HEAT4€

Research into energy technologies for competitive industrial decarbonization through energy flexibility and storage mechanisms

Optimizing Industrial Decarbonization through Energy Flexibility and Storage: The HEAT4€ Project

Consortium

DS INDUSTRY 2026

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Lead partner

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EUSKO JAURLARITZA GOBIERNO VASCO
INDUSTRIA, TRANSIZIO ENERGETIKO ETA JASANGARRITASUN SAILA
DEPARTAMENTO DE INDUSTRIA, TRANSICIÓN ENERGÉTICA Y SOSTENIBILIDAD

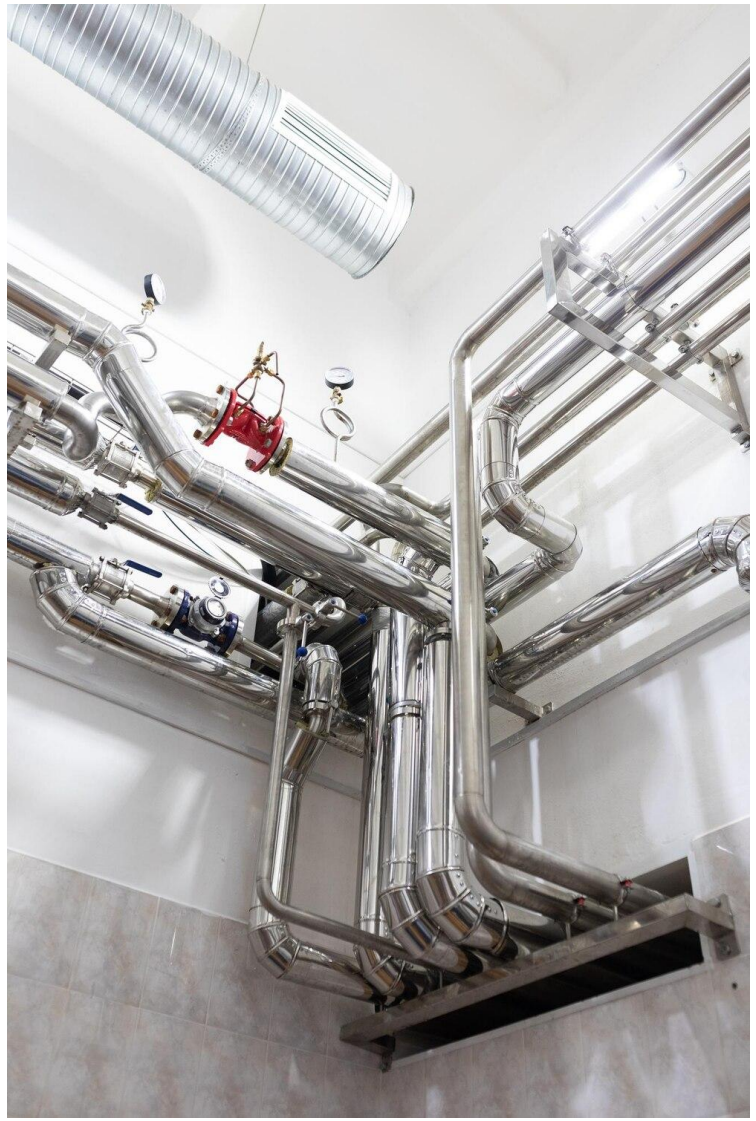
Fondo Europeo de Desarrollo Regional (FEDER)
Una manera de hacer Europa
Eskualde Garapenerako Europar Funtsa (EGEF)
Europa egiteko modu bat

Proyecto subvencionado por el Departamento de Industria, Transición Energética y Sostenibilidad del Gobierno Vasco (Programa HAZITEK 2025) y el Fondo Europeo de Desarrollo Regional (FEDER 2021 – 2027)
Eusko Jaurlaritzako Industria, Trantsizio Energetiko eta Jasangarritasun Sailla (HAZITEK 2025 Programa) eta Eskualde Garapenako Europako Funtsak (EGEF 2021 – 2027) diruz lagundutako proiektua

