



# ENERGY TRANSITION Executive Summary





# ENERGY TRANSITION

Global leader in solutions for green hydrogen technologies



## UNPRECEDENTED MARKET OPPORTUNITY

~5x hydrogen demand growth 2020-2050;  
~60% share of **green H<sub>2</sub>** by 2050



## R&D AS THE ENGINE OF FUTURE GROWTH

Continuous improvement of existing technologies and new products launch



## LARGEST ASSET BASE AND MANUFACTURING CAPACITY

**2GW** eq. Electrode production capacity<sup>1</sup>  
**6GW** Target by 2025



## KEY ENABLER OF ENERGY TRANSITION

providing cutting-edge, proprietary and ready-to-use **Clean Technologies** at the heart of the **green H<sub>2</sub>** value chain



## STRATEGIC PARTNERSHIPS AND MULTIPLE ROUTE TO MARKET

~20 Partnerships  
& other customers globally<sup>1</sup>



## PROFITABLE EXECUTION OF BEST-IN-CLASS BACKLOG AND PIPELINE PROVIDING VISIBILITY AROUND FUTURE GROWTH

>**2.0 GW** Backlog<sup>1</sup>  
>**40 GW** identified opportunities<sup>1</sup>  
in the **green H<sub>2</sub>** space

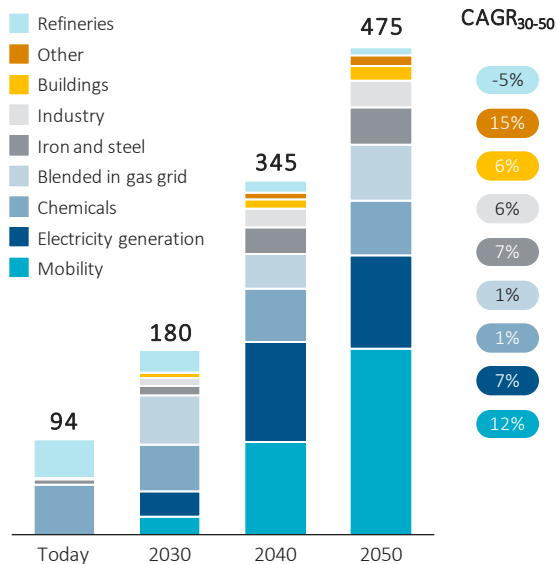




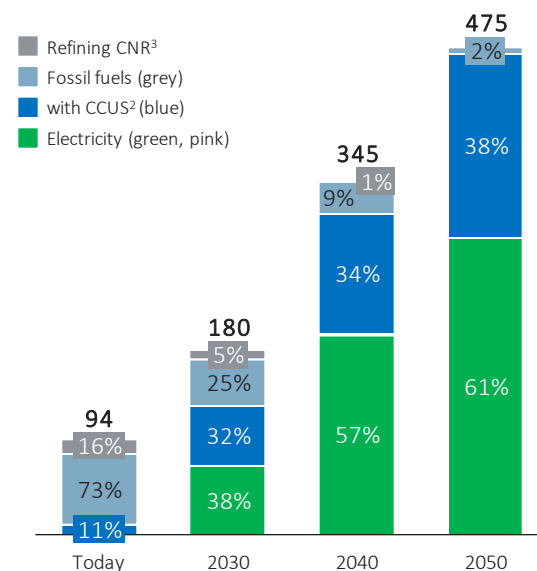
# UNPRECEDENTED MARKET OPPORTUNITY

H<sub>2</sub> demand to increase five-fold<sup>1</sup>, driven by new applications, requiring exponential growth in electrolyzer capacity

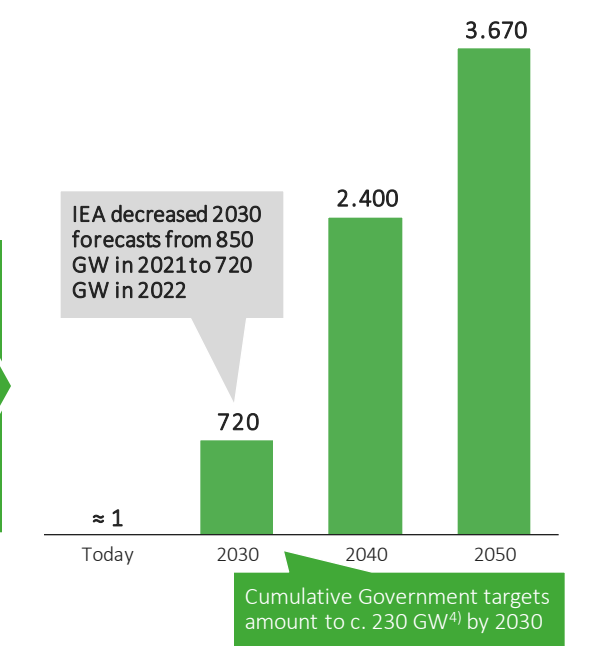
### Global hydrogen demand by application [Mt]<sup>1</sup>



