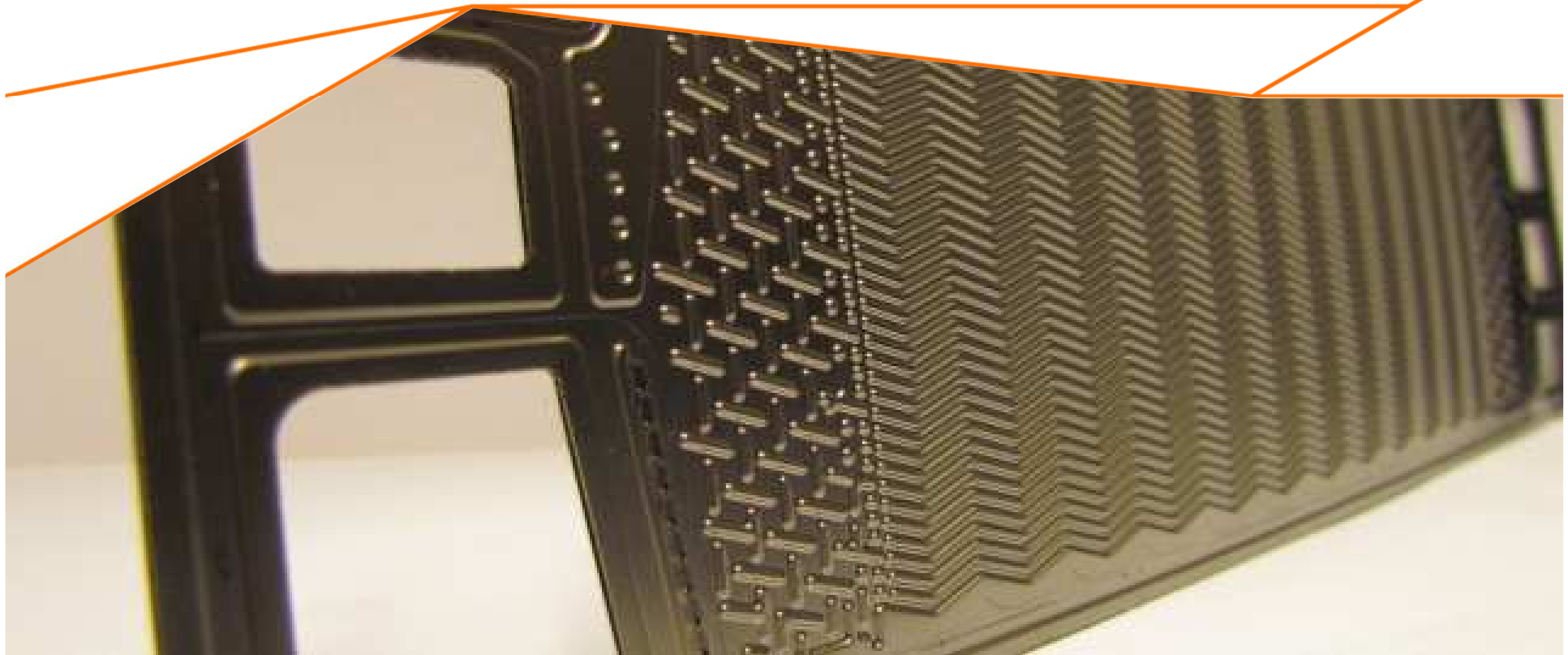


# SANDVIK MATERIALS TECHNOLOGY



- ADDRESSING THE ENERGY CHALLENGE



# THE ENERGY CHALLENGE

**“The biggest challenge of the 21st century:** provide sufficient food, water and energy to allow everyone on the planet to live decent lives, in the face of rising population\*, the threat of climate change, and declining fossil fuels.