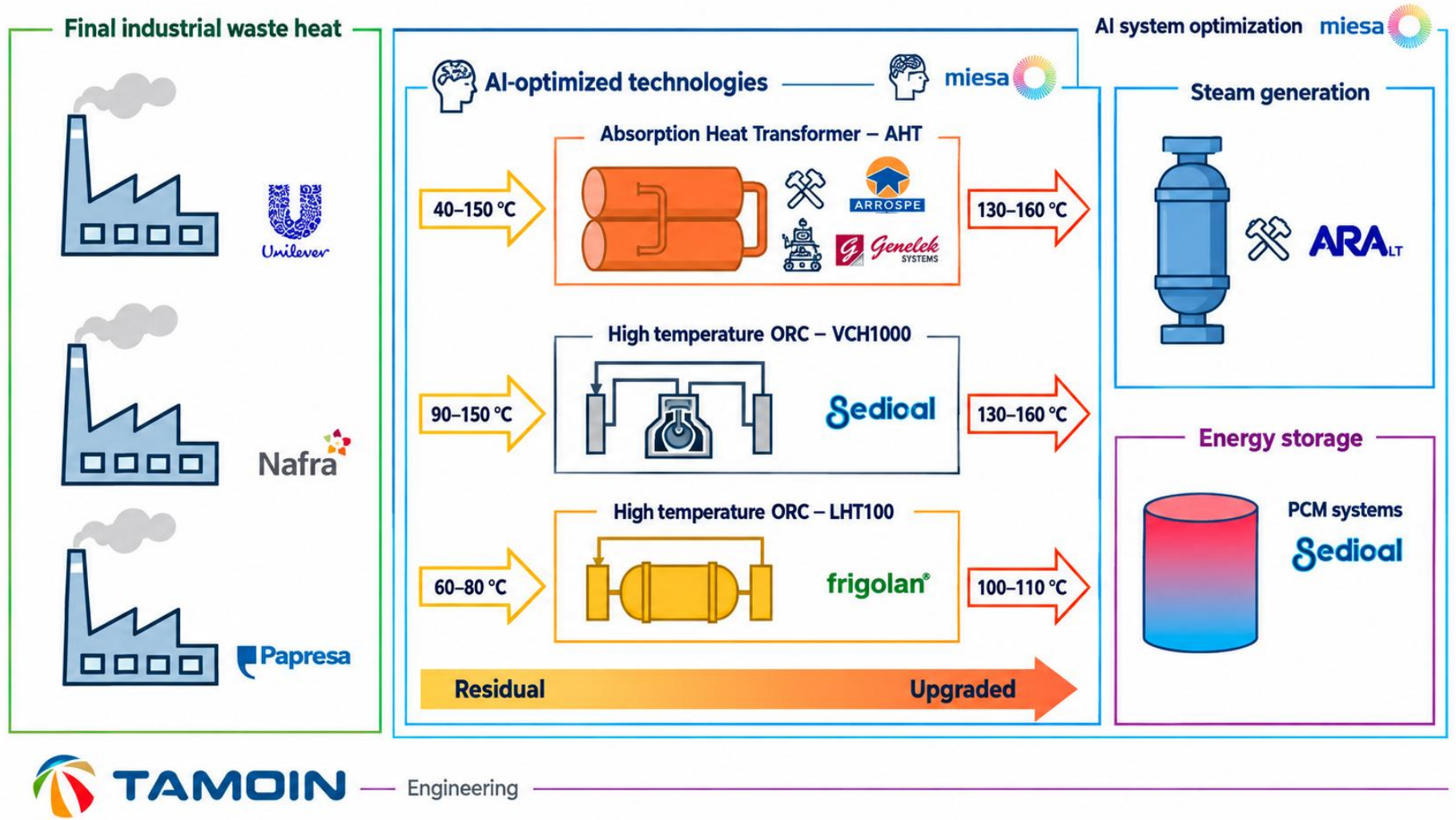
03/11/2026

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    III. Energy storage systems
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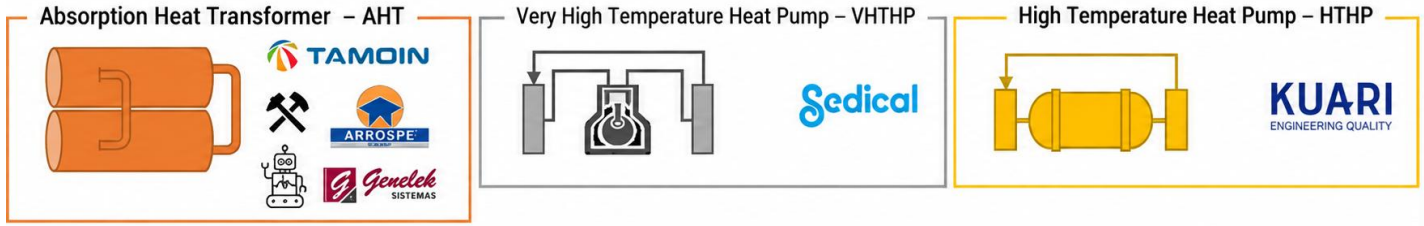
1. Context: BEROA+ Project



BEROA+

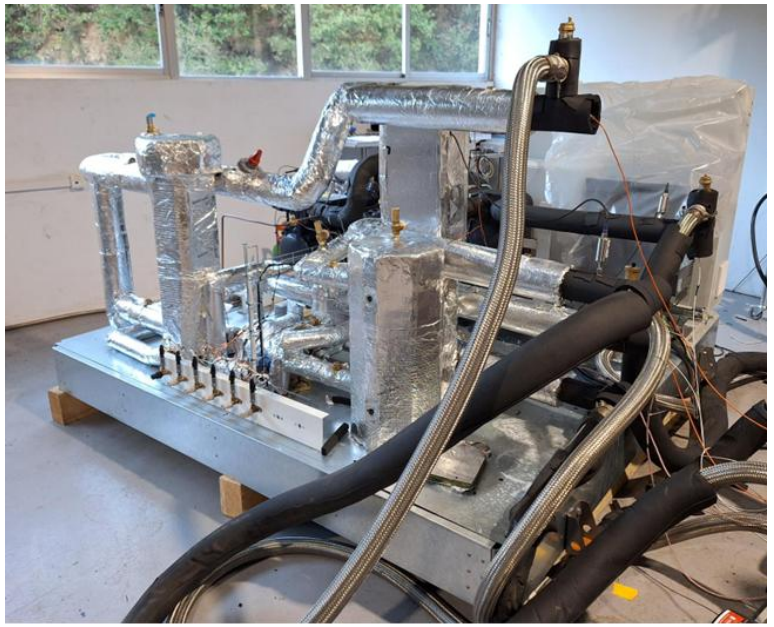
Research into energy technologies for competitive industrial decarbonization through energy flexibility and storage mechanisms

