CO$_2$-reduced Steel for the energy industry

Is it relevant and how do we do the right things together?
Who we are
Germany's largest flat steel manufacturer

~ 10.5 m metric tons crude steel p.a.
~ 13.2 bn € sales in 2020/21
~ 26,300 employees

Automotive sector
Special vehicles
General industry
Power generation & turbines

Consumer goods
Transformers & charging infrastructure
Structural elements
Packaging (e.g. cans and closures)
Electrical Steel powercore® by thyssenkrupp Steel Europe

NGO – Non grain-oriented electrical steel

GO – Grain-oriented electrical steel
Green transformation
Challenges and opportunities

- Steel per capita & year ~ 419 kg
- CO2 share steel ~ 5%
- CO2 share steel ~ 7%
- CO2 share tk in D ~ 2.5%
- CO2 share tk in the Ruhr region ~ 25%

Our goal by 2030

>30 % Reduction in CO2 emissions (-6 m metric tons)

2030 6 m t CO2 saving
Conversion of 3 million cars to electric propulsion

tkSE requirement: ~ 14 TWh 2030
Corresponds to 120% of the electricity demand of the city of Hamburg

H2 Best exchange rate
1 t H2 saves 26 t CO2

Our goal by 2045 at the latest

-100 % CO2 emissions (-20 m metric tons)

-30% CO2 emissions in 2030 refers to Scope 1 and Scope 2 emissions (reference year 2018). Additional target by 2030,
Steel is an essential component for a sustainable and successful energy transition …

… which is why we are converting our production to "green" to meet this requirement.
We expect that “green steel” demand will accelerate quickly – as also other important stakeholder incl. investors and regulators are acting with an ESG focus.

Expected “green steel” demand (% of total steel demand)

Intensified regulations and targets expected to result in larger demand than supply

Source: tkSE; Global Investor ESG Survey, PWC

~80% of investors questioned see ESG as relevant criteria when making investment decisions

~75% find ESG goals preferable to short-term profits

~50% are willing to deinvest if measures are inadequate
Across industries, companies including your direct customers set clear targets for CO2 reductions.

Number of companies that (committed to) set science-based targets\(^1\) in the respective year

<table>
<thead>
<tr>
<th>Year</th>
<th>Target set</th>
<th>Committed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>11</td>
<td>1355</td>
</tr>
<tr>
<td>2016</td>
<td>16</td>
<td>589</td>
</tr>
<tr>
<td>2017</td>
<td>17</td>
<td>766</td>
</tr>
<tr>
<td>2018</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>21</td>
<td></td>
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</tbody>
</table>

3,200+ Companies have joined the initiative across sectors since 2015

1,400+ Emission reduction targets have already been set by companies

Source: Science-Based Targets initiative; https://sciencebasedtargets.org/companies-taking-action

7 CO\(_2\)-reduced Steel for the Energy Industry – Outlook for the Transformer / Generator Industry and Electric Utilities
First players are announcing their plans to leverage decarbonized steel for achieving Scope 3 targets

Iberdrola, Vattenfall, Siemens Gamesa aim for net zero steel\(^1\)
Companies have set interim targets of using 50% low emission steel by 2030 on joining SteelZero initiative

Ørsted joins the SteelZero initiative to support transition to low-carbon steel\(^2\)
The renewable energy company sees low-carbon steel as critical to achieving a carbon-neutral supply chain by 2040, and important to meeting global climate goals.

CO2-reduced electrical steel of thyssenkrupp as sustainable basic material for the energy transition
thyssenkrupp Electrical Steel supplies bluemint powercore to Siemens Energy for Amprion´s HVDC Ultranet project

1. https://renews.biz/
2. https://orsted.com/
ESG is becoming increasingly relevant – consequently companies are committing to specific decarbonization targets.

Your big customers have announced ambitious targets…

-86% Emission in three decades
-43% Scope 1, 2 and 3 emissions by 2030
Net Zero Globally before 2050

Commitment to invest 150bn EUR in renewables, storage and grids¹
78% of all emissions account to Scope 3

iberdrola joined international initiative SteelZero and announced commitment to using 50% low emission steel by 2030²

Targets approved by the Science Based Target initiative in December 2020, in line with 1.5°C

¹ In this decade; 2. Net Zero by 2050

...as well as other leading organizations

“60% of Scope 1 & 2 and 47% of Scope 3 by 2030”

“50% per kWh of Scope 1&2 and 30% of Scope 3 by 2030”

“Net zero by 2040, 75% of Scope 1&2 and 50% of Scope 3 by 2030”

“80% per kWh of Scope 1 by 2030, Net Zero by 2040”
Reduction of emissions in purchased transformers is an important part of their strategy.

