

'BREAKING CO₂ REDUCTION BARRIERS'

EUROPEAN INDUSTRY & ENERGY SUMMIT 2021
ENERGIZING A SUSTAINABLE FUTURE
7-8 DECEMBER 2021 • ROTTERDAM AHOY



Project 6-25 | Community of Practitioners Enabling Industry to Reduce 6 Mton CO₂ emission in '25

Hans van der Spek

→ FME

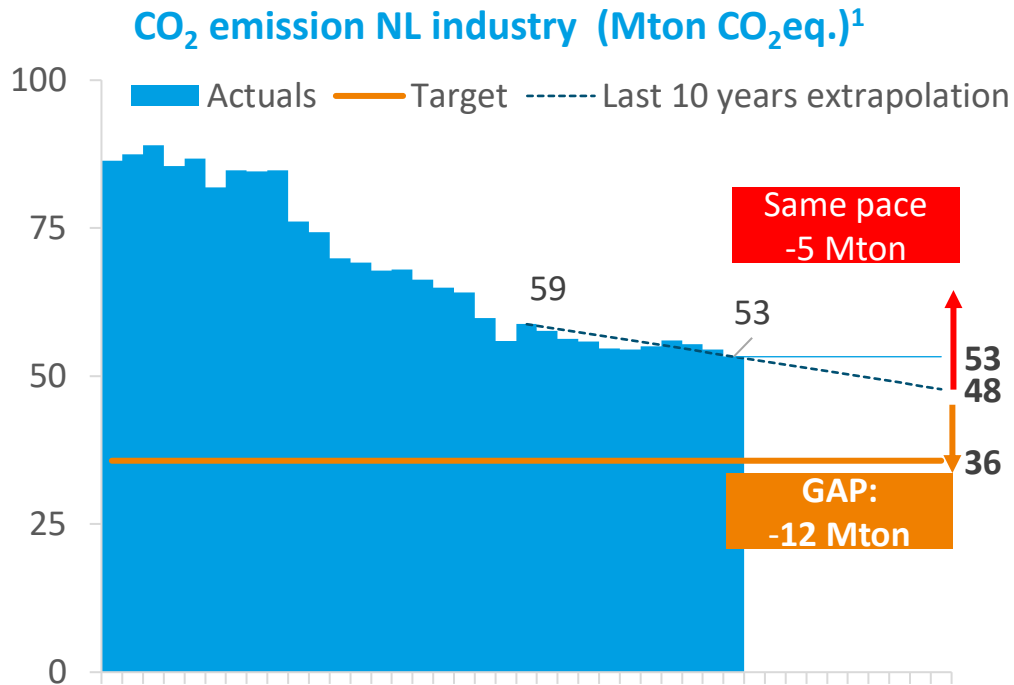
BARRIER 1

Priority



The urgency to accelerate CO₂ reduction is increasing

If we continue the CO₂ reduction pace of the last 10 years, we are 12 Mton CO₂eq. off-target