### Global hydrogen demand by source [Mt]<sup>1</sup>



### Required electrolyzer capacity for Green H<sub>2</sub> [GW]<sup>1</sup>



1. Based on Net zero emission scenario 2022; 2. Carbon Capture, Utilization and Storage; 3. Catalytic Naphtha Reformer; 4. Incl. increased EU targets post-Ukraine  
Source: Roland Berger elaboration based on IEA and desk research - April 2023



## 720 GW

Global needs under IEA's Net Zero Emission scenario<sup>1</sup>

~720 GW total installed electrolyzer capacity is required until 2030 to stay on a path to meet the 1.5°C target set out in the Paris Agreement<sup>1</sup>.



## ~120 GW

Achievable market projection of which ~6.1 GW in operation and under development as of 2023<sup>2</sup>

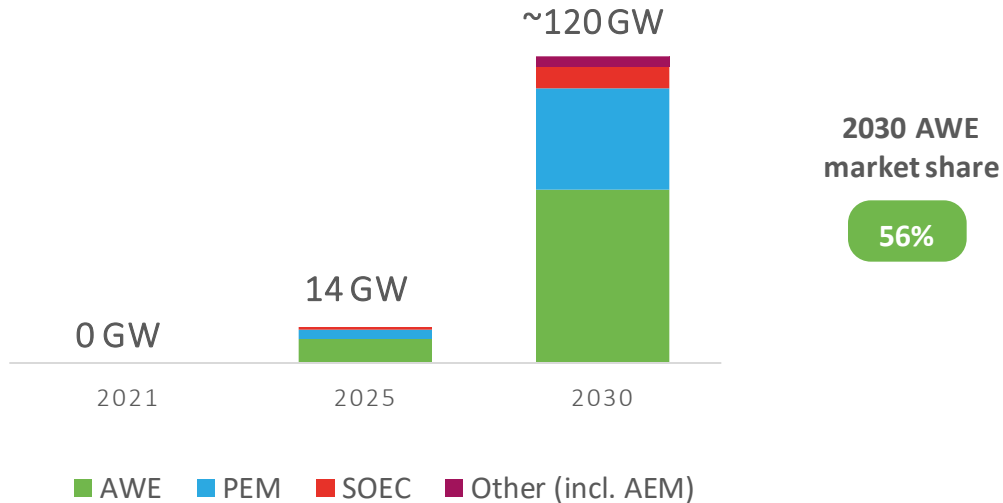
~ 120 GW by 2030 seems achievable as of today based on announced projects, government' targets, project status, lead time for execution, typical failure rates, and risks<sup>2</sup>.



## UNPRECEDENTED MARKET OPPORTUNITY

AWE is expected to capture most of this decade's market, with a market share above 50% of the installed base

### Total installed electrolysis capacity by technology [GW]



**Remarkable overall growth** of the total installed electrolysis capacity with an average size of projects increasing.

**AWE to account for >50%** of the total installed base, given its technological maturity, lowest cost structure, and current efficiency advantages.

