CERAMIC TILE MANUFACTURING WITH 100% ELECTRIC KILNS: A REALITY TODAY



EQUIPE CERÁMICAS
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ACKNOWLEDGEMENTS

jtc

SystemFoc

IBERDROLA

ESCAL
ESCOLA SUPERIOR DE CERÀMICA DE L'ALCORA

Alianza Q-Cero

EQUIPE

- Born 1999; headquarters: Figueroles (Castellón, Spain)
- 4 production plants (25.000 m^2/day); over 450 employees; 100 M€ revenue 2025
- Industry leadership: A global benchmark in small-format ceramic floor and wall tiles
- Global presence: Products distributed worldwide, with Europe and North America as the main markets
- Part of Italcer Group since 2021; Italcer became part of Wienerberger Group in April 2026


FIGUEROLES


ONDA

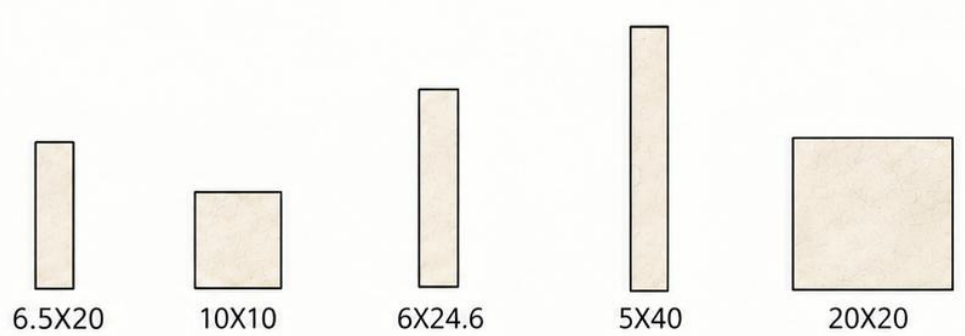


SOME OF OUR FORMATS



FLOORING
Floors with character, for every style.

WALL TILES
Walls that decorate and transform.



HIGH QUALITY | TIMELESS DESIGN | STRENGTH AND DURABILITY | INSPIRED BY NATURE



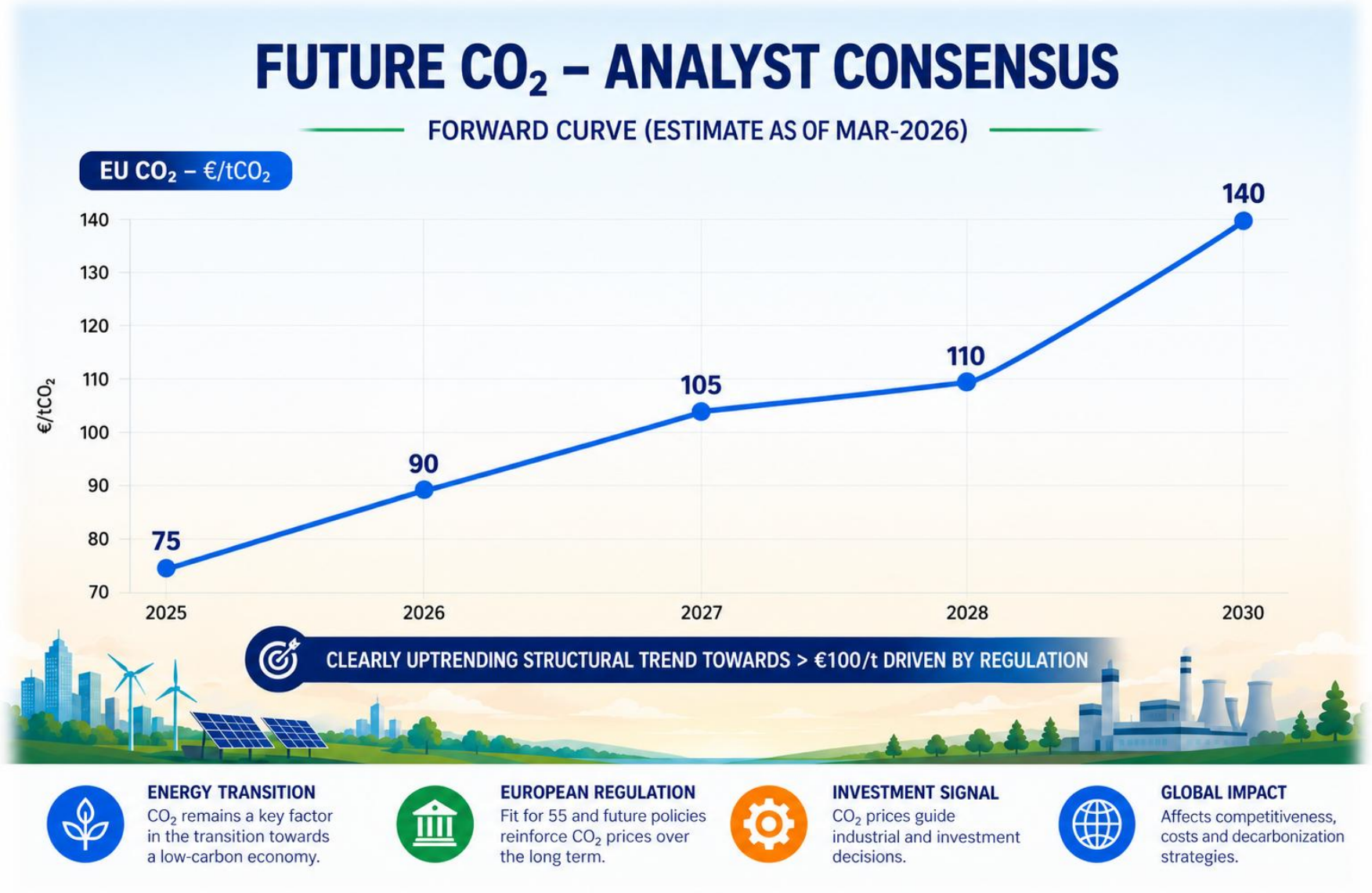
- Dependence on gas
- Energy cost volatility
- CO_2 emission objectives (2030 Agenda)
- Sustainability
- Differentiation - Innovation



