

CO₂-reduced Steel for the energy industry

How to collaborate within our industry and do the right things together?

June 6, 2023 | Dubrovnik Croatia | Transformers Magazine – Sustainability Conference
Marcel Hilgers – thyssenkrupp Electrical Steel Group

engineering.tomorrow.together.



Who we are

Germany's largest flat steel manufacturer



~ 10.5 m metric tons
crude steel p.a.

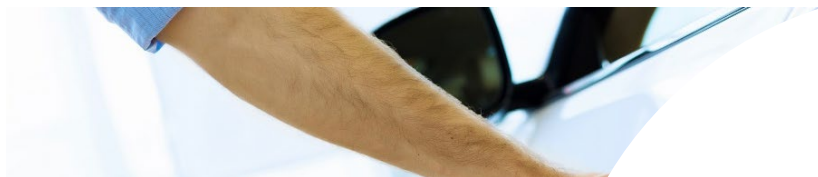


~ 13.2 bn €
sales in 2020/21



~ 26,300
employees

Automotive
sector



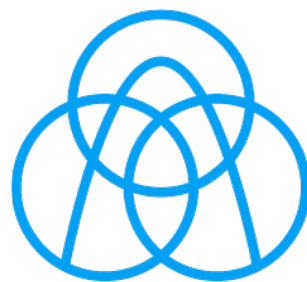
Special
vehicles



General
industry



Power
generation &
turbines



thyssenkrupp

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

EUROPE
No. 2

Upgrade of production facility
for improved product quality and
higher capacities under construction

GO – Grain-oriented electrical steel

EUROPE
No. 1

Green transformation

Challenges and opportunities



~ 419 kg
Steel per
capita & year



~ 5 %
CO₂ share
steel



~ 7 %
CO₂ share
steel



~ 2.5 %
CO₂ share
tk in D



~ 25 %
CO₂ share
tk in the Ruhr region

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 2030

>30 %

Reduction in CO₂
emissions
(-6 m metric tons)

-30% CO₂ emissions in 2030 refers to Scope 1 and Scope 2 emissions (reference year 2018). Additional target by 2030,

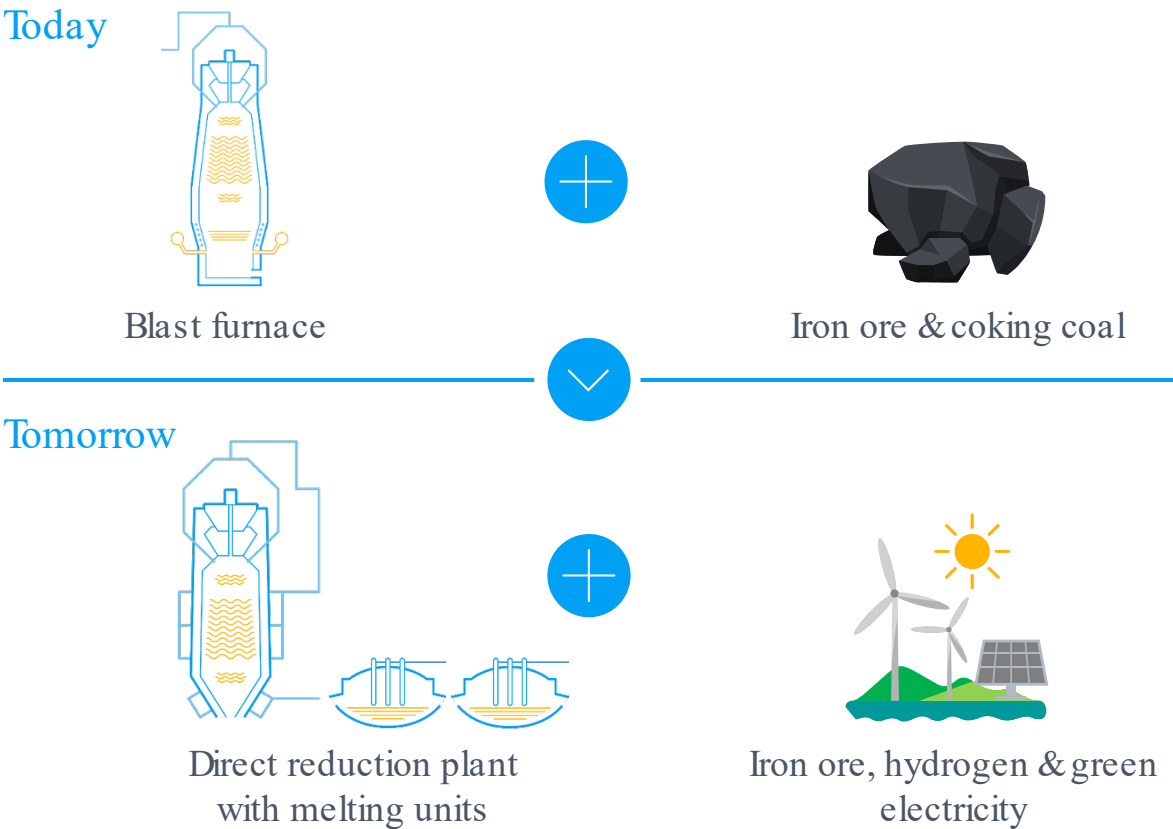
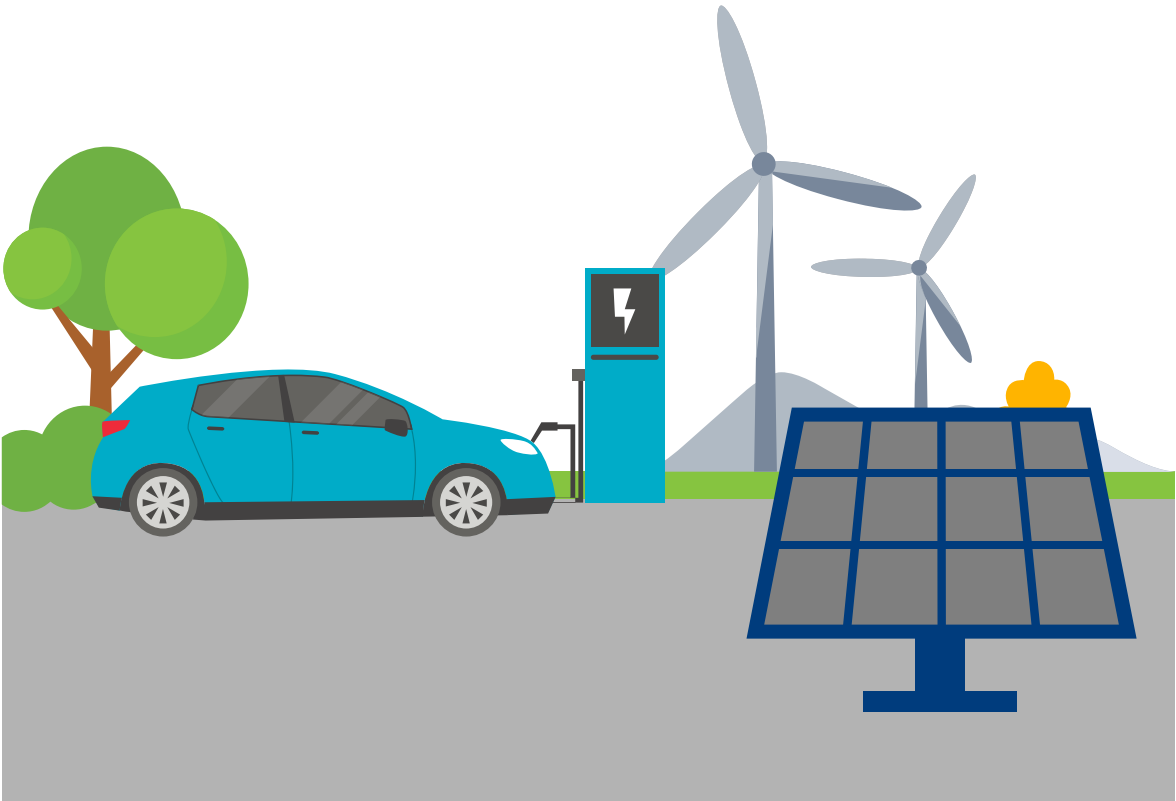
Our goal
by 2045 at the latest