**PEM and SOEC** are expected to grow more strongly than AWE, albeit starting from a low base.

**AEM** is expected to enter the market commercially towards the end of the decade.



# INDUSTRIAL SCALE GREEN H<sub>2</sub> SOLUTIONS

Unique, Efficient, Ready to use Technologies... and ongoing innovation



## In The Market

## Under development

## Services

ELECTRODES  
FOR AWE

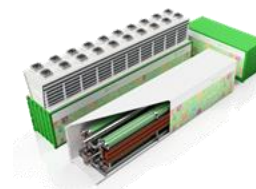
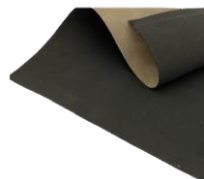
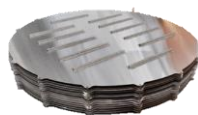
CELLS  
FOR AWE<sup>1</sup>

ELECTRODES  
FOR FUEL  
CELLS

SMALL SIZE AWE  
ELECTROLYZERS

OTHER R&D  
INITIATIVES

AFTERMARKET



AEM Electrodes  
Transport &  
Storage  
Carbon Utilization

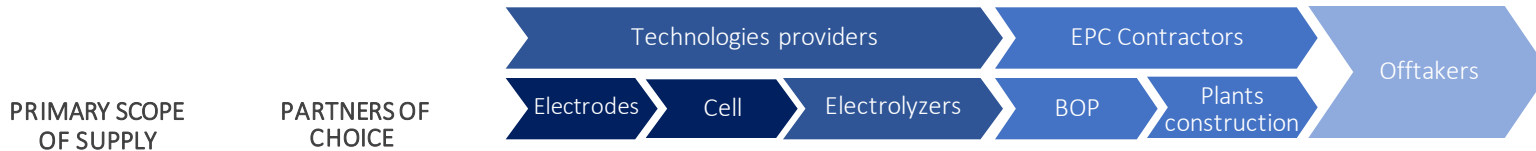


1. For thyssenkrupp nucera



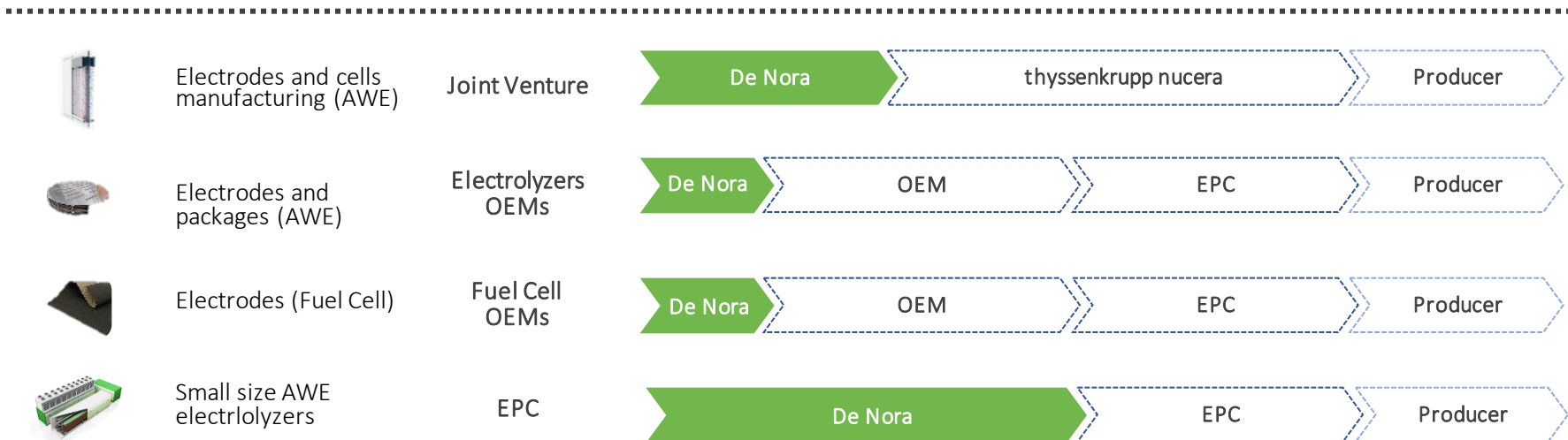
# MULTIPLE ROUTES-TO-MARKET

Distinctive position in the value chain and strategic partnerships with major market leaders in the hydrogen space