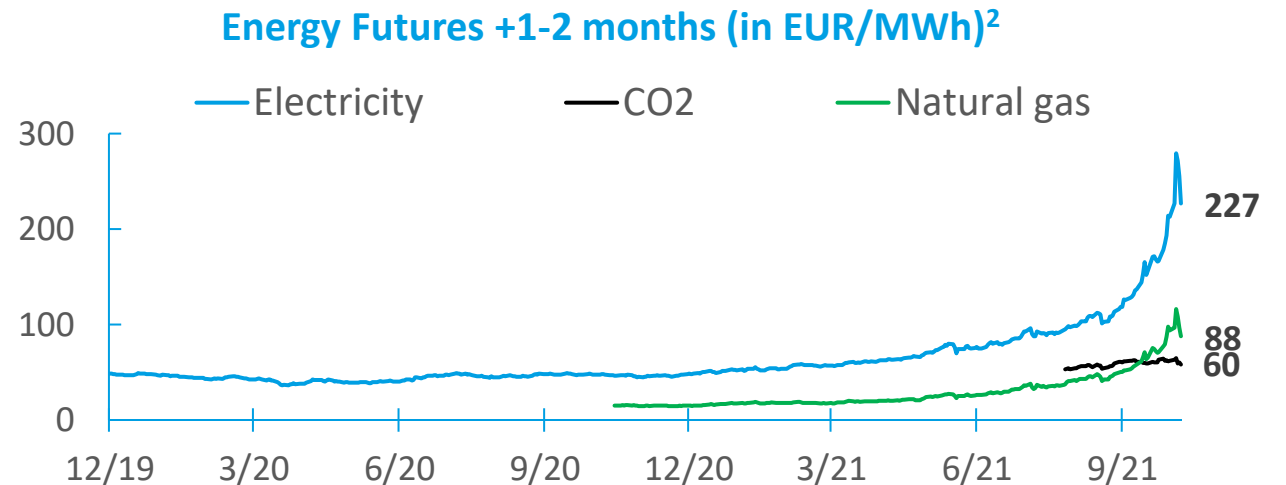
And the urgency is only increasing

1. The CO₂ reduction Target is to increase

EU '30 target :-55% vs. '90

NL target: -40% ; higher target expected

2. Gas & Electricity prices are at an all time high and CO₂ price rising



3. Societal pressure increases: examples TATA & Shell

¹ Source: CBS; ² Source ICE: Electricity (Power base M+2), CO₂ (EUA M+1), Natural gas (Dutch TTF M+1)

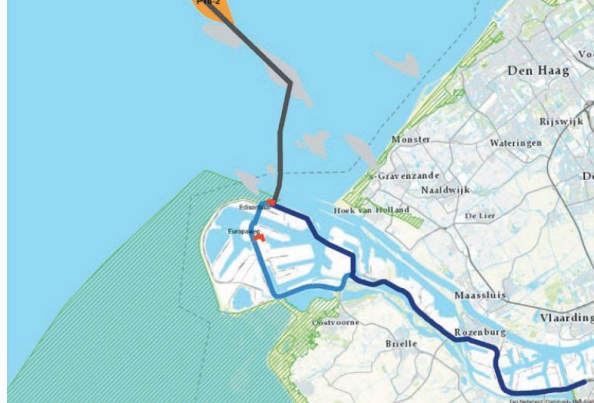
And energy efficiency is the ONLY option in the near term

Electrification



- Infrastructure not ready for large electrification
- Not enough green electricity towards 2030

CCS



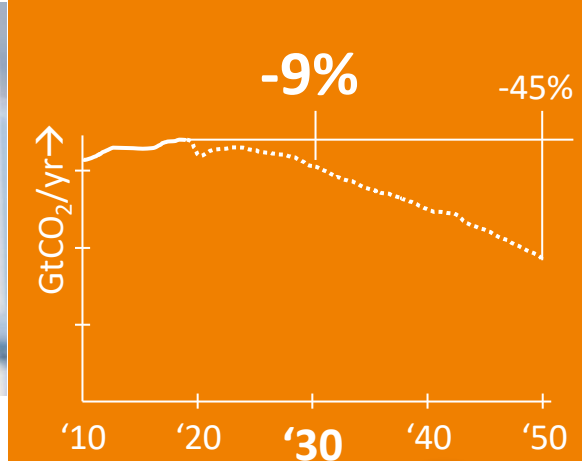
- Infrastructure not ready / available before 2027 or later

Hydrogen



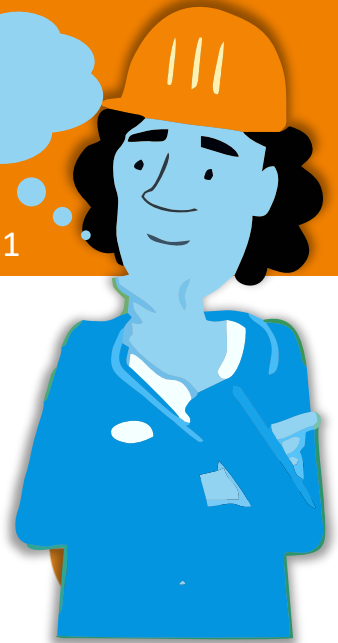
- Faces same barriers as electrification
- Cost green hydrogen not competitive before 2040 (DNV ETO)