**ENERGY is a necessary means to meet this challenge.”**

**Chris Llewellyn Smith**  
Director of Energy Research  
Oxford University

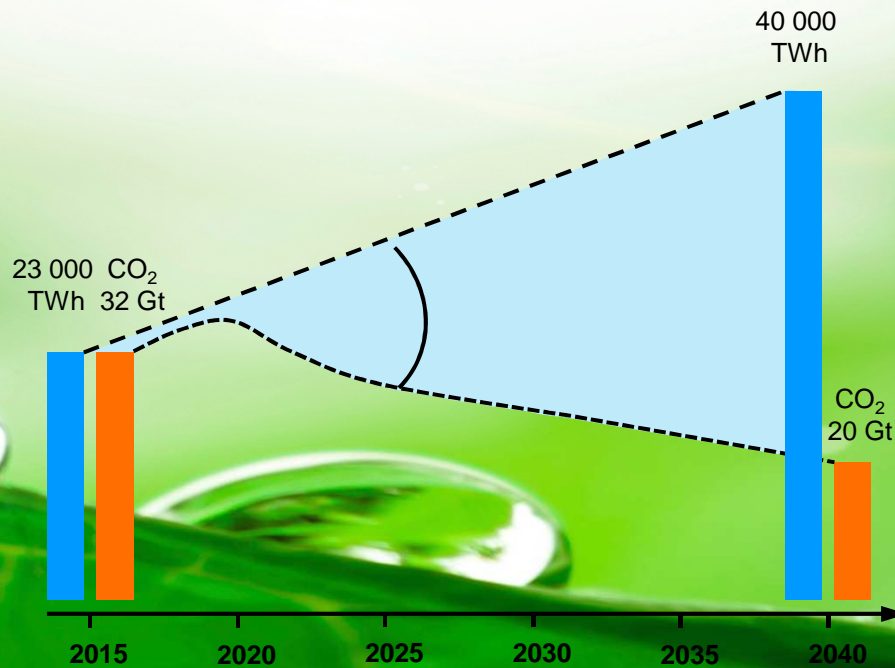
*\*Today nearly 7 billion, over 50% living in big cities. Later in the century 9 to 10 billion, 80% in big cities.*



## ENERGY & ENERGY EFFICIENCY CORE PART OF SANDVIK'S STRATEGY



# THE ENERGY AND CLIMATE CHALLENGE



References: IEA – World Energy Outlook 2015 & Energy and Climate Change 2015 & Key World Energy Statistics, IPCC – Climate change 2014

3

## → WE ARE PART OF THE SOLUTION

- **SANDVIK SANICRO 25™** reducing CO<sub>2</sub> emissions by 24% in coal-fired power plants.
- **KANTHAL APMT™** for increasing safety and efficiency in next generation nuclear power plants.
- **SANDVIK SANERGY™** for fuel cell technology, reducing CO<sub>2</sub> emissions.
- **SANDVIK HIFLEX™** compressor valve steel for improved energy efficiency in refrigerators and air conditioners.
- **SANDVIK SAF 3207HD™** next generation material for ultra-deepwater oil exploration.
- **SANDVIK SAFUREX™+** next generation fertilizer material, also for powder-based components.

