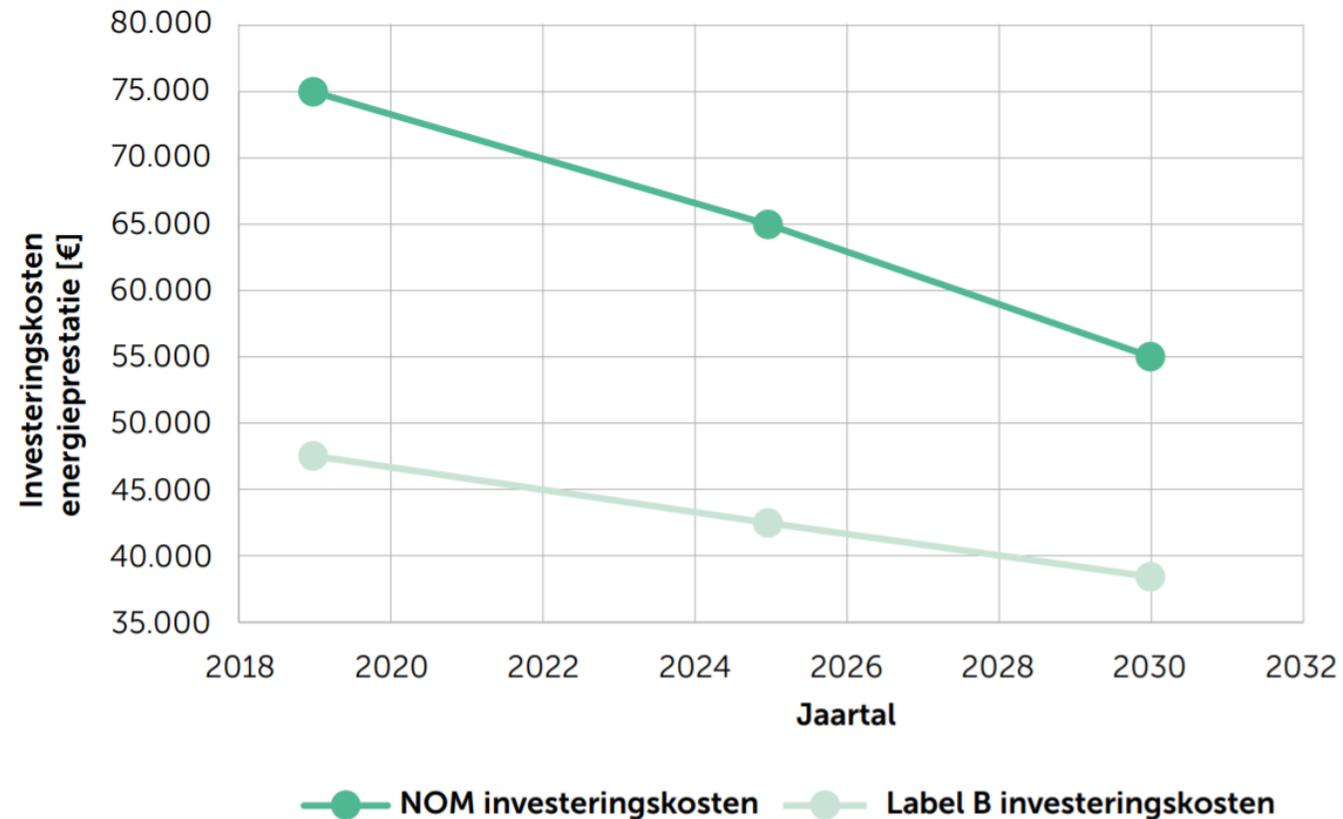
Affordable renovation is available

- Zero energy renovation has already begun
- TCO is sound
- Net present value as well
- Sentiment focusses on the initial investment
- Scaling up and innovation tackle both that sentiment and opens market to individual home owners



