Aiming for Carbon Neutrality: Experiences and Perspectives From a Current Sensor Maker

Webinar series episode 3

Confidential | © 2023

Today's Webinar Content Is Brought to You by Presenters From LEM, Strategy Engineers (SE) and AVL

Today's Presenters

Quentin Piat

Global Head of Sustainability

>12 yrs. of experience

Risk Management, ESG, Sustainability

qpi@lem.com

Martin Rothbart

Senior Product Manager

>20 yrs. of experience

Product strategy, environmental sustainability

martin.rothbart@avl.com

Arndt von Gregory

Principal

>20 yrs. of experience

Transformation strategy, organisation, product profitability

avg@strategyengineers.com

Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

5 Action plan and quick wins

6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

3rd Webinar in Our 3-Part Series on CO_2 – Experiences and Perspectives From an Automotive (TIER1) Supplier

Introduction of Webinar series and content

Webinar 1

From Carbon Footprint to the Future: CO_2 Compliance as a Mandatory Entry Ticket to Markets, Customers and Financing

Date:
May 16th 2023

Webinar 2

Design to CO_2: Reality Check

Date:
June 13th 2023

Webinar 3

Aiming for Carbon Neutrality: Experiences and Perspectives From a Current Sensor Maker

Date:
October 20th 2023, 10.00 CET

Confidential © 2023

In the First Webinar We Laid the Foundation: Relevance of CO_2 for Companies and Particularly for Product Design

From Carbon Footprint to the Future – webinar No 1 – May 16th 2023

Webinar No 1

Content-details

- **Stakeholder** for CO_2 footprint reduction
- Greenhouse gas protocol & **scope 1/ 2 / 3** definitions
- **Regulation** & systems to reduce CO_2 emissions
- Relevance of **CO_2 in** product **cost calculation**
- Steps to become **carbon neutral**
- **Governance** requirements for carbon neutrality
- **Managing** carbon neutrality

Confidential © 2023

Co2e to Be Considered in Development Process & Design Guidelines

Design to CO_2: Reality Check – webinar No 2 – June 13th 2023

Webinar No 2

Content details

- A battery case study is used to explore the opportunities for CO_2e reduction through material and design decisions.
- Standardized rules for future comparability were proposed.
- Trade-off between cost and sustainability in the future production of traction batteries.

Key topics and takeaways:

- Comparison of proven pack manufacturing technologies: steel vs. aluminum vs. composite
- Outlining improvement potentials on CO_2e emissions
- Explore guidelines for minimized carbon footprint in a dedicated design to CO_2e development process

Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

5 Action plan and quick wins

6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

LEM, in short

Leading the world in electrical measurement, LEM engineers the best solutions for energy and mobility, ensuring that our customers' systems are optimized, reliable and safe.

1,700 people in 17 countries

Innovative electrical solutions

The broadest product portfolio in the industry

Our key businesses

Automation | Automotive | Renewable Energy | Track | Energy Distribution & High Precision

Confidential © 2023

LEM's Production Capacity

4 soon 5

Production centers
in China, Bulgaria, Switzerland, Japan, Malaysia
+ sub-contractors