PRIMARY SCOPE OF SUPPLY

PARTNERS OF CHOICE



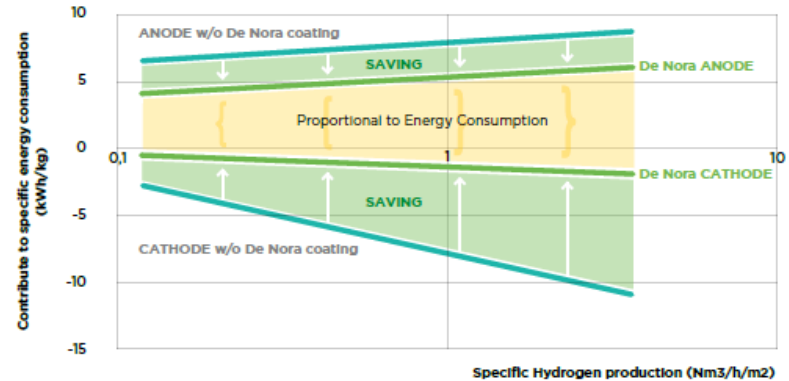


De Nora's Electrodes: diversified offer addressing all AWE technologies needs

- PRESSURIZED AWE ELECTROLYZERS
- ATMOSPHERIC AWE ELECTROLYZERS
- RENEWABLE SOURCES OPERATION
- CONTINUOUS OPERATION



De Nora's Electrodes: premium performance to deliver lower Levelized Cost of Hydrogen



- De Nora's electrodes allow a reduced specific energy consumption (kWh/kg) at any current density.
- De Nora high performing electrodes can be operated at higher current densities than competitive technologies, resulting in a higher H<sub>2</sub> production rate.





# ELECTRODES AND CELLS FOR AWE

De Nora is thyssenkrupp nucera's partner, coating supplier and cell manufacturer

## ANODE AND CATHODE COATINGS



- **Proprietary coatings** solutions, ensuring best-in-class technical performance.
- **Dedicated development** with thyssenkrupp nucera

## AWE CELL MANUFACTURING



Rodenbach (Germany)  
Manufacturing Facility



## INDUSTRY-LEADING ELECTROLYZER CELL



thyssenkrupp nucera  
design IP





De Nora has been a specialized manufacturer of Fuel Cell Electrodes since 1998, continuously working on technology improvement.



### De Nora's E-TEK® products

Gas Diffusion Electrodes (GDE), Gas Diffusion Layers (GDL), and catalysts for fuel cells

### Main served technologies

- High-temperature PEM Fuel Cell
- Alkaline Fuel Cell

### E-TEK® products' competitive advantages

- Superior longevity
- Voltage performance
- Simple design
- Competitive usage of raw materials

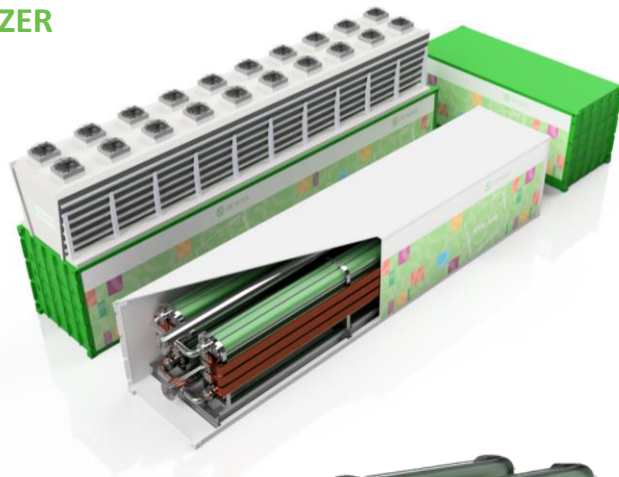


# SMALL SIZE AWE ELECTROLYSER

Pressurized system designed to lower LCOH



## ELECTROLYZER



## STACK

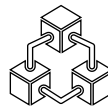


Containerized Dragonfly® electrolyzer (up to 7.5 MW) in the validation phase



### PERFORMANCE EXCELLENCE

High-efficiency electrodes within an innovative proprietary system



### HIGH STANDARDIZATION

Optimized construction costs



### FULLY AUTOMATED

Unmanned operation with remote control



## Strategic ongoing projects:

Continuous improvement of DSA® Electrodes performances

- Current density increase
- Operating temperature increase
- Noble Metals usage optimization
- Sustainable solutions exploitation

Development of cutting-edge technologies in a rapidly evolving environment



### HYDROGEN STORAGE & TRANSPORTATION



#### Application

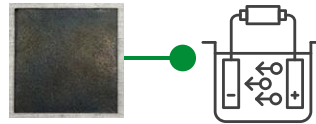
Liquid Organic Hydrogen Carrier (LOHC)<sup>1</sup> to store and release hydrogen through electrolysis.

