



ELECTRODE TECHNOLOGIES

Executive Summary



Market Evolution

Chlor-Alkali

Stable in 2024, recovery in 2025-2026.
Growth's driver: Technological upgrades, Aftermarket

Electronics

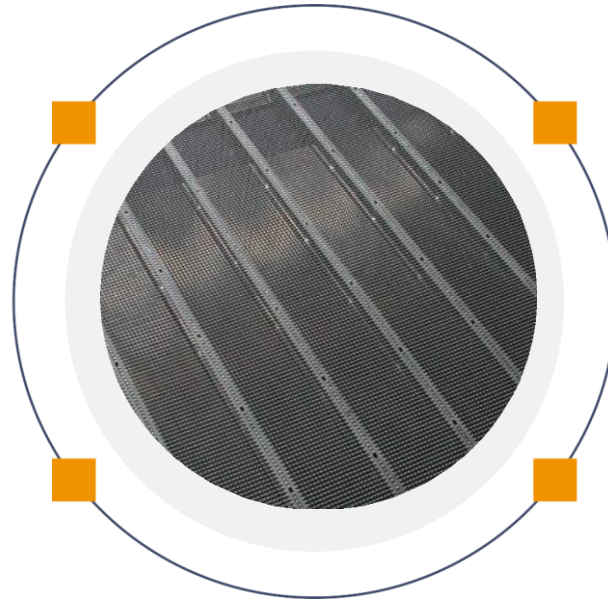
Slight recovery for PCBs and Copper Foil.
Electrodes for batteries' copper will see demand increase from 2025

Electrowinning

Stable installed capacity for Nickel and Cobalt
Electrowinning

Competitive Scenario

- China remains a competitive market, with local players, providing lower performing techs.
- Limited competition in US and EU



Our SDGs Commitment



Strategic Guidance

- Innovative and Sustainable Electrodes
- Optimizing Noble Metal Usage
- Maintaining Customer and Partner Relationships
- Investing in manufacturing capacity
- Focus on Aftermarket development



De Nora's Strengths

- Undisputed industry leadership
- Global and balanced geographic footprint
- Proprietary technologies, continuous R&D
- Long-term customer relationship
- Strategic Partnerships
- Growing Aftermarket business



ELECTRODE TECHNOLOGIES

Addressing multiple industrial applications with a wide range of products



KEY PRODUCTS

ANODES



CATHODES



CATALYTIC COATINGS GDE¹



MAIN ADDRESSED INDUSTRIES

Chlor-alkali



Electronics



Mining



OTHER INDUSTRIES



Pulp & paper



Steel galvanizing



Automotive Chrome plating



Plumbing & furniture Surface finishing



Steel & concrete Corrosion protection

¹ GDE: Gas Diffusion Electrodes



CHLOR-ALKALI

Electrodes at the core of the value chain with bespoke mission-critical solutions matching customers' needs



Value chain



Aftermarket services



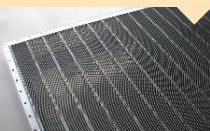
Components suppliers

Equipment suppliers and EPC¹ players

Electrodes

Several coatings matching all needs

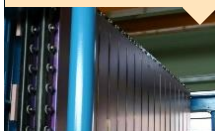
Anodes



Cell elements

>160,000 elements made for tk nucera

Manufacturing



Electrolysers, cell room & basic design



Complete plants



Cathodes



Other OEM

EPC/
construction companies

Chlor-alkali producers



Recoating & repairs



Cell refurbishment and performance upgrade



Spare parts

¹Engineering, Procurement, and Construction.



ELECTRONICS

Electrodes are deeply embedded in the copper foil production and PCB manufacturing processes



Value chain



Electrode suppliers

OEM/ equipment suppliers

Producers

Anodes



Electro-deposited cells



Plating lines



Copper Foil



PCB



De Nora aftermarket services



Electrodes recoating/replacement



Performance monitoring



Technology renovation/upgrade



Lithium Batteries



Rigid PCB



Flexible PCB



Semiconductors



HDI

¹ Electrodes for copper foil manufactured in 2021.



ELECTROWINNING

De Nora's anodes and complete solutions are key in modern metals refining processes



Value chain



Ore extraction



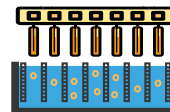
Handling



Transformation



Metal refining (EW)



DSA® anodes



Nickel (Ni)



Cobalt (Co)



Copper (Cu)¹

De Nora services



Recoating & maintenance



Aftersales & spare parts



Technology upgrade

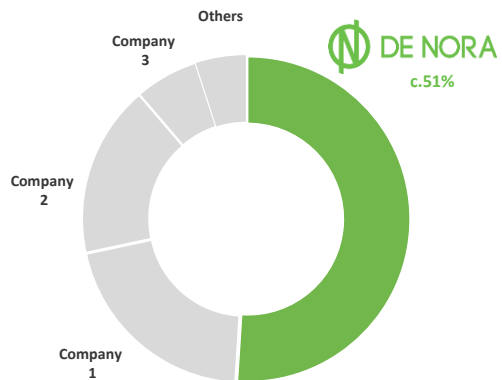
¹De Nora is testing a technology to penetrate the copper electrowinning market.



