

# CO<sub>2</sub>-reduced Steel for the energy industry

## Is it relevant and how do we do the right things together?

September 13, 2023 | Antwerp, Belgium | worldsteel Open Forum  
Marcel Hilgers – thyssenkrupp Electrical Steel Group

engineering.tomorrow.together.

  
thyssenkrupp

# 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



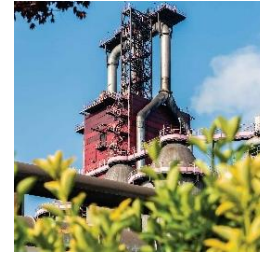
~ 419 kg  
Steel per  
capita & year



~ 5 %  
CO<sub>2</sub> share  
steel



~ 7 %  
CO<sub>2</sub> share  
steel



~ 2.5 %  
CO<sub>2</sub> share  
tk in D



~ 25 %  
CO<sub>2</sub> share  
tk in the Ruhr region

**2030** 6 m t CO<sub>2</sub> 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

**H<sub>2</sub>** Best exchange rate

1 t H<sub>2</sub> saves  
26 t CO<sub>2</sub>

Our goal  
by 2030

**> 30 %** Reduction in CO<sub>2</sub>  
emissions  
(-6 m metric tons)

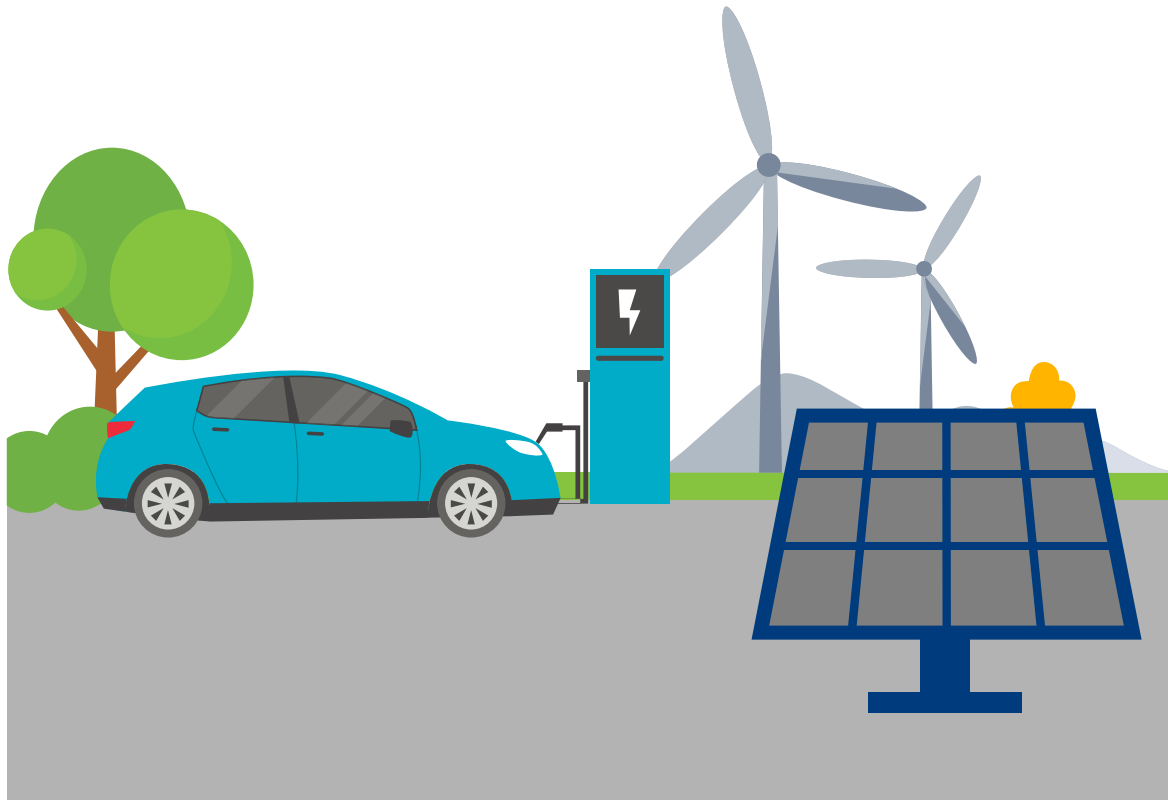
Our goal  
by 2045 at the latest

**-100 %** CO<sub>2</sub> emissions  
(-20 m metric  
tons)

-30% CO<sub>2</sub> 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



Today

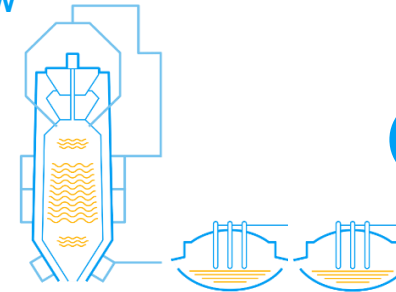


Blast furnace

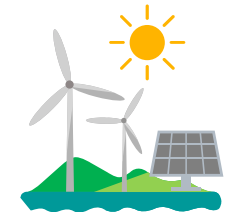


Iron ore & coking coal

Tomorrow



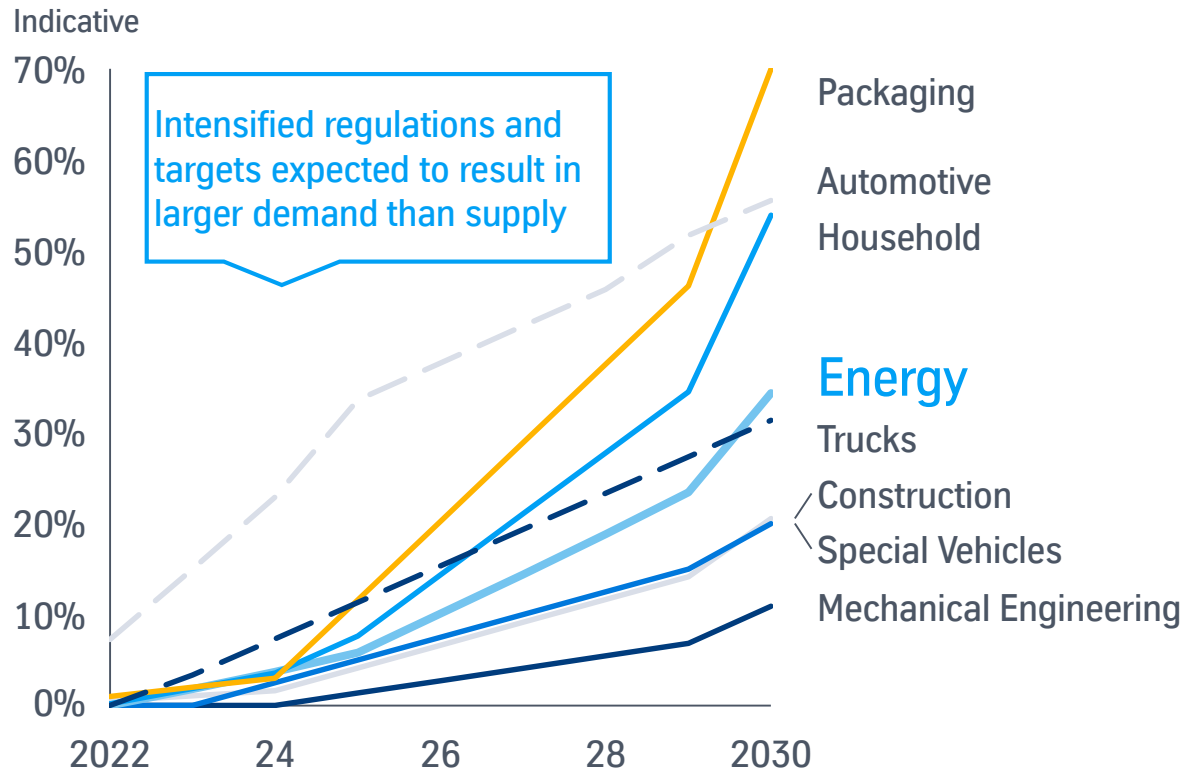
Direct reduction plant  
with melting units