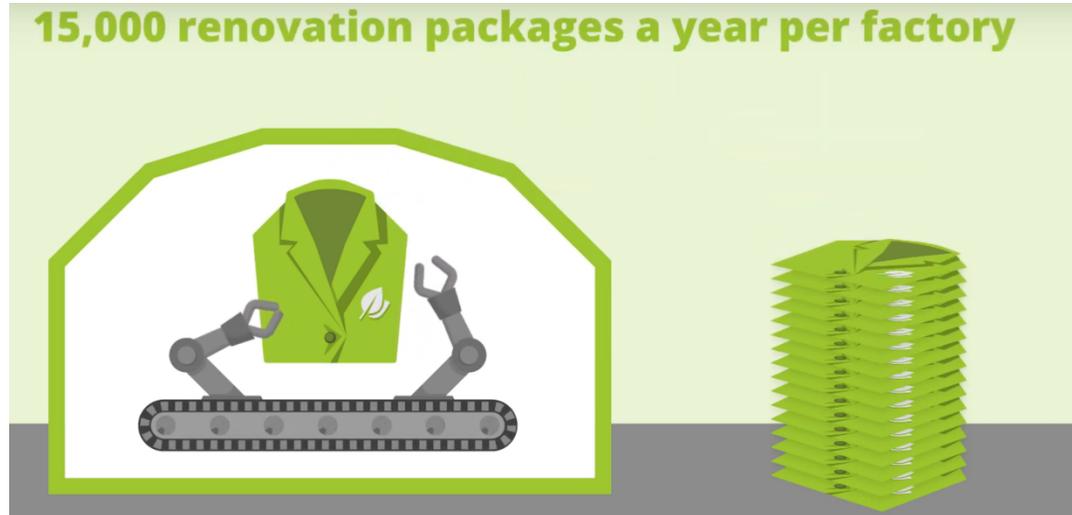
Initial investment costs are falling

Publication of Dutch “Stroomversnelling” (energiesprong) shows that after a few years of experimenting, the costs are now falling significantly.



Scale up factory by Indu Zero

15,000 renovation packages a year per factory



€40.000,



X 5 + roof and installation = 15X



Start with the end in mind



Successful renovations start with the end in mind. Production as well!



Fair and integral assessment



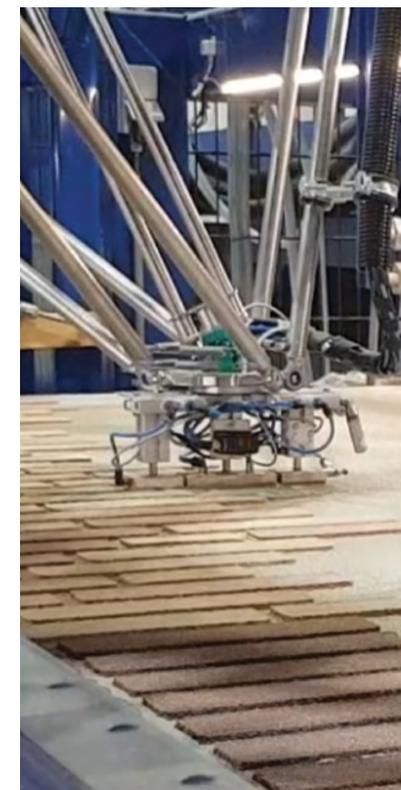
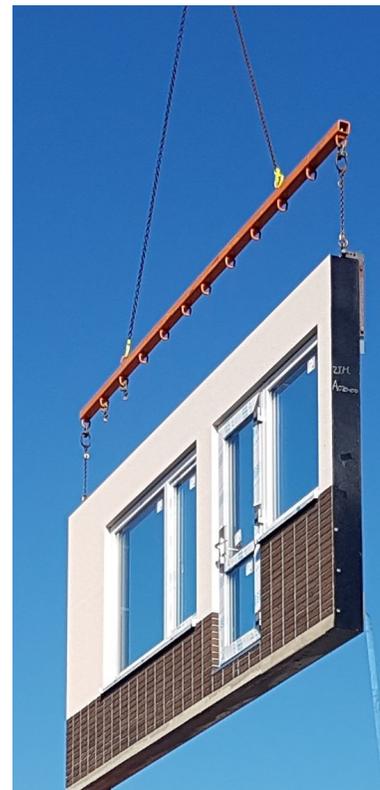
Suitable for large volumes and speed



