



BUILDINGS
PERFORMANCE
INSTITUTE
EUROPE

co2online



INDUSTRIAL NET-ZERO RENOVATION IN EUROPE: EXPERIENCE OF THE ENERGIESPRONG APPROACH IN THE NETHERLANDS, FRANCE AND UK

Factsheet

Deep renovation of the European building stock is necessary to reduce its energy consumption and meet European climate policy objectives. Industrial prefabrication for the renovation of (residential) buildings is an effective way of reducing the cost of energy efficiency improvements and addressing the shortage of skilled labour and innovation in the construction sector.

Industrial renovation with prefabricated elements has great potential to achieve accelerated, cost-effective and deep refurbishment of existing buildings. It is characterised by the industrial prefabrication of construction modules, innovative process optimisation and digital planning, implementation and monitoring.



Industrial prefabrication

Standardised modules

Adaptable to the individual design

Versatile combination



Process optimisation

Standardised processes

Funding opportunities

Innovative business models



Digitalisation

Digital measurement/ BIM

Automatic data readability

Building monitoring

The "Energiesprong" business model emerged in the Netherlands a few years ago, using prefabricated elements to achieve deep renovation to a net-zero energy level within a short period of time. Since then, numerous renovation projects

based on the Energiesprong approach have been implemented or are in preparation in several European countries, including Germany, France and the UK. But what are the key factors of the **Energiesprong business model**?

Net-zero annual average energy consumption through renewable energy generation (PV, heat pump) and facade insulation

A 10-40 year performance guarantee that can be secured by the NOM-keur industry standard in the Netherlands.

A socially just renovation due to (almost) steady rents, which is why the model is used primarily in social housing

CASE STUDIES



Status quo: >12,000 dwellings completed with prefabricated components (6,900 new buildings/ 5,700 renovations), positive market development

Main driver: Political decision for a gas phase-out in 2025

Important success factor: Favourable framework conditions through "change agents" in the market development team

Status quo: Implementation of 3 projects (22 net zero-renovations), 4 projects planned, high expectations for 2020

Main driver: Energy Transition Law from 2015 (Plan: Refurbishment of 500,000 dwellings/ year)

Important success factor: Market entrance of small, agile and innovative SMEs and start-ups



Status quo: Feasibility study for implementation completed; a project with 10 net-zero renovations finalised; several projects in the pipeline

Main driver: Ambitious sub-national climate protection targets and commitments by mayors in Nottingham, London, Devon and Essex

Important success factor: Early and active involvement of tenants

DEMAND AGGREGATION

In the pilot projects, social housing companies are making a large number of similar properties available for renovation, enabling serial prefabrication to be carried out on a larger scale. This bundling of demand is a key aspect of industrial renovation and leads to reduced costs and a positive business model for a large number of renovation projects due to economies of scale.

Market development

Industrial prefabrication in the Netherlands is on the threshold of the mass market. Technological solutions are now needed that can be used both in new buildings and in renovation projects in order to avoid production downtimes for prefabricated elements. In France and the UK, too, there is already a strong cost degression, which gives reason to hope for a positive market development.

Cost saving potential

Through industrial prefabrication, costs can be saved at various stages of the renovation process. According to Dutch actors, savings potential can be expected from shorter construction times, especially in terms of labour costs:

- According to a Dutch interviewee, the ratio of wage costs to material costs is now around 40:60 - in the future, industrial prefabrication could result in a ratio of 10:90 for a mass market.
- In a new building using the Energiepsrong approach, the labour costs are already around 10-20 % lower due to automation and robotisation than for a conventional new building. According to another interviewee, savings of around 40-50 % could be achieved here in the future.

SUCCESS FACTORS



Process innovations

- Innovative value chain
- New business models
- Standardised process
- 3D-scan
- Building information modelling (BIM)
- Innovative start-ups

Process restructuring

Companies that successfully implement industrial prefabricated renovation projects have redesigned internal workflows or **outsourced processes**. The new performance guarantee requires that the responsible companies ensure that all suppliers along the value chain maintain high quality. Maintenance must also be ensured by the housing company or the general contractor, with **reliable monitoring** playing an important role.