Iron ore, hydrogen & green  
electricity

# 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)

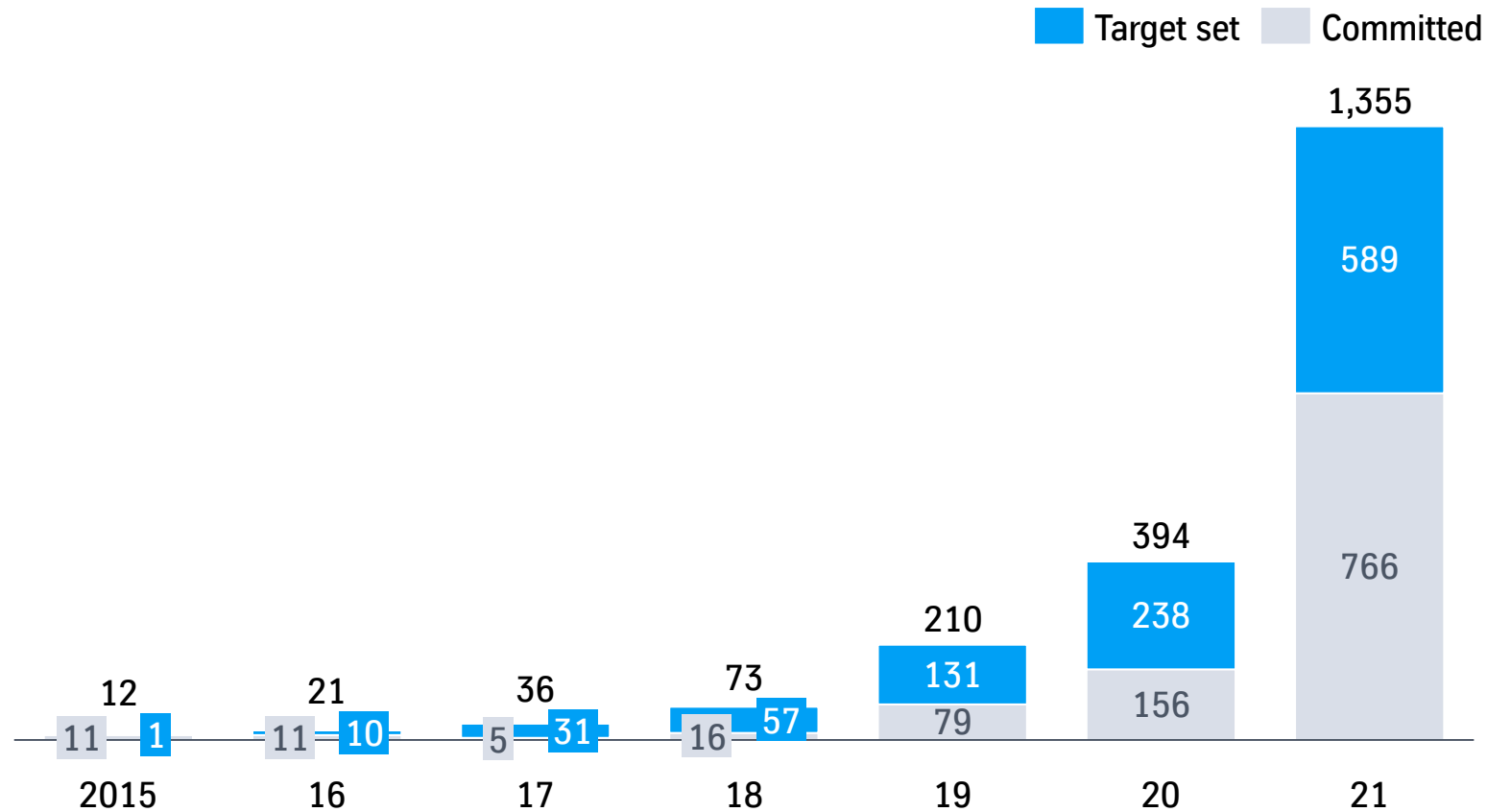


Source: tkSE; Global Investor ESG Survey, PWC



# Across industries, companies including your direct customers set clear targets for CO2 reductions

Number of companies that (committed to) set science-based targets<sup>1</sup> in the respective year



**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>



First players are announcing their plans to leverage decarbonized steel for achieving Scope 3 targets

## Iberdrola, Vattenfall, Siemens Gamesa aim for net zero steel<sup>1</sup>

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<sup>2</sup>

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.