-100 %

CO₂ emissions
(-20 m metric
tons)

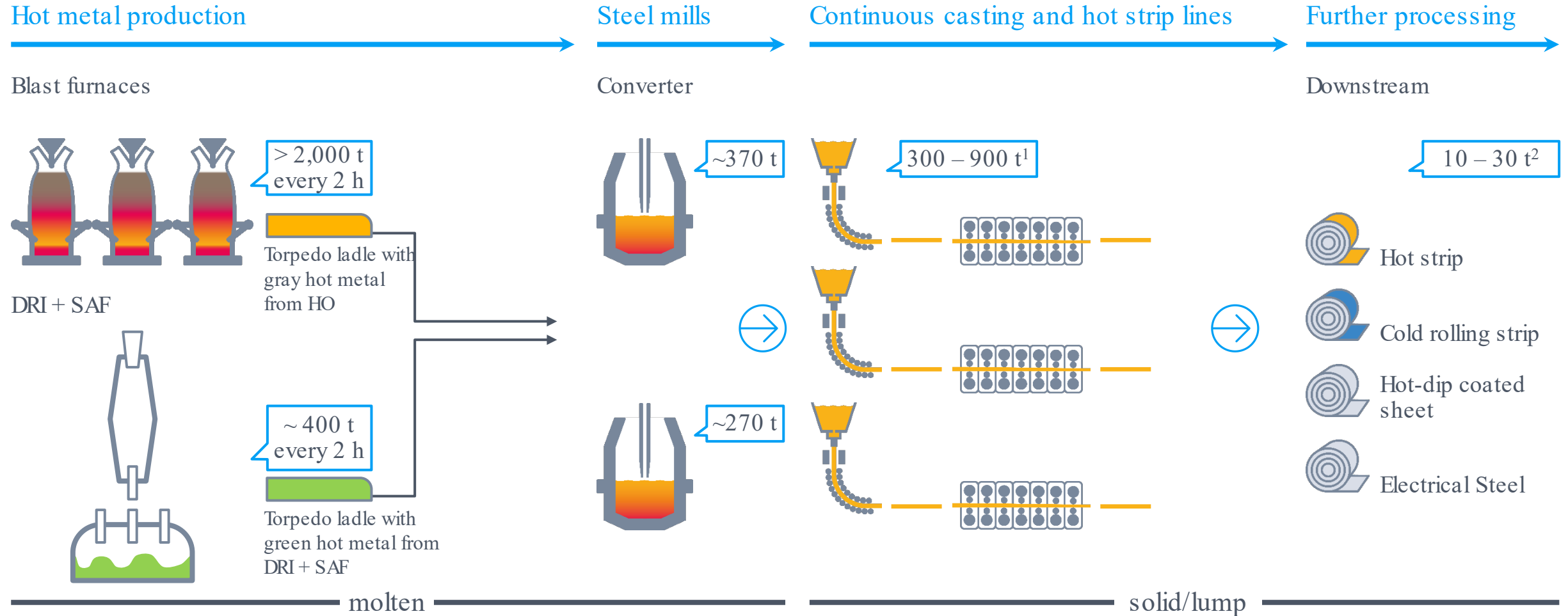
Steel is an essential component for a sustainable and successful energy transition ...

