

Industry decarbonization

The challenge of the best roadmap

November 2022



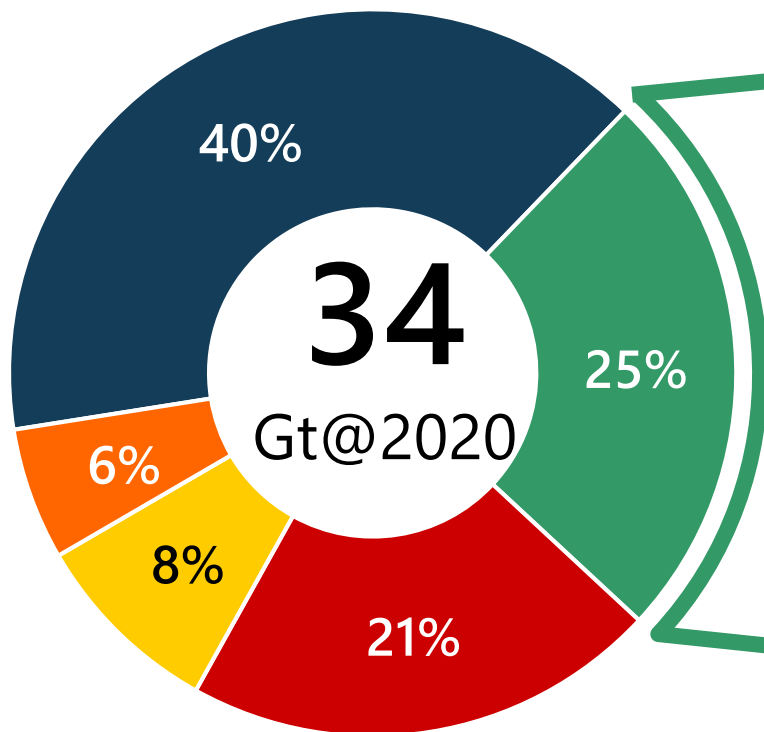
TECNICAS REUNIDAS

Supporting your decarbonization journey

— Dealing with industry emissions represent a big stake towards the Net Zero target. And all industries are facing market, legislation or administrations new requirements...