CO<sub>2</sub>-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

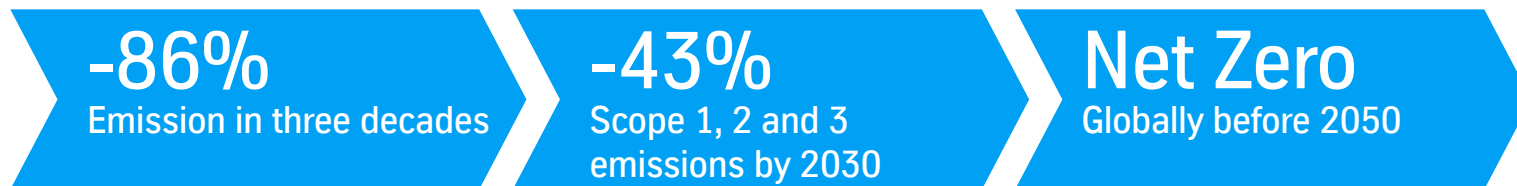
1. <https://renews.biz/>  
2. <https://orsted.com/>





# ESG is becoming increasingly relevant – consequently companies are committing to specific decarbonization targets

Your big customers have announced ambitious targets...



Commitment to invest 150bn EUR in renewables, storage and grids<sup>1</sup>

78% of all emissions account to Scope 3

## CLIMATE GROUP STEELZERO

Iberdrola joined international initiative SteelZero and announced commitment to using 50% low emission steel by 2030<sup>2</sup>



SCIENCE  
BASED  
TARGETS

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

## Transformers and Reactors

Low Losses and Biodegradable Insulating liquids (Natural and Synthetic esters)



**SUSTAINABILITY**  
Lower CO2 emissions from manufacturing to use



**FIRE RESISTANCE**  
Class K insulating liquid, self-extinguishing

**OVERLOADING CAPABILITY/  
LIFE EXTENSION**  
Higher possible operating temperature

**BIODEGRADABILITY**  
Lower environmental impact in case of liquid losses

- Enel Global Standards are open to alternative Insulating liquids
- Enel Purchases: 10% of Power Transformers and more than 50 % of Distribution Transformers

Can we optimize the standards for less raw material consumption exploiting natural ester increased performances?

© Enel Global Infrastructure and Networks s.r.l.



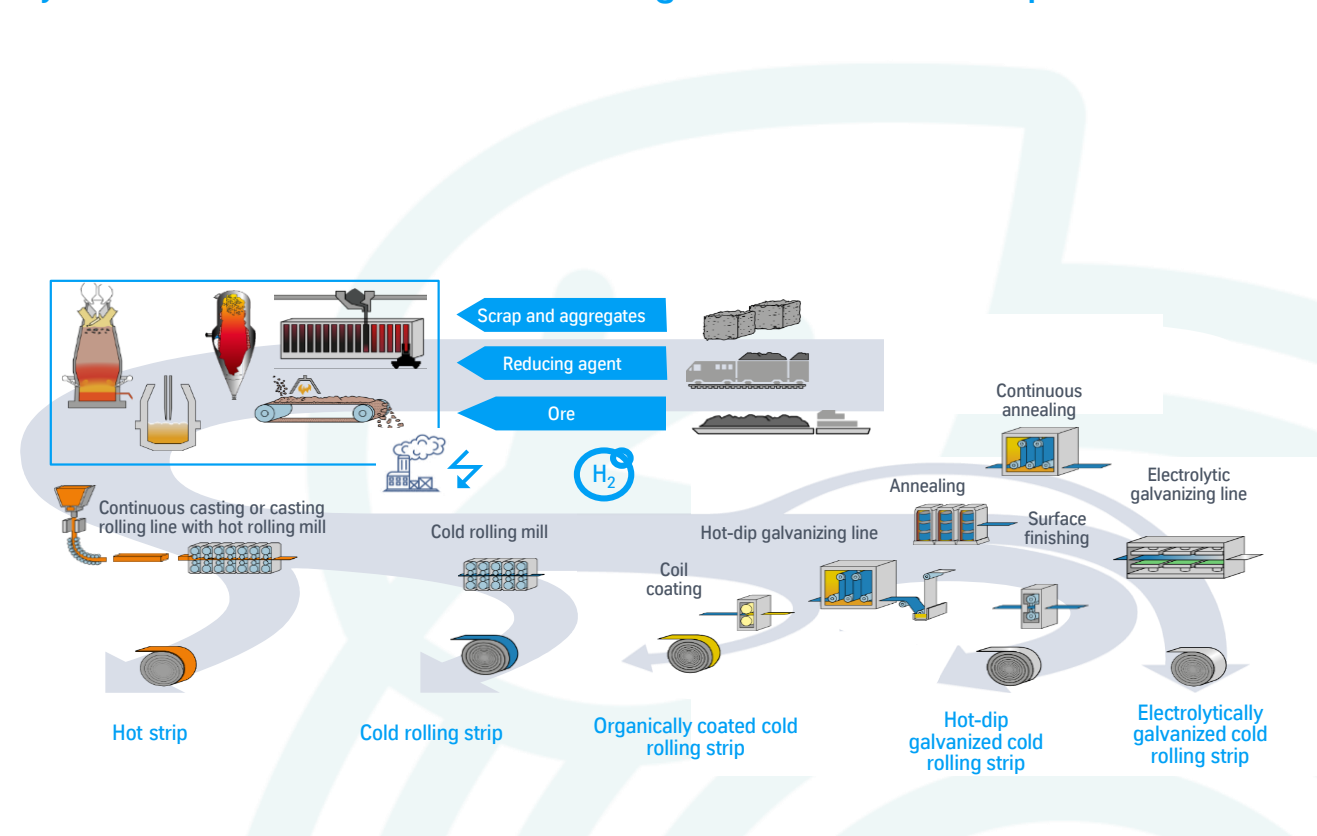
Green steel is an important additional lever to achieve your customers goals for sustainably sourced transformers

