

SALZGITTER AG

# SALCOS<sup>®</sup> - SALZGITTER LOW CO2 STEELMAKING

Decarbonizing the Steel Sector

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**SALZGITTER AG**  
People, Steel and Technology



# AGENDA

- 01 Starting Point and Motivation
- 02 Salzgitter AG - Background Information
- 03 Strategy 2030
- 04 SALCOS® program

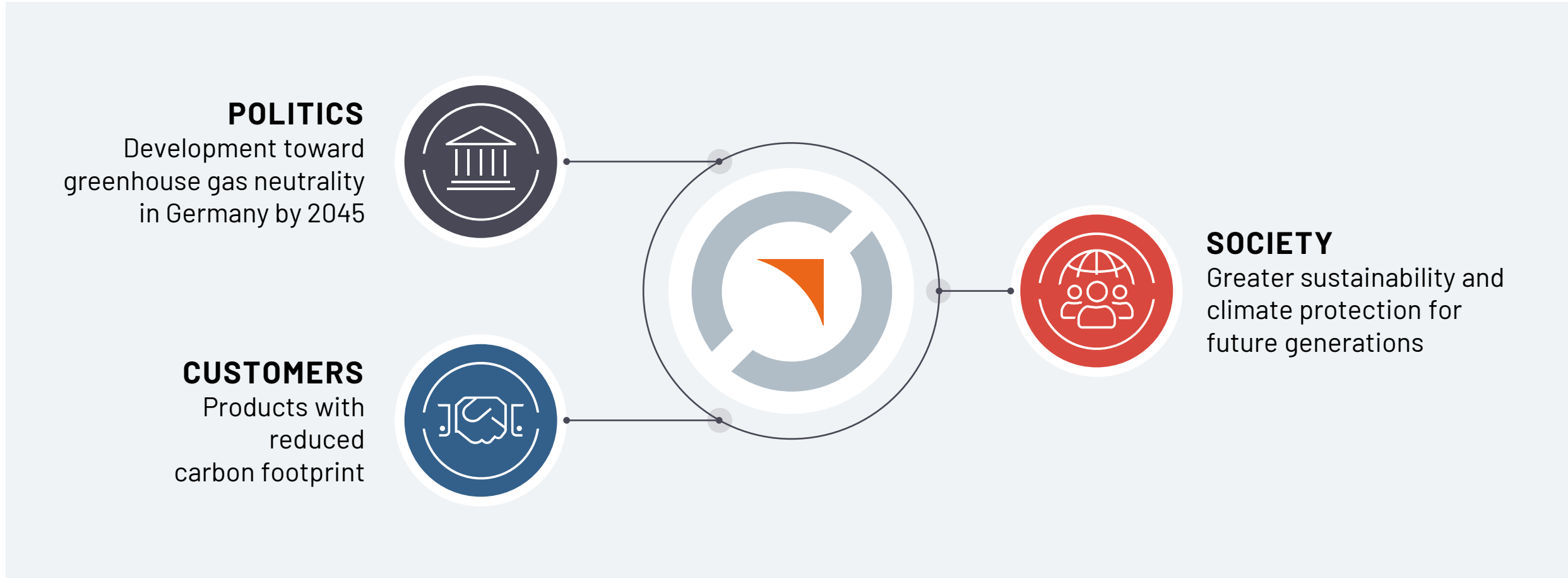


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# STARTING POINT

Different stakeholder demands



## POLITICS

Development toward greenhouse gas neutrality in Germany by 2045

## CUSTOMERS

Products with reduced carbon footprint

## SOCIETY

Greater sustainability and climate protection for future generations

# SOCIETY

Greater sustainability and climate protection for future generations



Source: Umweltverschmutzung (environmental pollution): kamilpetran/stock.adobe.com, e-mobility: Olivier Le Moal/ Fotalia, Fridays for Future: Michael Kappeler/dpa, climate change: fotolia, coal phase-out: <https://finanzblog.lgt.com/kohle/>, green house gases: <https://www.entega.de/blog/kohleausstieg/>

# POLITICS

Legal situation in Germany: climate-neutral by 2045

Germany's entire greenhouse gas emissions amounted to **739 million tons** of CO<sub>2</sub>-equivalents in 2020.

BMUV, 2021

With a share of **8 million tons**, Salzgitter AG is responsible for **one percent**.

A total of **7 percent** of Germany's emissions are attributable to the **steel industry**.