World Energy related CO₂

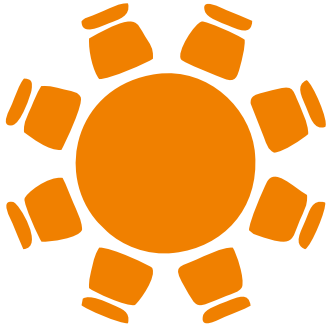


Keep on dreaming

DNV ETO 2021



Project 6-25 helps plant staff to become champions



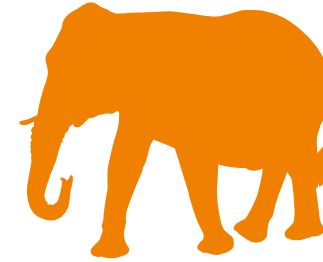
**Board commitment
from the beginning**



**All relevant barriers
addressed:
technological,
financial, capacity**



**Profitability
improvement: short
& long term**



**Scale through a
portfolio of projects:
multi technology,
scalable**



**Unburden
staff**

BARRIER 2

Resource Scarcity

Availability of Skilled staff is the main barrier for Energy Efficiency investments

Source: 2019 European Investment Bank – EIBIS, GOING green



44%



22%



17%



14%



8%



FME



POWERED
BY DUTCH
TECHNOLOGY

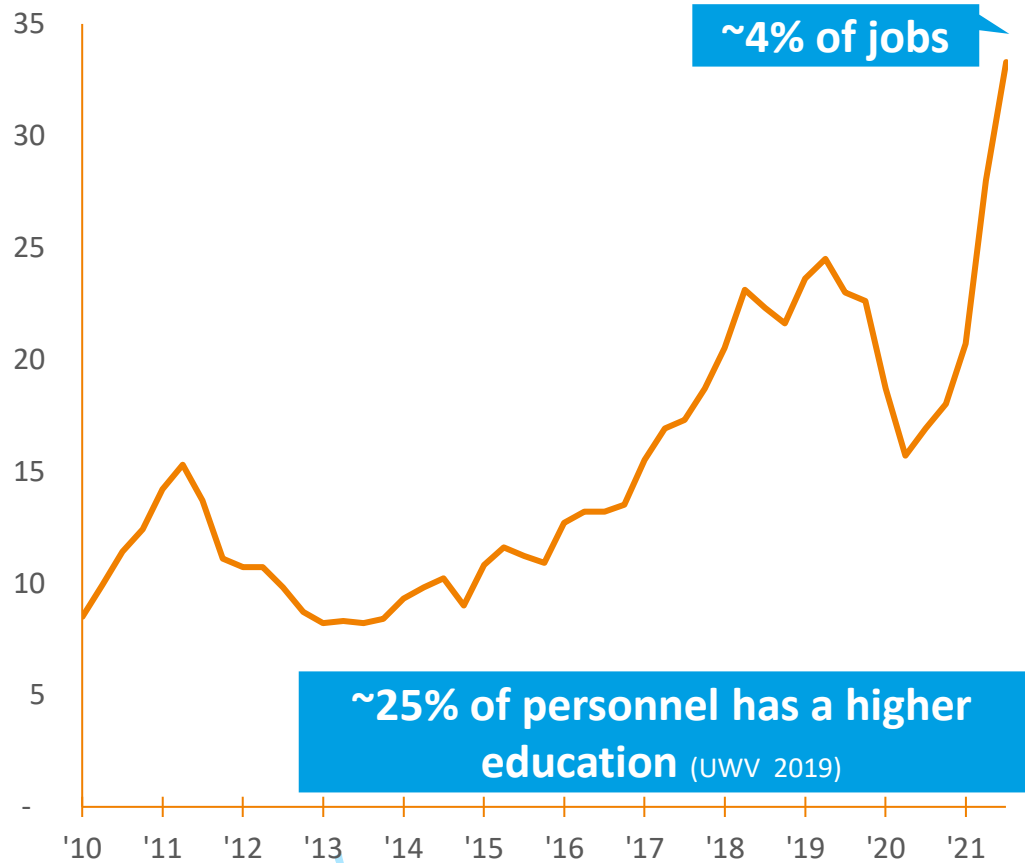
KONINKLIJKE
vemw

Kenniscentrum en belangenbehartiger
van zakelijke energie- en watergebruikers

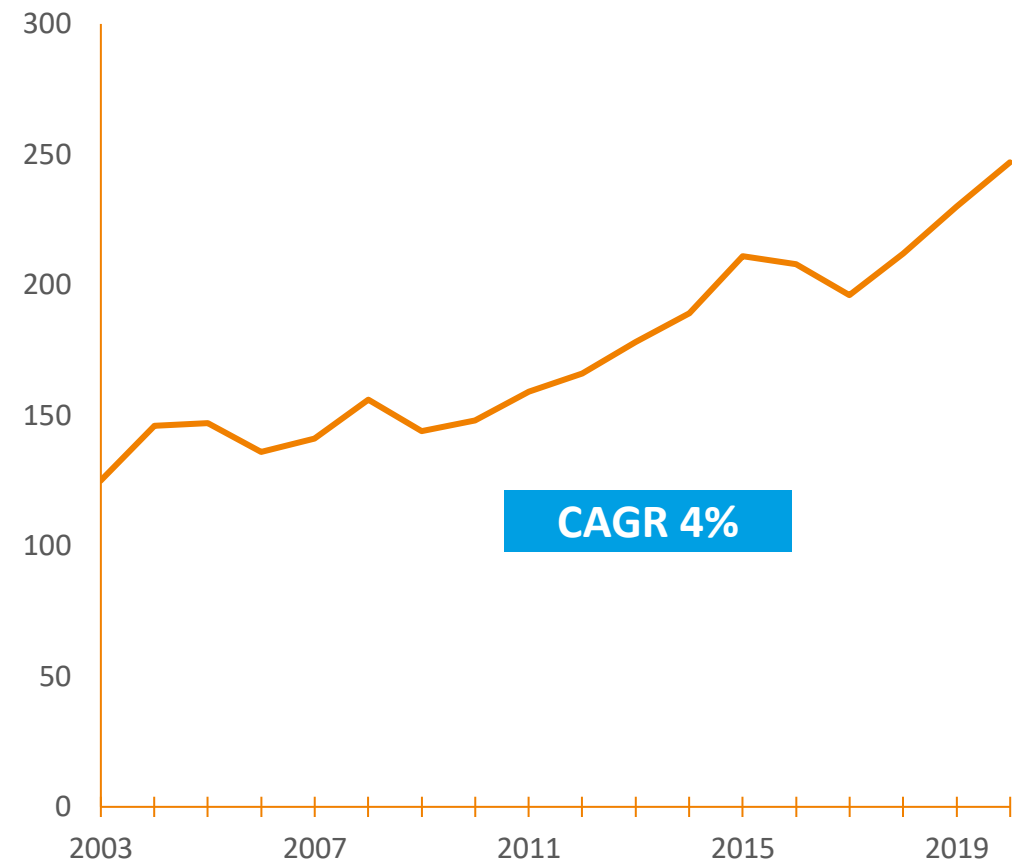


But engineering capacity in the marketplace is not the issue

Open vacancies in Industry *1000 (Source CBS)



people in engineering jobs NL *1000 (Source CBS)



Priority is the cause



Project portfolio Σ S C €

	90	94	85	91	..
	88	91	89	84	..
	87	91	87	83	..
	85	87	83	85	..
	79	80	78	79	..
	76	77	78	73	..
	75	70	73	82	..
Energy Efficiency	66	64	70	64	..
	64	60	68	64	..
	62	62	66	58	..
	60	55	55	70	..
	59	61	63	53	..
	51	47	47	59	..
	50	45	55	50	..
Energy Efficiency	48	44	47	53	..
	46	47	42	49	..
Energy Efficiency	45	44	44	47	..
Energy Efficiency	34	31	33	38	..
	31	31	29	33	..
Energy Efficiency	30	34	33	25	..
Energy Efficiency	29	27	25	35	..



And we solve it!

Energy Efficiency	29	27	25	35	..
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Project portfolio Σ S C €

	90	94	85	91	..
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Energy Efficiency	30	34	33	25	..
Energy Efficiency	29	27	25	35	..