# bluemint® Steel reflects real CO<sub>2</sub> savings

CO<sub>2</sub> footprint, in t CO<sub>2</sub>e/t

Conventional steel	bluemint® recycled	CO <sub>2</sub> savings from bluemint® recycled
Hot strip 2.10	0.75	64%
Hot-dip galvanized 2.37	0.95	60%
NO electrical steel 2.75	1.13	59%
GO electrical steel 3.80	1.9	50%

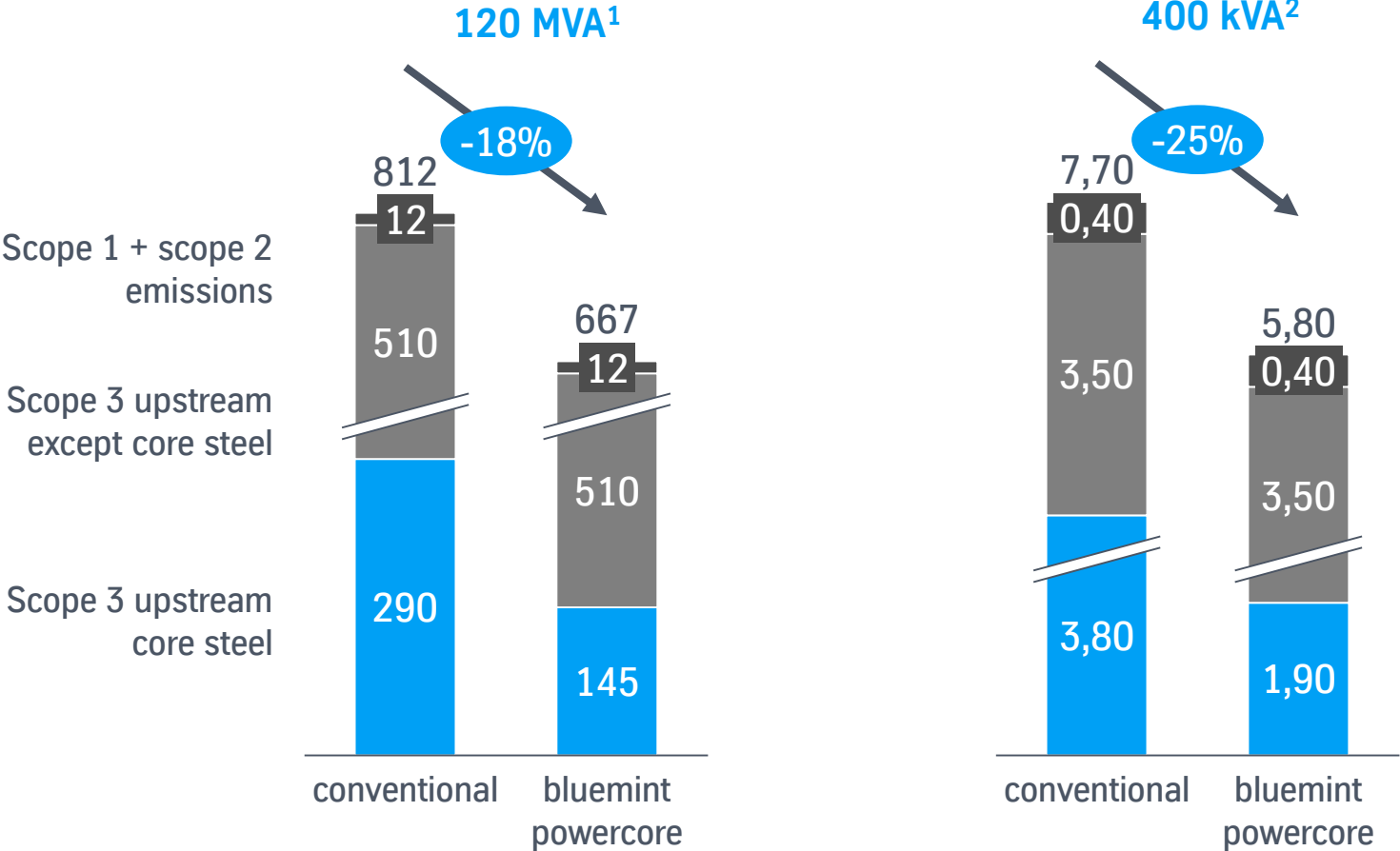
All relevant production steps are taken into account in our detailed life cycle assessment model for our integrated iron and steel plant



