Building a sustainable and circular industry through partnerships and the enabling role of Hydrogen

DoE EAC, June 2021
Annemarie Manger (TataSteel Europe), Marcel Galjee (Nobian)

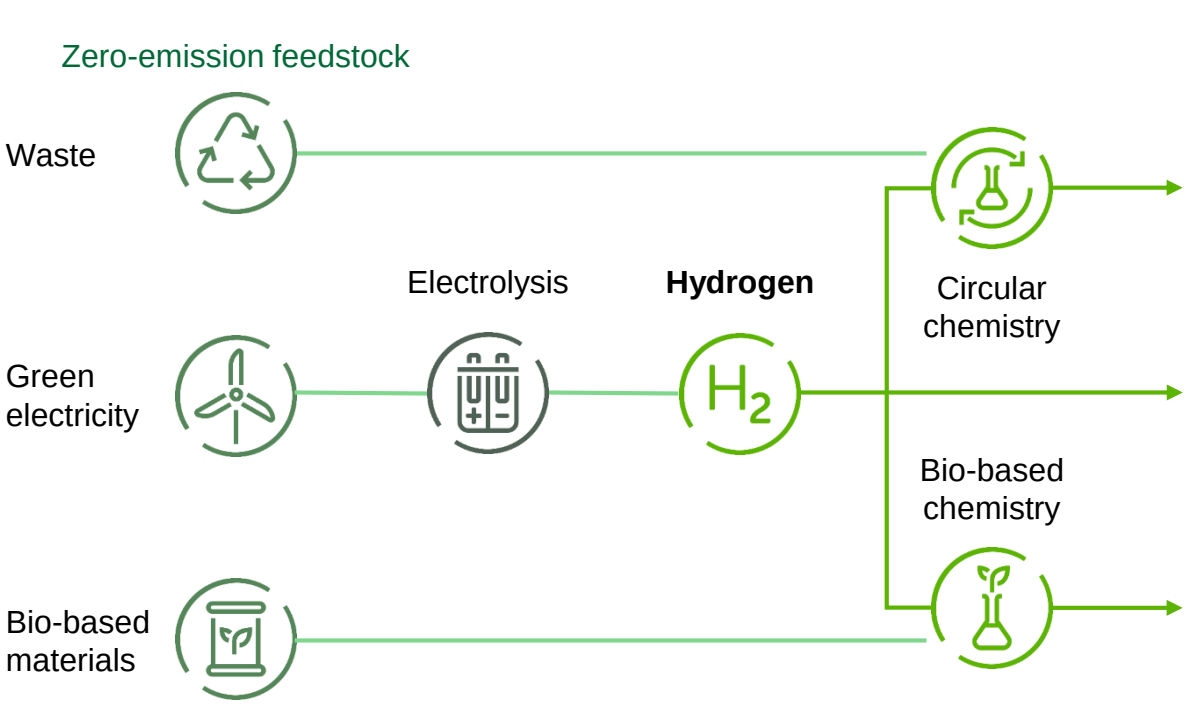
TATA STEEL

NOBIAN
A Nouryon company

Hydrogen an essential building block in the decarbonization of the hard to abate sectors

NOBIAN

TATA STEEL



Electrolysis is in the heart of our global business, the basis for green electrochemistry