Hassle-free and regret free



High quality and affordability



System integration



File to Factory RcPanels



Digital from existing real estate to factory floor

- Scan
- BIM
- Production

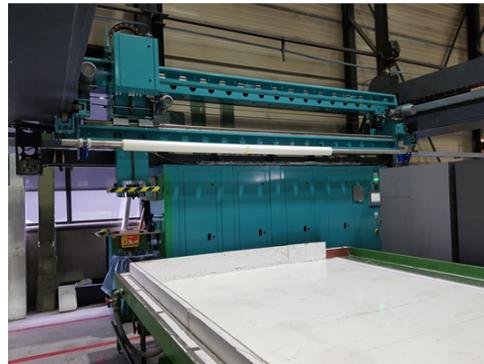


Product for mass production

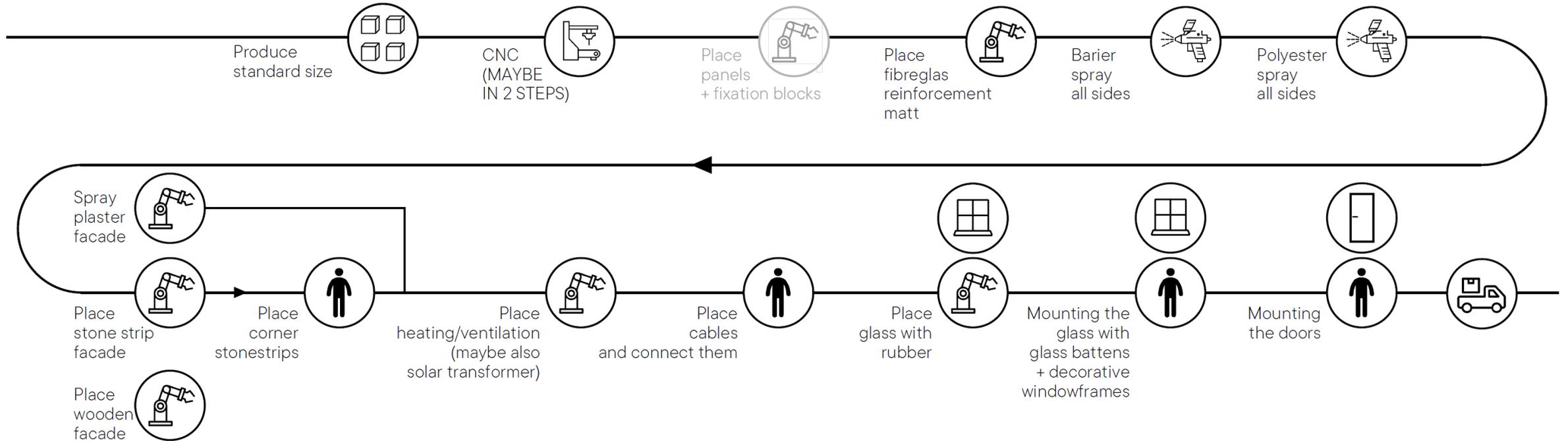


Industrialized process

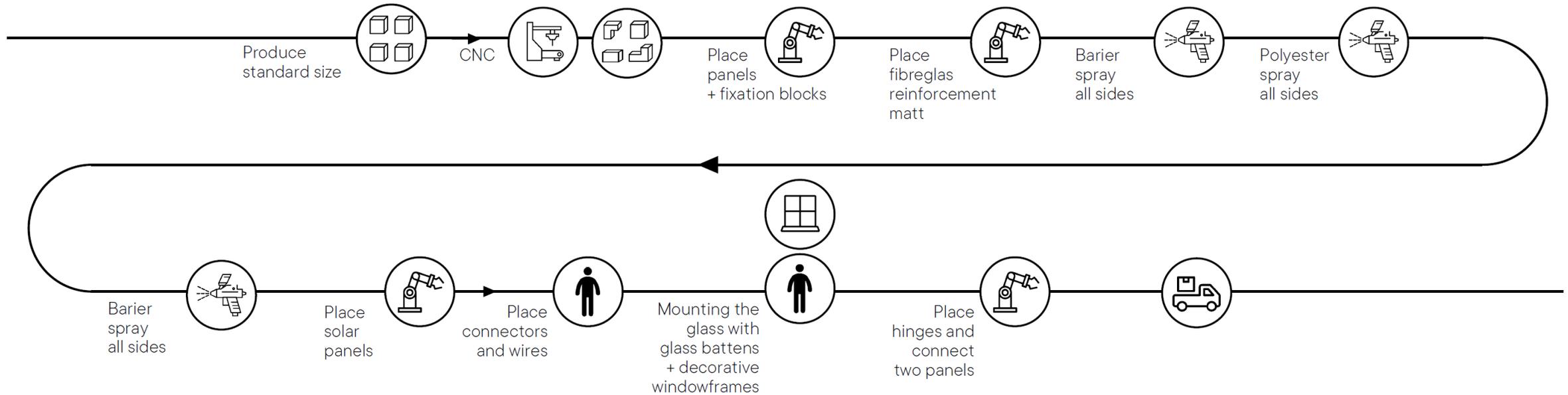
- Glue
- CNC
- Brick robot



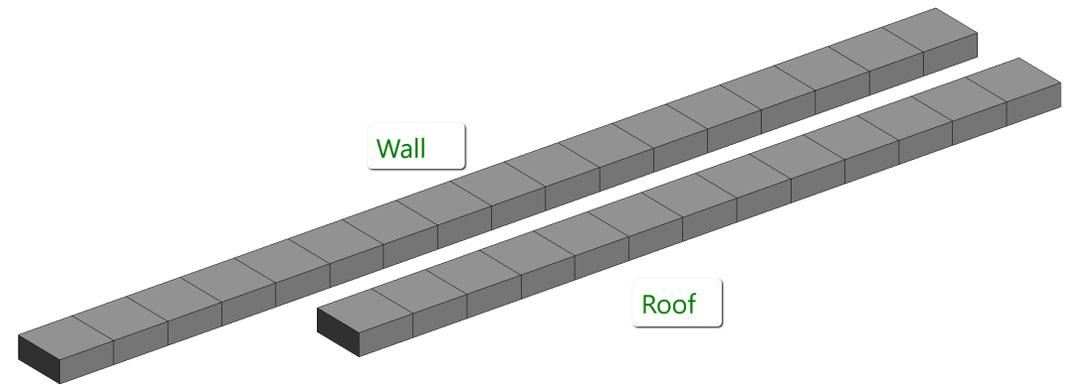
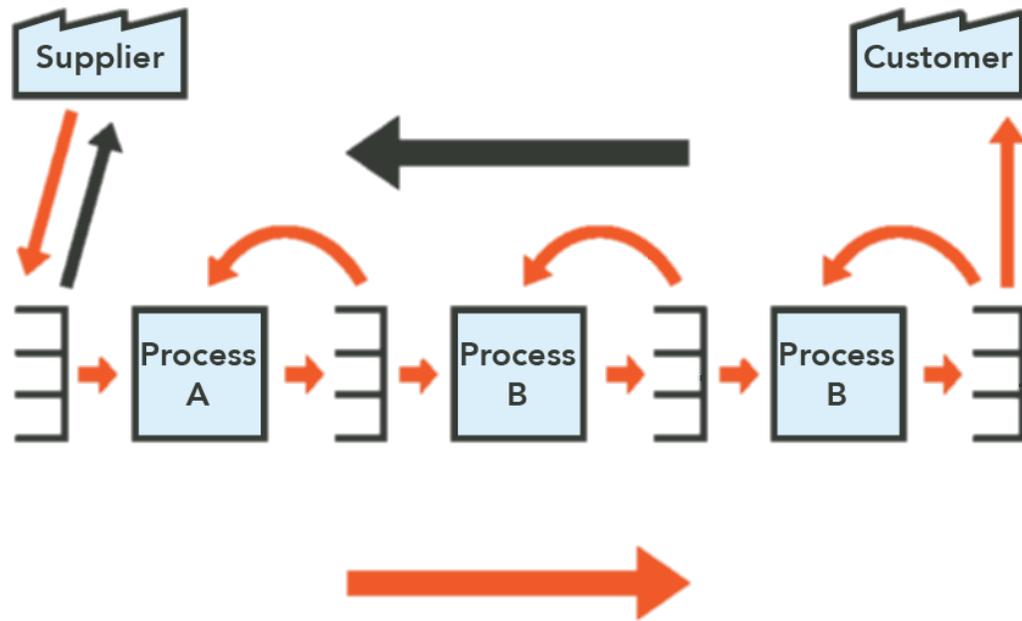
Pull Production line wall