Certification of the genuine CO<sub>2</sub> savings by TÜV Süd

# Using bluemint® in your products, you can achieve scope 3 Upstream CO<sub>2</sub>-footprint reductions by up to 40%

Transformer emissions in production phase (in t CO<sub>2</sub>)



1. Rated power 120 MVA, 3phase; Working induction 1.5 T; Core weight 75t; 2. Rated power 400 kVA, 3phase; Core weight 940 kg


Up to -40% CO<sub>2</sub> emissions per transformer when using bluemint® powercore®

Certified by DNV

CO<sub>2</sub> savings and resulting specific CO<sub>2</sub> 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 CO<sub>2</sub>-emissions (Scope 3)

# bluemint® is a major lever for reducing CO<sub>2</sub> emissions

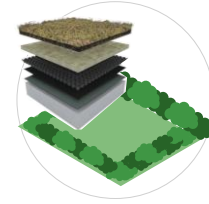


**240 t CO<sub>2</sub>**  
can be reduced  
by ...

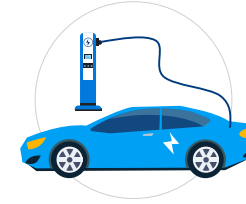
Use case Siemens Energy for  
Amprion+EnBW (TSO) Ultranet



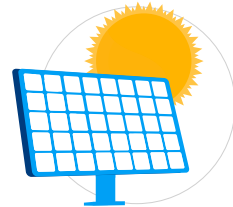
Switching ~9,600  
light bulbs to LED



Greening roofs of  
>790 transformer  
houses (functioning  
for 10 years)



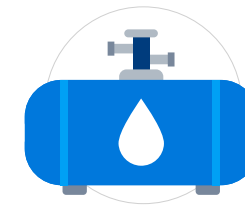
Driving 1.4m km with  
electric vehicles instead  
of combustion engines  
(~36x around the earth)