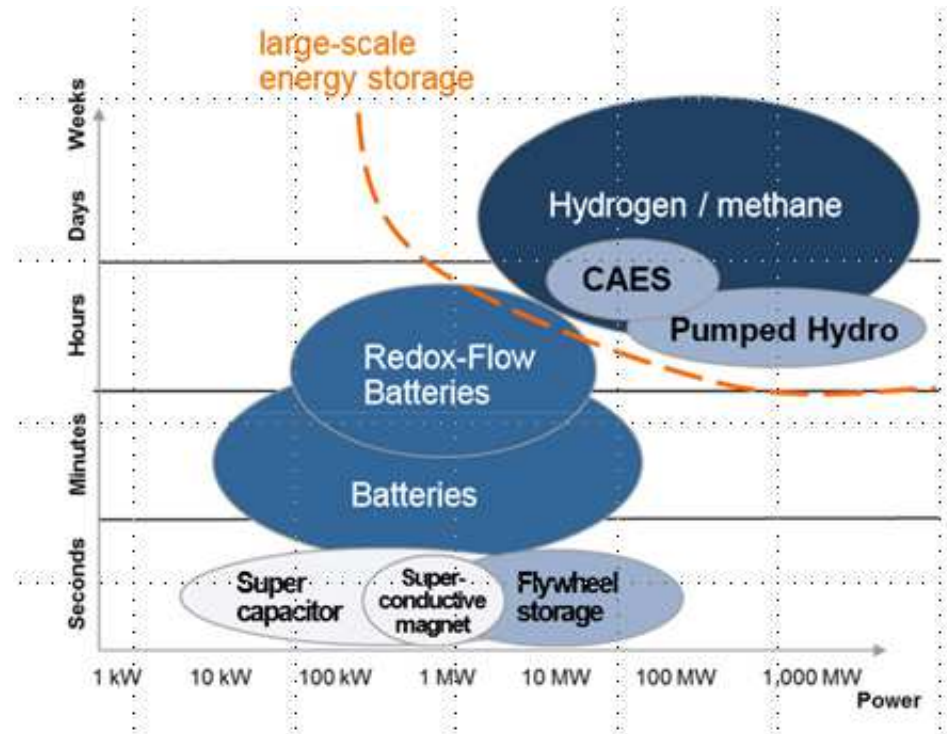


# RENEWABLE ENERGY AND STORAGE - A MUST TO REACH CLIMATE GOALS

## ENERGY

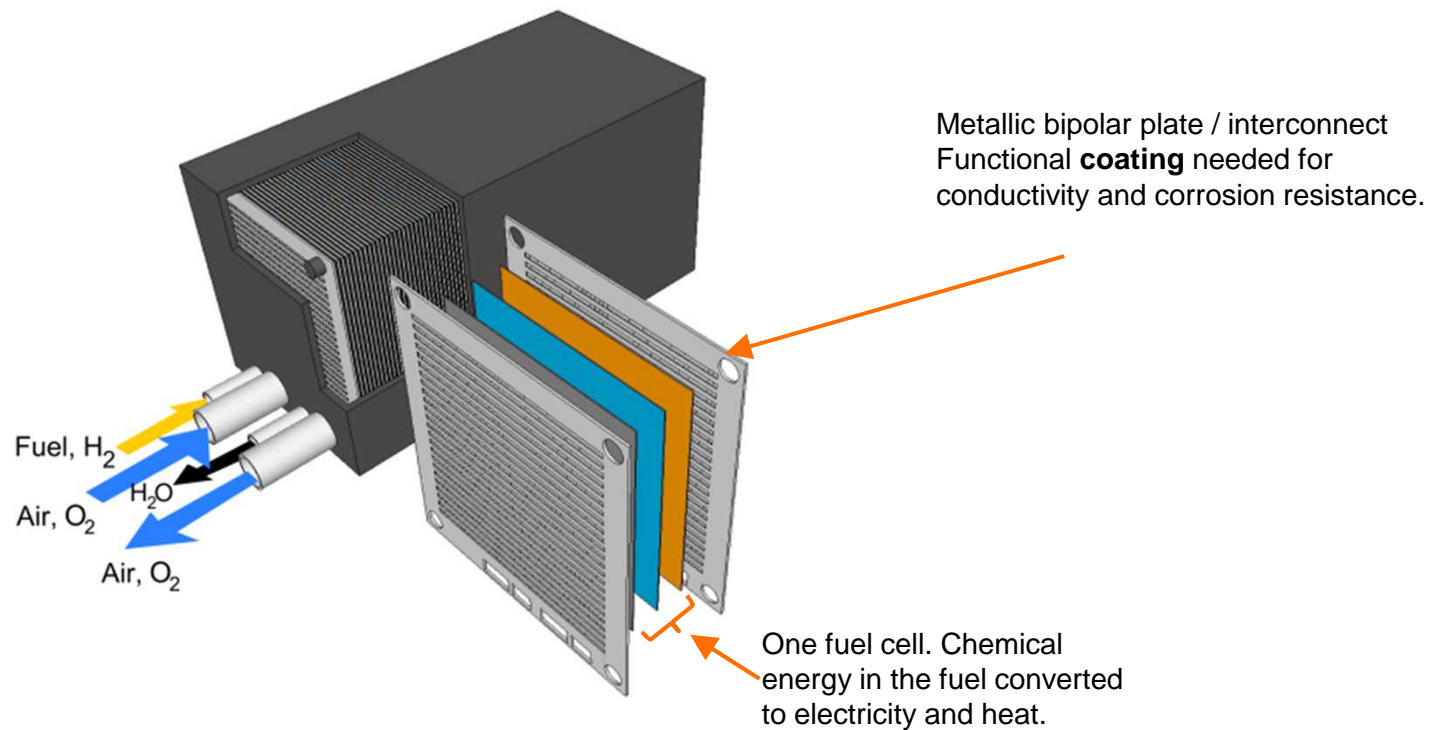
- **Energy consumption will increase**
  - More people (+2 billion 2050)
  - Growing middle class
  - Increased mobility (prognosis +45%)
- **Fossil free energy a must to reach climate goals**
  - For heating and electricity for buildings
  - As fuel for vehicles
- **Fossil free energy requires storage**
  - Fluctuating production