... which is why we are converting our production to "green" to meet this requirement

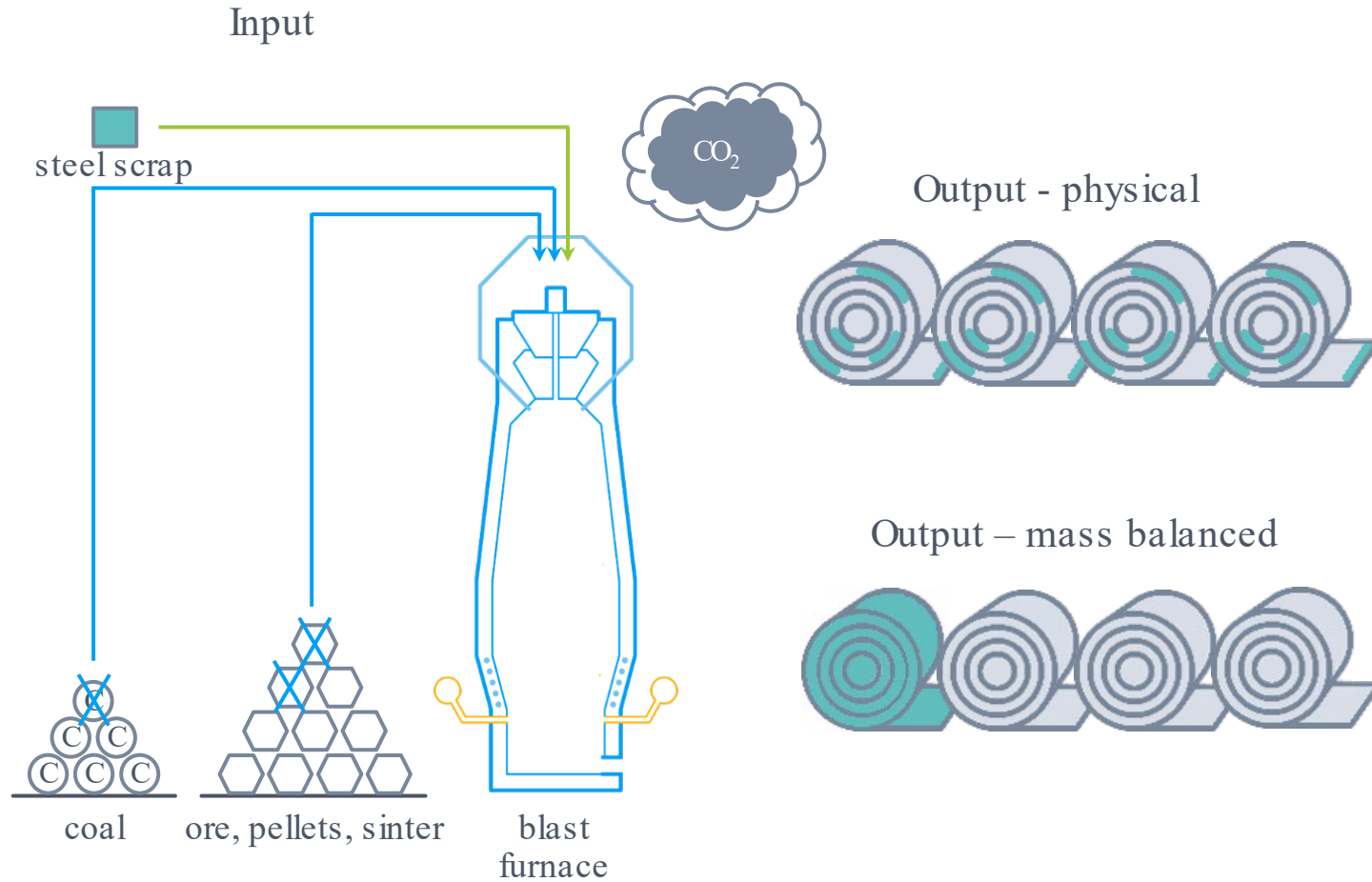


Steel production is highly complex for analysis and process-related reasons

A separate CO₂-reduced route is not possible in the transition



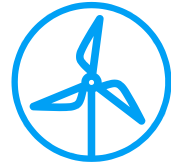
thyssenkrupp mass-balancing approach



mass-balancing in steel production

- Steel scrap is used in the blast furnace to partly replace coal, ore, pellets and sinter, resulting in a mix of sustainable and grey pig iron, that can't be physically traced or separated
- Controlling of used amounts of raw materials and output ensure that not more final product is being certified, than was produced by bringing in steel scrap
- Accounting recording of certified pig iron to be used for bluemint® products
- Emissions calculation is split into the conventional blast furnace route and the steel scrap route

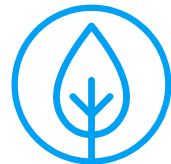
Balancing in the electricity market long established



Marketing of green power generation through guarantees of origin and power purchase agreements (PPA's).



Feeding electricity from renewable energies into the public grid
- avoiding the creation of a dual electricity infrastructure



The most sustainable approach from an ecological and economic point of view



"Zero emissions" does not mean "zero"