Installing ~48 solar  
PV panels operating  
for 25 years



Replacing ~84  
transformers to  
more energy  
efficient models

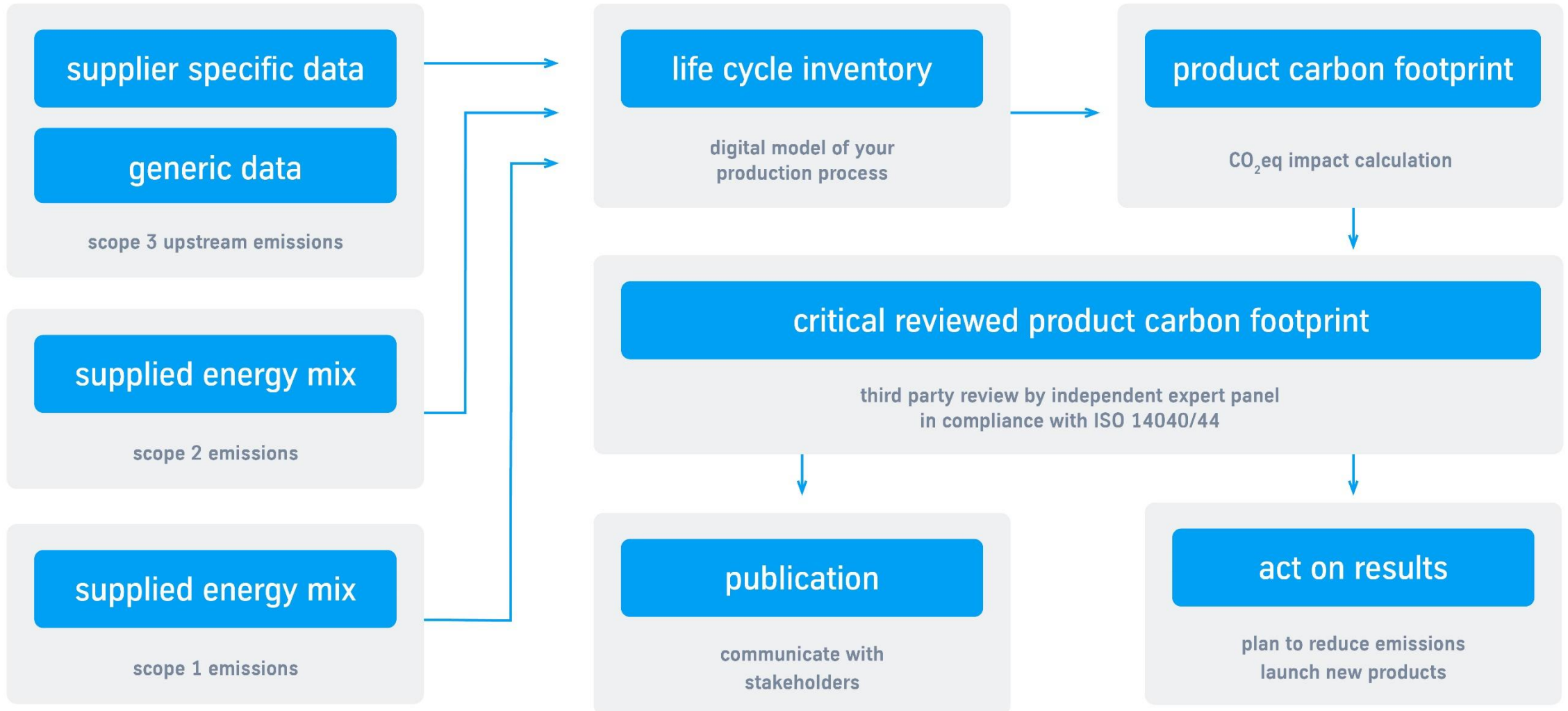


Sourcing ~2.4mn MJ  
biomethane instead of  
natural gas (heating  
~83 single-family  
homes for one year)



Producing 1 Power  
transformer  
(135t core weight)  
with bluemint®  
powercore®

# What do I need to calculate my product carbon footprint?

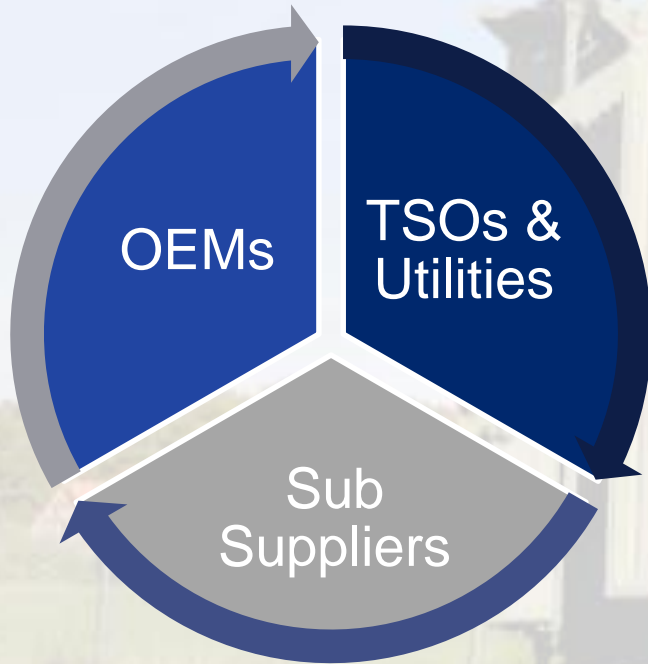


# Joint Industrial Project

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

*Workshops and  
discussion with  
stakeholders*

- 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

engineering.tomorrow.together.

  
thyssenkrupp