700

total production workers

11 soon 20

K sqm total production surface

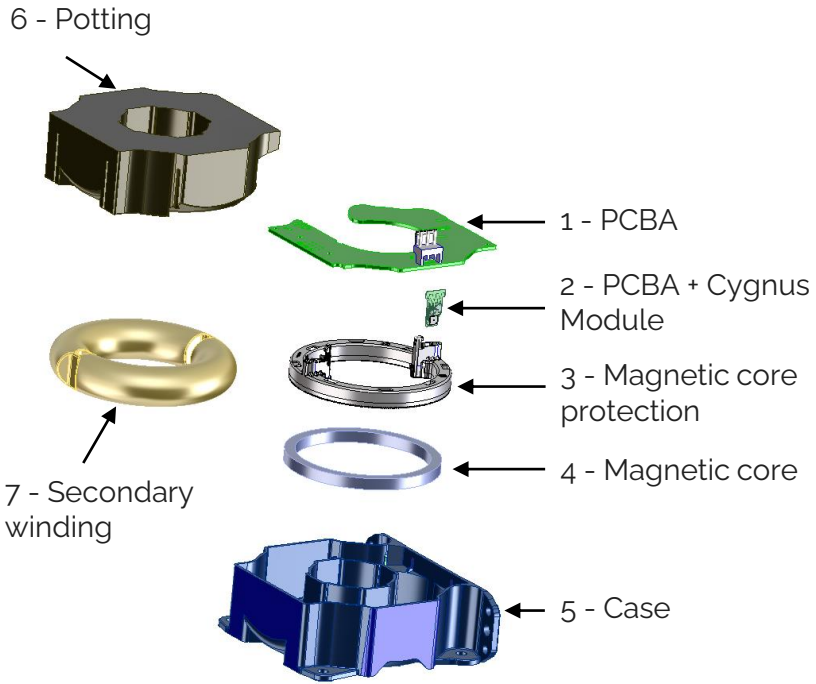
+ 60 million

sensors and solutions produced per year

Confidential © 2023

LEM's Products Are Characterized by a Limited Number of Components With Broad Range of Suppliers in Different Territories

Product specifics of a selected LEM sensor LF 1010-S/SP16



The LF 1010-S/SP16 sensor consists of 7 components, from 8 different suppliers.

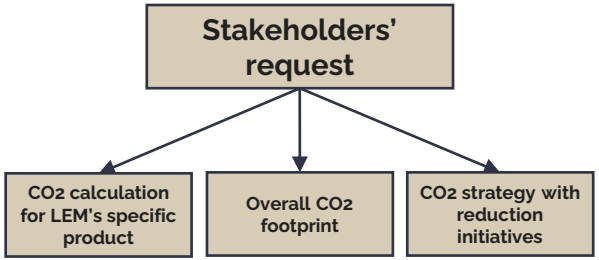
Component	Supplier	Region
1 - PCBA	Supplier 1	Eastern EU
2 - PCBA Cygnus module	Supplier 2 Supplier 3	Eastern EU Western EU
3 - Magnetic core protection	Supplier 4	Western EU
4 - Magnetic core	Supplier 5	APAC
5 - Case	Supplier 6	Eastern EU
6 - Potting	Supplier 7	APAC
7 - Secondary winding	Supplier 8	Western EU

Confidential © 2023

Almost Two Years Ago LEM Has Started to Consider CO_2-Emissions as a Major Focus Area …

Background and project objectives

Background

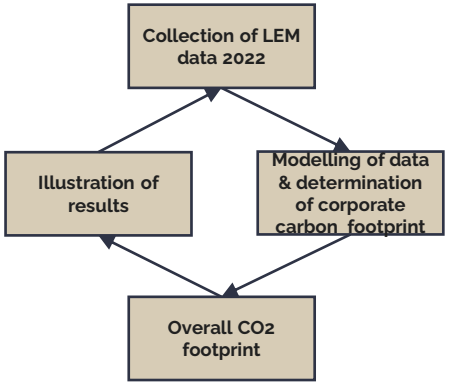


Initial project objectives

- Answer to the stakeholders' request through :
  - CO_2 calculation of 6 products representing the LEM's technologies
  - Company-wide high-level CO_2 assessment, (scope 1 – 3) on its 3 key production sites and 1 R&D center;
  - Identify high-level CO_2 emission reduction ideas.

Follow up project workstreams

- Workstream 1: Assessment of LEM corporate carbon footprint



- Workstream 2: Review of the implementation status of the CO_2 strategy
  - Identification of gaps and improvement potentials;
  - Report on action implementation status.