1. Expertise to make existing projects more attractive

2. Identify new projects that meet the attractiveness criteria

3. Facilitate onboarding of external staff (TSE)

4. Capacity of P6-25 team & 37 partners

5. Financial solutions to avoid investment

POWERED BY DUTCH TECHNOLOGY

KONINKLIJKE
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Kenniscentrum en belangenbehartiger van zakelijke energie- en watergebruikers



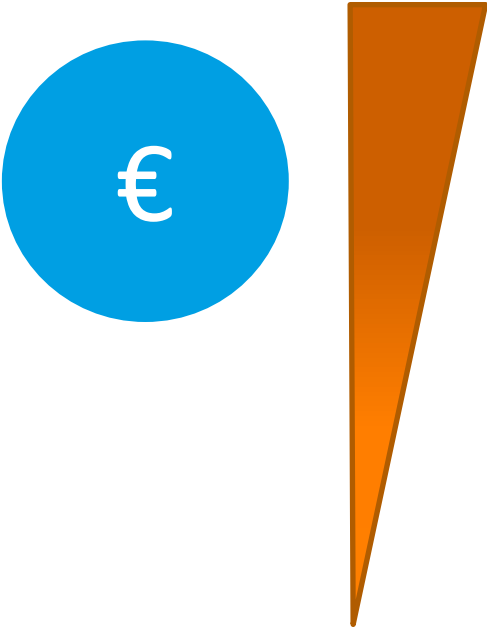


BARRIER 3

Business case Attractiveness

Businesscases for energy efficiency projects are considered not attractive enough

Barriers to overcome

- 
1. Higher priority for production continuity projects (safety, maintenance, uptime, production volume)
 2. CAPEX restrictions
 3. Minimum financial project requirements (KPIs)
 4. Off-balance vs on-balance
 5. Lack of confidence in cost-effectiveness
 6. Limited knowledge and resources for energy efficiency
 7. Complex to implement



P625 facilitates better decision making

1 Better (price) data / assumptions in the businesscase

Non-energy benefits included

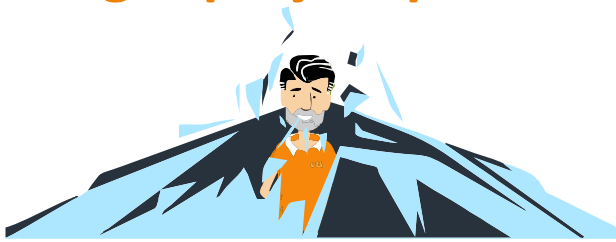
- Cost savings on: Emissions, Waste, Maintenance
- Risk reduction: Safety, Liabilities, License to operate
- Value increase through: Availability, Throughput, Quality