BMUV, 2021

- \* Assumption: One hectare (ca 2.47 acres) of forest saves around 6 tons of CO<sub>2</sub> a year (wald.de)
- \*\* Assumption: 1,000 km saves around 100 liters of fuel and that saves 250 kg of CO<sub>2</sub> (Greenpeace)
- \*\*\* Assumption: Actual emissions from industry in 2020: 172 million tons of CO<sub>2</sub> minus target for 2030: 118 million tons CO<sub>2</sub> = 54 million tons CO<sub>2</sub>. Of which 8 million tons of CO<sub>2</sub> = 15 %
- \*\*\*\* Assumption: Consumption of 1,700 kWh a year (Greenpeace); power mix Germany 2020: 0.366 kg/kWh

## SAVINGS OF 8 MILLION TONS OF CO<sub>2</sub> IN COMPARISON:

- / Annual carbon savings of around 12,500 km<sup>2</sup> of forested land\* (ca 80 % of the surface area of Schleswig Holstein)
- / 32 billion kilometers less by car\*\* (ca 5 % of Germany's truck & car transport)
- / 15 % industrial target of German climate protection law \*\*\* (required reductions of 54 million tons of carbon emissions in industry)
- / Switch of 13 million single-person households to green electricity suppliers\*\*\*\*

# CUSTOMERS

Products with reduced carbon footprint



"Volkswagen is working on new carbon neutral supply chains."



"Here and now we are striving for carbon neutral production worldwide by the end of 2022."



"Cutting absolute greenhouse gas emissions by 50 % by 2030."



"By 2030 we will have reduced carbon in the supply chain by around >20 %."



"Our goal is to achieve greenhouse-gas-neutral mobility by 2050."



"Our plants will all be carbon neutral by 2030."





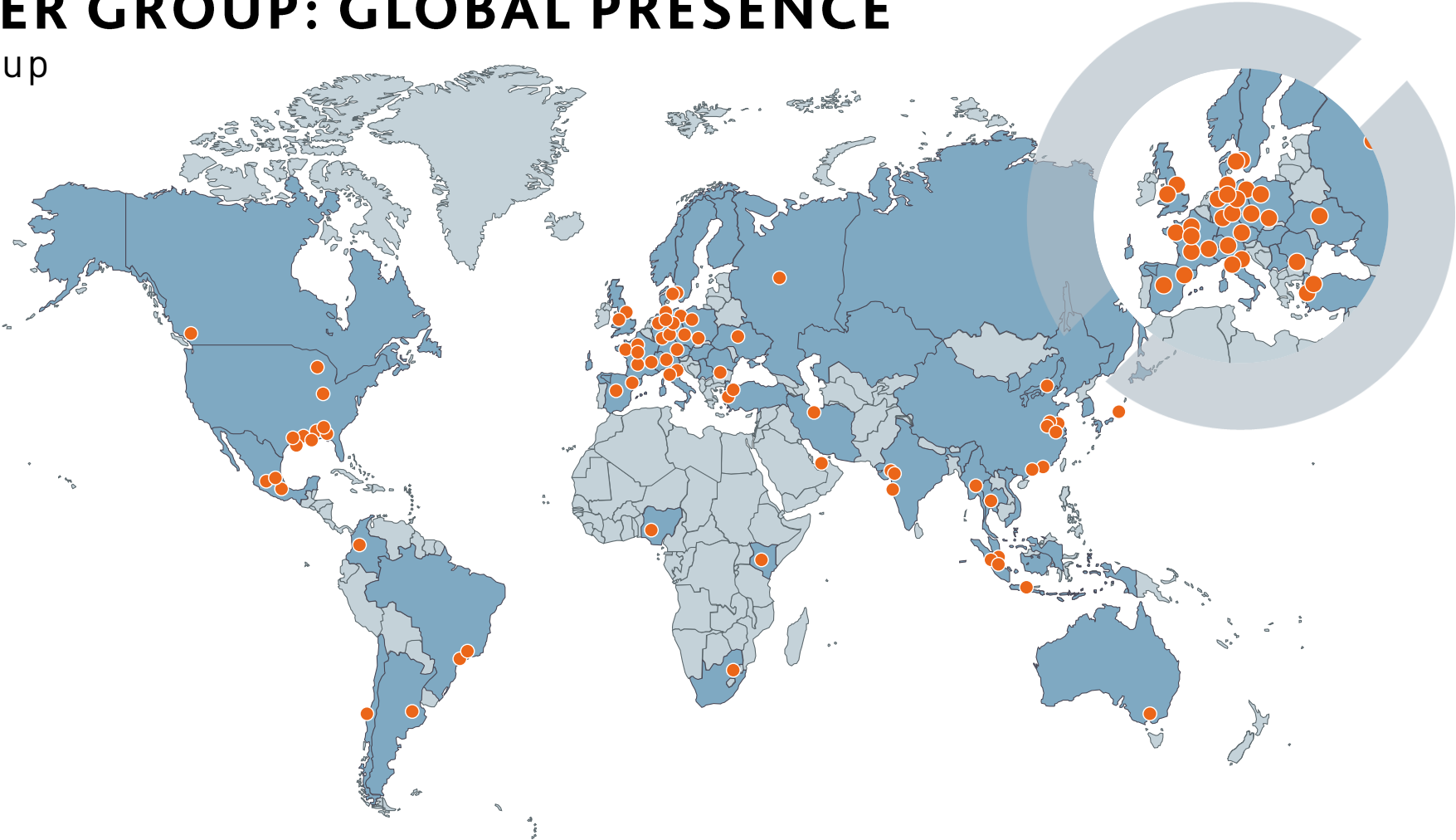
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# SALZGITTER GROUP: GLOBAL PRESENCE