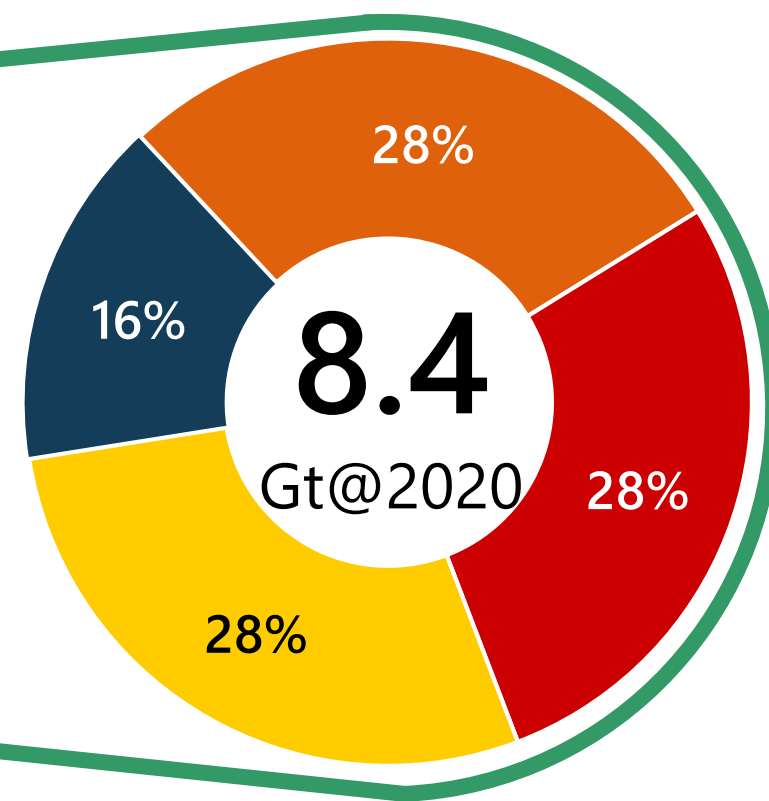
CO₂ total emissions - 2020

International Energy Agency (2021), Net Zero by 2050, IEA, Paris



CO₂ industry emissions - 2020

International Energy Agency (2021), Net Zero by 2050, IEA, Paris



- Electricity
- Industry
- Transport
- Buildings
- Others

- Chemicals
- Steel
- Cement
- Otros

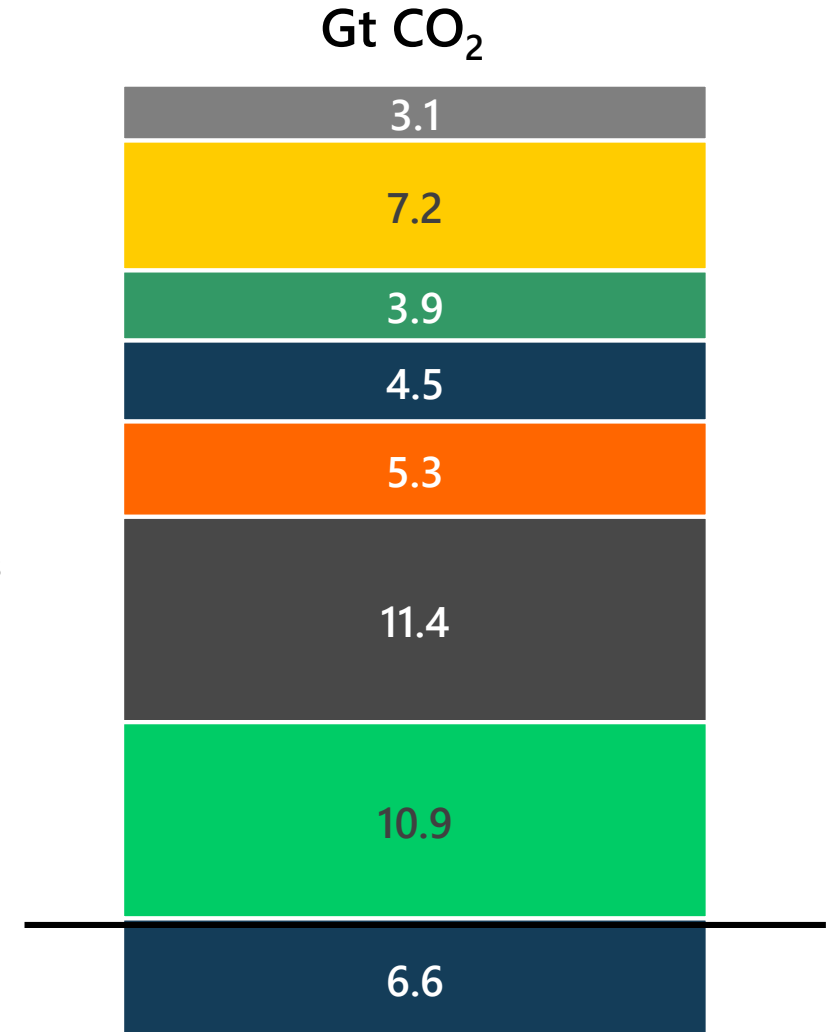
— Low carbon energy solutions are multiple and most probably a combination of them will make the optimum solution for certain industry actors



53

Gt CO₂ avoided by 2050
(Net Zero 2050. International Energy Agency)

- Other
- CCS
- Bioenergies
- Hydrogen
- Technology improvements
- Electrification
- Renewable energy
- Energy efficiency



— The industrial customers are therefore now facing the need to respond to important and very complex questions, likely with multiple possible answers.