Company searches for carbon credits

- More and more companies are claiming to produce zero emissions products



Technically not feasible

- Steel production is not possible without carbon for purely physical reasons



Transparency and credibility

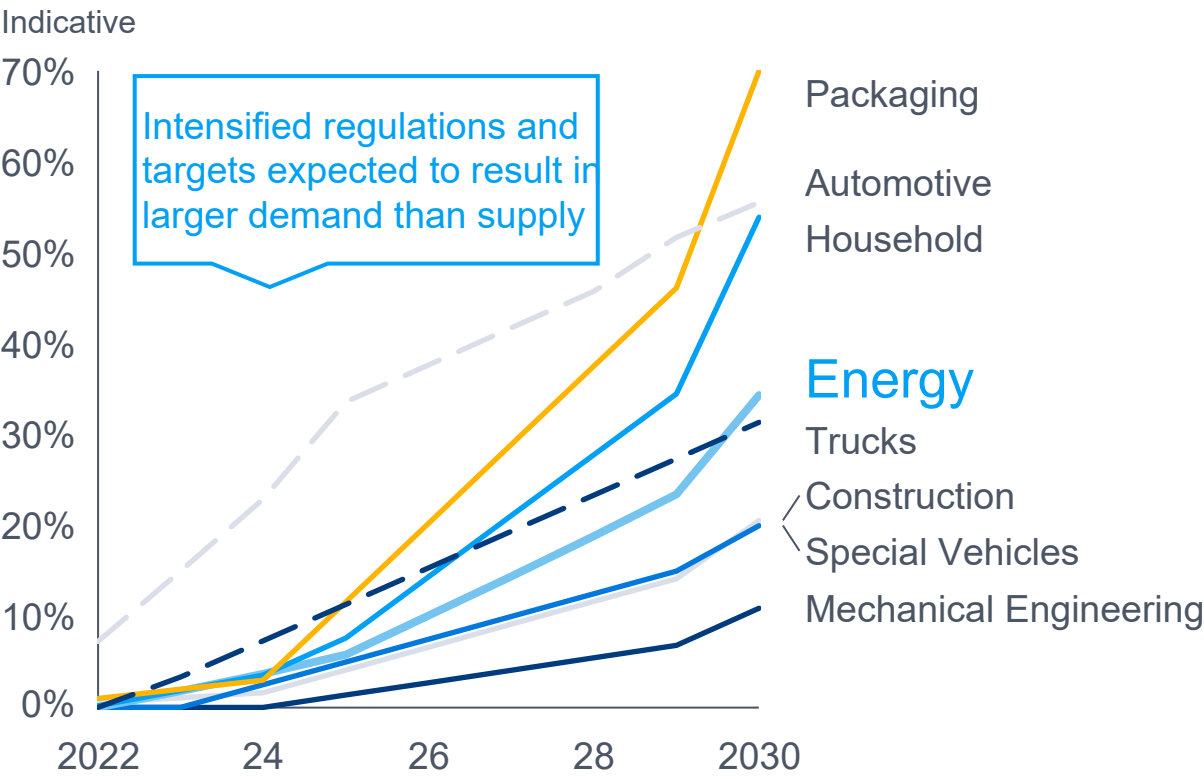
- Calculating “zero” emissions is achieved by overbalancing or compensating
- Mass-balancing for technically feasible products is to be preferred

“zero emissions” claim not credible



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)

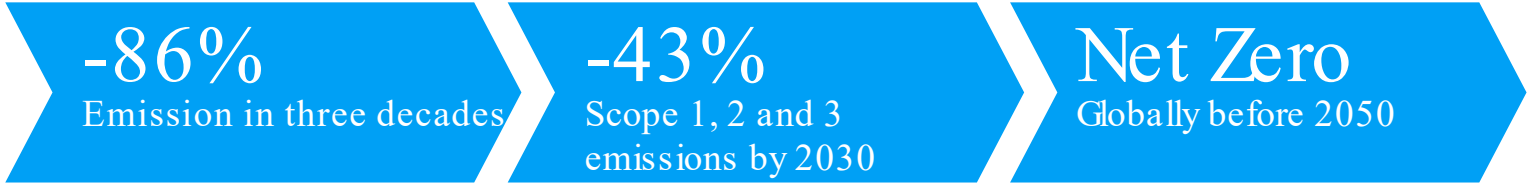


Source: tkSE; Global Investor ESG Survey, PWC



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 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

...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”



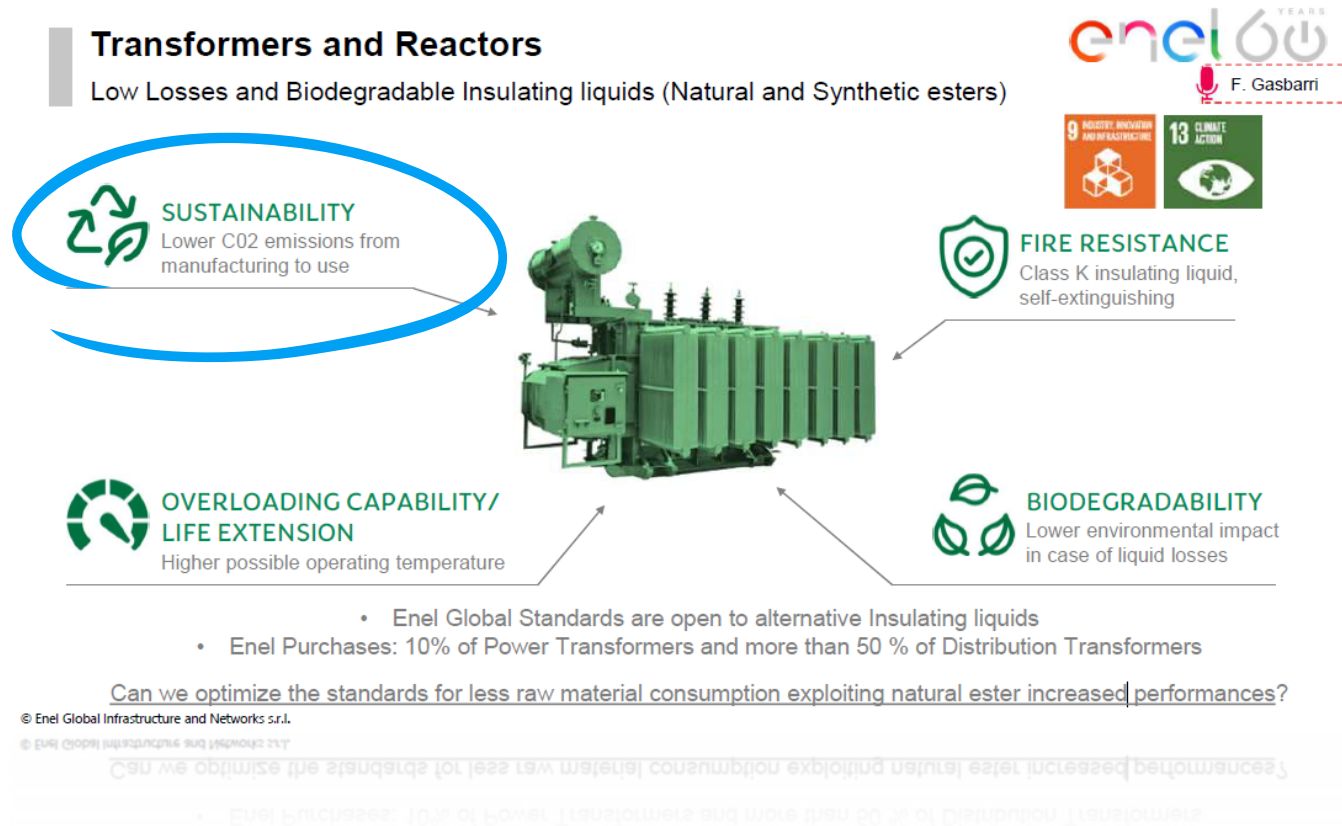
“Net zero by 2040, 75% of Scope 1&2 and 50% of Scope 3 by 2030”