TTF



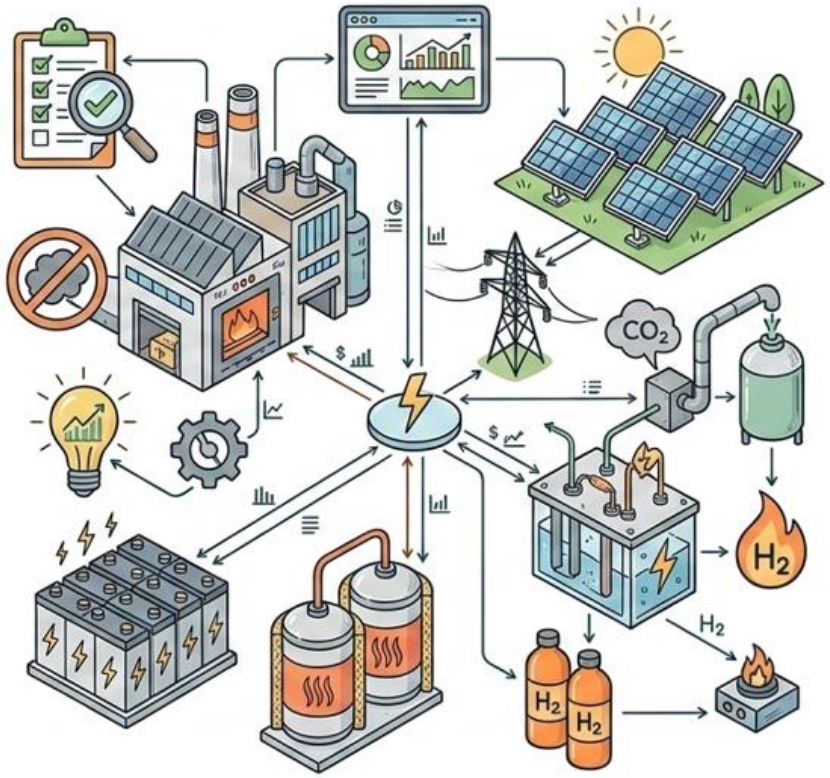
investing.com



ASCER data: Technical Affairs Committee meeting, May 6, 2026

DECARBONIZATION PLAN

SOLAR SELF-CONSUMPTION
ENERGY AUDITS
ENERGY MONITORING
ENERGY EFFICIENCY
100% ELECTRIC KILNS
ELECTRICITY STORAGE
CO_2 CAPTURE
THERMAL BATTERIES
HYDROGEN (Orange.Bat)