NOBIAN

NOBIAN

Active in electrochemistry since 1899

Water electrolysis since 1940

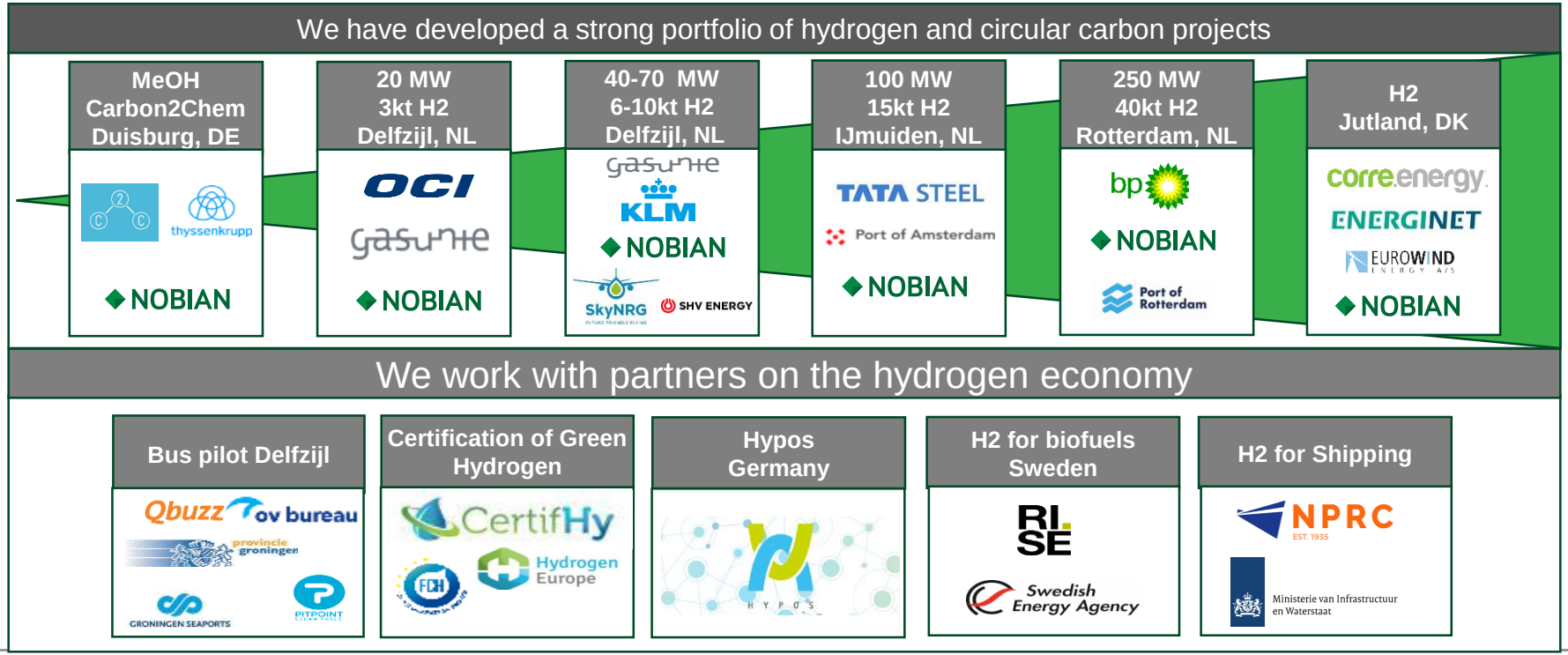
50% share of renewable energy

Chlor-alkali	Sodium chlorate	Water electrolysis
		
Installed capacity: 380 MW **H_2 production: 38 kta**	**Installed capacity: 620 MW** **H_2 production: 62 kta**	**Installed capacity: 10 MW** **H_2 production: 1.5 kta**

Nobian operates 1000 MW of electrolysis capacity

Building partnerships in the hard to abate sectors and scaling up the hydrogen value chain

NOBIAN



Next to building our project portfolio, we're driving improvements through our Hydrogen innovation program

NOBIAN

Aimed at achieving 80% CAPEX reduction in 2030, while at the same time supporting our current project portfolio and technology agenda

Breakthrough technology

- **Purpose:** work with universities and manufacturing industry to develop the technology of the future, focusing on advanced alkaline and AEM technology
- Key projects:
  - **Alkaliboost**
  - **RELEASE**
  - **Bubblelectric**
  - **ECCM tenure track**

Piloting of stacks

- **Purpose:** work with (component) suppliers to improve their technology and make it suitable for our projects
- **Hydrohub – MW test center**
  - Test new stack components to boost performance
  - Make low-cost Chinese technology suitable for Europe
  - Operational in early 2021

Total plant design: costing & scale-up

- **Purpose:** create deep understanding of cost and scaling factors to come to optimal design for GW scale
- Key projects:
  - **Cost estimation tool**
  - **GW project**
  - **HYCHAIN**

