

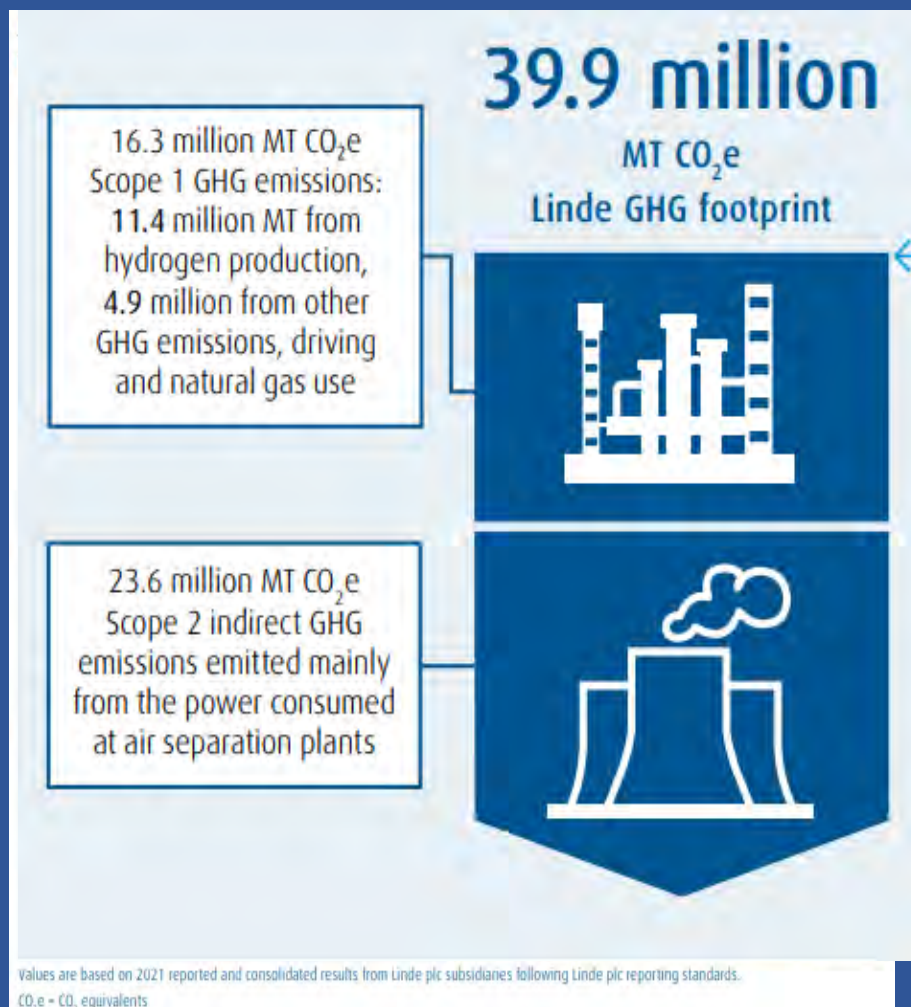
Investing for a Just Energy Transition

A View from a Retired Corporate Executive

National Academies Workshop
Investing for Just Transitions and Sustainable Development
July 24 2023

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Linde plc: GHG Baseline



~40 MM MT GHG⁽¹⁾

Scope 1 includes CH₄ + Steam for Grey H₂ production:

- 11.4 MM MT CO₂e

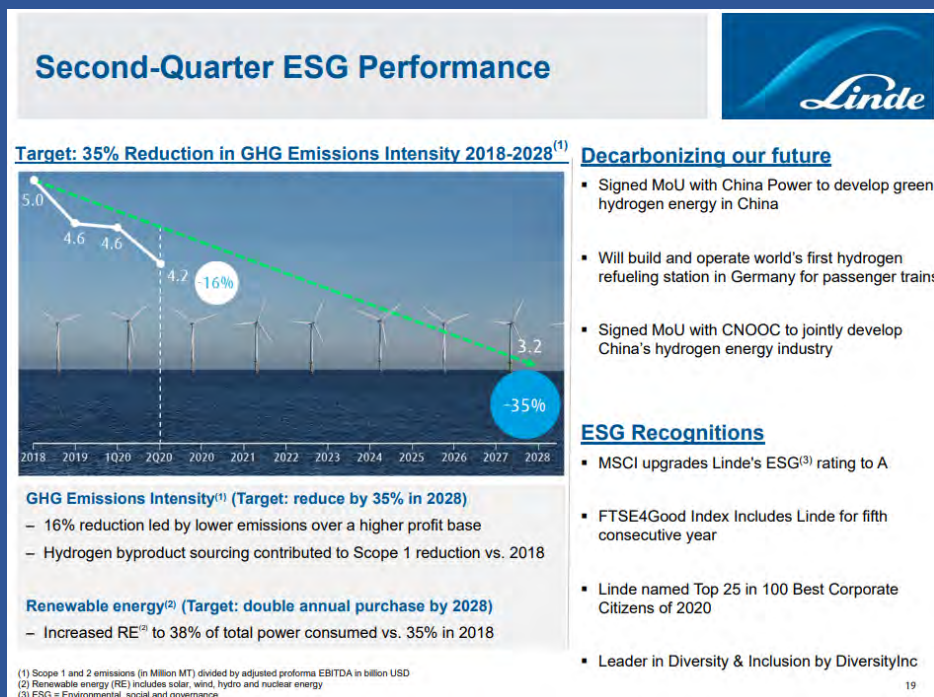
Scope 2 includes 42 MM MWh⁽²⁾ electricity for industrial processes:

- 23.6 MM MT CO₂e

(1) ≈ Switzerland

(2) ≈ Hungary or New Zealand

Linde plc: Climate Targets 2018-2020



Timeline

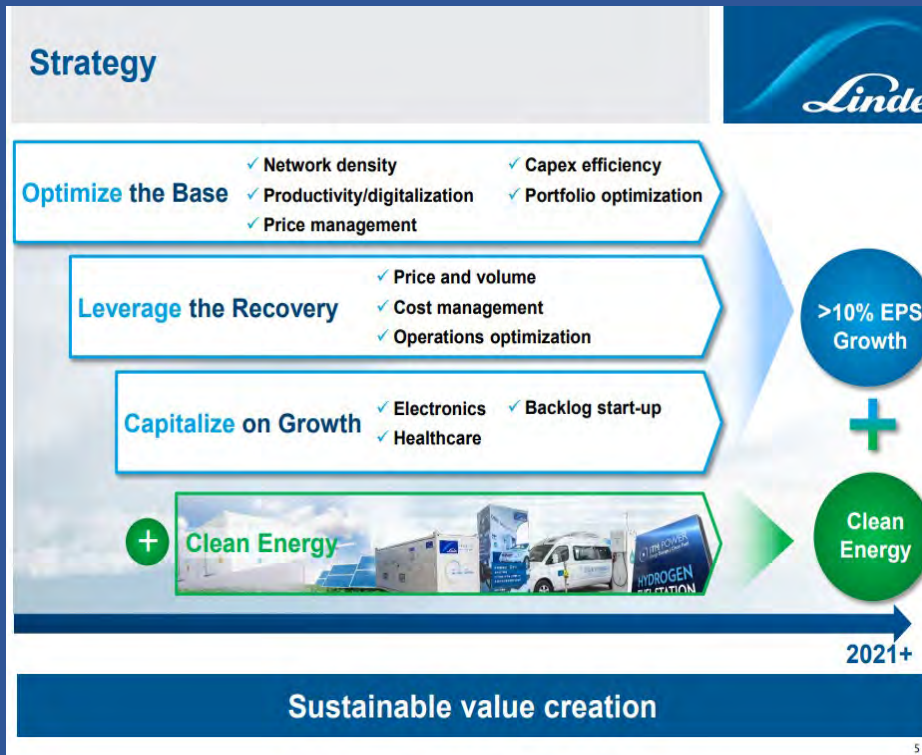
2019 Q4:

- Q4 Established GHG reduction targets

2020 Q2:

- Results v GHG Targets in Q Investor Calls
- Clean H2 Market Potential Identified

Linde plc: Clean Energy Strategy 2021



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2021 Q1:

- Clean Energy Strategy
- Incremental Market Opportunity
- SBTi target: 35% by 2035
- Climate Neutral ambition by 2050

Linde plc: Clean Energy Strategy 2023

Clean Energy Update

Strategy

Stick to core industrial gas model

- Build on integrated asset base leveraging ~\$3B H₂ business
- Develop networks to meet local market strategies
- Leverage engineering and technology capabilities

Major projects in execution

Project	Country	Technology	US\$	
Clean H₂ (Backlog capex)	OCI	US	ASU, ATR & CC	\$1.8B
Clean H₂ (Backlog & Base capex)	Niagara Falls	US	>90MW Electrolyzers (PEM / Alkaline)	\$0.2B
	Leuna	Germany		
	Evonik	Singapore		
	California	US		
	Plansee	Austria		
	Electronics	Netherlands		
Sale of Plant	RWE	Germany	>200MW Electrolyzers / SMR & CC	\$0.4B
	Yara	Norway		
	Shell	Netherlands		

Major project under development

Customer	
Technology	ASU, ATR & CC
Application	Fuel switching for ethylene cracker
Country	Canada

... And more projects under development

Significant investment opportunity \$50B+

Blue H₂: Hydrogen production from natural gas with CO₂ capture and sequestration
Green H₂: Hydrogen produced by electrolysis, powered by renewable energy; no operational CO₂ emissions

ASU: Air Separation Unit
ATR: Auto-thermal Reformer
PEM: Proton Exchange Membrane

SMR: Steam Methane Reformer
CC: Carbon Capture

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2023 Q1:

- Lead with Clean Energy Update
- \$50B+ Investment Opportunity
- 2MM MWh RE sourced in Brazil

Clean Energy Transition – H2

- Clean and Green H2 broadly seen as having a role in net zero ambition
- 40+ governments have developed national H2 strategies
- National programs prompted by concerns about energy independence
- National hydrogen strategies include social equity concerns, e.g. local jobs
- Government incentives bring price parity with Grey and Blue H2
- Step-change in the number and scale of Clean and Green H2 investment projects
- New regional and global Clean Energy market opportunities for areas with sun, wind and land assets -- from South Africa to Saudi Arabia to South Dakota

Reflections

- Opportunities for a global market in Clean Energy vs. emergence of national/ regional trade protectionism
- Endemic environmental and social trade-offs
- Legacy of 'resource curse'
- Enduring and Just Transition will require engaging locally with proximate problem solvers and implementers