3 Higher feasibility of subsidies through early involvement RVO

Right financial evaluation KPI

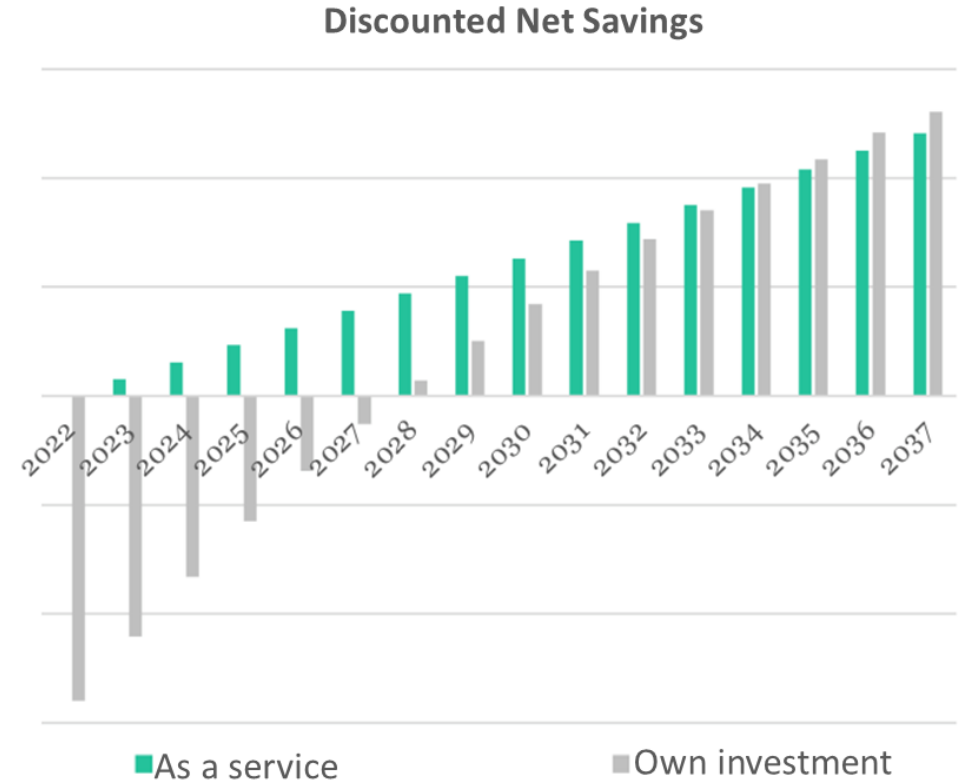
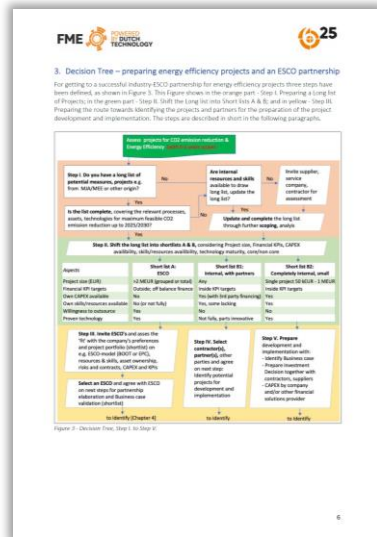
- Investment size
- Cash flow balance
- Time horizon and Risks
- Other revenues: Subsidies
- Mutually exclusive projects

5 Right project prioritisation process



P625 facilitates financial solutions for energy efficiency projects

1. On/Off balance financing solutions
2. ESCO partnerships, with performance guarantees
3. Improved financing decision making



Source: Adven



BARRIER 4

Solution Applicability



Barrier 4: Solution Applicability

Efficient electric motor systems

Reduction:
~240 kton CO₂/yr

Technology provider	Efficient motors	Industrial lubricants	Motor drive & control	Technology offered
ABB	•		•	* Direct drive cooling tower motor
	•			* Low voltage IE5 synchronous reluctance motors, Low voltage permanent magnet motors
			•	* Ultra low harmonic drives
			•	* Variable speed drives
Dex Oil		•		* Lubrication of rotating and hydraulic equipment
KSB Nederland	•			* Supreme IE5 pump motors
Zytec			•	* Contact free magnetic coupling