They face an important challenge in defining the “Best Possible Roadmap”



- When to invest?
- In what to invest?
- How to integrate the new investments with the current assets...or replace?
- Is the value chain of the solution mature enough?
- What is the level of robustness or resiliency of the different alternatives?
- ...

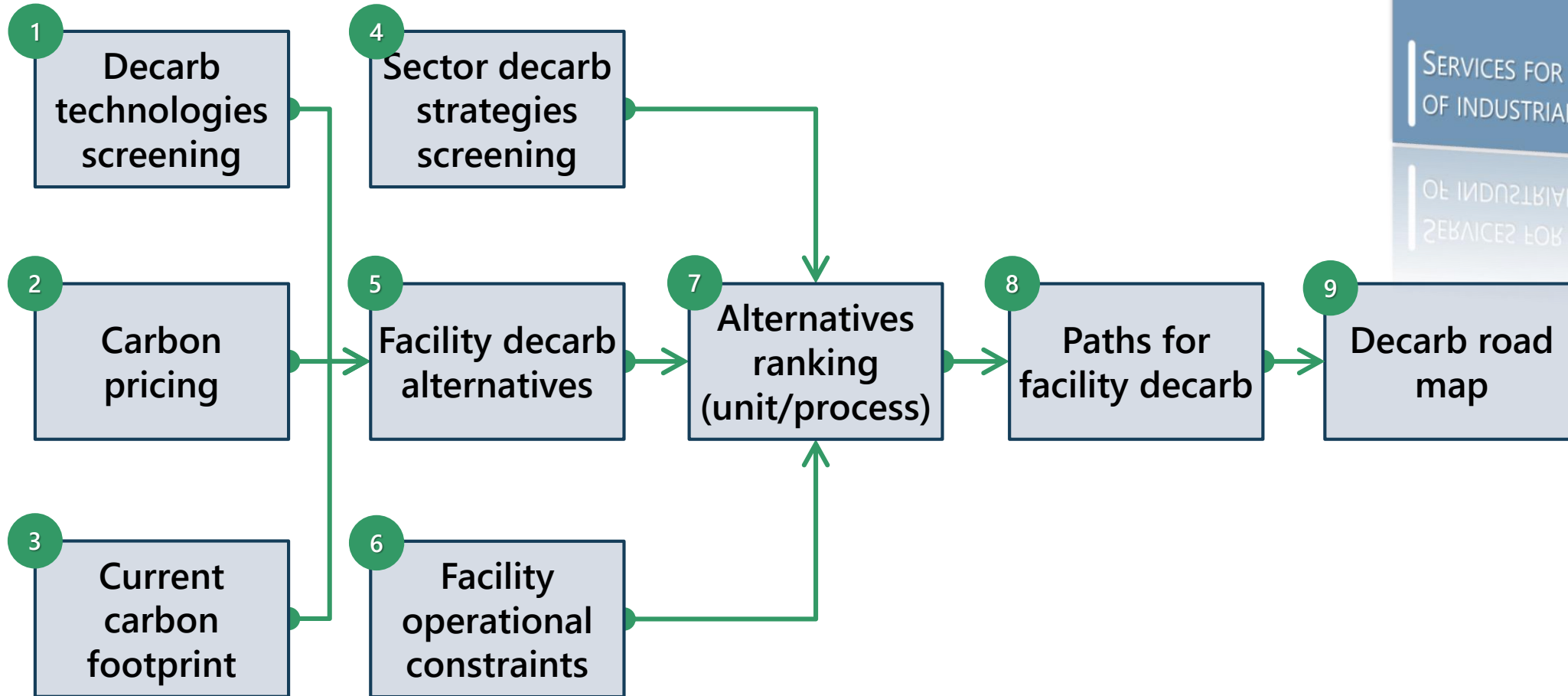


- ✓ Long term availability (quality and quantity) of raw materials & feedstocks. Market perspectives.
- ✓ Tech maturity and potential evolution (performance and pricing).
- ✓ Supply chain distress.
- ✓ Integration operational challenges. Renewable power intermittence management..
- ✓ CAPEX and OPEX. Evolution perspectives.
- ✓ CO₂ market Price evolution
- ✓ Regulatory frameworks
- ✓ Financing considerations