Source: SE, LEM

Confidential © 2023

… and Has Committed Itself to Reach Net Zero Targets in 2025 for Scope 1 and 2 Emissions and 2040 for Scope 3

Scope 1

Generation of energy/ electricity / heat / cold

Fugitive emissions during production

Combustion in vehicles

Direct GHG emissions from the company's own emission sources due to burn of fossil fuels

Scope 2

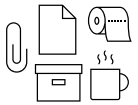
Purchased electricity / energy

Indirect GHG emissions from generation of purchased electricity

Scope 3

Production material

Employee commuting

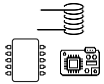


Purchased goods and services

Up- and down-stream transportation

Solid and liquid waste

Capital goods



Purchased components

Business travel

GHG emissions from a company's upstream & downstream activities

Net zero in FY 2025

Net zero in FY 2040

Source: SE, LEM

Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

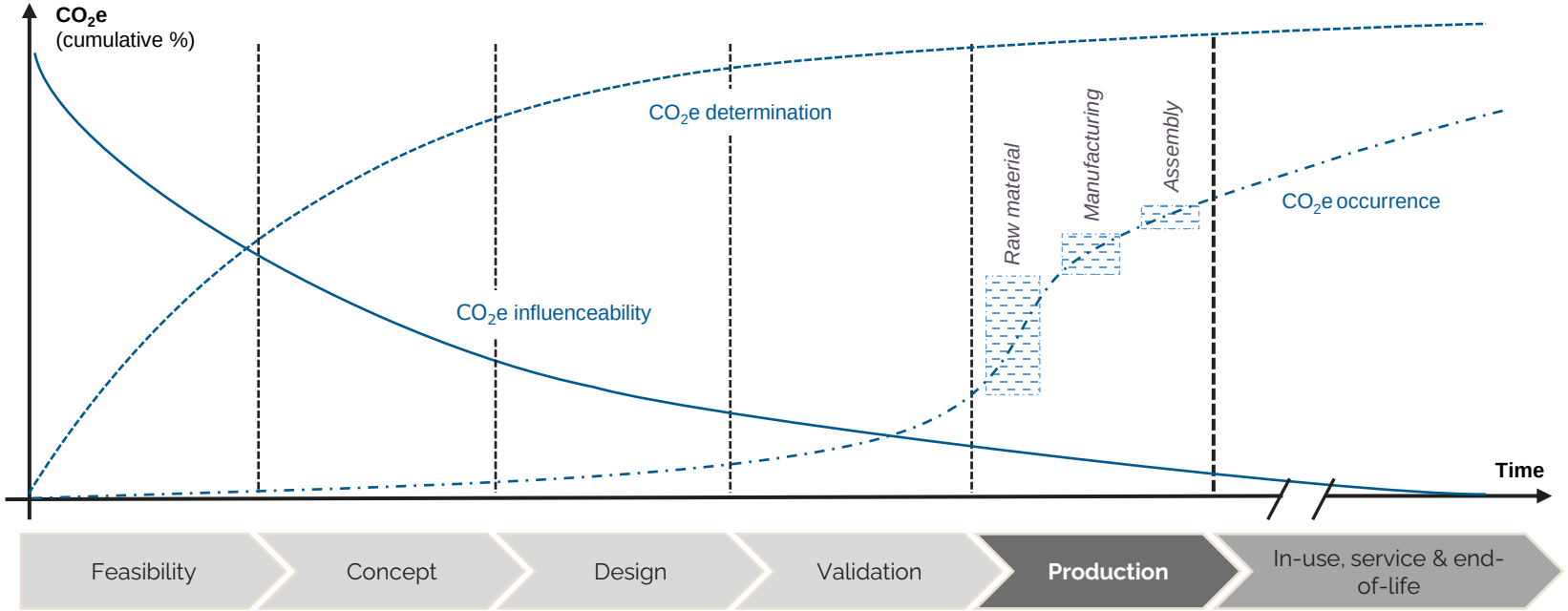
5 Action plan and quick wins

6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

Product Lifecycle Model With Qualitative Patterns for CO_2e Influenceability, Determination and Occurrence