THE 100% ELECTRIC KILN



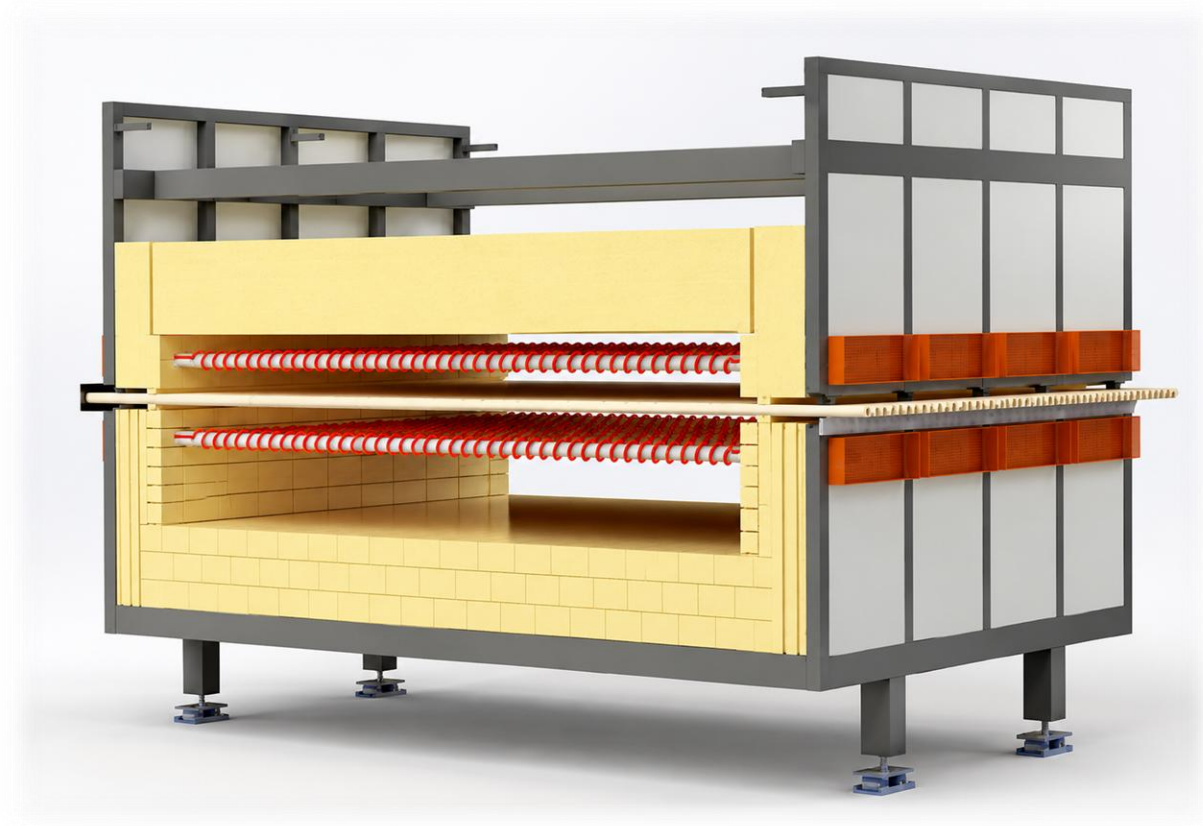
2nd 100% Electric Kiln – Figueroles (Castellón)

SPECIFICATIONS

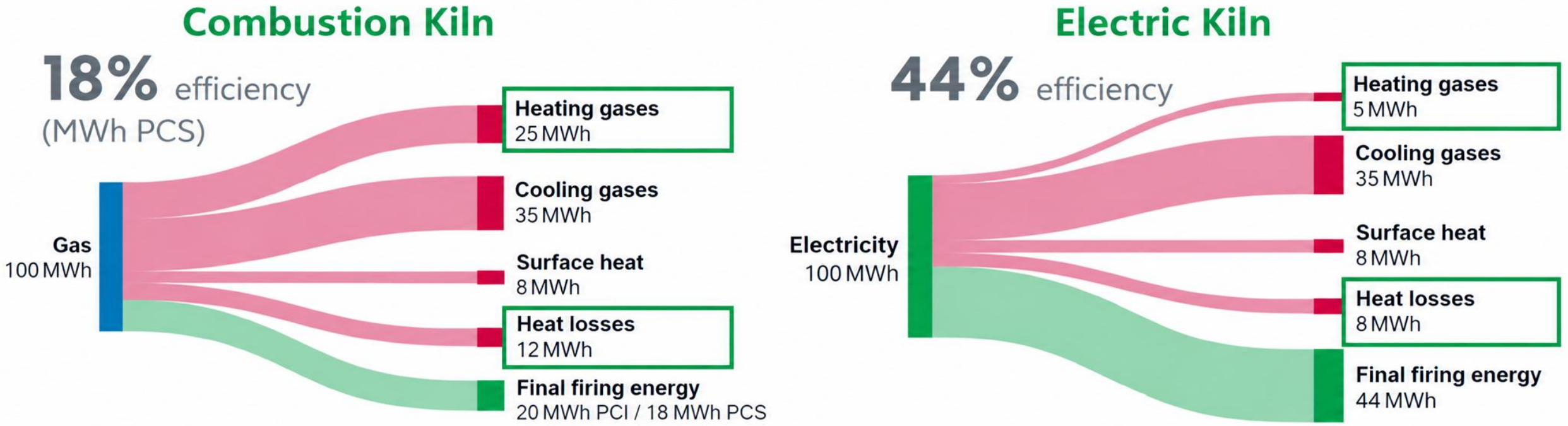
	1st 100% Electric Kiln (April 2024)	2nd 100% Electric Kiln (June 2026)
Location	F3 - Onda	F1B - Figueroles
Length	31m	57 m
Width	1.500 mm	1.600 mm
Production capacity	1.500 m²/day	3.600 m²/day
Max. Temperature	1.200 ºC	1.200 ºC
Installed electric power	1.210 kW	2.349 kW
Ceramic rollers	690 uds	1.180 uds