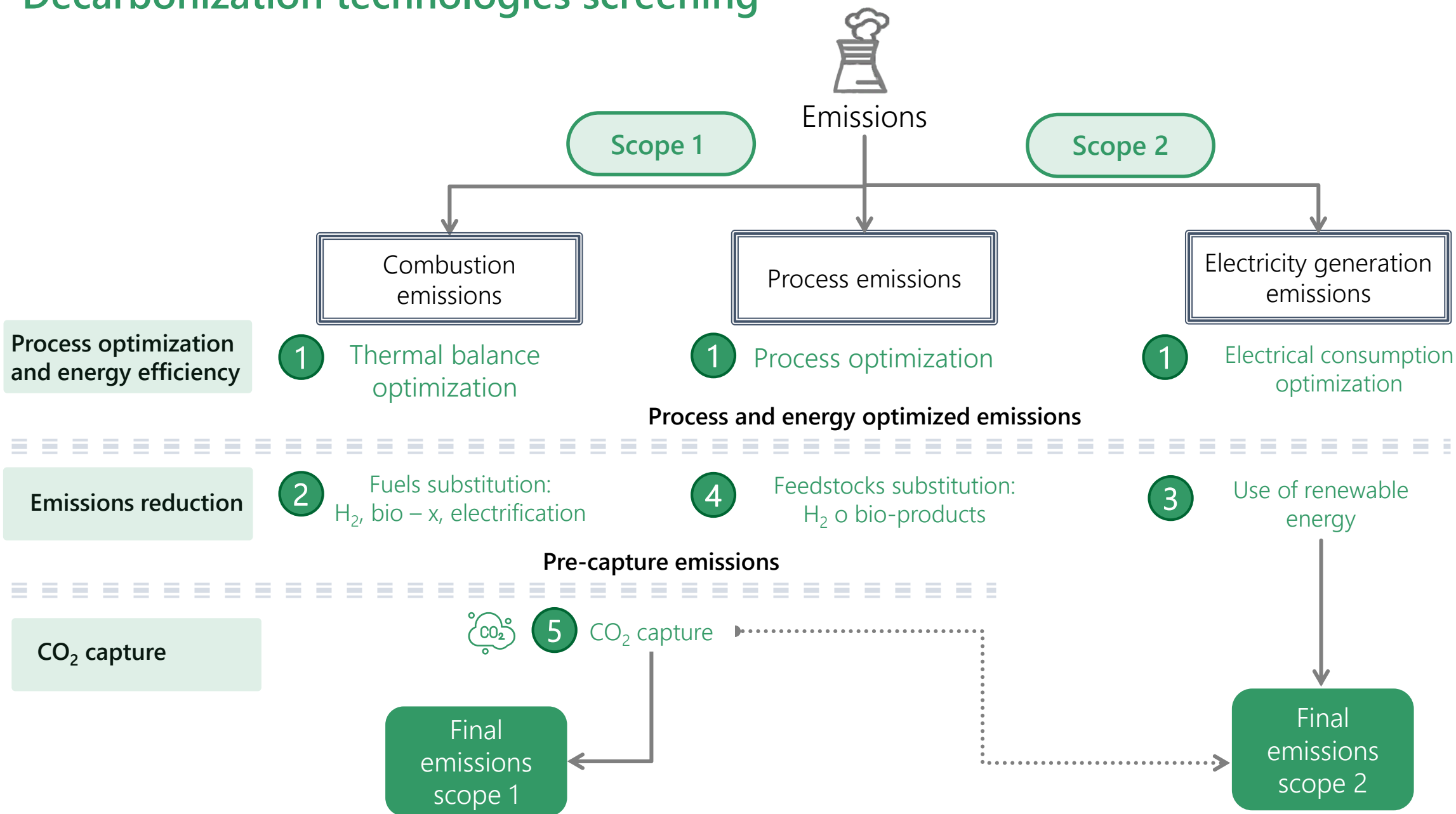
....