The market development team in the Netherlands has supported companies in tackling transformation processes along the value chain in order to integrate performance guarantees and **quality standards into supply agreements**. Some housing companies have created entire teams for net-zero refurbishment projects outside the established structures to ensure the necessary innovative capacity.

Technological innovations

Technological innovations are an important success factor in making industrial renovation viable. Intelligent **data acquisition** and efficient data management not only reduce costs, but also accelerate and simplify the business model and important processes.

Building information modelling (BIM) is a central component of digital planning, covering various dimensions of building planning. In addition to components, time and resources are also recorded in 5D, which enables continuous data availability for all parties involved. This improves the productivity of the planning and manufacturing process with positive impacts on costs, deadlines and quality.

Start-ups can often adapt more quickly to new processes and digital innovations, which is why they have been identified as important players.



Quality assurance

- Long-term performance guarantee
- High quality control during production
- Nom-keur industry standard
- Performance monitoring

A high quality standard and a 10-40 year performance guarantee are central aspects of the Energiesprong business model and a decisive difference compared to conventional renovation projects.

Regular **controls during the production** of building modules guarantee a high quality and minimize errors as well as time during assembly.

Digital operational monitoring of energy consumption enables **real consumption data** to be checked and user behaviour and operating parameters to be adjusted or optimised if necessary. A continuous exchange with the tenants and their early integration into the processes are important success factors.

In the Netherlands, an **independent quality standard** was developed to ensure the quality and performance of net-zero renovations and new buildings. The Nom-keur industry standard guarantees the annual balancing of energy consumption and energy generation, which is achieved by, for example, PV modules on the roof.

The evaluation of the building concept is carried out in three steps (project proposal, offer and implementation) and reviewed during the construction phase and one year after completion. In addition to energy consumption, the quality categories also include **comfort criteria**, such as the temperature in the bathroom, ventilation, the materials used and user-friendliness from the perspective of residents.



Framework conditions

- Ambitious climate targets
- Political support
- Financial support programmes
- Support of innovative funding models

Political framework

Strong political support at the **beginning of the market launch** was identified in all countries as an important success factor. The government-funded market development teams actively support the companies in overcoming economic and regulatory barriers and bringing project teams together.

National climate protection ambitions and **long-term goals** in the building sector also form important framework conditions for the success of climate-neutral business models, such as the ambitious climate goals of some cities in the UK. Important drivers are in the Netherlands the decision to phase out gas in 2025 and in France the Energy Transformation Act from 2015.

Support programmes

In all case studies, **financial support** from EU research funds, national governments or private actors is required to achieve

the necessary volume and cost reductions. The Interreg North-West Europe project E=0 implements renovation projects according to the Energiesprong model in France, the UK and Luxembourg. Financing in 2016-2018 also came from the Horizon 2020 project Transition Zero and the French project Es'Ope.

Enabling funding models

The Energiesprong business model from the Netherlands is **financed through energy cost savings** from net-zero renovations, with housing construction companies taking on the role of energy suppliers.

Prerequisites for similar financing models are a relatively high energy and/or CO₂ price, which makes renovations attractive, and a legal framework that allows financing to be allocated via the rental contracts.

REFERENCES

BPIE 2016, [Driving transformational change in the construction value chain](#)

Nom-keur industry standard, <https://nomkeur.nl/>

Energiesprong International, <https://energiesprong.org/>

Frontier Economics, 2016, [London Energiesprong Transferability Assessment](#)

Oprene, [Es'Ope project](#), 2018-2022

Interreg NEW, [E=0](#), 2016-2019

Energiesprong, [Transition Zero](#), Horizon2020 Project, 2016-2018



This project was commissioned by the German Environment Agency (Umweltbundesamt) as part of the environmental research plan—research number FKZ 37EV 17 107 0—and financed with federal funds.

January 2020

The Buildings Performance Institute Europe is a European not-for-profit think-tank with a focus on independent analysis and knowledge dissemination, supporting evidence-based policy making in the field of energy performance in buildings. It delivers policy analysis, policy advice and implementation support.

Buildings Performance Institute Europe
Sebastianstraße 21, D-10179 Berlin
Rue de la Science / Wetenschapsstraat 23, B-1040 Brussels
germany@bpie.eu / www.bpie.eu / [@BPIE_eu](https://twitter.com/BPIE_eu)