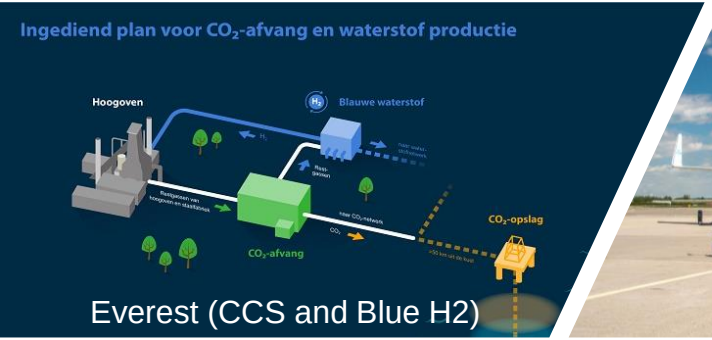
Cost-effective safe design

- **Purpose:** develop a cost-effective inherently safe pressurized electrolysis process
- Projects under development:
  - **New Balance of Plant design**
  - **Explosion proof design**

Many projects are under development, but have a strong synergy

NOBIAN

TATA STEEL



Everest (CCS and Blue H2)


Taxibot

Green hydrogen production

Sustainable aviation fuel production

Sustainable fuel production


08 February 2021

Synkero builds facility in the port of Amsterdam, producing sustainable aviation fuel from CO2

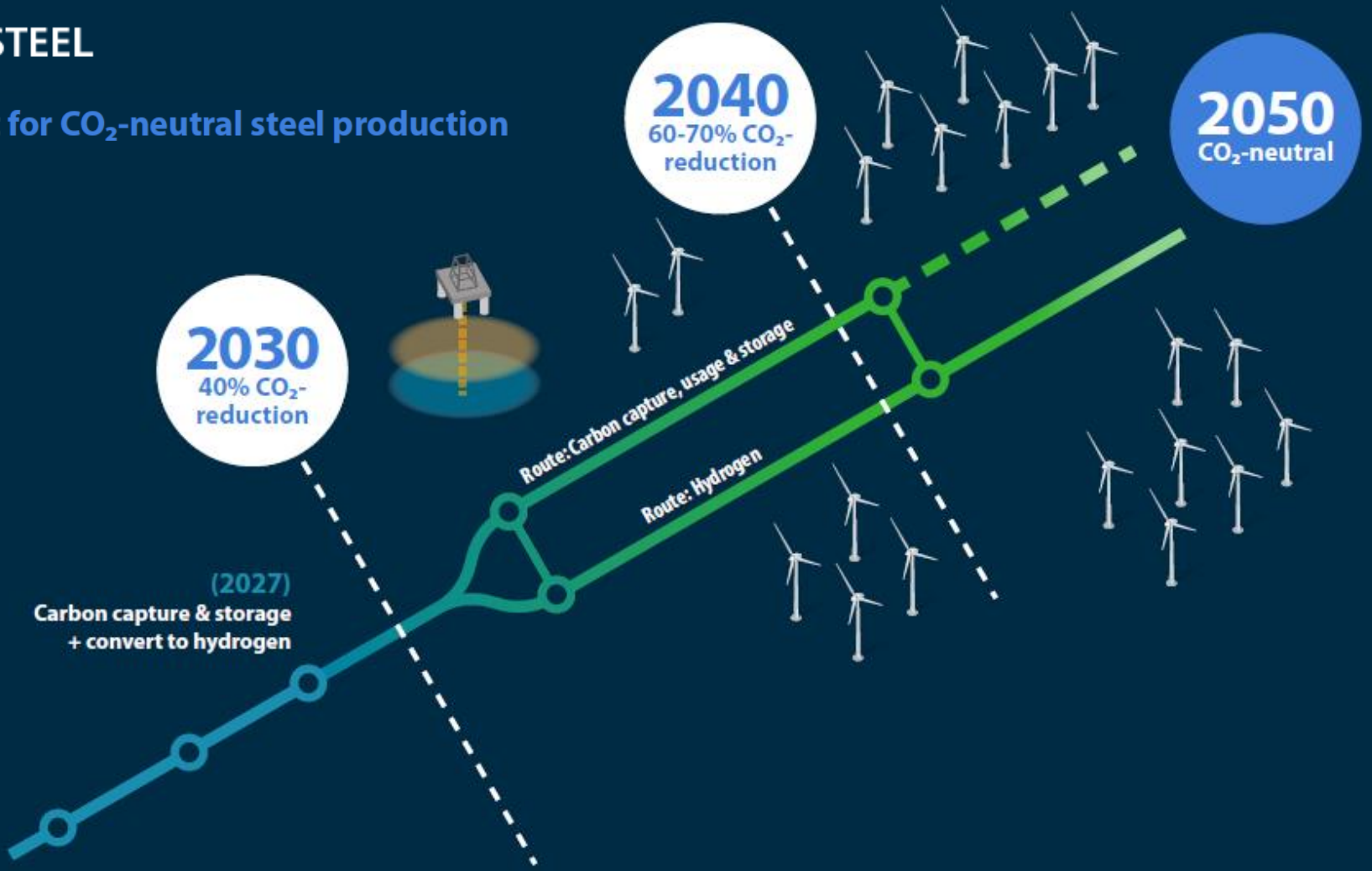
Synkero, a project development start-up, was launched during the European Conference for Sustainable Aviation Fuel (SAF). Synkero aims to develop a commercial plant for the production of SAF. This so-called "e-fuel" will be produced using green hydrogen and CO_2. This green hydrogen is produced from water and renewable energy. The factory will be located in the Port of Amsterdam, which has an existing kerosene pipeline to Schiphol Airport. The factory is scheduled to be completed in 2027. With this plant, Synkero's ambition is to produce 50,000 tons of sustainable aviation fuel annually. The production of sustainable aviation fuel is extremely important in order to achieve climate targets.

