



Project Title

GreenBricks – The Carbon Neutral Brick Factory

Industry Partner

Wienerberger AG, Wienerberger Österreich GmbH

Industry Sector

Other Energy Intensive & Hard to Abate

Technology Pathway (Primary)

Alternative materials & more efficient processes

NIM Pillar

Technology Demonstration

Source

NIM Awards 2025

Description

GreenBricks is setting new global benchmarks in brick manufacturing with a globally pioneering concept. At Wienerberger's demonstration plant in Uttendorf, an 85-meter-long, fully electrified tunnel kiln is operated entirely with green electricity. This innovation is complemented by numerous energy efficiency measures, including an extended drying tunnel equipped with three industrial heat pumps for brick drying at 80–90 °C.

Besides, innovative carbon-neutral clay blends have been developed, replacing fossil-based and non-sustainable additives such as coal and paper fibers with climate-friendly sawdust sourced as a by-product from local wood processing plants. To maximize process flexibility, automated guided vehicles (AGVs) are now being used for brick transport, simultaneously providing valuable real-time product data to the process control system. The plant's electricity demand is met entirely from renewable sources and is partly generated onsite via a roof-integrated PV-system with a total capacity of 1,000 kWp. The remainder is secured through a long-term Power Purchase Agreement (PPA) with a renewable energy provider. These first-of-its-kind solutions reduce CO₂ emissions in the production of clay bricks at the demo site by around 90 %, equivalent to 7,340 t CO₂-eq. per year (based on 270 t/day production). At the same time, primary energy demand has been cut by 30 %. Drying and firing processes – including the electrified kiln, heat pumps, flue gas scrubber, and other key equipment – have been optimized using a digital twin and advanced thermodynamic simulations.

With a carbon footprint of just 10,67 kg CO₂-eq. per tonne of bricks, the GreenBricks project establishes a new global benchmark for Best Available Technology (BAT) in large-scale industrial brick production, redefining energy efficiency and climate performance in the industry.

Innovations Employed

GreenBricks integrates multiple innovations, with a fully electrified tunnel kiln replacing a gas-fired one representing the central technological leap. The novel e-kiln features:

- a) first-time on-site implementation and validation of high-performance electric heating elements, and
- b) first-time demonstration of advanced heat and airflow distribution concepts with optimized electric heating system design, active ventilation, precise electric heating elements control, and improved brick stacking in the kiln for uniform quality and efficiency.



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Another breakthrough is the switch to carbon-neutral additives. Instead of paper sludge or coal, locally sourced CO₂-neutral bio-porosification agents such as sawdust are used in clay formulations, which are adapted to varying clay properties of different sites. Several digital innovations, including e.g. a digital twin of the brick drying process, optimize the integration of the new technologies for brick production and plant performance.

Dimension of Novelty

New on the international market

Innovation Collaboration

Cooperation with scientific institution

AIT Austrian Institute of Technology GmbH

External partners

ONEJOON GmbH

Intellectual Properties

- Electric kiln: European Patent – EP4191182A1
- Heat pump based drying: Austrian Patent submitted / ongoing – A 50474/2024
- Heat pump based drying: European Patent submitted / ongoing – EP 25181434.9
- Air circulation kiln – ToreTech: Austrian Patent – AT524257B1
- Air circulation kiln – ToreTech: European Patent – EP 3 982 072 A1

IP Links

Timetable & Progress

Development commenced in 2022

Financing (Public/ Private)

Public funding

FFG: 4th Call Energy Model Region, research funding 1.7 m€

KPC: 5.1 m€ investment support for the demo plant

Finance Links

Project Phase TRL

TRL 8

Problems to be Solved and Risks to be Managed

Technology/know-how: A problem still to be understood in detail is the occasional overheating of electrical heating elements (shortens their lifespan, causes costly production stops).

Challenges/problems solved include esp.

- inhomogeneous heat transfer/distribution within brick stacks (sales risks due to insufficient brick properties e.g. low mechanical strength or change in the bricks' colour perceived as "poor quality")
- insufficient performance of low calorific sawdust additives during clay firing (sales risks due to changes in product quality)
- insufficient brick drying resulting from using heat pumps (sales risk due to inadequate mechanical brick properties, risk of higher energy demand/energy costs)

Market: Due to the current tense situation in the Austrian construction industry, the main focus is on political and public lobbying for additional funding for sustainable construction projects.



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Preliminary or Final Results Achieved

The results achieved include:

- e-kiln fully operational with 100% green electricity optimized in terms of operation strategies of electric heating elements / heat distribution on brick/brick stack level (TRL6-TRL8)
- new carbon neutral clay blend formulations for producing highly thermally insulating bricks successfully tested on lab & industrial scale for various locations (TRL6-TRL8)
- adapted brick drying tunnel equipped with three heat pumps and other equipment optimized in terms of thermal performance of dryer-heat pump-scrubber network. (TRL7-TRL8)
- adapted IT-infrastructure accounting the requirements of the novel technologies incl. e.g. novel bricks transport system (AGVs) and several digital operational optimization tools e.g., digital twin of drying process (TRL6-TRL8).
- replicability of results positively evaluated for > 20 wienerberger sites
- carbon emission savings of 88% confirmed.
- reduction in primary energy demand of 30% confirmed.

CO2 Emissions Reduction Potential – Implementation and Future Market

The results of the GreenBricks project are directly applicable to the production of roof tiles, backing and facing bricks. Further replication potential—still under evaluation—is expected in other ceramic sectors, esp. refractories, as well as in the metal industry.

Wienerberger group is one of the world's largest brick producers, operating over 200 sites, eight of them in Austria. The technologies, expertise, and insights gained during the GreenBricks project are continuously applied in brick production both in Austria and internationally. To date, novel know-how in optimized e-kiln design/operation, improved brick drying with heat pumps, or enhanced clay formulations with CO₂-neutral additives has been implemented in more than 7 Wienerberger brick factories across Europe.

Considering 30% market diffusion by 2040, the European clay brick & roof tile industry could employ 360 e-kilns (market volume: €7,2 bn), cutting annual CO₂ emissions by 2,200 kt CO₂-eq.

Market Positioning

The bricks produced in the world's first fully electric brick kiln were launched on the market in January 2025 under the name 'Porotherm Plan E'. The communication activities focused in particular on the substantial reduction in CO₂ emissions during production and the innovation from Austria.

Several objectives were pursued for the product launch: to raise awareness of the brick among the target group of architects, planners and investors, to attract selected premium trading partners as multipliers, and to implement pilot projects in every federal state. These projects received special media coverage, and each builder was awarded a certificate as a 'pioneer in construction'.

Project Location

Austria

Project & Technology Links

<https://www.wienerberger.at/nachhaltigkeit/greenbricks.html>

<https://www.nefi.at/en/project/GreenBricks>



NET-ZERO INDUSTRIES

MISSION



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[GreenBricks Impressions from the demo-site Uttendorf](#), .pdf File, Various fotos from the brick production site in Uttendorf, project work and market uptake initiatives

[GreenBricks Folder A4 Uttendorf Plan E brick](#), .pdf file, Description of GreenBricks project and its innovations in both qualitative and quantitative terms

Technology Links