“80% per kWh of Scope 1 by 2030, Net Zero by 2040”

1. In this decade; 2. Net Zero by 2050

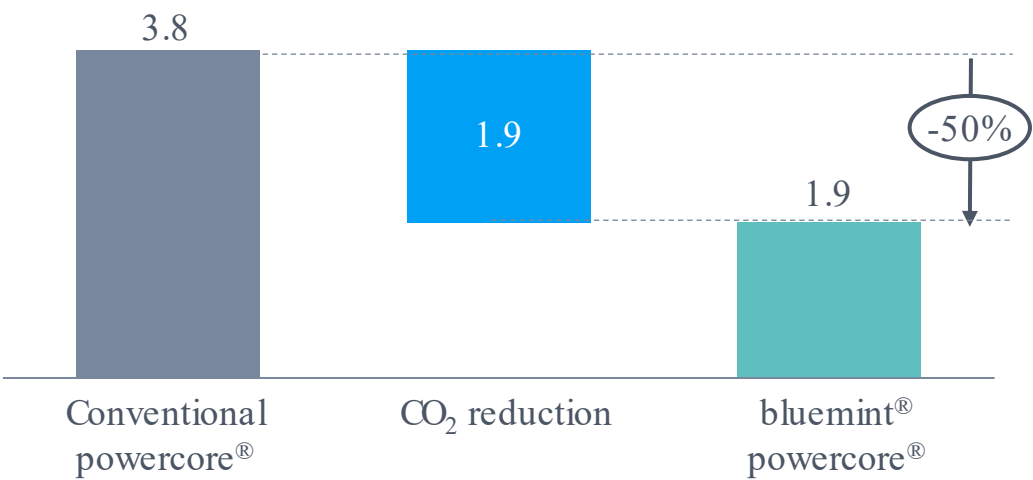
Reduction of emissions in purchased transformers is an important part of their strategy



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

bluemint® powercore® provides you with numerous advantages and opportunities to reduce upstream emissions along the supply chain

CO₂ intensity in grain oriented electrical steel
(t CO₂-equ/t powercore®)



Effortless technical implementation

Continuation of existing processes means there is no need for (re-) qualification

Continuous commitment to excellent magnetic and low-noise performance

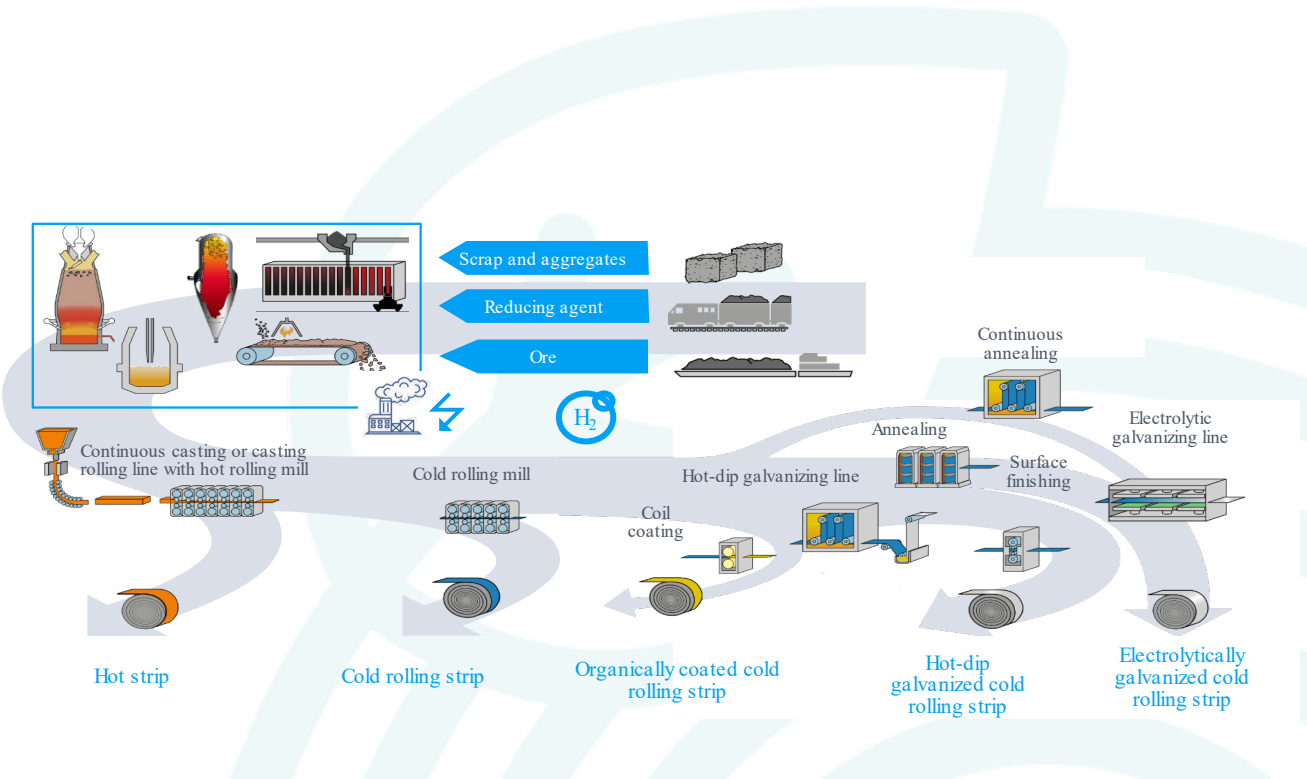
A certificate for bluemint® pure steel from thyssenkrupp. The certificate is titled 'CERTIFICATE for bluemint® pure' and includes details such as 'Presented to: Masterferm GmbH & Co. KG', 'Certificate Number: 123-456-789', and 'CO₂ savings: 0.5 t CO₂-equ/t powercore® pure'. It also features the thyssenkrupp logo and a QR code.