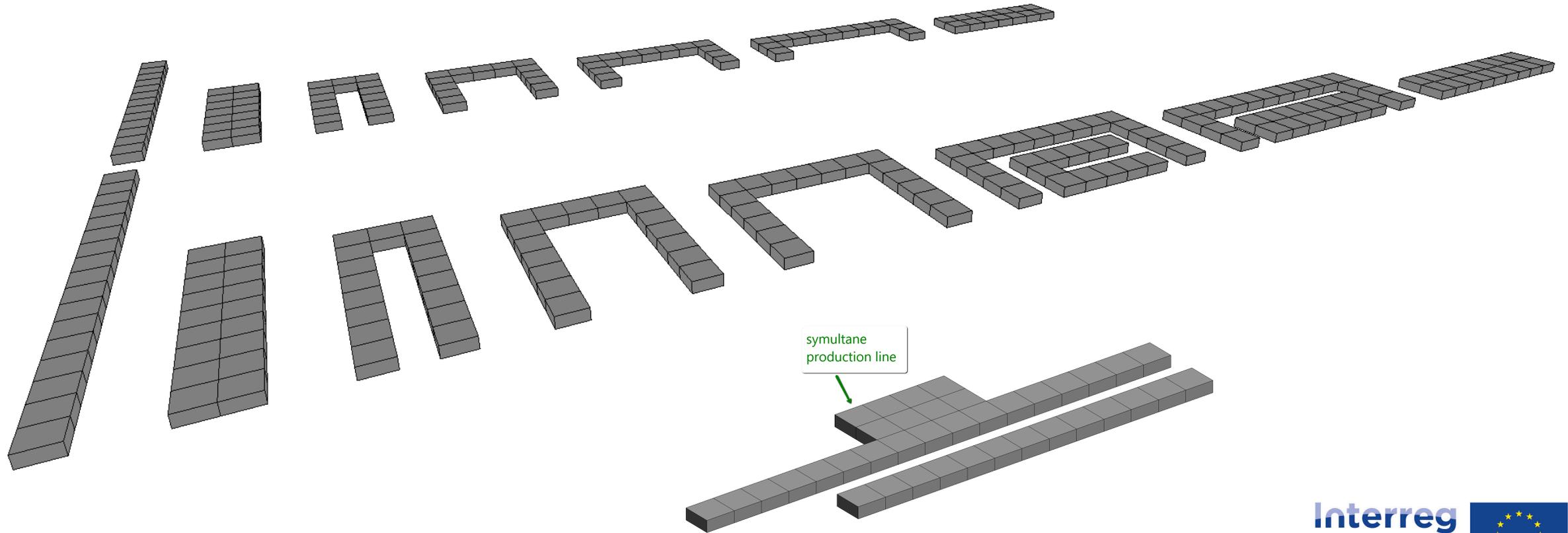
Pull Production line roof



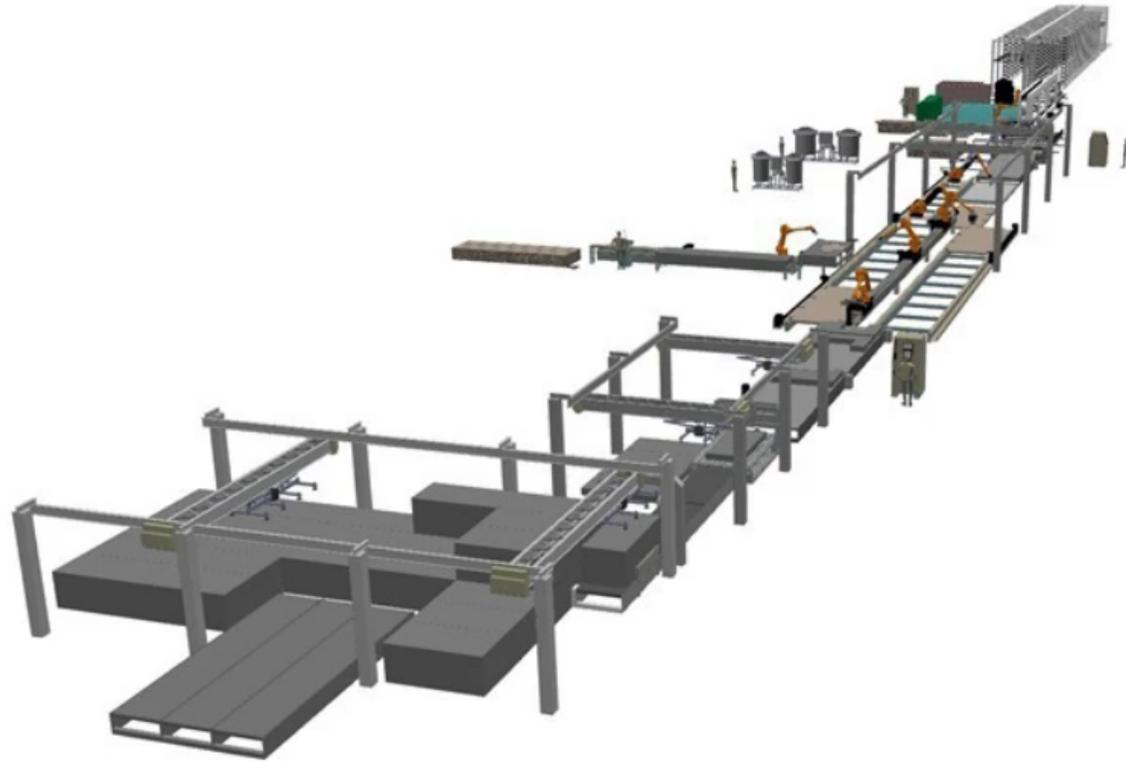
Lean pull system



Factory layout

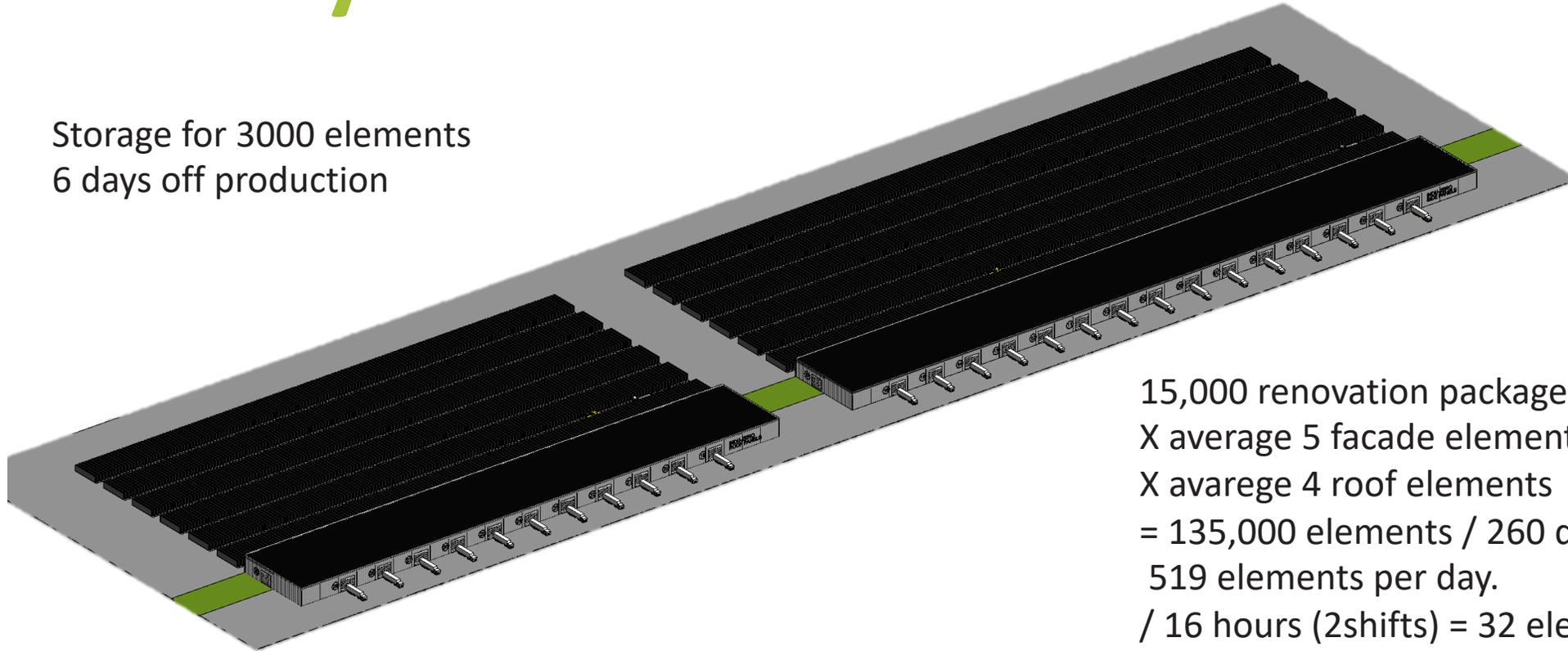


Factory automation



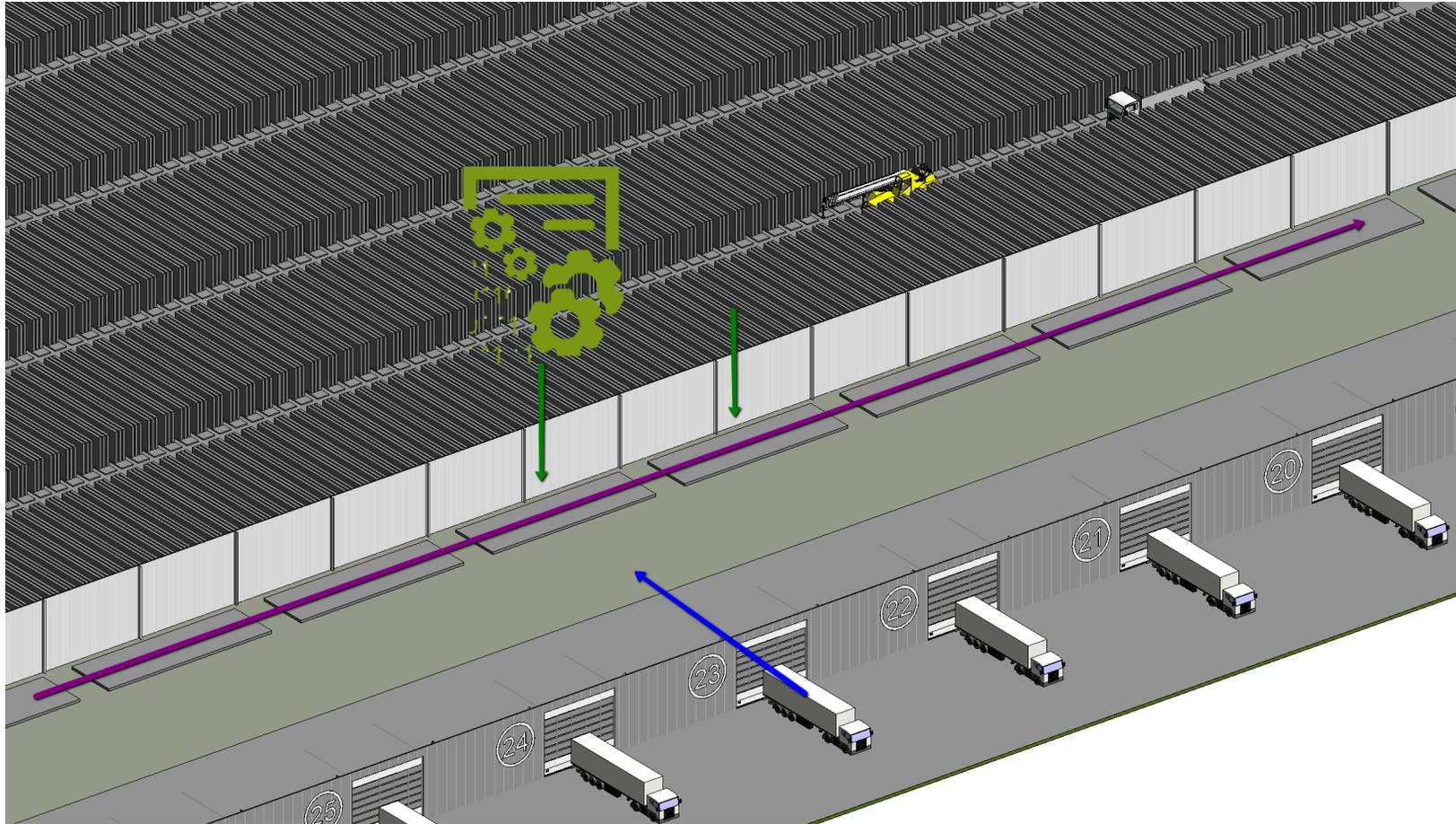