#### De Nora's scope

Electrodes and Electrolyzer development for Hydrogenation<sup>2</sup> & Dehydrogenation<sup>3</sup>

**Project type:** participated by industrial partner

### AEM ELECTRODES



#### Application

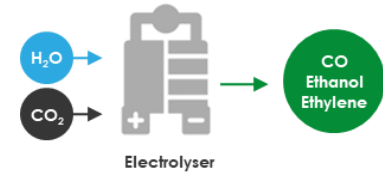
Anion exchange membrane water electrolysis (AEM), a technology under development potentially capable of joint PEM and AWE advantages

#### De Nora's scope

Electrodes and components development for AEM technology

**Project type:** De Nora and financed projects

### GDE ELECTRODES FOR CARBON UTILIZATION



#### Application

CO<sub>2</sub> direct transformation into higher-value chemicals by means of electrolysis

#### De Nora's scope

E-Tek<sup>®</sup> GDE Electrodes development

**Project type:** EU and US financed projects

*1. Liquid organic hydrogen carriers (LOHC) are organic compounds that can absorb and release hydrogen through chemical reactions; 2. Chemical reaction transforming toluene in MCH, which is then eligible for transport and storage; 3. Chemical reaction that converts MCH into toluene and hydrogen.*



Ensure readiness by expanding the manufacturing setup

2022

## 2 GW eq.

De Nora has the **largest production capacity**, with strong strategic positioning across the value chain built in one century



Best-in-class manufacturing capacity in place, highly utilized



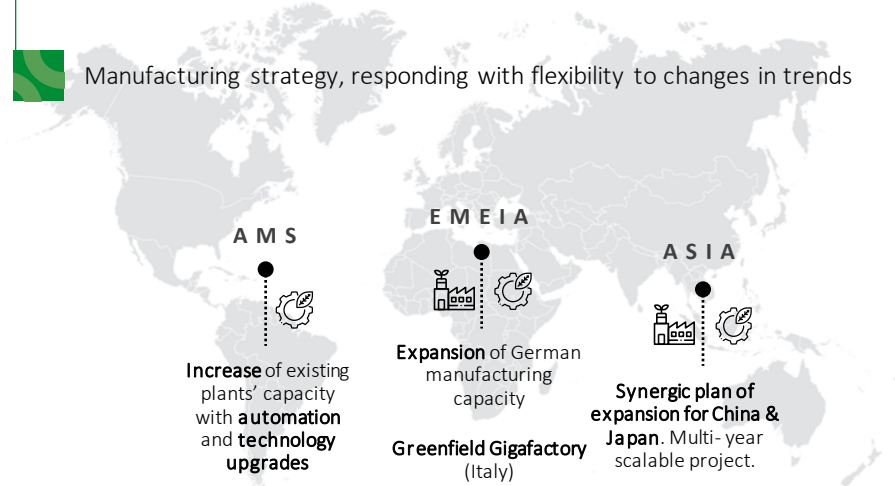
2025E

## 6 GW eq.

A **strategic and scalable investment plan** is under execution to sustain the mid-long-term growth



Manufacturing strategy, responding with flexibility to changes in trends



Brownfield



Greenfield



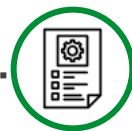
*«Be the key enabler for the green hydrogen revolution, thanks to a diversified portfolio of best-performing electrodes and the readiness of our production capacity.»*



TECHNOLOGY  
LEADERSHIP



STRATEGIC  
PARTNERS SERVICE



BROAD PORTFOLIO  
OFFERING



MANUFACTURING  
EXPANSION



# DISCLAIMER

The content of this presentation has a merely informative and provisional nature and does not constitute a public offer under any applicable legislation or an offer to sell or solicitation of an offer to purchase or subscribe for securities or financial instruments or any advice or recommendation with respect to such securities or other financial instruments, nor shall it or any part of it nor the fact of its distribution form the basis of, or be relied on in connection with, any contract or investment decision in relation thereto. The information contained in this presentation does not purport to be comprehensive and has not been independently verified by any independent third party.