bluemint® Steel reflects real CO₂ savings

CO₂ footprint, in t CO₂e/t

Conventional steel	bluemint® recycled	CO ₂ 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%

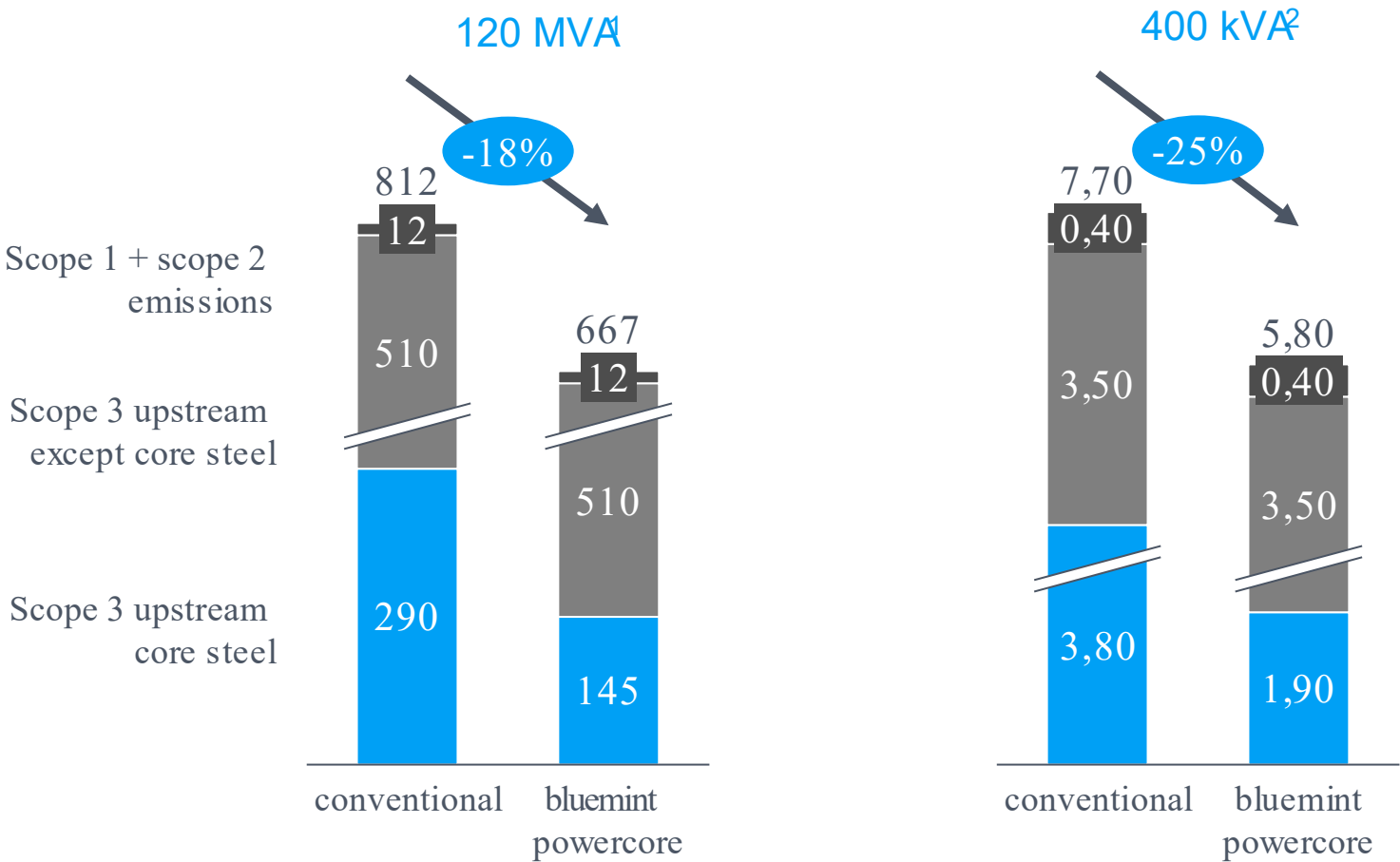
All relevant production steps are taken into account in our detailed life cycle assessment model for our integrated iron and steel plant



Certification of the genuine 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)



