EUROPEAN FORUM ALPBACH

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DECARBONISATION
SOME THOUGHTS TO DISCUSS

- **Climate change is a global issue – and has to be tackled globally**
- **Decarbonisation is neither a legal topic nor can it be decreed by just setting political target values**
- **Fundamental transformation and new definition of the energy system are preconditions**
- **Besides technological challenges, it is a question of economic rationality and feasibility**
- **Overall, an open, honest, broad and serious dialog with all stakeholders in our society is required**

… and which of these issues have already been solved?

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STEEL INDUSTRY
STATUS AND CHALLENGES

- EU steel industry committed to substantial reduction of CO_2 emissions
- Limits of existing production techniques (mainly coal-based) reached
- Development and implementation of new breakthrough technologies together with supportive energy infrastructure and services required

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STEEL INDUSTRY
STATUS AND CHALLENGES (2)

- EU steel companies intensely exploring a number of possible emission reduction approaches.
- Not only a technological and R&D challenge!
  - Effectiveness dependent on competitive commercialisation
- Coordinated and comprehensive energy and funding strategy on EU level is the key.
- There is no short-term solution available.

STEEL INDUSTRY
LOW-CARBON APPROACHES

- **CDA** (Carbon Direct Avoidance): Directly avoiding CO_2 emissions through an **increased use of renewable electrical power in basic steelmaking (e.g. hydrogen** replacing carbon in metallurgical processes)
- **CCU** (Carbon Capture and Usage): Chemical conversion of CO_2 captured from industrial processes, using the CO_2 as a raw material
- **CCS:** Process integration with reduced use of carbon and with or without Carbon Capture and Storage

based on the utilisation of **"green" hydrogen**

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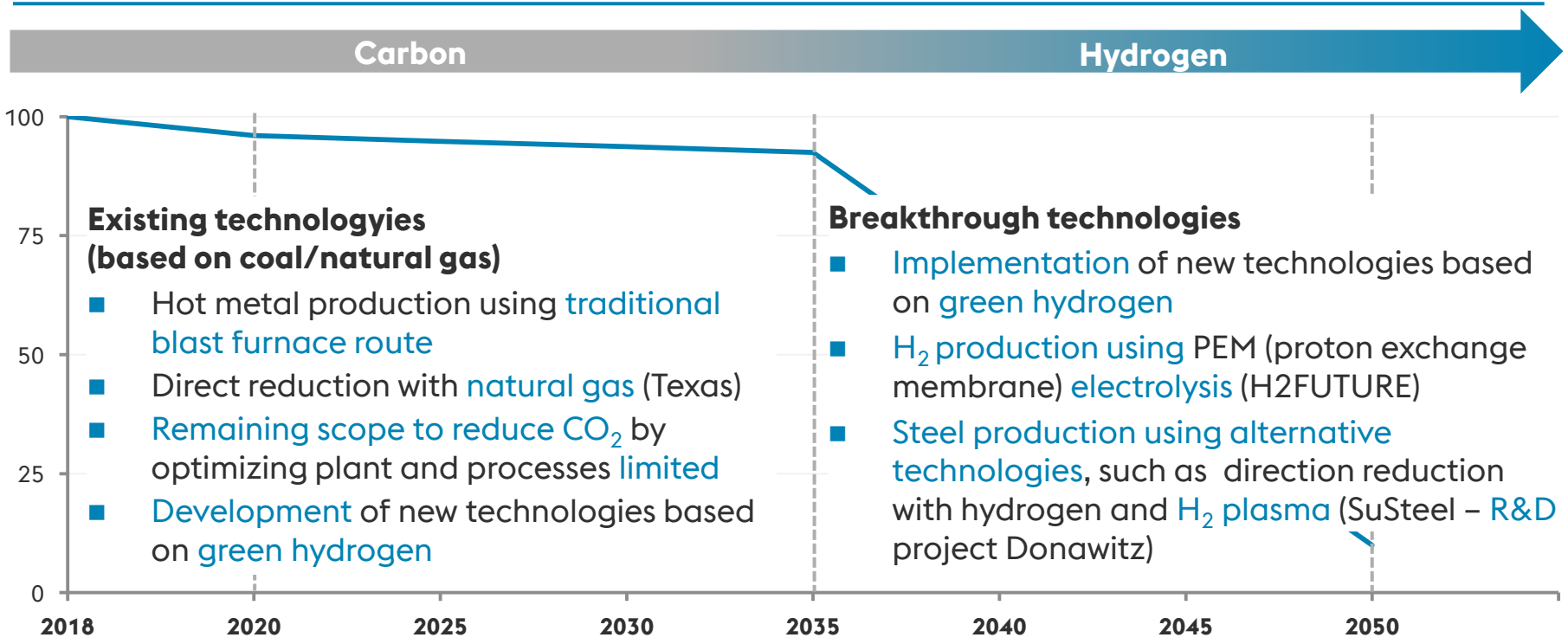
GRADUAL DECARBONISATION
voestalpine CONCEPT

- **Bridge technology:** Direct reduction plant in Texas (USA); using natural gas as reducing agent in direct reduction plants; potential for gradual introduction of green hydrogen generated using renewables.
- **Renewable hydrogen generation:** H2FUTURE project in Linz (Austria); investigating hydrogen electrolysis technology on an industrial scale.
- **Breakthrough technology:** SuSteel ("**Su**stainable **Steelmaking**"); reduction of iron ore using hydrogen plasma, ongoing research using pilot plant at the Donawitz site (Austria).