1. Context:

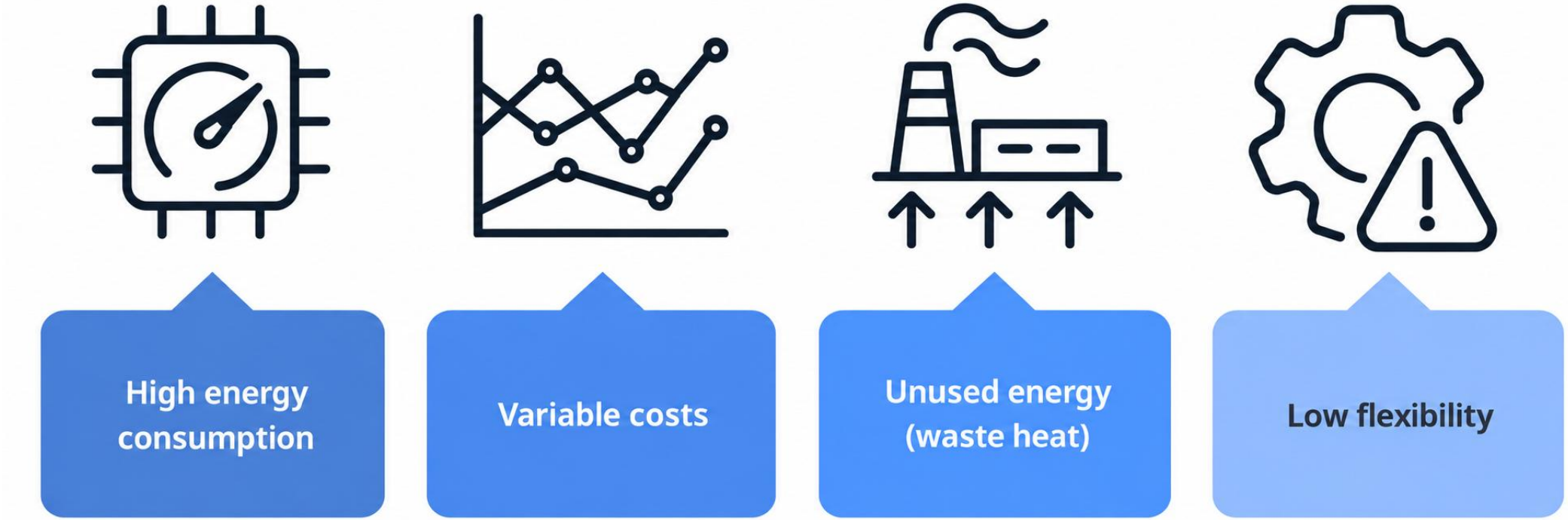

Absorption Heat Transformer – AHT
TAMOIN
ARROSPE
Genelek
SISTEMAS
Very High Temperature Heat Pump – VHTHP
Sedical
High Temperature Heat Pump – HTHP
KUARI
ENGINEERING QUALITY