Salzgitter Group



Crude steel output 2022: 6.1 million tons; trading volumes: 3.6 million tons  
Among the top 3 manufacturers of filling and packaging plants

# GROUP STRUCTURE AND KEY DATA FY 2022

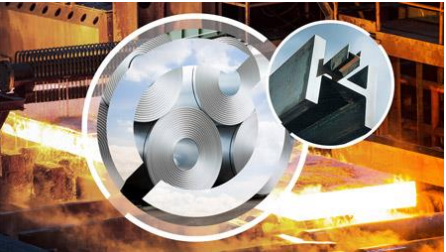
Salzgitter Group

## Salzgitter Group

External sales cons.: € 12.5 bn / EBT: € 1.2 bn / Employees: 22,622

### Steel Production

/ External sales: € 4.3 bn  
/ Employees: 7,369



### Steel Processing

/ External sales: € 2.1 bn  
/ Employees: 5,341



### Trading

/ External sales: € 4.6 bn  
/ Employees: 1,975



### Technology

/ External sales: € 1.4 bn  
/ Employees: 5,329



All information on employees as of 31/12



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# PILLARS OF THE "SALZGITTER AG 2030" STRATEGY

Vision and Mission

## PIONEERING FOR CIRCULAR SOLUTIONS

"We are the market leader for circular economy solutions in global industrial value chains with our innovative products and processes."