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

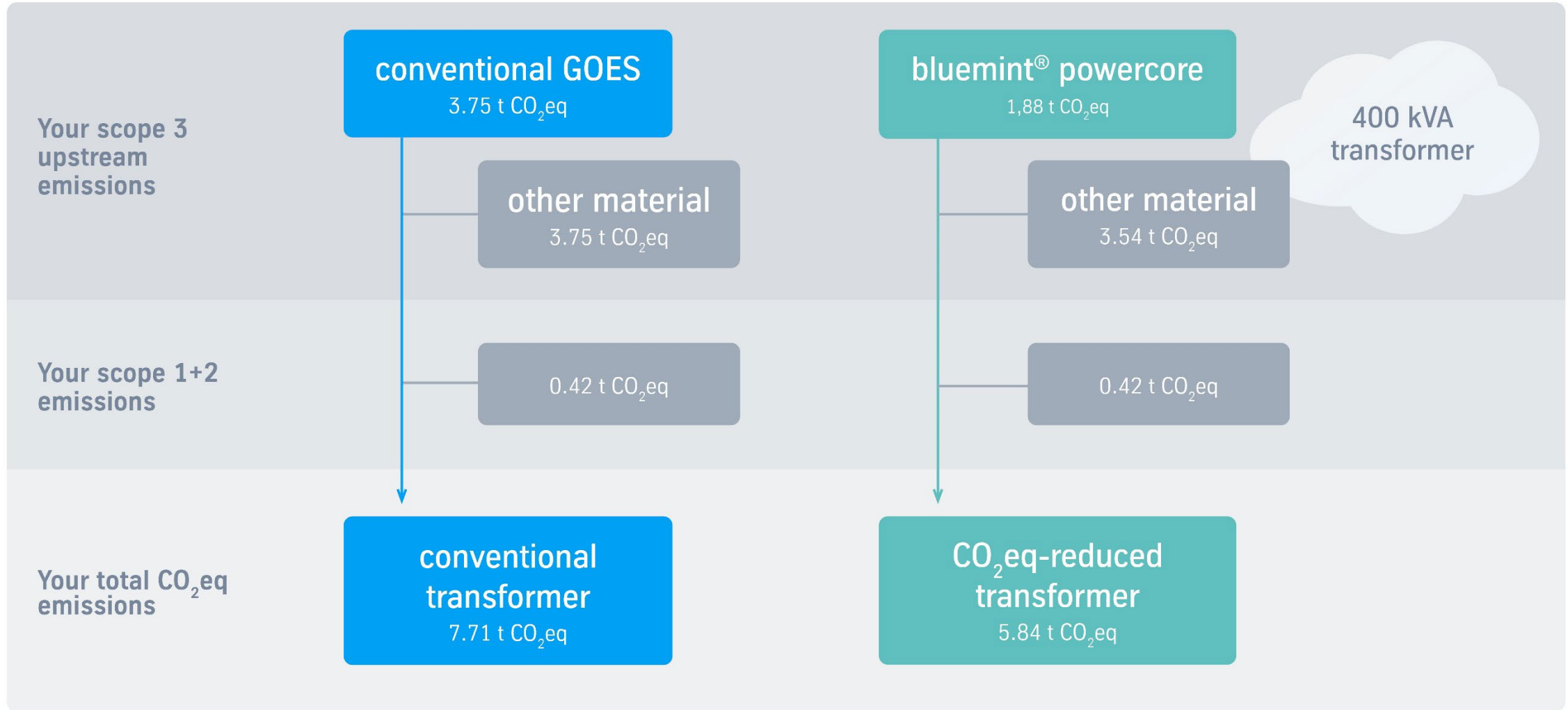
Up to -40% CO₂ emissions per transformer when using bluemint® powercore®

Certified by DNV

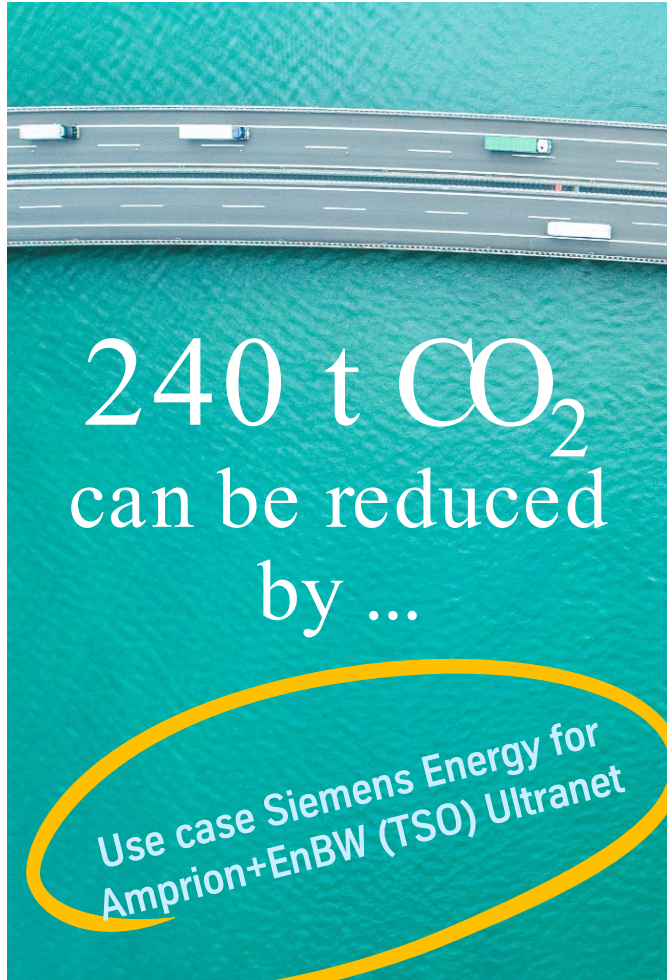
CO₂ savings and resulting specific CO₂ emissions of bluemint® powercore® are already externally certified by DNV, no additional effort needed

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

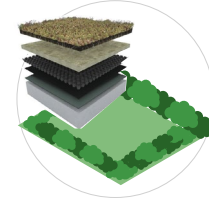
Your products' total emissions are part of your customers' scope 3 upstream emissions



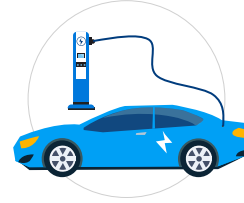
bluemint® is a major lever for reducing CO₂ emissions