Electrification is not simply a matter of replacing burners with heating resistors





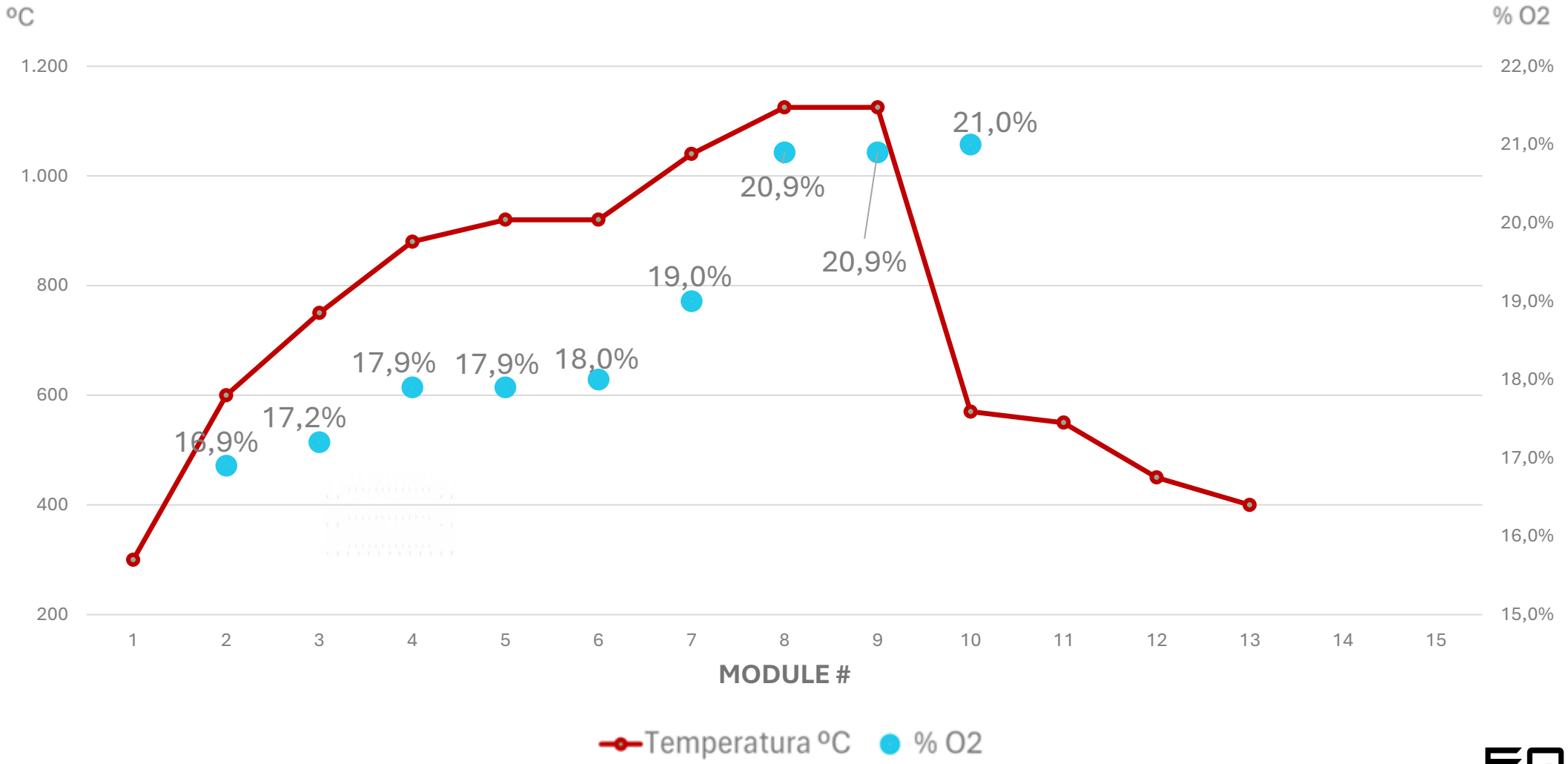
Systemfoc – Original image from the manufacturer



The electric kiln is **~2.4** times more efficient and with **no direct CO_2 emissions**

Source: Iberdrola

1st 100% Electric Kiln - O_2 Levels



100% Electric Kiln – Transverse Temperature Distribution

Measurement of transverse temperature gradients using the KTT equipment.