Need of a methodology to define the “best roadmap” of an industrial facility

Defining a credible and feasible decarbonization strategy ... which minimizes the impact on current operations ... maximizes the net present value of the investment ... and allows the achievement of decarbonization goals.

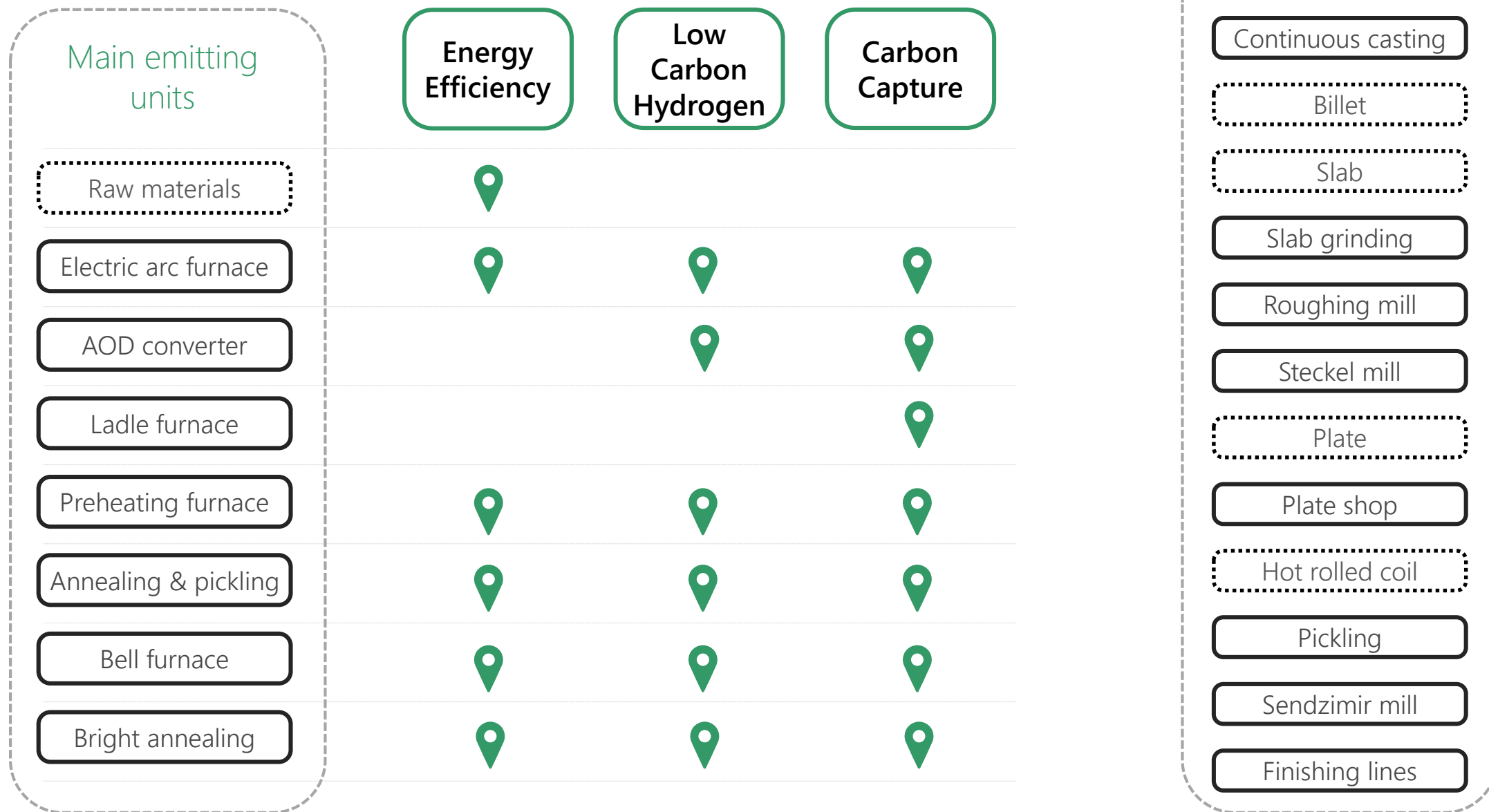


Decarbonization technologies screening



Case study of an energy intensive industry process facility

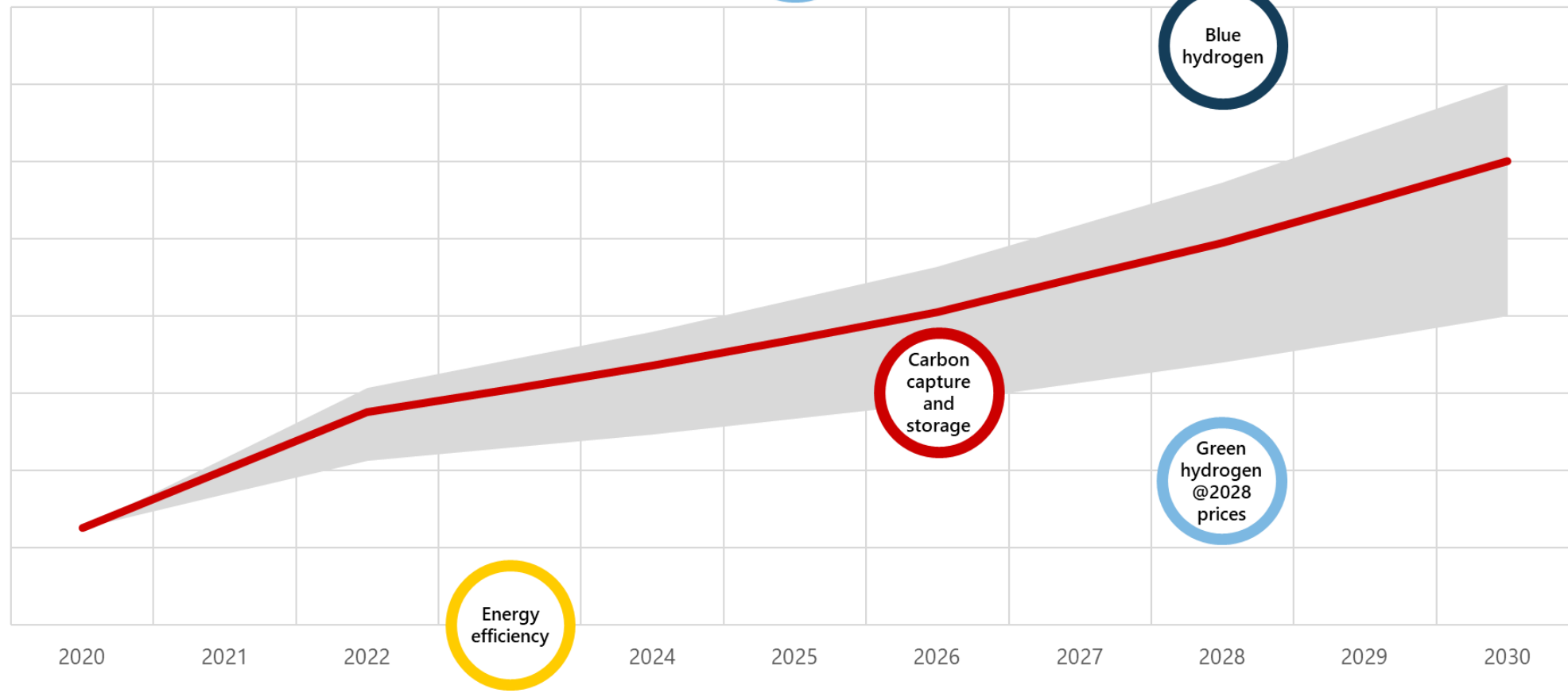
Alternatives comparison



Case study of an energy intensive industry process facility

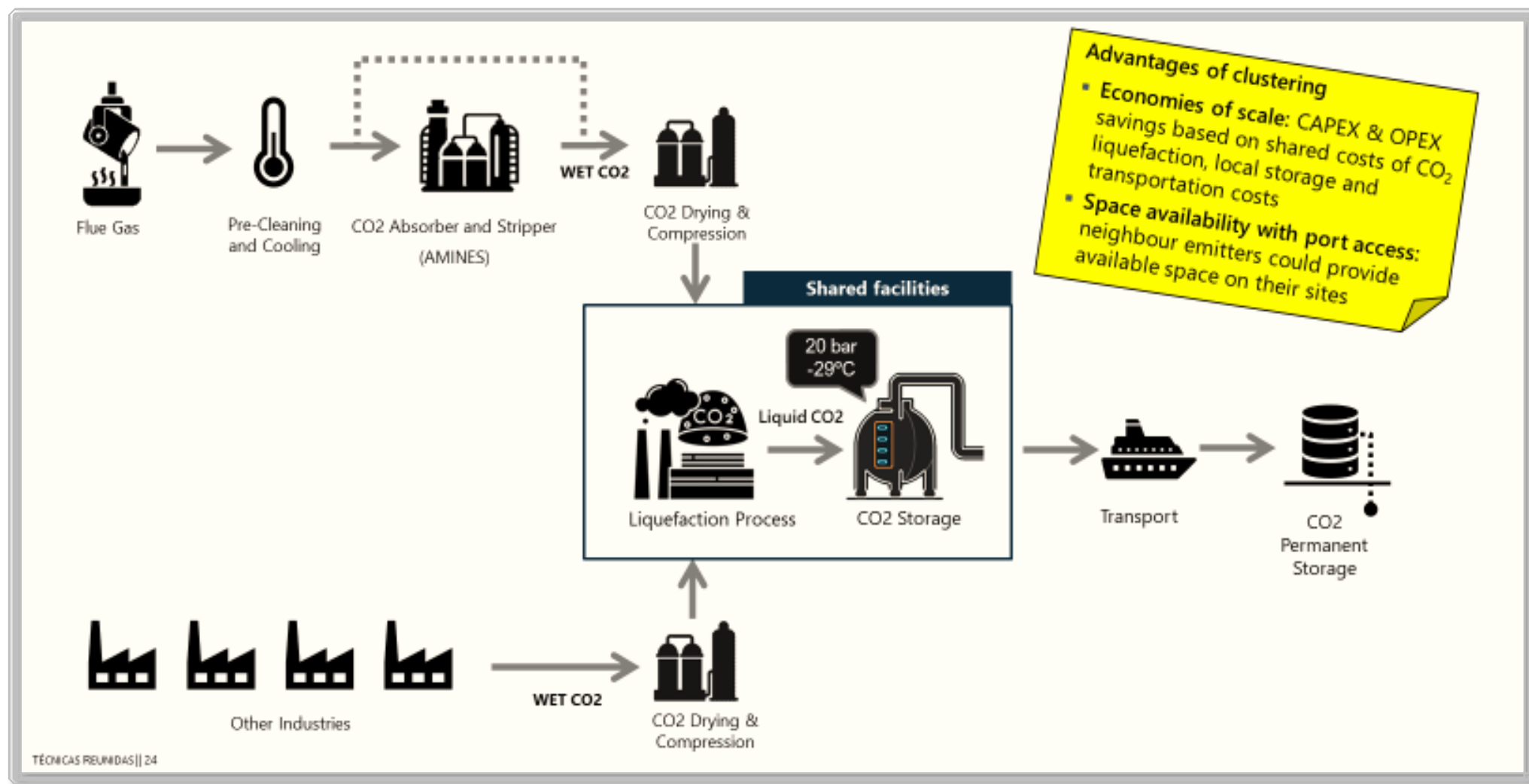
Alternatives comparison

Forecasts of carbon prices
€/ton CO₂



	Eficiencia energética	Secuestro de carbono	Hidrógeno azul	Hidrógeno verde @ precios 2021	Hidrógeno verde @ precios 2028