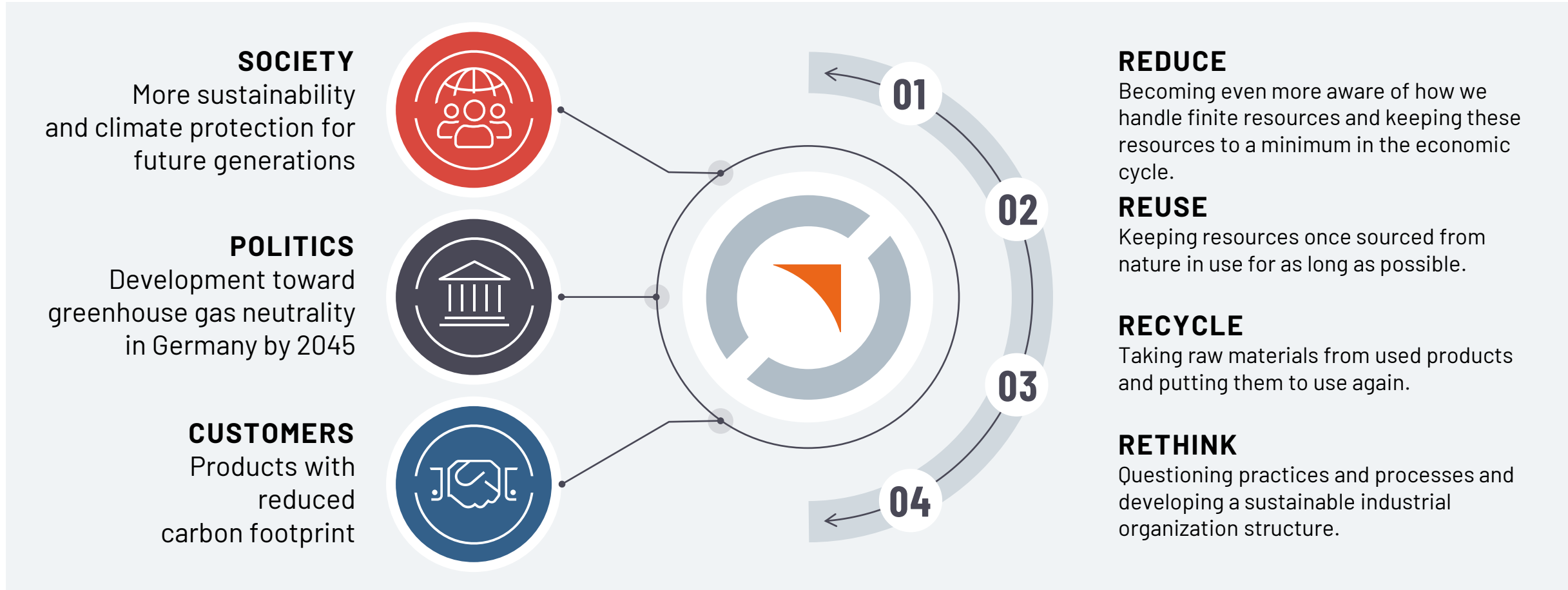


## PARTNERING FOR TRANSFORMATION

"Together we will resolutely chart new courses, transform industry, and create sustainable value for the future."

# OUR VISION: PIONEERING FOR CIRCULAR SOLUTIONS

Circularity as the answer to stakeholder demands









# OUR MISSION: PARTNERING FOR TRANSFORMATION

Decarbonizing value chains can only be done together



# MEASURES FOR DECARBONIZATION

Firmly anchored in our Salzgitter AG 2030 strategy

-  / Reducing Scope 1 and 2 carbon emissions by more than 50 % compared with 2018
-  / Sourcing power exclusively from renewable energy carriers
-  / Expanding scrap recycling activities
-  / Accelerated decarbonization under SALCOS®
-  / As from 2026: 1/3 of production has been switched to the SALCOS® route
-  / By 2033: transformation of the steelworks already complete



# DECARBONIZING STEEL PRODUCTION

SALCOS® as part of the strategy and answer to demands from our stakeholders







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# THE IDEA BEHIND SALCOS®

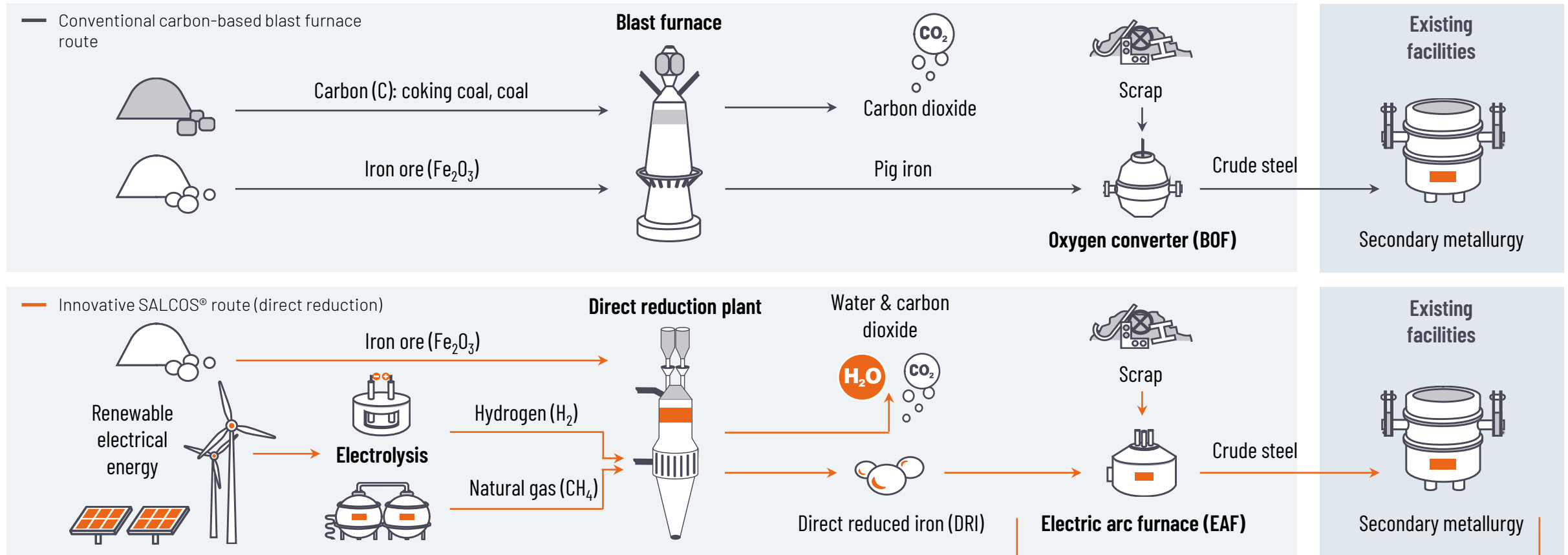
## Salzgitter Low CO<sub>2</sub> Steelmaking