MEASUREMENT EQUIPMENT



KTT – Kiln Temperature Tracker

Technical name: Data acquisition system for measuring the temperature distribution in roller kilns using a monoblock sample.

- Thermally insulated metal container with internal data acquisition electronics.
- Two type K thermocouples protruding laterally to record the temperature at different positions.
- Compartments with water that protect the electronics (maximum internal temperature < 100 °C).

TEST METHODOLOGY

1 EQUIPMENT INTRODUCTION

The KTT equipment is placed on the roller plane at the height of the piece, at different transverse positions of the kiln.

2 TEMPERATURE RECORDING

The thermocouples record the actual temperature along the entire length of the kiln simultaneously.

3 DATA ACQUISITION AND STORAGE

The internal electronics store the temperature data during the entire kiln run.

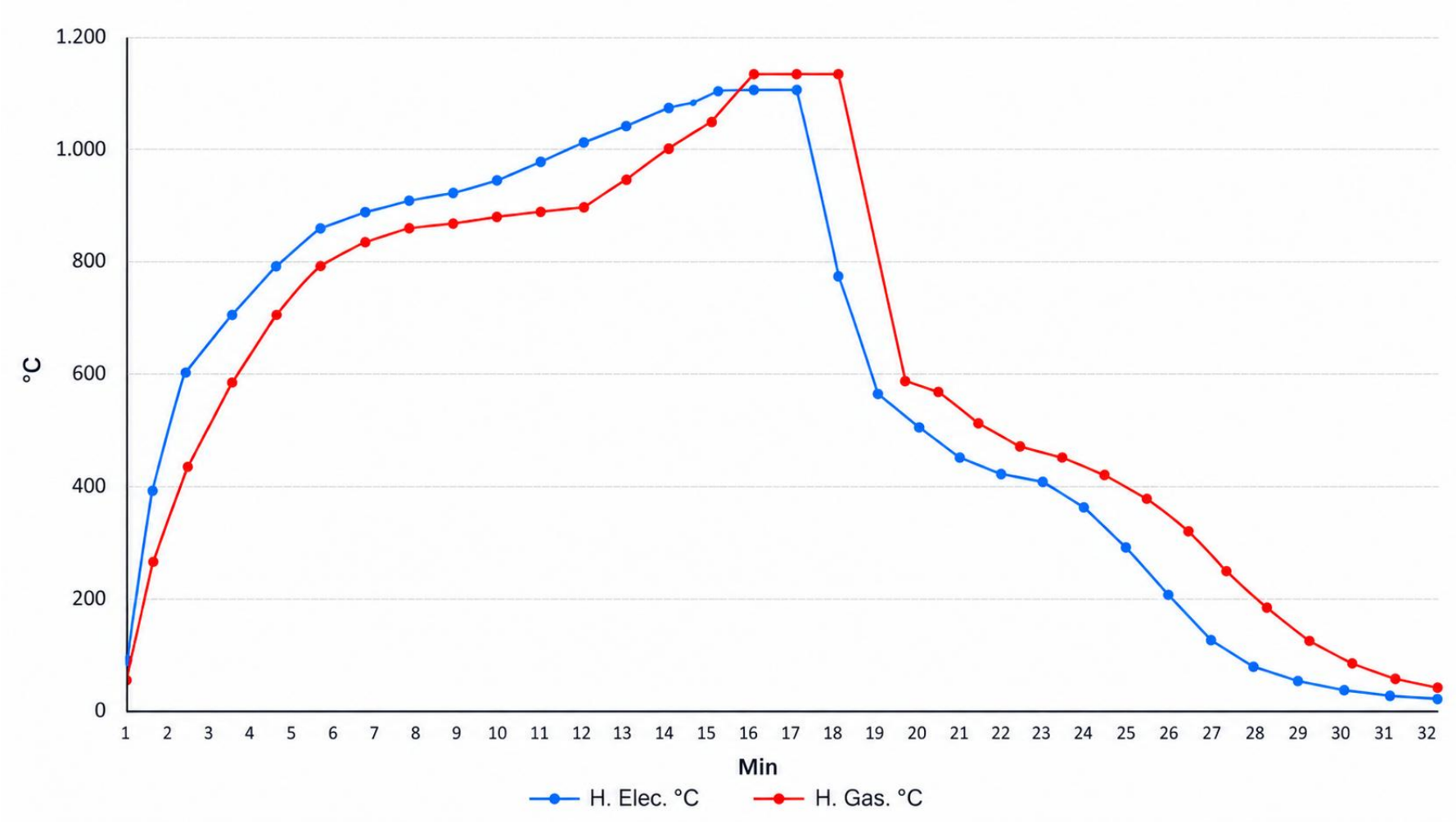
4 RESULT ANALYSIS

Temperature profiles and the temperature difference between positions are obtained to evaluate the transverse thermal uniformity.