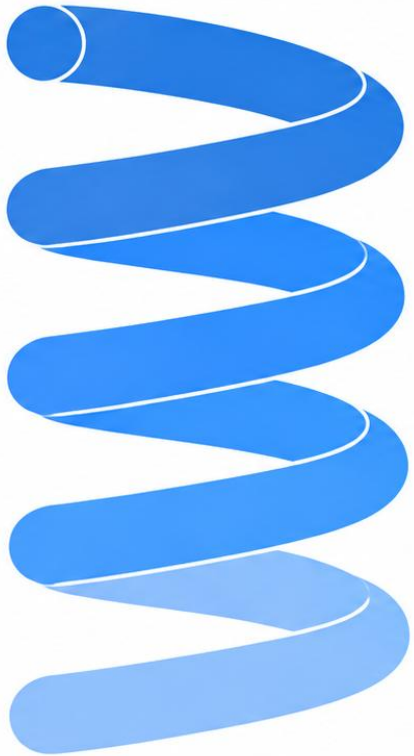


2. Solving a problem in industry



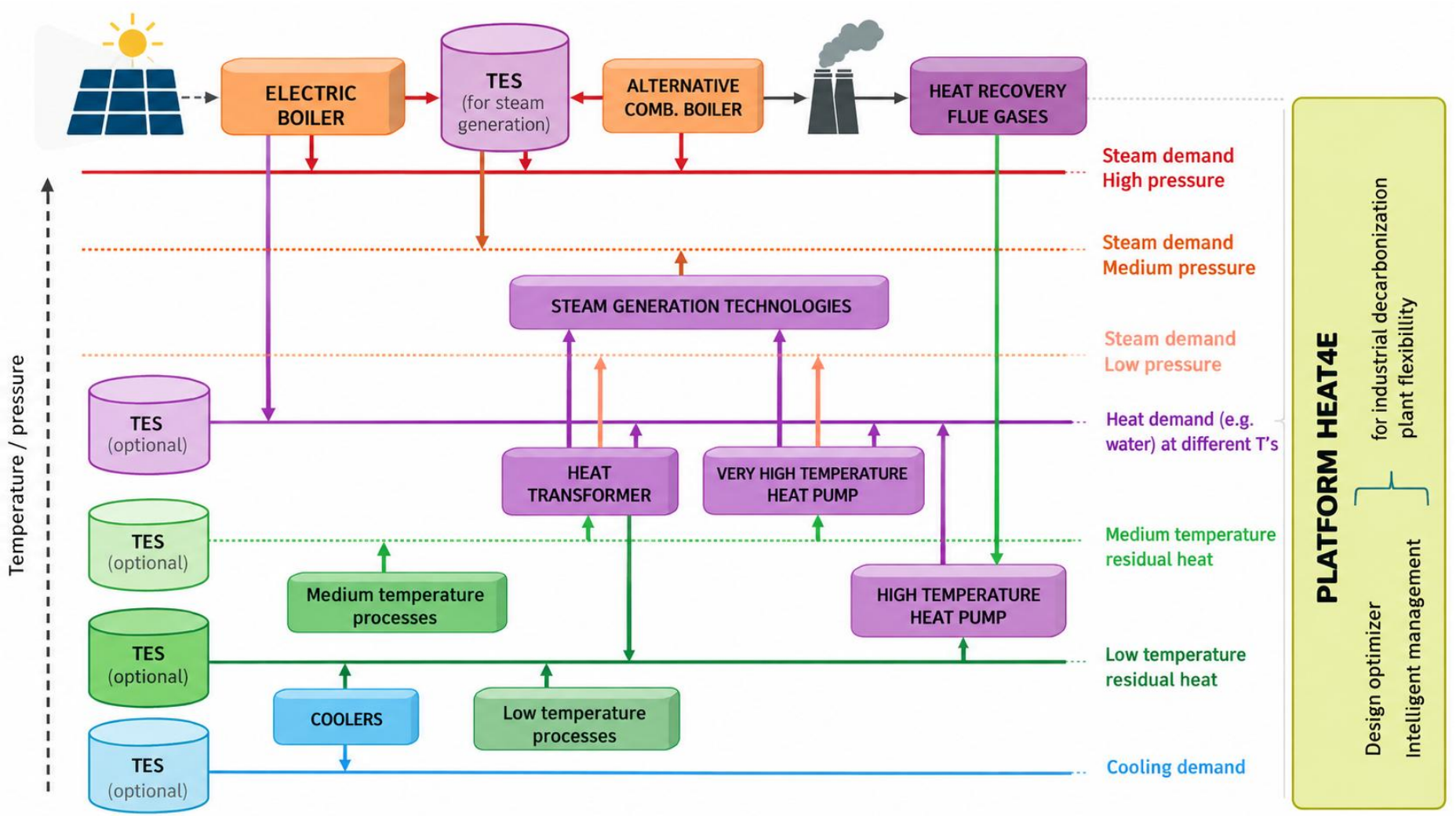
3. Objetive of the project

Optimize industrial energy use to reduce direct costs (€)



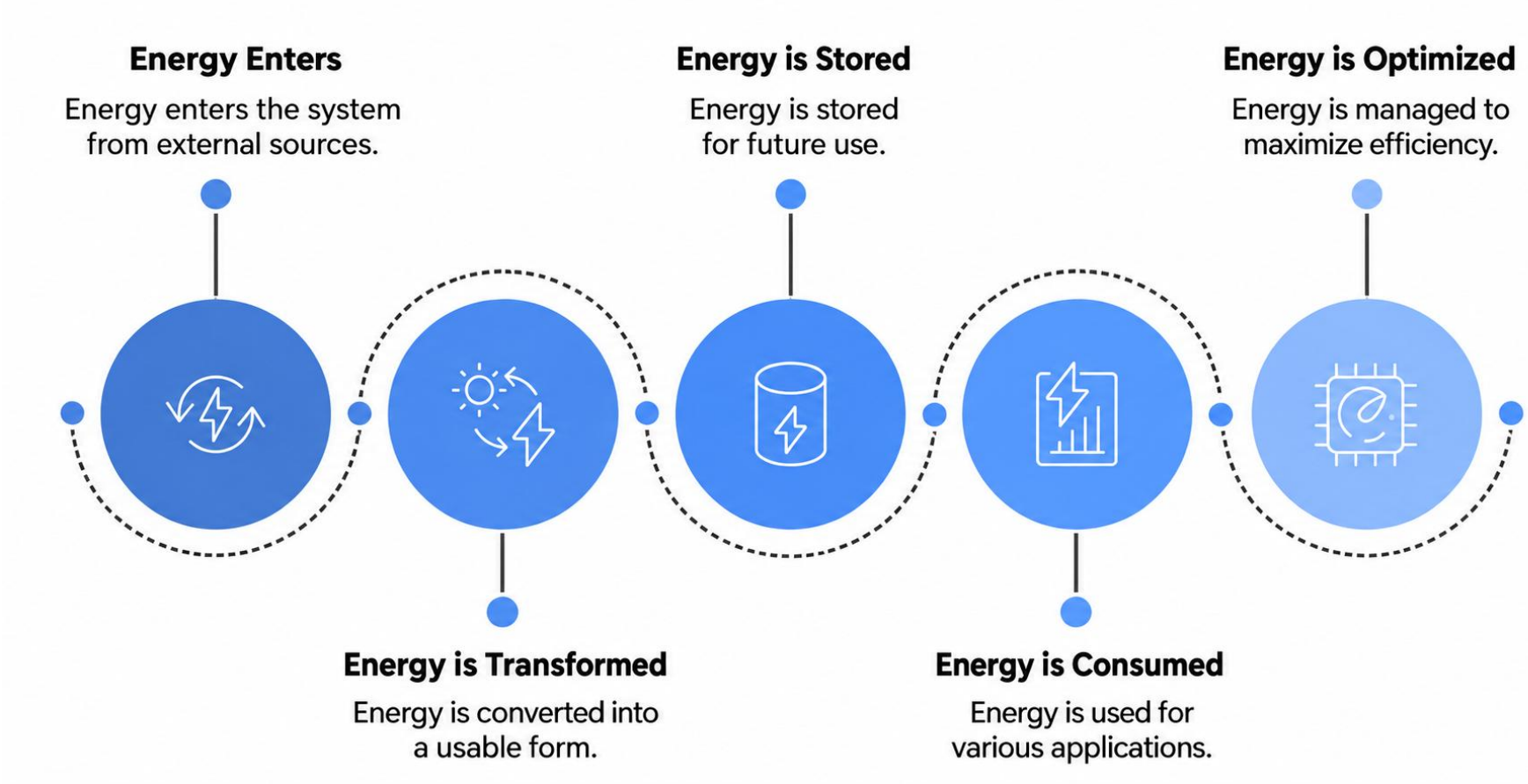
- Recovery of Waste Heat (using heat pumps)
- Energy Storage: thermal (PCM) and compressed air
- Hybridization of Technologies and intelligent management
- Integration of Technologies (electrified technologies, renewable energies, storage systems)