- / Our approach: **Carbon Direct Avoidance** (CDA)
- / **SALCOS®** can map out the route to **virtually carbon-neutral** steel production
- / **Hydrogen** as a **reduction agent** will replace carbon
- / Transformation process is planned **in three stages**
- / **Integration** of the new facilities **into the existing steelworks**
- / **Same production capacity**
- / By **2033: targeted reduction of more than 95 % of carbon emissions**



# AND THE TECHNICAL IMPLEMENTATION

## Comparison of conventional and future production technology

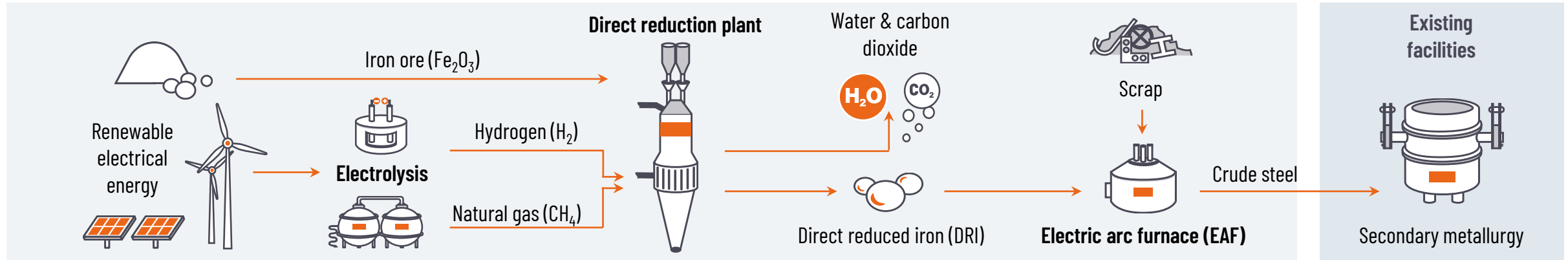


Part of this future process route is already in place at the Peine site.

**ENERGIRON** (flexible variation of natural gas and  $\text{H}_2$ )  
DRI TECHNOLOGY BY TENOVA AND DANIELI

# HOW TO VISUALIZE STEEL PRODUCTION OF THE FUTURE?

The innovative and flexible SALCOS® route – a few key data



## Electrolysis

- / 100 MW output
- / For 5 % of the H<sub>2</sub> volume required by a DR plant
- / Unprecedented in Europe on this scale

## Media infrastructure, incl. 380 kV

- / A range of media is necessary, including natural gas, steam, compressed air, oxygen, water, electricity, nitrogen
- / Mega media route, annual switchovers
- / New 380 kV power connection (overhead lines, transformer stations, distribution networks)
- / Raising the electr. connected load (250 MW – 550 MW – 1000 MW)