Residual heat recuperation & Heat storage & Efficient burners

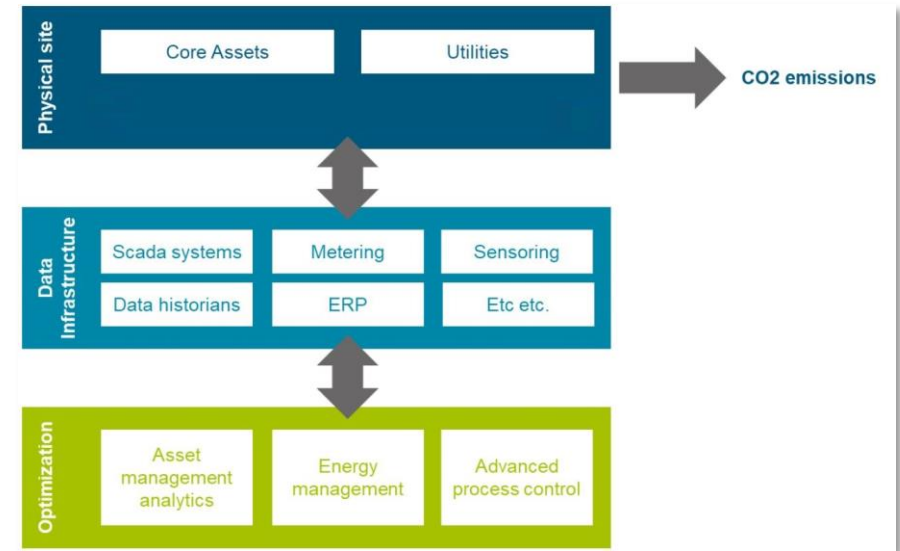
Reduction:
~ 1250 kton CO₂/yr

Technology provider	Heat exchangers	Heat pumps / MVR / heat transformers	Heat recovery from flue gas or dryers	Heat storage	High efficiency burners	Technology offered
A. de Jong Group					•	* Air preheated combustion
Bronswerk heat transfer		•				* Conventional heat pumps, MVR
Carrier		•				* Hot water driven absorption chillers
Duiker Combustion Engineers					•	* Furnace & fired heater optimization
EnergyNext				•		* Thermal battery system for energy storage
GEA		•				* Conventional heat pumps, MVR, ORC systems
Heat Matrix Group	•		•			* Corrosion resistant flue gas heat exchanger
IBK		•				* Conventional heat pumps, absorption chillers
Klaren International	•					* Self-cleaning fluidized bed heat exchanger
Qpinch		•				* Chemical heat transformer
RGS development		•				* Direct conversion of waste heat (>700°C) emitted from a material into electricity
Siemens Energy		•				* Conventional heat pumps, MVR
Siemens Gamesa Renewable Energy				•		* Electro thermal energy storage
Spilling technologies		•				* MVR
VDL Energy Systems		•				* Thermo-acoustic waste heat (160°C) driven chiller



Barrier 4: Solution Applicability

Automation & Digitalization



Reduction:
~ 925 kton CO₂/year

Technology provider	Smart sensors & metering	Asset management analytics	Industrial energy management	Advanced process control	Technology offered
ABB	•				* Non invasive temperature sensor, CO2 analyzer
Control Care		•		•	* Condition monitoring for powertrains
Emerson Automation Solutions		•			* Turbomachinery complete control systems
		•			* Steam trap monitoring
			•		* Equipment performance optimization
		•			* Self learning real-time energy management information system
			•		* Air compressor system monitoring, Flare system monitoring
				•	* Boiler optimization, steam header optimization, Process unit energy optimization
EnerGQ		•	•		* A.I. process performance optimization
Energy21			•		* Utility management system
IFM electronic		•			* Compressed air monitoring
KSB Nederland		•			* Pump system optimization
			•		* Sonolyzer analysis App
	•				* Pump meter
Semiotic Labs		•			* Predictive maintenance solution for AC motors and rotating equipment
Sensorfact			•		* Energy management systems (complete with sensors, software, analysis, advice)
Sorama	•				* Handheld or fixed-installed (ultra)sonic acoustic camera
Yokogawa Europe				•	* Advanced process control



Barrier 4: Solution Applicability

Separations

1. Membrane separation of H₂ from hydrocarbons
2. Membrane separation of N₂ / O₂ from air
3. Pervaporation-based ethanol drying

Reduction:
~ 77 kton CO₂/yr

Power & heat flexibility

Reduction:
~ 370 kton CO₂/yr

Technology provider	Electric storage systems	Gas turbine retrofit for high H ₂ fuels	H ₂ combustion	Hybrid boiler	Technology offered
A. de Jong Group			•		* Flexible combustion of hydrogen rich fuels
Eaton Industries	•				* Effective UPS (uninterrupted power supply) via batteries & electricity grid peak shaving
HANWA - Thomassen		•			* Hydrogen gas turbine retrofit combustor
S4 Energy	•				* Electrical storage systems
Stork Thermeq				•	* Hybrid boiler
Standard Fasel				•	* E-boiler
Technip Energies			•		* Large scale vortex burner for 100% firing of hydrogen



Barrier 4: Solution Applicability

Unique features

1. Broad technology portfolio

- No mainstream, yet proven technologies
- Can be implemented before 2025

2. Free guidance/support from the P6-25 platform

- Help with the initial scoping by independent P6-25 experts (selection of ideas to be investigated further in feasibility studies)
- Guidance during feasibility studies

3. Accelerated route to RVO subsidy programs

4. Financing:

- ESCO or
- pure financial partner



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