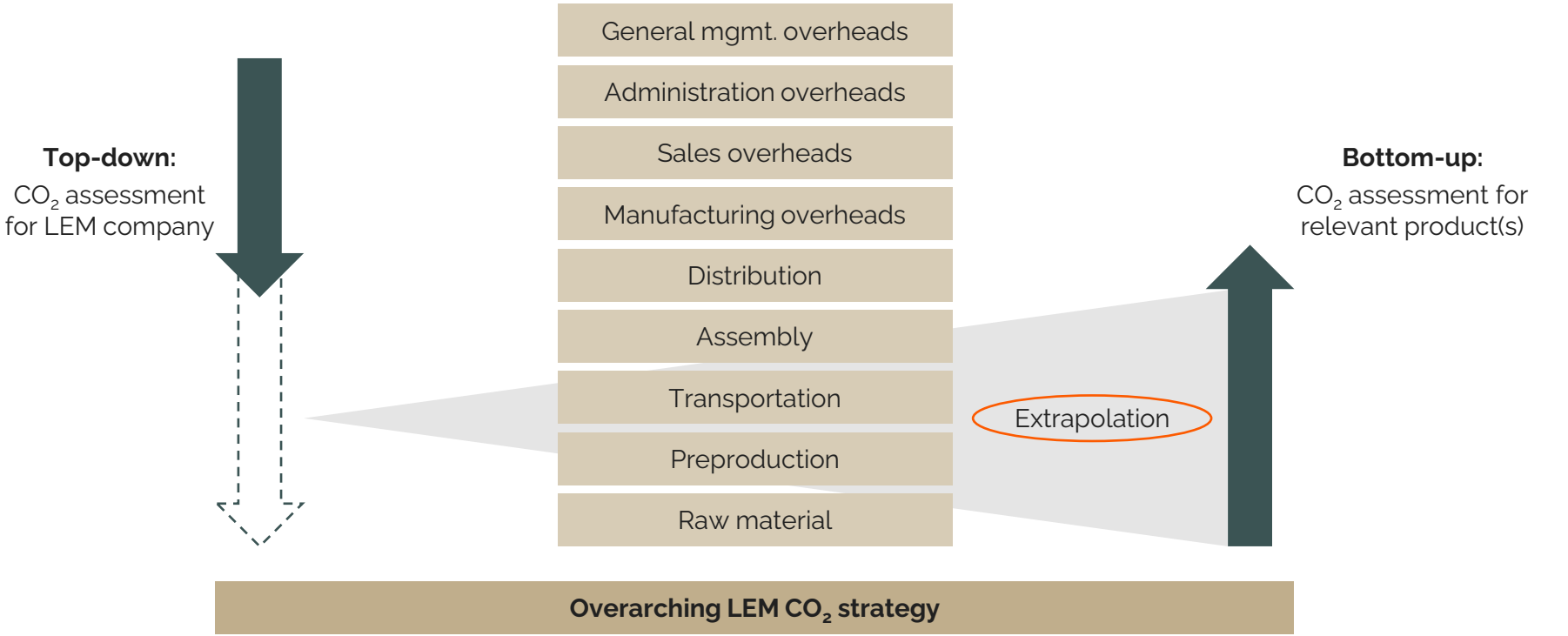
Significance of early development phase for lifecycle CO_2e



Confidential © 2023

To Assess All Three Scopes, Our Methodology Follows a Combined Top-Down and Bottom-up Approach

Recap: Methodology – Combined Top-down and Bottom-up Approach



Source: SE, LEM

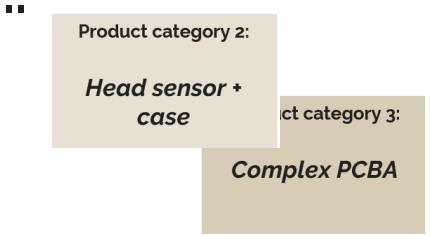
Confidential © 2023

The Bottom-up Approach for Product CO_2 Emissions Is Based on Detailed CO_2 Calculations for 6 Products Which Are Extrapolated to the Entire Portfolio