Factory scale

Storage for 3000 elements
6 days off production

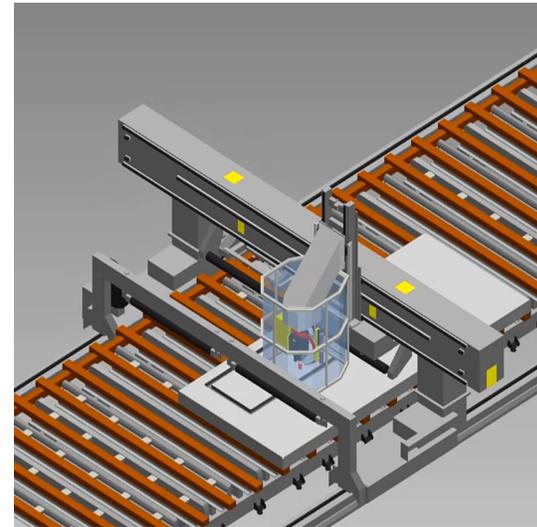
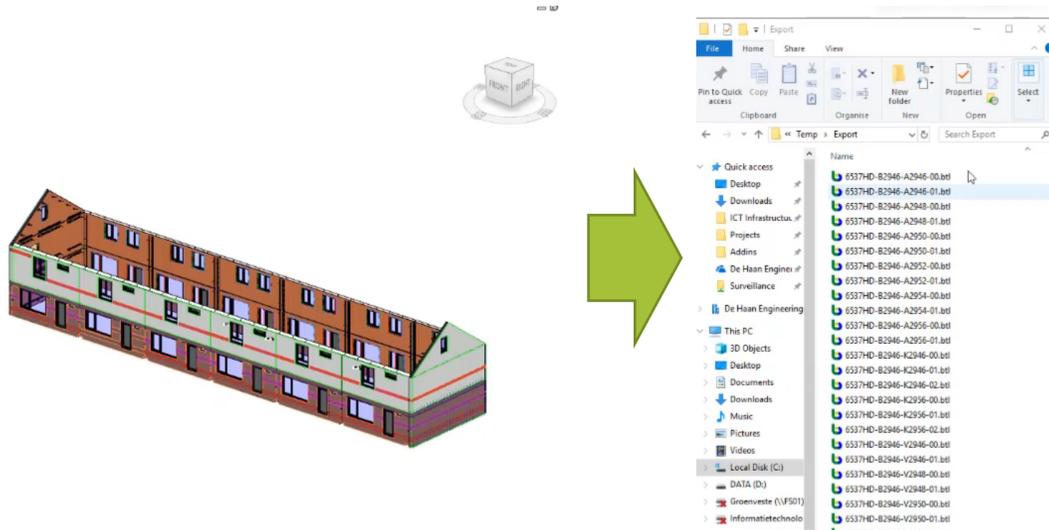


15,000 renovation packages
X average 5 facade elements
X average 4 roof elements