CHLOR ALKALI

Global electrodes market share¹

[m MT Cl₂]²



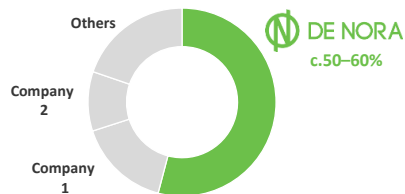
Partnership with tk nucera, key relationship with major licensor and many world class chemicals producers

ELECTRONICS

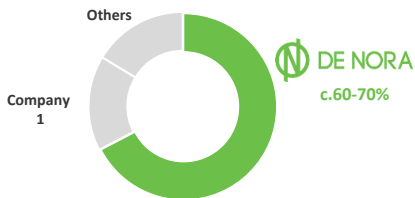
Global electronics market share

[#installed cells]²

Copper foil



PCB



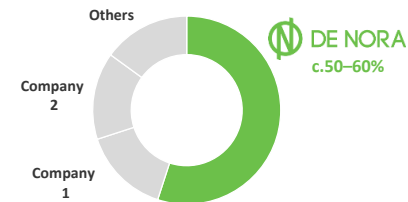
Leader in copper foil and PCB with significantly higher market share than competitors

ELECTROWINNING

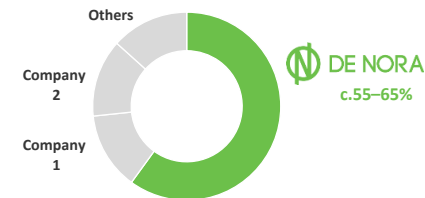
Global metal market share

[# of installed titanium anodes]²

Nickel



Cobalt



States-of-the-art titanium anode for nickel and cobalt and testing ongoing to penetrate the copper market



ELECTRODE TECHNOLOGIES

What makes De Nora's electrodes different?



One century of investments and technological breakthrough



Best-in-class manufacturing capacity in place



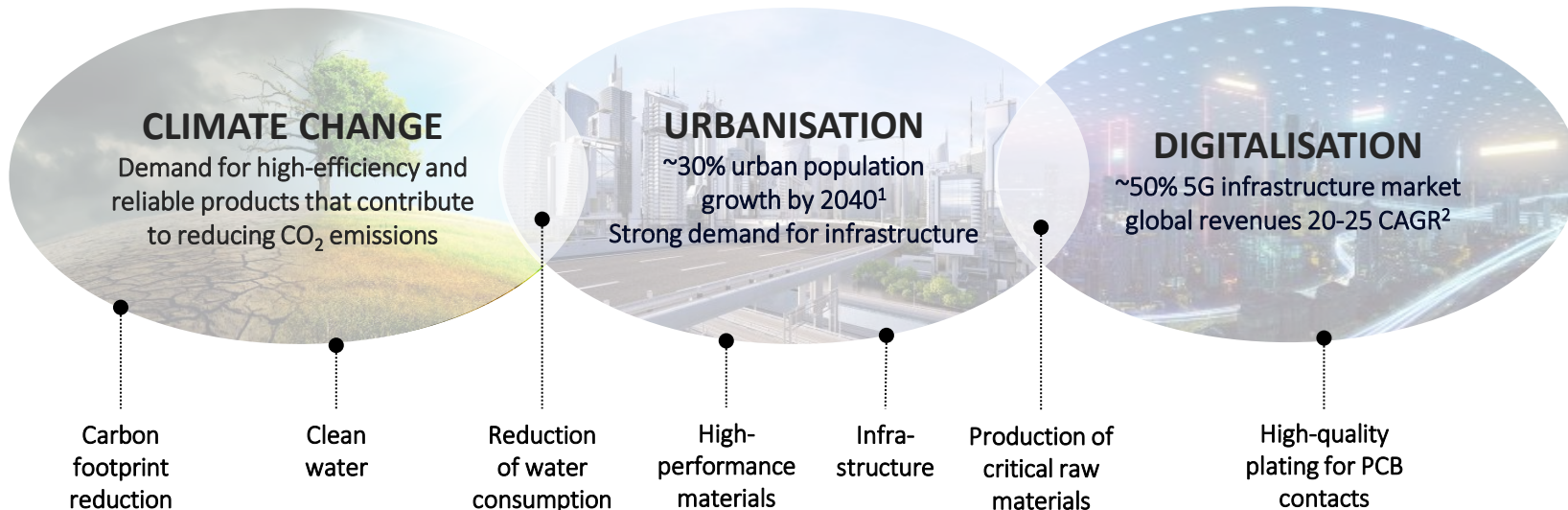
Superior performance in terms of energy consumption, efficiency, and durability



Outperforming for quality and range of aftermarket services



Demand for electrodes is being driven by well-established mega-trends



¹ The World Bank website as of 21 February 2022. ² Mordor Intelligence (Global 5G Infrastructure Market).



«Continuously safeguard leadership position across products, industries, and geographies by leveraging strengths.»



MAINTAIN
LEADERSHIP POSITION

Leverage **large offers**, **global footprint**, and **relations with key stakeholders**



EXPAND
SERVICES

Exploit all **opportunities** coming from **large installed base**



OPERATIONAL
EXCELLENCE

Strengthen **manufacturing setup** and **improve supply chain management**



INVEST IN TECHNOLOGY
INNOVATION

Continuous **technological innovation** and **performance upgrade**



DE NORA

discover more