4. Value Chain of the Project



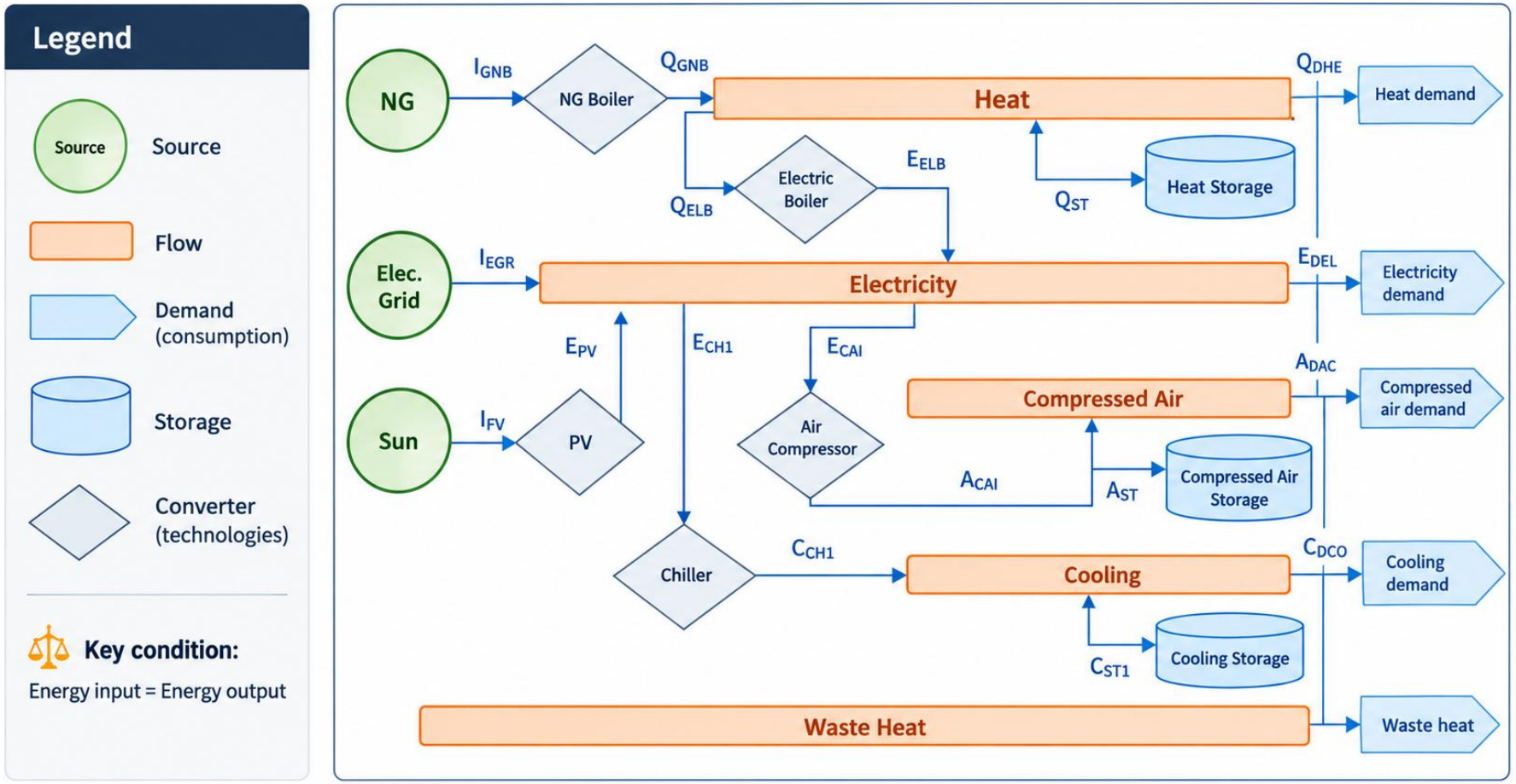
5. Main idea

Energy management as an optimizable system



6. Our technical progress
I. Base models for industrial facilities

Representative energy flows and its interactions



6. Our technical progress
I. Base models for industrial facilities

📊 **Inputs:**



Hora	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Septiembre	Octubre	Noviembre	Diciembre	Sábados, domingos y festivos
00:00 - 01:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
01:00 - 02:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
02:00 - 03:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
03:00 - 04:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
04:00 - 05:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
05:00 - 06:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
06:00 - 07:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
07:00 - 08:00	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6	P6
08:00 - 09:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
09:00 - 10:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
10:00 - 11:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
11:00 - 12:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
12:00 - 13:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
13:00 - 14:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
14:00 - 15:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
15:00 - 16:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
16:00 - 17:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
17:00 - 18:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
18:00 - 19:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
19:00 - 20:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
20:00 - 21:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
21:00 - 22:00	P1	P1	P2	P4	P4	P3	P1	P3	P3	P4	P2	P1	P6
22:00 - 23:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6
23:00 - 24:00	P2	P2	P3	P5	P5	P4	P2	P4	P4	P5	P3	P2	P6

P1 PEAK — Very high price — Most expensive
P2 High price — Expensive
P3 Medium price — Medium
P4 Medium-low price — Medium-low
P5 Low price — Low
P6 OFF-PEAK — Very low price — Cheapest

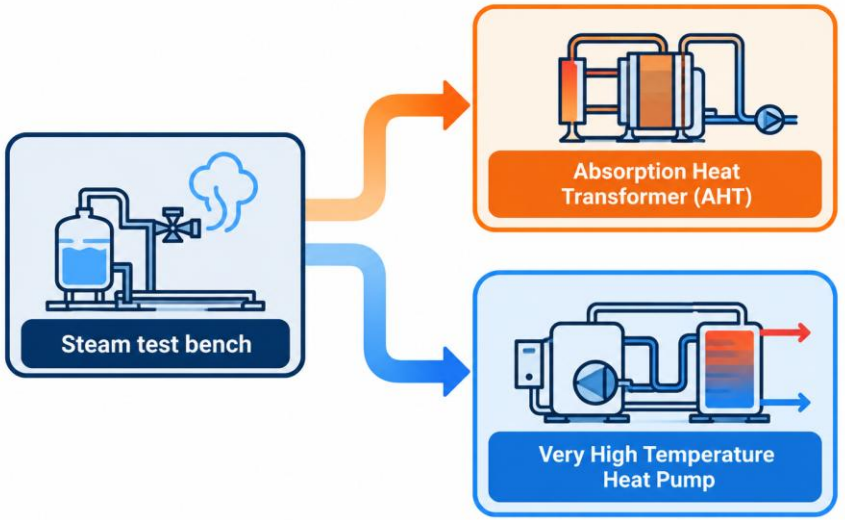
💰 **Outputs:** Costs optimization

6. Our technical progress
II. Industrial waste heat recovery systems

Steam, especially at medium and low pressures, is one of the main energy carriers in industrial processes

Implementation of the hybridization of the steam test bench
Hybrid configuration under implementation