TRANSFORMATION SCENARIO



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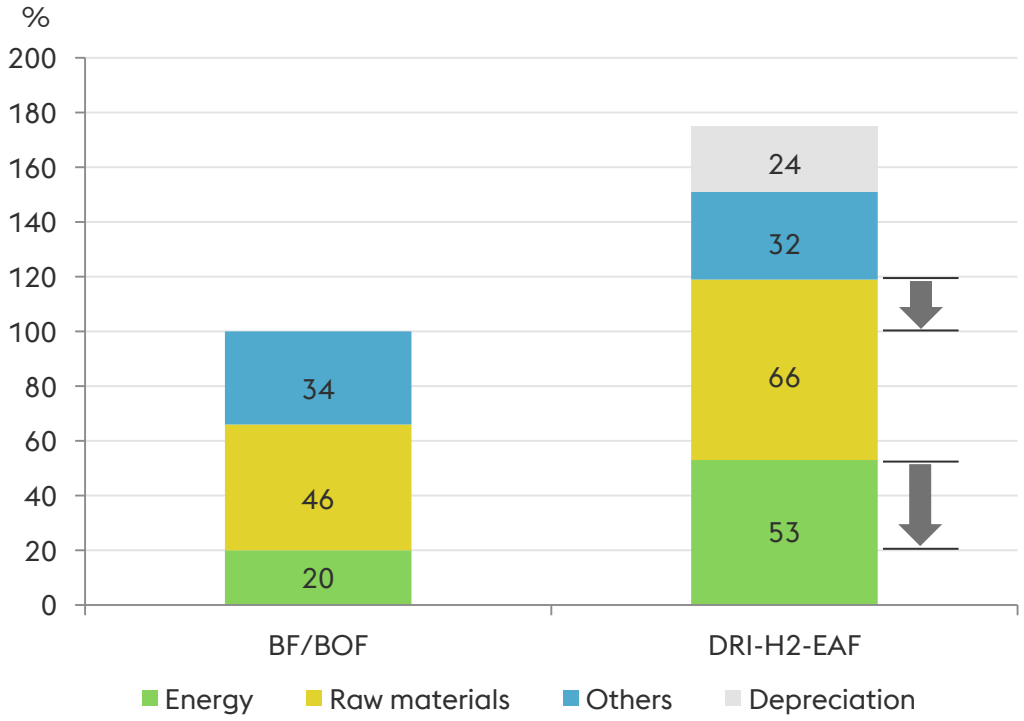
TRANSFORMATION SCENARIO
PRODUCTION COSTS



» Besides investments in R&D, Upscaling and technology change (CAPEX), the production costs (OPEX) of breaktrough technologies have to be brought to a competitive level.

» From today's perspective, fully renewable transformation would nearly result in a doubling of production costs.

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SUMMARY
HOW CAN DECARBONISATION WORK?

- **Low-carbon technologies are not only a challenge for the steel industry**
  - Precondition: Fundamental transformation of energy management (generation, supply, infrastructure, …)
  - Competitiveness at least on European, if not on global level
- **Additional electricity demand** from renewable sources has to be available **not only for steel,** but also for other energy-intensive industries, e-mobility etc. → ambitious, but **realistic expansion scenarios**

Just to give you an illustration:

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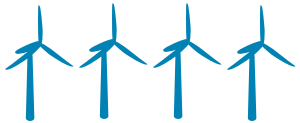
HOW MANY WIND TURBINES NEEDED FOR STEEL INDUSTRY ALONE?

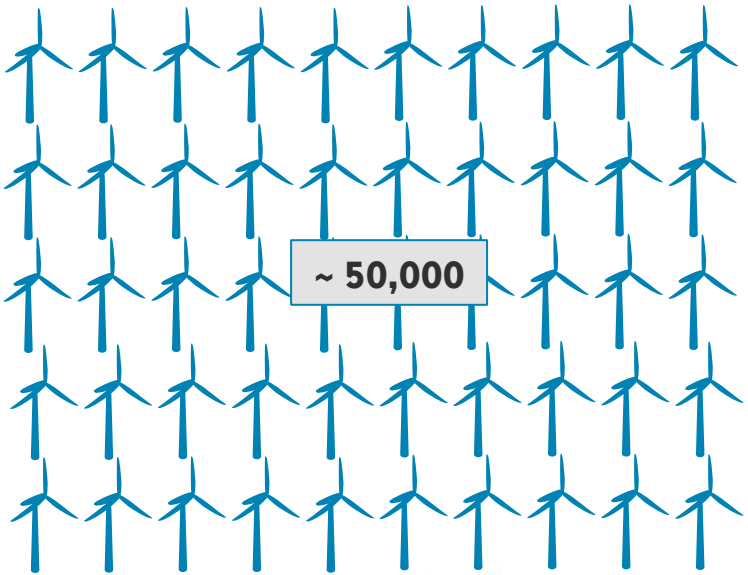
~ 40 TWh

~ 500 TWh



~ 4,000

= 1,000 wind turbines (à 4 MW capacity)



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SUMMARY
HOW CAN DECARBONISATION WORK? (2)

- **Renewables are not always reliable**
  - Grid stability is essential (24-7-365): Considering purely the annual output is not enough – availability of supply has to be secured constantly
  - R&D and investments in storage, transmission, and infrastructure technologies necessary
- **Cross-sectoral approach** (energy-intensive industries and energy suppliers) – **broad cooperation** with all stakeholders
- A **reliable framework for long-term investment** decisions – we are an integral part of the solution!

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