This method enables the real temperature distribution along the kiln to be known and the transverse thermal uniformity to be evaluated, **key for the final product quality.**

EQUIPE

Firing cycles



MEASUREMENTS TAKEN IN THE TWO KILNS

PARAMETER		GAS KILN	ELECTRIC KILN	REDUCTION Electric kiln vs. gas kiln
Average flue gas velocity	(m/s)	7,633	3,3	↓ 56,7 %
Average dry flue gas flow rate	(Nm^3/h)	6.181	946,7	↓ 84,7 %
Average particle emission	(g/h)	<13,552	11,468	↓ 15,4 %
Average TOC emission	(g/h)	54,77	7,158	↓ 86,9 %
Average CO emission	(Kg/h)	0,179	0,167	↓ 6,7 %
Average NOx emission	(Kg/h)	0,308	0,037	↓ 88,0 %
Average SO_2 emission	(Kg/h)	0,146	<0,032	↓ 78,1 %
Average CO_2 emission	(Kg/h)	246,509	39,694	↓ 83,9 %

Values expressed as averages during the sampling period. Comparison carried out between the gas kiln and the electric kiln.

AUDEMA. Atmospheric emissions reports for Equipe Cerámicas

ADVANTAGES

- Direct heating + No combustion air –> **Greater energy efficiency**
- No burners -> **Zero direct CO_2 emissions**
- More uniform temperature control
- Faster firing cycles
- Higher O_2 levels
- Reduction of pollutants in emissions
- Better thermal inertia during standby periods with gaps or partial loads
- Better response to brief power interruptions
- Less refractory material shedding
- Fewer adjustments / settings
- No flammable fuel -> Improved operational safety
- Flexibility: start-ups, shutdowns and changeovers
- Integration with solar PV energy
- Integration with energy storage
- Compatible with energy savings certificates (CAEs)

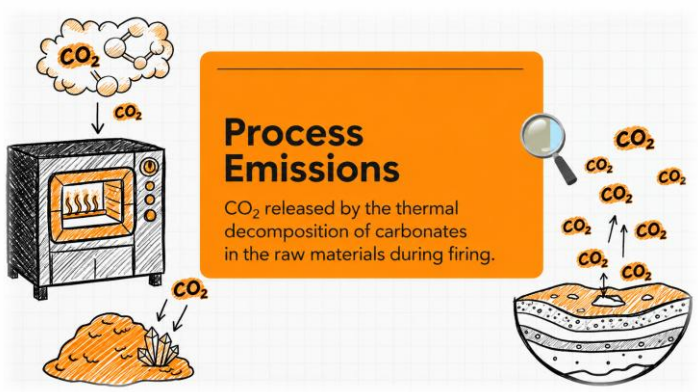
Comparison of energy consumption and CO_2 emissions with a gas-fired kiln



ASSUMPTIONS

Ceramic body type	Equivalent Emission Factor
White body	46 $kgCO_2/ton$
Porcelain	3,2 $kgCO_2/ton$

Energy source	Equivalent Emission Factor
Natural Gas	0,182 $kgCO_2/kWh$
Electricity	0,210 $kgCO_2/kWh$



	GAS KILN	ELECTRIC KILN (no PV)	ELECTRIC KILN (30% PV)
Energy source	Natural gas + electricity	Electricity	Electricity
Cycle (min)	32'	32'	32'
Clay Type	White body	White body	White body
Production (m^2/day)	3.335	3.289	3.289
Production (kgs/day)	45.058	48.463	48.463
Natural Gas consumption (kWh/day)	*33.176*	*0*	*0*
Electricity consumption (kWh/day)	752	19.779	13.845
Total energy consumption (kWh/day)	33.928	19.779	13.845
Specific energy consumption (kWh/ton)	753	408 (-46%)	286 (-62%)