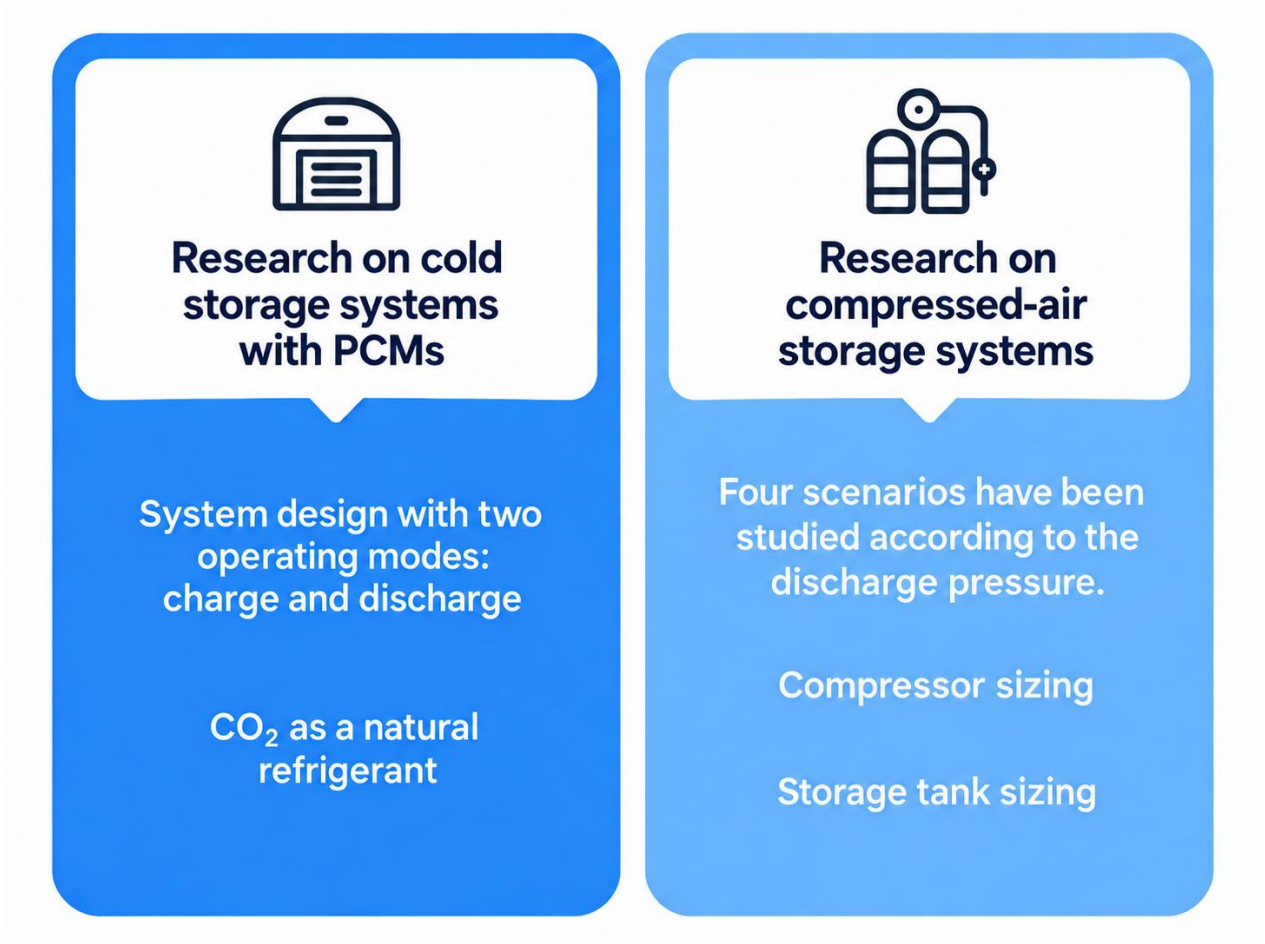


Technical basis for hybridization:
- Operating ranges
- Thermal limitations

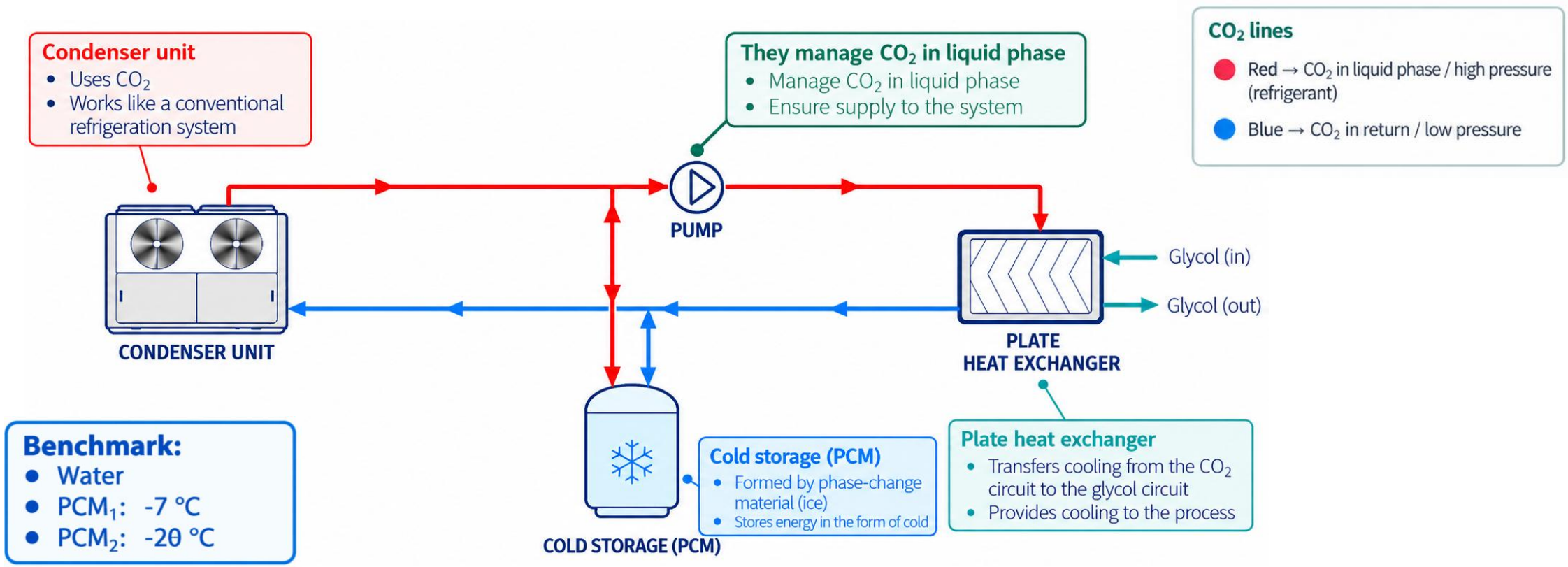


The steam test bench connected to the AHT

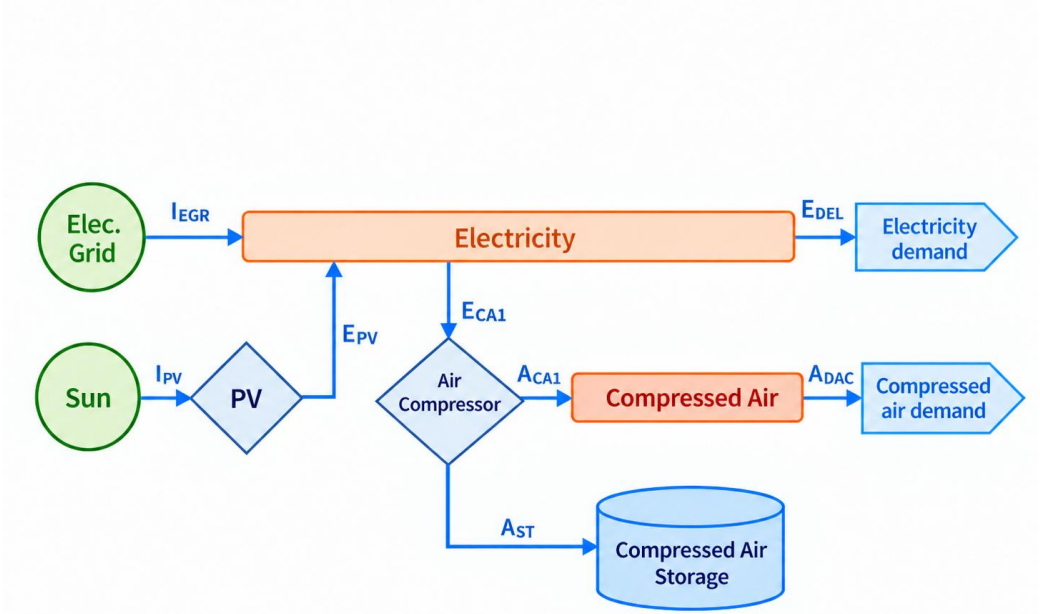
6. Our technical progress
III. Energy storage systems



6. Our technical progress
III. Energy storage systems: Cold Storage using PCMs



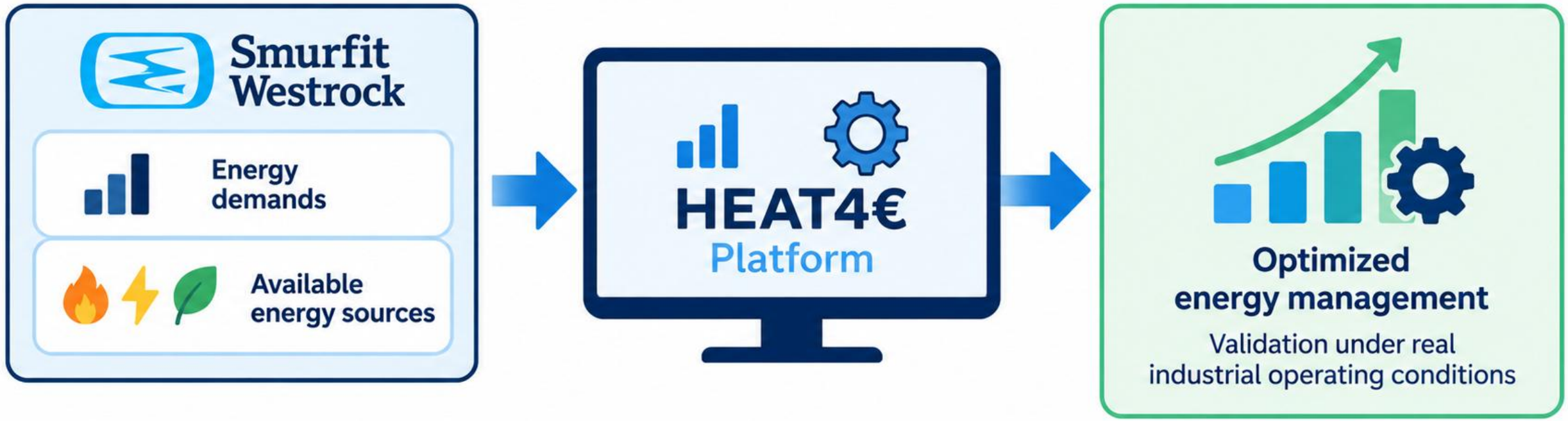
6. Our technical progress
III. Energy storage systems: Compressed Air Storage



4 scenarios according to storage pressure

	Storage pressure (barG)	Pressure demand (barG)	Compressor Power (kW)	Air Demand (Nm^3/h)	Storage time (h)	Volume (m^3)
1	40	29	490.39	1,100	1	116.06
2	60	29	553.22	1,100	1	38.84
3	100	29	579.58	1,100	1	16.67
4	200	29	678.98	1,100	1	6.87

6. Our technical progress
IV. HEAT4€ Digital Tool



tecnalia
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BASQUENERGY CLUSTER

HEAT4€

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Thank you for your attention!

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Consortium

Coordinator

TAMOIN · ABC COMPRESSORS · ekonek Drying Innovation · KUARI · miesa GRUPO · Sedical Técnica para el ahorro de energía · Smurfit Westrock

EUSKO JAURLARITZA GOBIERNO VASCO

European Union
European Regional Development Fund
A way to make Europe

Project subsidised by the Department of Industry, Energy Transition and Sustainability of the Basque Government (HAZITEK 2025 Programme) and the European Regional Development Fund (FEDER 2021 – 2027)
Eusko Jaurlaritzako Industria, Trantsizio Energetiko eta Jasangarritasun Sailak (HAZITEK 2025 Programa) eta Eskualde Garapeneko Europako Funtsak (EGEF 2021 – 2027) diruz lagundutako proiektua