## Direct reduction plant

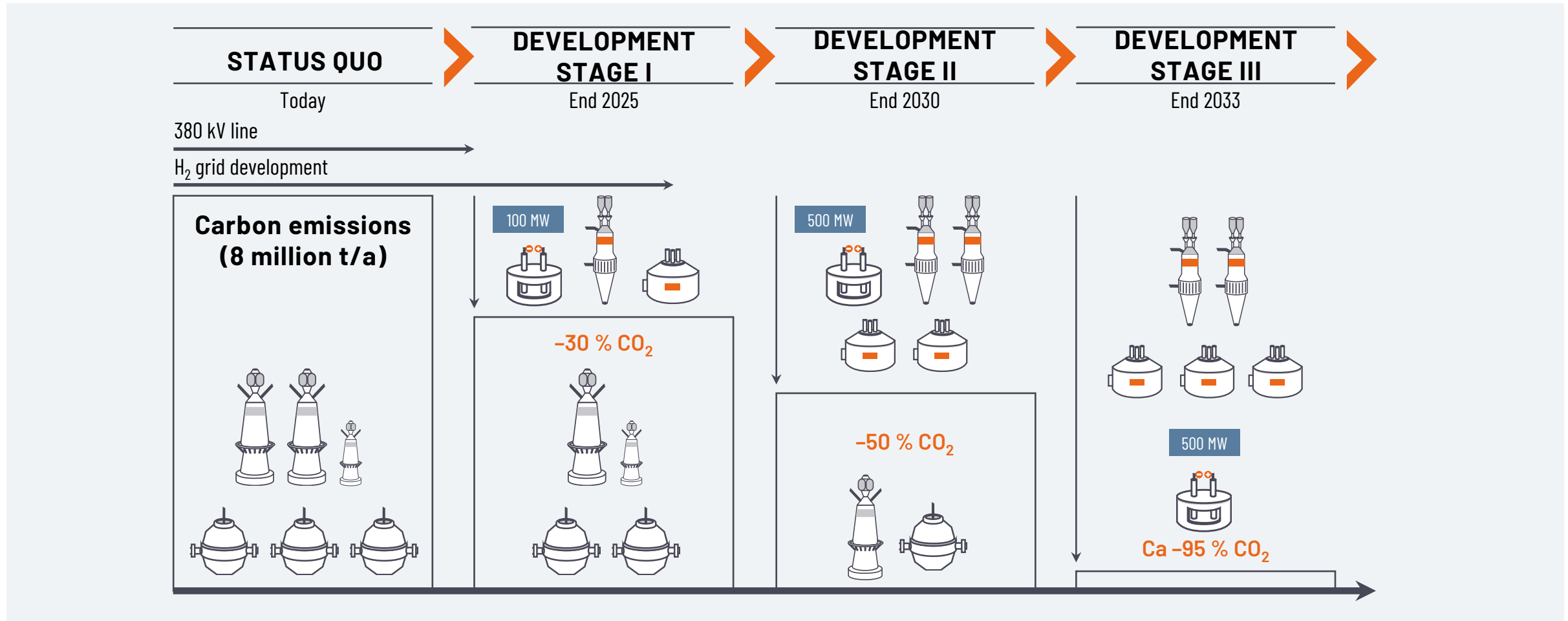
- / Tenova "Energiron ZR® Direct Reduction" technology, i.e. flexible use of natural gas and hydrogen
- / 2.1 million t DRI production capacity
- / Reactor tower more than 100 m high
- / Transport of DRI via Hy-Temp-Turm

## Electric arc furnace

- / Casting weight 220 t
- / Alternating current electric arc furnace
- / Average tap-to-tap time of less than an hour
- / Secondary metallurgy to be retained to ensure product quality