ETS - EMISSIONS TRADING SYSTEM

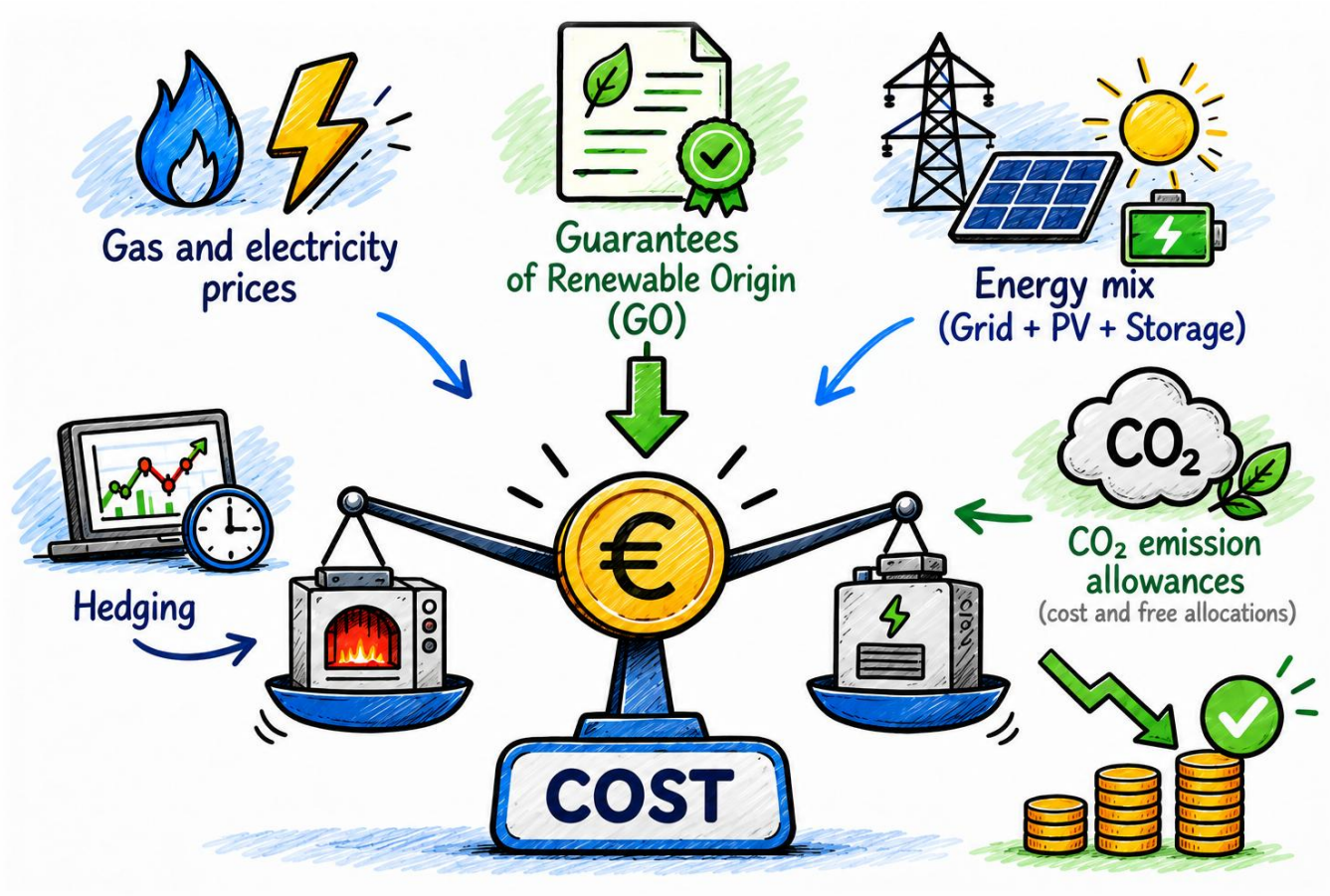
Direct emissions	GAS KILN	ELECTRIC KILN (no PV)	ELECTRIC KILN (30% PV)
$kgCO_2$/ton (combustion)	*134*	*0*	*0*
$kgCO_2$/ton (process)	*46*	*46*	*46*
Total $kgCO_2$/ton	180	46 (-74%)	46 (-74%)

CARBON FOOTPRINT

	GAS KILN	ELECTRIC KILN (no PV)	ELECTRIC KILN (30% PV)
tCO_{2eq} (combustion)	*1.902*	*0*	*0*
tCO_{2eq} (process)	*653*	*702*	*702*
tCO_{2eq} (electricity)	*50*	*1.308*	*916*
Total tCO_{2eq}	2.605	2.011	1.618
Total kgCO2/ton	184	132 (-28%)	106 (-38%)