= 135,000 elements / 260 days
519 elements per day.
/ 16 hours (2shifts) = 32 elements per hour
Takt time less than 2 minutes

Factory on production steps



Digital factory



Industrie 4.0

Before :
[mass production]



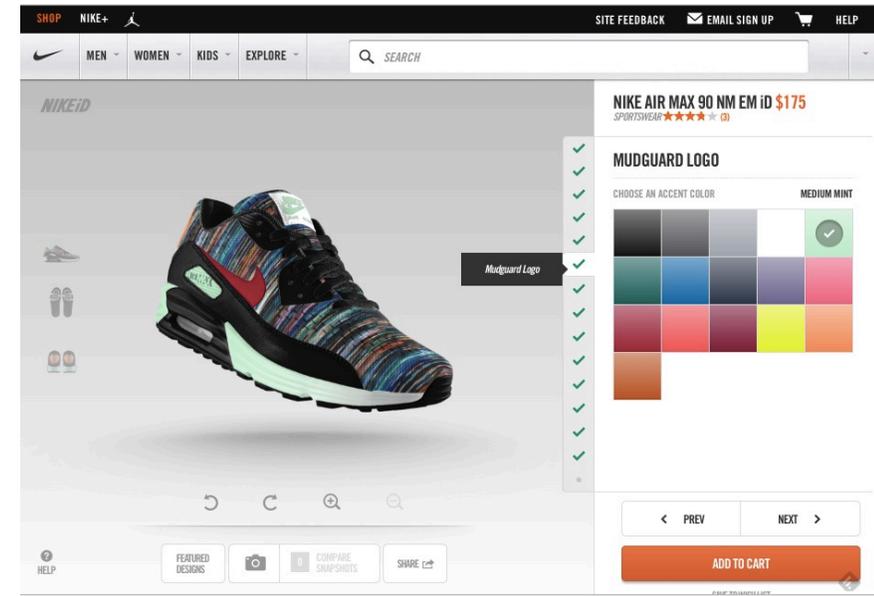
→
one way



After :
[mass customization]



↔
interactive
dialogue



Example mass customisation



Take home message

Why? CO2 reduction

How? Indu Zero

For? Us, join our team “the coalition of the willing”