**Green steel** is an important additional lever to achieve your customers goals for sustainably sourced transformers.
bluemint® Steel reflects real CO₂ savings

<table>
<thead>
<tr>
<th>Conventional steel</th>
<th>bluemint® recycled</th>
<th>CO₂ savings from bluemint® recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot strip</td>
<td>2.10</td>
<td>0.75</td>
</tr>
<tr>
<td>Hot-dip galvanized</td>
<td>2.37</td>
<td>0.95</td>
</tr>
<tr>
<td>NO electrical steel</td>
<td>2.75</td>
<td>1.13</td>
</tr>
<tr>
<td>GO electrical steel</td>
<td>3.80</td>
<td>1.9</td>
</tr>
</tbody>
</table>

All relevant production steps are taken into account in our detailed life cycle assessment model for our integrated iron and steel plant.

Certification of the genuine CO₂ savings by TÜV Süd
Using bluemint® in your products, you can achieve scope 3 Upstream CO₂-footprint reductions by up to 40%

Transformer emissions in production phase (in t CO₂)

Up to -40% CO₂ emissions per transformer when using bluemint® powercore®

Certified by DNV

CO₂ savings and resulting specific CO₂ emissions of bluemint® powercore® are already externally certified by DNV – no additional effort needed

You will receive a certificate for bluemint® powercore® confirming carbon intensity and savings of CO₂-emissions (Scope 3)

1. Rated power 120 MVA, 3phase; Working induction 1.5 T; Core weight 75t; 2. Rated power 400 kVA, 3phase; Core weight 940 kg
bluemint® is a major lever for reducing CO₂ emissions

240 t CO₂ can be reduced by ...

Switching ~9,600 light bulbs to LED
Greening roofs of >790 transformer houses (functioning for 10 years)
Driving 1.4m km with electric vehicles instead of combustion engines (~36x around the earth)

Installing ~48 solar PV panels operating for 25 years
Replacing ~84 transformers to more energy efficient models
Sourcing ~2.4mn MJ biomethane instead of natural gas (heating ~83 single-family homes for one year)

Use case Siemens Energy for Amprion+EnBW (TSO) Ultranet
What do I need to calculate my product carbon footprint?

- **supplier specific data**
  - scope 3 upstream emissions

- **generic data**
  - scope 3 upstream emissions

- **supplied energy mix**
  - scope 2 emissions

- **supplied energy mix**
  - scope 1 emissions

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**life cycle inventory**
- digital model of your production process

**product carbon footprint**
- CO₂ eq impact calculation

**critical reviewed product carbon footprint**
- third party review by independent expert panel in compliance with ISO 14040/44

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**publication**
- communicate with stakeholders

**act on results**
- plan to reduce emissions
  - launch new products
Joint Industrial Project

Recommended Practice for Decarbonization of High Voltage Industry with a Focus on Power Transformers

Transmission & Distribution Technology Department
Why High Voltage Power Transformer need a best practices in Sustainability?

**Risks**
- SBT/COP commitments
- Lack of knowledge sharing and standard approaches
- Increase in timelines and decrease in appeal and trust
- Failure of green commitments

**Value Proposition**
- KNOWLEDGE SHARING
- STANDARDIZED BEST PRACTICES
- HIGHER QUALITY AND TRUST
- ACCOMPLISHMENT & CONSOLIDATED MARKET
Work packages & Deliverables

- Terminology definition
- Defining standards & methodologies
- Define boundaries and KPIs
- LCI & LCIA of power transformers
- Integration of different stages of LCAs
- Interpretation of scoring of relative results in a absolute way

**Deliverables:**
- Recommended practice document including all agreed topics, parameters and templates
- Generic LCA analysis of a power transformer
- Standard template for material passport, EPD reporting

JIP group aims to deliver the complete scope by early 2024
The transformation will succeed if policymakers create framework conditions

- Fair competitive conditions
- Political and regulatory framework for climate-neutral technologies
- Market model: Incentives for the purchase of green products
Required next steps …

- Strengthen public and private investment
- Speed up planning and approval processes
- Lead markets for green basic materials
- Fit for 55 – impact assessment and adaptation of instruments
- Further develop EU state aid law
- Promote hydrogen economy, define use priorities
It is our moment of choice

...and we can only do it together

How do we get our grids and infrastructure “fit for 55” and what are your current priorities to achieve a carbon neutral infrastructure?

How can we communicate the value of decarbonized electrical equipment to customers and society?

How can be ensured that this message is understood as input for the regulatory discussion?
Thank you for your attention.