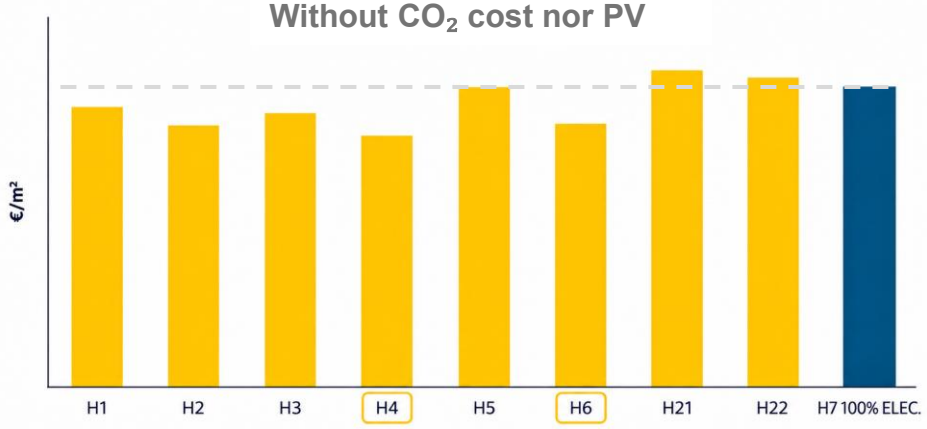
- **Certified renewable electricity** reduces the indirect carbon footprint

Is the 100% electric kiln cost-competitive?



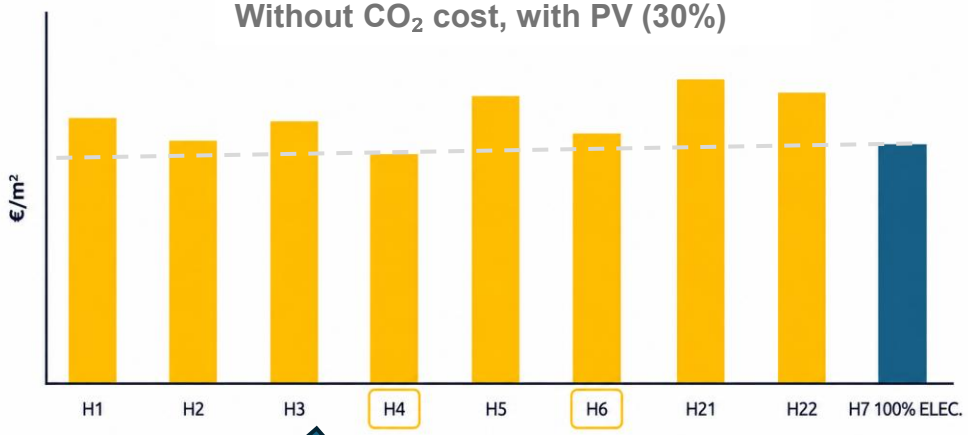
Energy cost (€/m²)

Without CO_2 cost nor PV



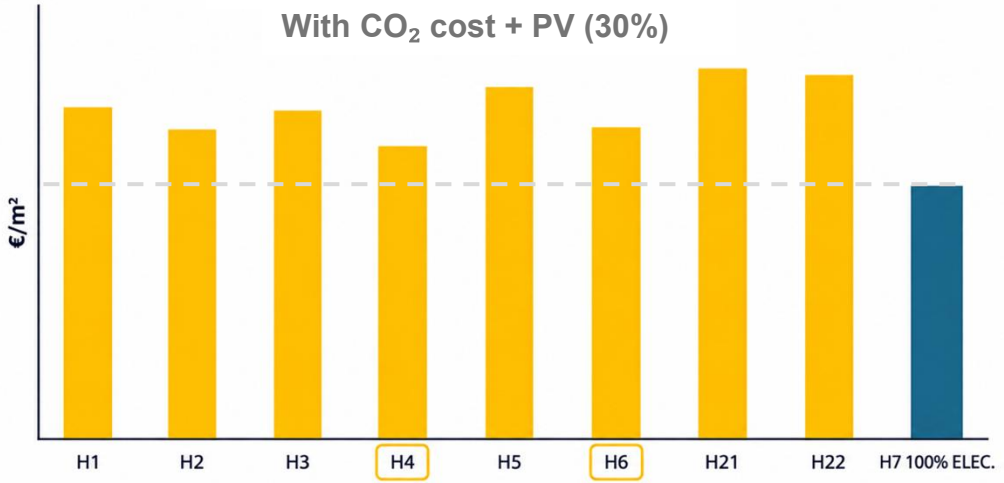
Energy cost (€/m²)

Without CO_2 cost, with PV (30%)



Energy cost (€/m²)

With CO_2 cost + PV (30%)



➢ Potential benefits from energy arbitrage and battery storage are not included

PROJECT SCALABILITY: MAIN CHALLENGES

- R&D&I, applied engineering
- Electric grid infrastructure (+ Capacity + Faster administrative procedures)
- Support for the ceramic industry (+ Subsidies) (Over 300 gas kilns installed today in Castellón)

"Gas kilns have achieved very good efficiency levels after decades of development…"

" but 100% electric kilns have proved to be able to improve this efficiency, and provide new opportunities to significantly reduce production costs…

… and they are ***just beginning*** *their technological improvement curve"*

EQUIPE

Thank you for your attention