## HYDROGEN – OPTIMAL ENERGY CARRIER

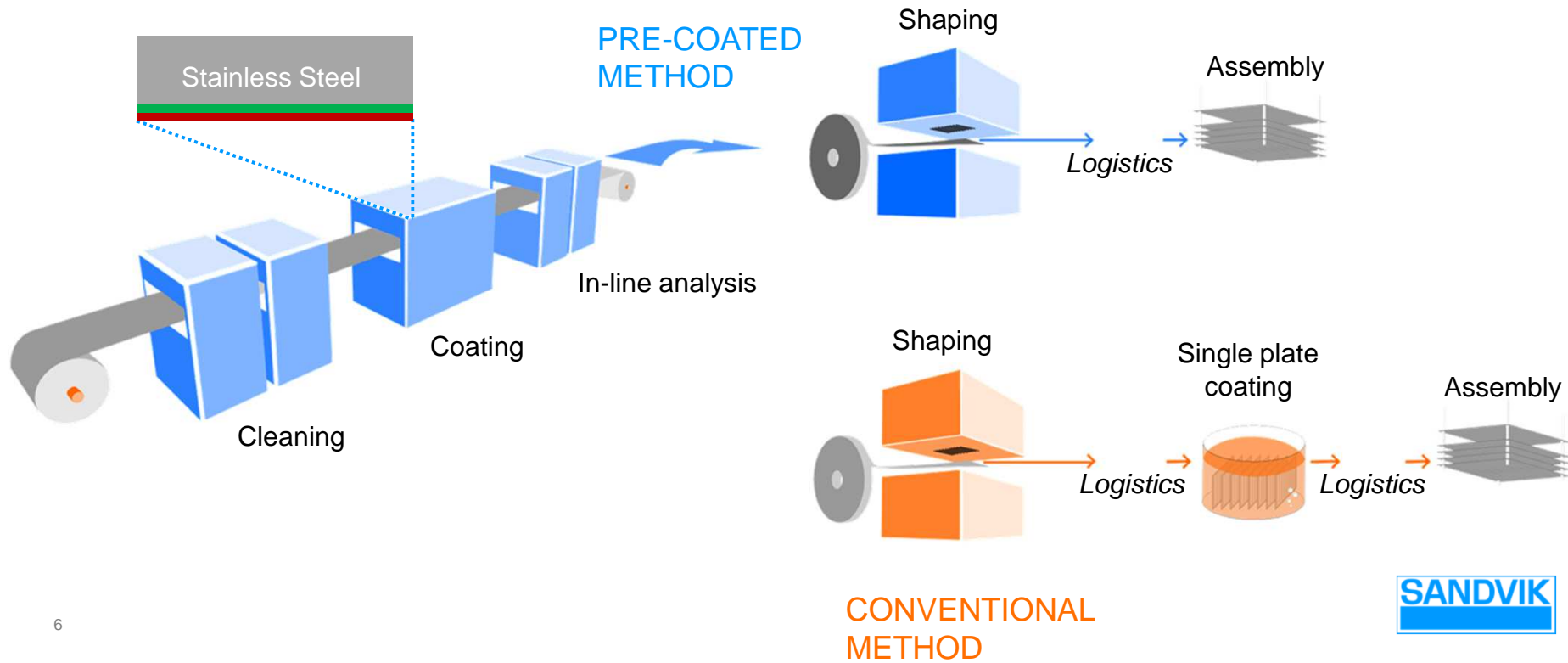


# FUEL CELLS

CONVERTS CHEMICAL ENERGY TO ELECTRICITY



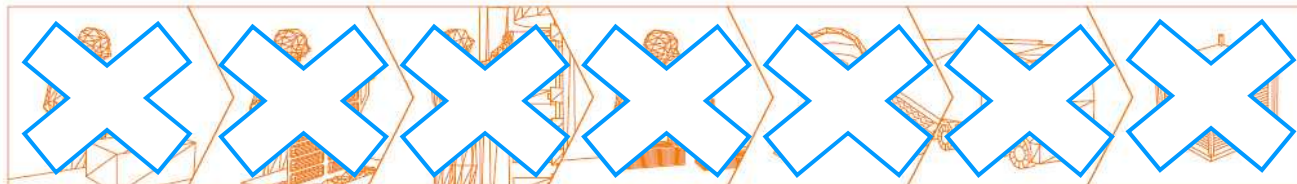
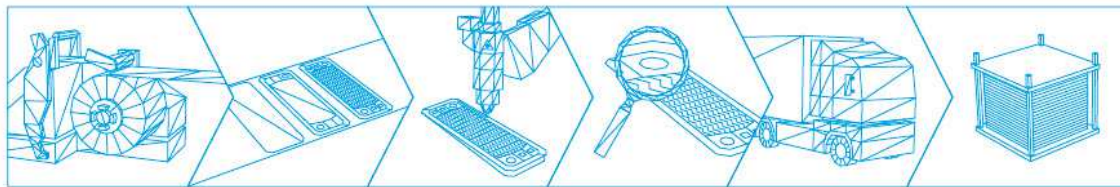
# SANDVIK PRE-COATED SOLUTION FOR PEMFC AND SOFC READY FOR MASS PRODUCTION