Año de implantación	2023	2026	2028	2025	2028
Inversión	1.1 x	1.9 x	2.4 x	2.0 x	1.0 x
Rentabilidad	32%	--	--	--	--
Coste de abatimiento, €/ton	--	1.9 x	4.9 x	5.5 x	1.0 x
Incremento precio producto	--	0.9%	1.2%	1.5%	0.4%
Emisiones alcance 1 remanentes, kton/año	100%	6%	6%	0%	0%

+ Going beyond the fence: clustering



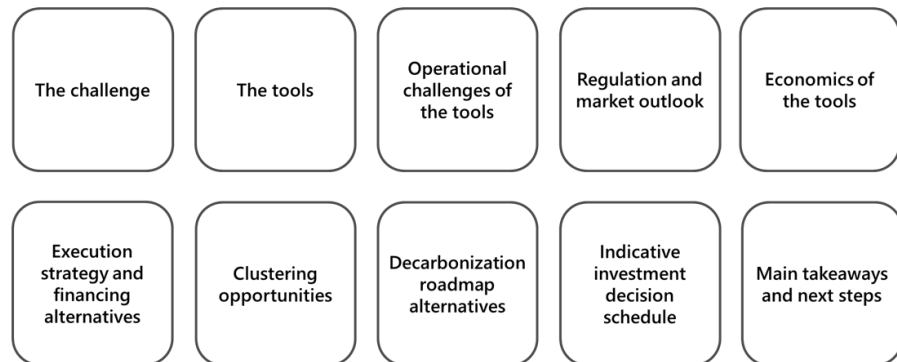
— Key take-aways

- Preparing a **decarbonization strategy** for any industrial plant is already **a must**.
- A **complete analysis** (operational environmental, economical) of the different alternatives is required.
- There are already **available technical solutions** to many of the challenges, ready to be implemented in many of the industrial processes.
- The **clustering** of nearby industries can be a very relevant factor to reach targets.



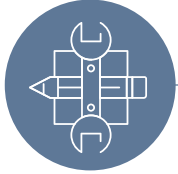