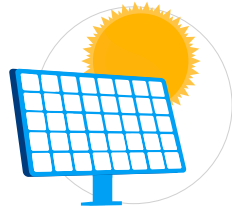
Switching ~ 9,600
light bulbs to LED



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



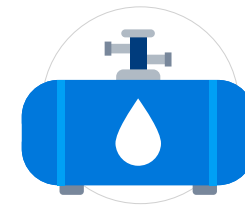
Driving 1.4m km with
electric vehicles instead
of combustion engines
(~36x around the earth)



Installing ~48 solar
PV panels operating
for 25 years



Replacing ~84
transformers to
more energy
efficient models

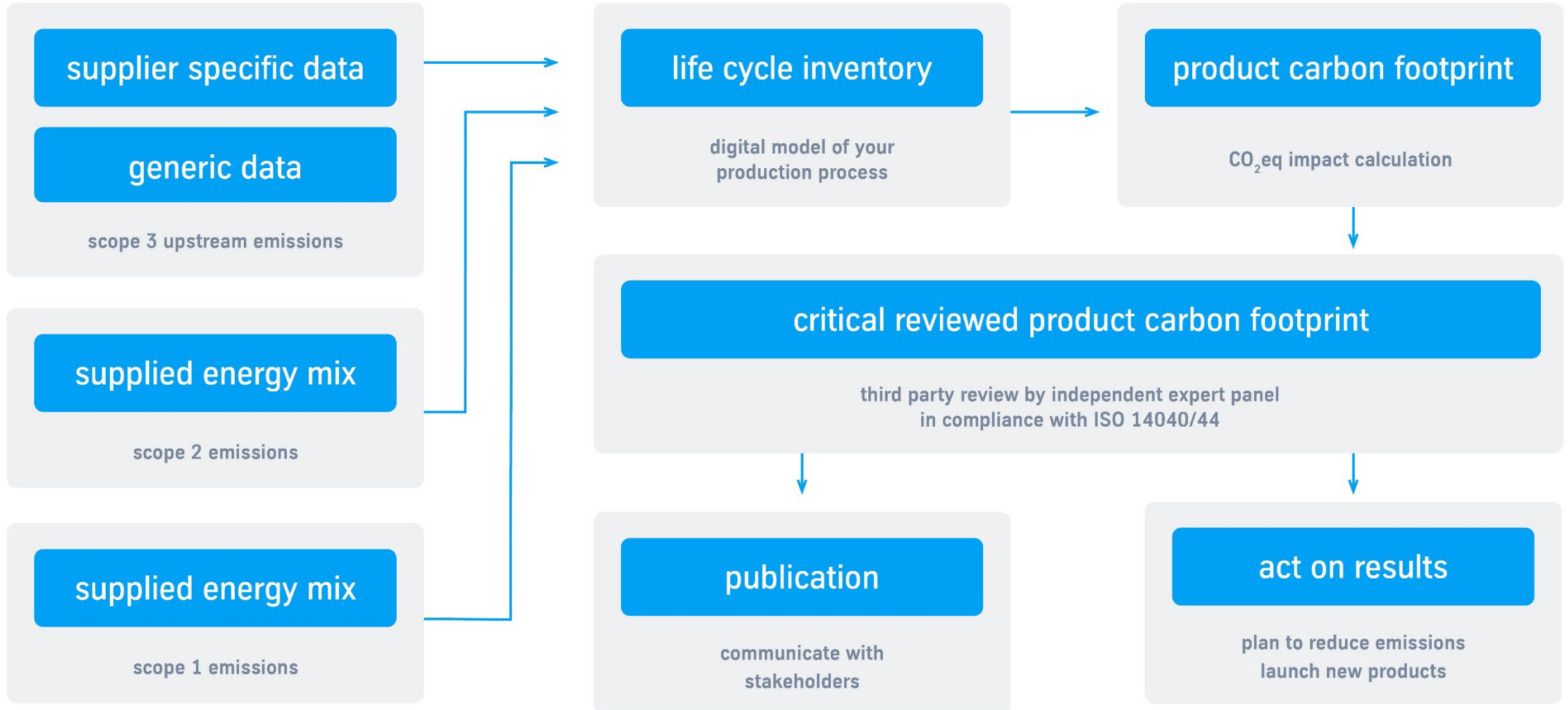


Sourcing ~2.4mn MJ
biomethane instead of
natural gas (heating
~83 single-family
homes for one year)



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

What do I need to calculate my product carbon footprint?

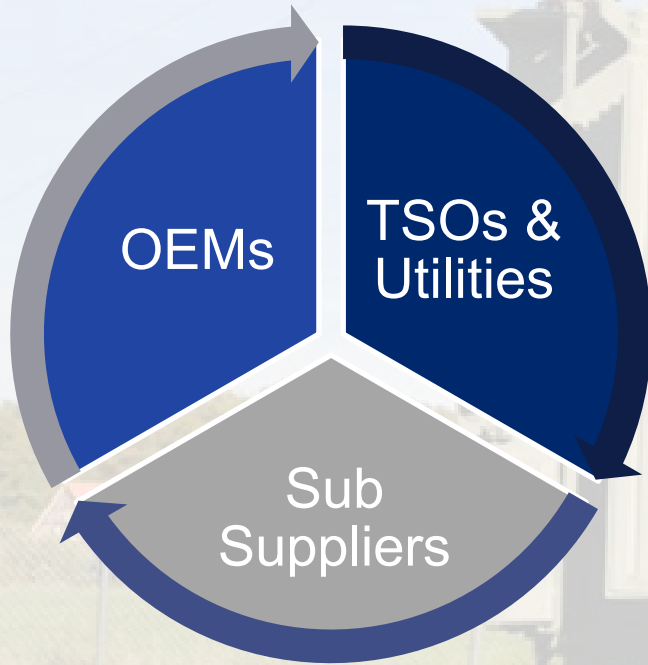


Joint Industrial Project

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



It is our moment of choice

A photograph of three people (two men and one woman) sitting around a table in a meeting. The woman in the center is looking towards the man on the right. The man on the left is gesturing with his hands. The image has a blue tint.

...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