# SHORTENING THE VALUE CHAIN

## COIL COATING CONCEPT

SANDVIK COIL-COATING CONCEPT FOR INDUSTRIAL BIPOLAR PLATE PRODUCTION



ADDITIONAL PROCESS STEPS FOR BATCH COATING OF BIPOLAR PLATES





# APPLICATIONS

## THREE SEGMENTS, DIFFERENT MATURITY



**PORTABLE (2015)**  
5 W – 500 kW

Ex: USB Chargers,  
PCs, Torches, Toys,  
GPS



**TRANSPORT (2017-2018)**  
1kW – 1 MW

Ex: Scooters, Automobiles,  
Forklifts, Boats, Airplanes



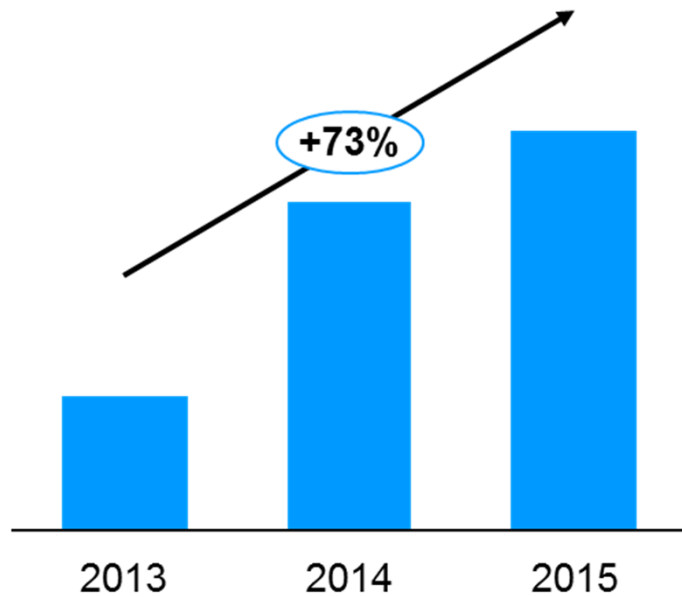
**STATIONARY (2015-2016)**  
0,5kW – 3 MW

Ex: Powerstations, Emergency  
Power, CHPs, APUs

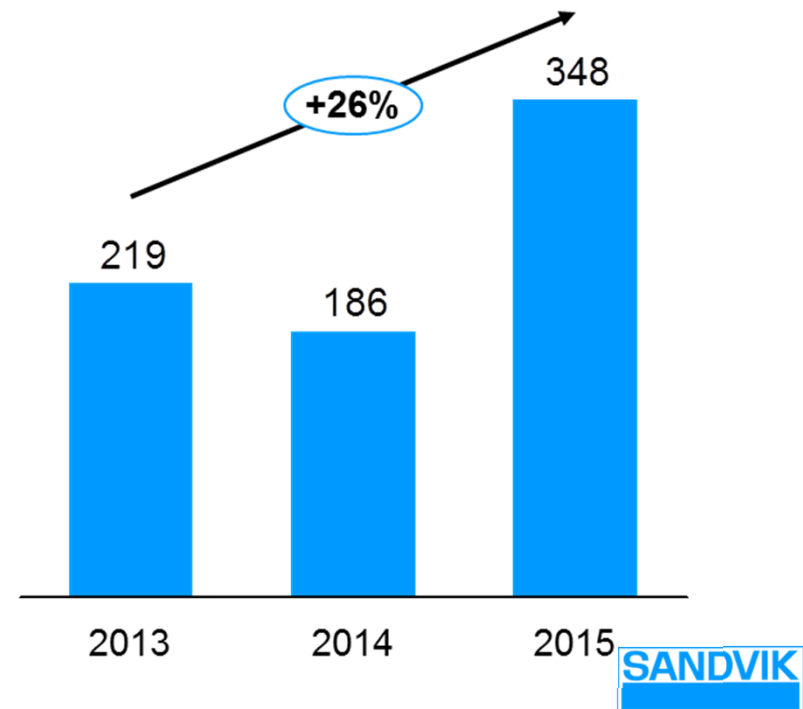


# SANDVIK GAINING FUEL CELLS MARKET SHARE

SURFTECH SALES (SEK)



GLOBALLY SHIPPED (MW)



# HYBRIT: CO<sub>2</sub>-EMISSION FREE IRONMAKING



# HYDROGEN INFRASTRUCTURE

Arbetsbladet.

SANDVIKEN 20 november

## Nu är vätgasstationen i Sandviken på plats - den första utanför storstäderna



1 december invigs stationen.

Jenny Lundberg

### TRILATERAL COOPERATION

- Sandviken Municipality
- Sandvik
- AGA Linde

### FIRST STEP TOWARDS A FOSSIL-FREE REGION

- 6 hydrogen cars
- 1 HRS (6 cars/hr)