The industry faces the challenge of how to change in an ambitious timeframe a system that was built over decades of long-term investment.

Assessment for decarbonization of an industrial plant



About Técnicas Reunidas

Highlights



+62

years of history designing and building plants in more than 60 countries



+1.000

complex industrial plants designed/built in different geographies and execution schemes



+6.500

employees of more than 70 nationalities. Our team, our key asset



Focus on

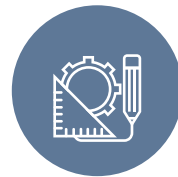
safety

Zero incident target



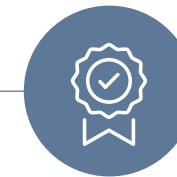
Continuous innovation in our DNA

Use of state-of-the-art technologies and in house digitalization skills



50.000 M\$

in projects executed in the last 10 years.



50%

recurrency rate from our customers



150 million

average annual construction hours

9 million

annual engineering hours



Our products and services

A broad product portfolio combined with a comprehensive service offering to meet decarbonization needs. We apply Técnicas Reunidas' capabilities and knowledge to the challenges of low-carbon energy.



TECNICAS REUNIDAS

Energy transition
Decarbonization

Conceptual assessment

Feasibility study

Engineering services and
FEED

Project development and
structuration

Technology development
and escalation

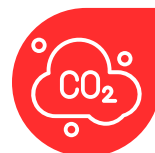
Carbon and methane
management outsourcing



Hydrogen



Circular
economy
and bio
products



Carbon
capture and
storage



Methane



Oil and gas industries



Energy intensive industries



Investors in energy
infrastructures