Statements contained in this presentation regarding past trends or activities should not be taken as a representation that such trends or activities will continue in the future. Past performance of De Nora Group cannot be relied on as a guide to future performance. The market data and certain economic and industry data and forecasts used in this presentation were obtained from governmental and other publicly available information, independent industry publications and reports prepared by trade associations and industry consultants, including Roland Berger. In addition to the foregoing, certain information regarding markets, market size, market share, market position, growth rates and other industry data pertaining to our business contained in this presentation was estimated or derived based on assumptions we deem reasonable and from our own research, surveys or studies conducted by third parties, including trade associations, and other industry or general publications. Industry publications and forecasts generally state that the information they contain has been obtained from sources believed to be reliable, but that the accuracy and completeness of such information is not guaranteed. While we believe that each of these studies and publications is reliable, we have not independently verified such data and cannot guarantee their accuracy or completeness. To the extent that information presented in this presentation has been sourced from third parties, such information has been accurately reproduced and, as far as we are aware and able to ascertain from the information published by such third parties, no facts have been omitted that would render the reproduced information inaccurate or misleading. Market studies and analyses are, however, inherently predictive and subject to uncertainty and not necessarily reflective of actual market conditions, are frequently based on information and assumptions that may not be accurate or technically correct, and their methodology may be forward-looking and speculative. In particular, market studies and analyses are based on market research, which itself is based on sampling and subjective judgments by both the researchers and the respondents, including judgments about what types of products and transactions should be included in the relevant market. In many cases, there is no readily available external information (whether from trade associations, governmental bodies or other organizations) to validate market related analyses and estimates, requiring us to rely on our own internally developed estimates regarding the industry in which we operate, our position in the industry, our market share and the market shares of various industry participants based on our experience, our own investigation of market conditions and our review of industry publications, including information made available to the public by our competitors. Neither Industrie De Nora, nor any other person (including Roland Berger) makes any representation or warranty, whether expressed or implied, and no reliance should be placed on the fairness, accuracy, completeness, correctness or reliability of the information contained herein and/or discussed verbally.

This presentation contains forward-looking statements regarding future events and the future results of Industrie De Nora that are based on current expectations, estimates, forecasts, and projections about the industries in which Industrie De Nora operates and the beliefs and assumptions of the management of Industrie De Nora. In particular, among other statements, certain statements with regard to management objectives, trends in results of operations, margins, costs, return on equity, risk management are forward-looking in nature. Words such as 'expects', 'aims', 'forecasts', 'anticipates', 'targets', 'goals', 'projects', 'intends', 'plans', 'believes', 'seeks', 'estimates', variations of such words, and similar expressions (or their negative) are intended to identify such forward-looking statements. These forward-looking statements are subject to known and unknown risks, uncertainties, and assumptions that are difficult to predict because they relate to events and depend on circumstances that will occur in the future. Many of these risks and uncertainties relate to factors that are beyond the company's ability to control or estimate precisely, such as future market conditions, currency fluctuations, the behavior of other market participants, the actions of regulators and other factors. Therefore, Industrie De Nora's actual results may differ materially and adversely from those expressed or implied in any forward-looking statements. Factors that might cause or contribute to such differences include, but are not limited to, economic conditions globally, social, political, economic and regulatory developments or changes in economic or technological trends or conditions in Italy and internationally. Consequently, Industrie De Nora makes no representation, whether expressed or implied, as to the conformity of the actual results with those projected in the forward-looking statements. Any forward-looking statements made by or on behalf of Industrie De Nora speak only as of the date they are made. Industrie De Nora does not undertake to update forward-looking statements to reflect any changes in Industrie De Nora's expectations with regard thereto or any changes in events, conditions or circumstances on which any such statement is based. The reader should, however, consult any further disclosures Industrie De Nora may make in documents it files with the Italian Securities and Exchange Commission and with the Italian Stock Exchange.

This presentation contains alternative performance indicators that are not recognized by IFRS. Different companies and analysts may calculate these non-IFRS measures differently, so making comparisons among companies on this basis should be done very carefully. These non-IFRS measures have limitations as analytical tools, are not measures of performance or financial condition under IFRS and should not be considered in isolation or construed as substitutes for operating profit or net profit as an indicator of our operations in accordance with IFRS.

This presentation has to be accompanied by a verbal explanation. A simple reading of this presentation without the appropriate verbal explanation could give rise to a partial or incorrect understanding. By attending this presentation or otherwise accessing these materials, you agree to be bound by the foregoing limitations.





 **DE NORA**  
*discover more*