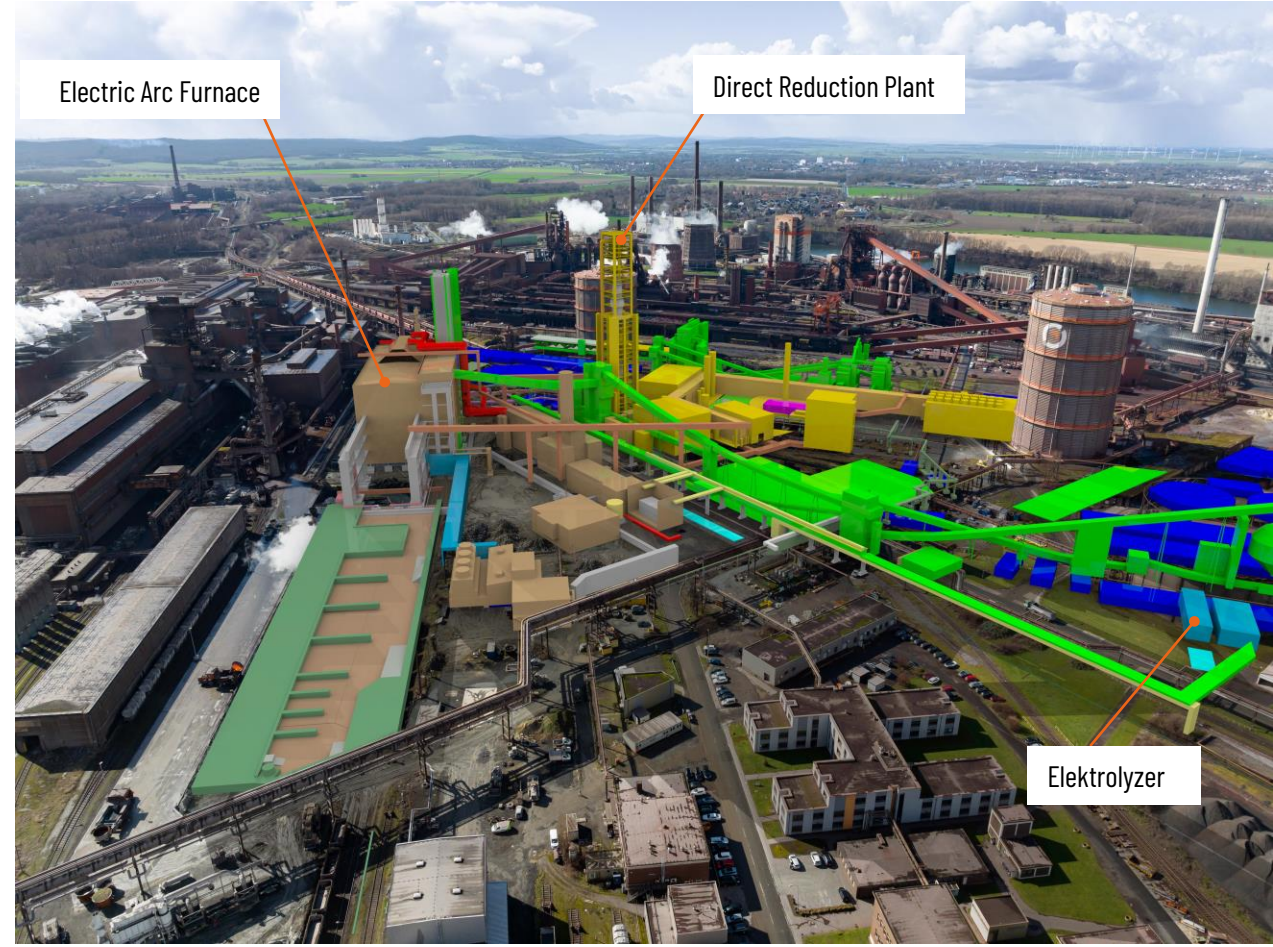
# SALCOS® – DEVELOPMENT STAGES

Construction and time schedule



# SALZGITTER STEELWORKS – PLANT INTEGRATION

Construction site and planned implementation of SALCOS® stage 1



# SALCOS® - CORE UNITS ON A DEMONSTRATOR SCALE

Hydrogen production, direct reduction of iron ore, flat steel production via EAF



**SINCE 2020**

Operation of seven wind turbines (30 MW) and 2.5 MW PEM electrolyzer in Salzgitter



**SINCE 2020**

Operation of the world's first steam electrolyzer in MW scale at Salzgitter Flachstahl GmbH



**SINCE 2022**

First direct reduced iron plant on line capable of flexible operation using hydrogen and natural gas  
Direct reduction plant

**EAF route**



**SINCE 2020**

Production of low carbon strip steel products based on steel scrap (cooperation SZFG and PTG)