"Worldwide people, business and countries are connected through aviation. To pass on that pleasure to future generations, we need to get rid of the carbon. Our goal is a net zero aviation sector in 2050. To achieve that, the development of sustainable aviation fuels is essential. With Synkero, we are taking the next step."
Dick Benschop, CEO of Royal Schiphol Group

The current generation aircraft engines require liquid fuels. These aircraft engines cannot switch to alternative energy sources such as hydrogen or electricity in the short term. SAF is, therefore, the solution to drastically reduce CO_2 emissions in aviation. This aviation fuel is known as a 'drop-in' fuel, meaning that pure SAF can be mixed with fossil kerosene. No further modifications to infrastructure or equipment are required. It is a clean, liquid alternative to fossil kerosene.

TATA STEEL

Blueprint for CO_2-neutral steel production

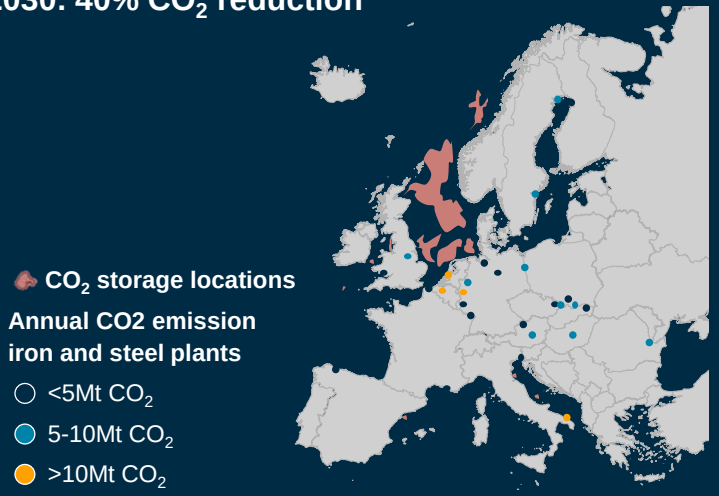


TSN has an unique location for future hydrogen-based steel production and to immediately reduce CO_2 emissions