# HYDROGEN PRODUCTION

Electrolyzer projects WindH<sub>2</sub> and GrInHy2.0

/ Salzgitter Hydrogen **WindH<sub>2</sub>**

/ 3,75 MW PEM-  
Elektrolyzere

/ 30 MW wind power on  
Group sites



/ Green Industrial Hydrogen 2.0  
**GrInHy2.0**

/ 0,72 MW High-  
Temperature  
Electrolyzer





# DIRECT REDUKTION OF IRON ORE

Energiron ZR<sup>®</sup>-Demonstration and R&D plant  $\mu$ DRAL

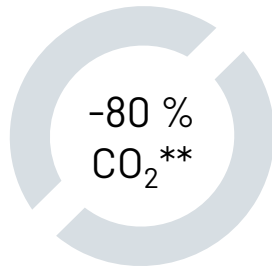
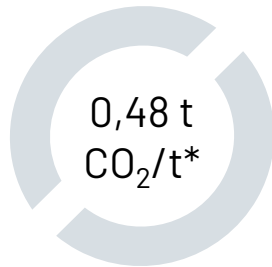
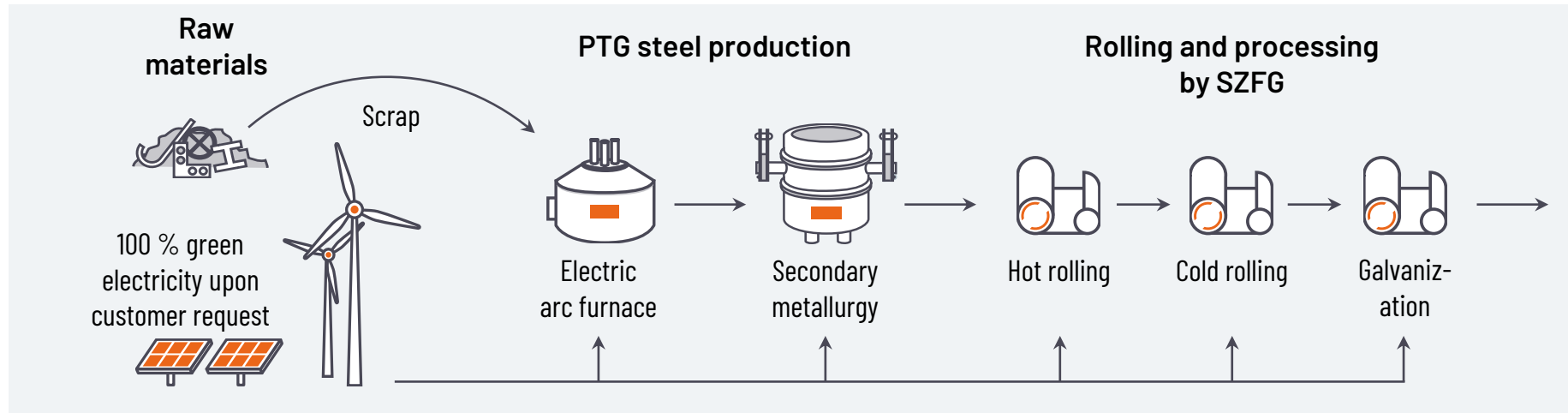
## / Direct Reduction Plant $\mu$ DRAL

- / World's first direct reduction plant flexibly operated with hydrogen and natural gas
- / 100 kg DRI / h production capacity
- / Investigation of flexible process gas mixtures
- / Investigation of different iron ore carriers
- / Training of employees



# EAF ROUTE – PTG AND SZFG COOPERATION

CO<sub>2</sub>-reduced hot-dip galvanized flat steel – already available today via the EAFs in Peine



\* Specific carbon emission for hot-dip galvanized 100 % sheet in coils with 100 % green electricity certified by TÜV Süd  
\*\* Specific carbon emission reduction for hot-dip galvanized sheet via the EAF production route with 100 % green electricity



# SALCOS® IS IN THE IMPLEMENTATION PHASE

Financing secured, investment decision taken, major equipment ordered

## / Financing for stage 1 secured

- / Government support for SALCOS® program (€700 million federal, €300 million state)
- / Total investment volume of €2.2-2.4 billion approved

## / Investment decision taken

## / Major equipment ordered

- / Electric arc furnace
  - / Annual capacity: 1.9 million tons of crude steel
  - / Technology partner: Primetals Technologies
- / Direct reduction plant
  - / Annual capacity: 2.1 million t DRI
  - / Technology partners: Tenova and Danieli



# YOUR CONTACTS

We are at hand to assist you.

We are looking forward to receiving your inquiries.  
Please do not hesitate to contact us.

**Dr. Stefan Mecke** / SALCOS® Project Spokesperson

+49 (0)5341-21-5798

E [mecke.s@salzgitter-ag.de](mailto:mecke.s@salzgitter-ag.de)



## FURTHER INFORMATION

SALCOS®

<https://salcos.salzgitter-ag.com/de/>

Strategy

<https://www.salzgitter-ag.com/en/company/strategy.html>

PEOPLE, STEEL AND TECHNOLOGY

# WE ARE TRANSFORMING STEEL PRODUCTION – SUSTAINABLY

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