Long-term hydrogen-based steel production

Offshore windfarms nearby providing green electricity

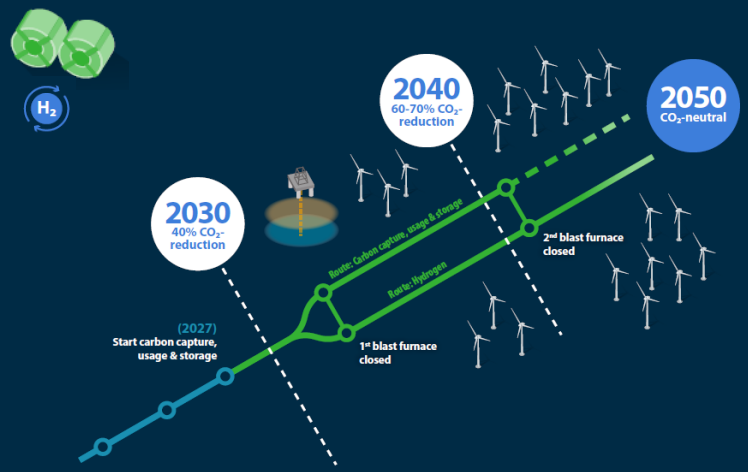
2030: 40% CO_2 reduction

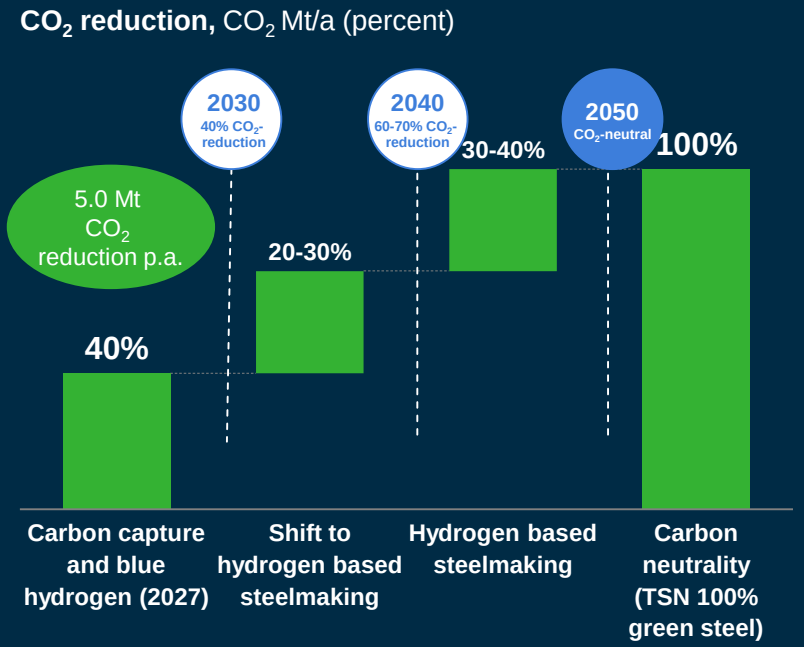


Offshore CO_2 storage locations nearby[1]

1. Source: McKinsey
2. Cost range dependent on ratio natural gas/hydrogen

Planned road to CO_2 neutral hydrogen based steelmaking





- 15kt/a **green hydrogen** together with Nobian
- 100kt/a **blue hydrogen** from blast furnace & steel plant gas. Carbon Capture to store CO_2

NOBIAN

A Nouryon company

Making green steel by capturing CO_2 from steel plant & blast furnace gases Converting remaining process gas to blue hydrogen for steel and other uses

Everest Carbon Capture

Green steel

2.7 Mt/a **green steel** in 2030

Emissions

5.0 Mt/a **CO_2 emission reduction**

Environmental

Up to **10%** reduction in **NO_x** and **SO_x emissions**

Everest Blue Hydrogen

Blue hydrogen

100 **kt/a blue hydrogen**

Emissions

0.7 Mt/a **CO_2 emission reduction** for consumers