Extrapolation approach for purchased components

Categorization of product portfolio

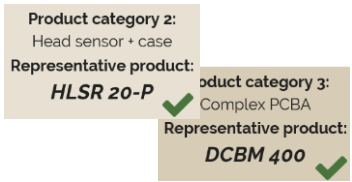
- Definition of 6 technologically representative product categories



- Allocation of entire product portfolio to this product categories

Calculation of CO_2 emissions of representative products

- Identification of 6 representative products for complete product portfolio

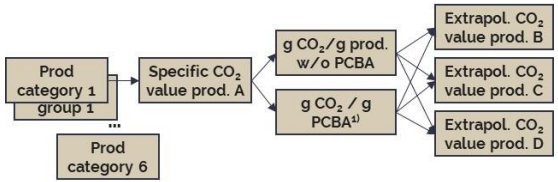


- Calculation of generated CO_2 emissions for each representative product

Product	Raw material [kg CO_2e]	Prod. at Tier 1 [kg CO_2e]	Transp. Tier 1 [kg CO_2e]	Assembly LEM [kg CO_2e]	CO_2 (1 sensor) [kg CO_2e]
HLSR 20-P	0.127	0.019	0.005	0.029	0.180
DCBM 400	22.742	0.773	0.846	0.007	24.369

Extrapolation

- Review of the LEM data: all components of product portfolio (e.g., area, size, weight)



- Derivation of suitable extrapolation parameters for representative products
- Execution of extrapolation

Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

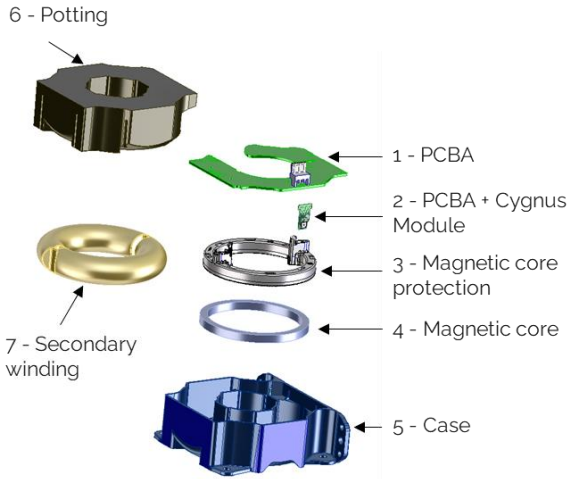
5 Action plan and quick wins

6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

Deep Dive in CO_2 Footprint Calculation of One LEM Specific Product: LF 1010-S/SP16

Detailed CO_2 footprint for LF 1010 incl. raw material, transportation, production and assembly

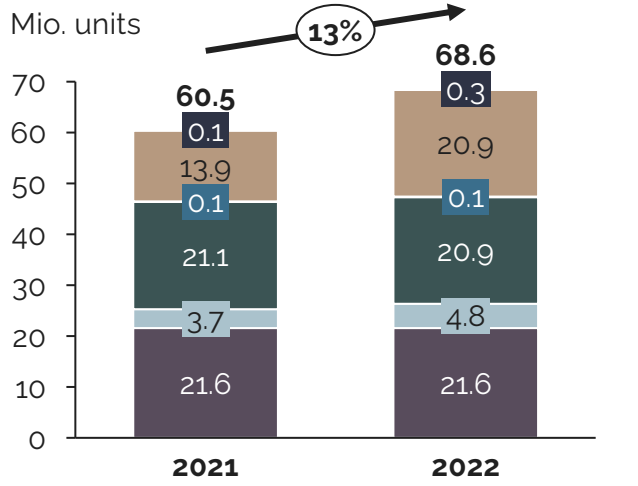


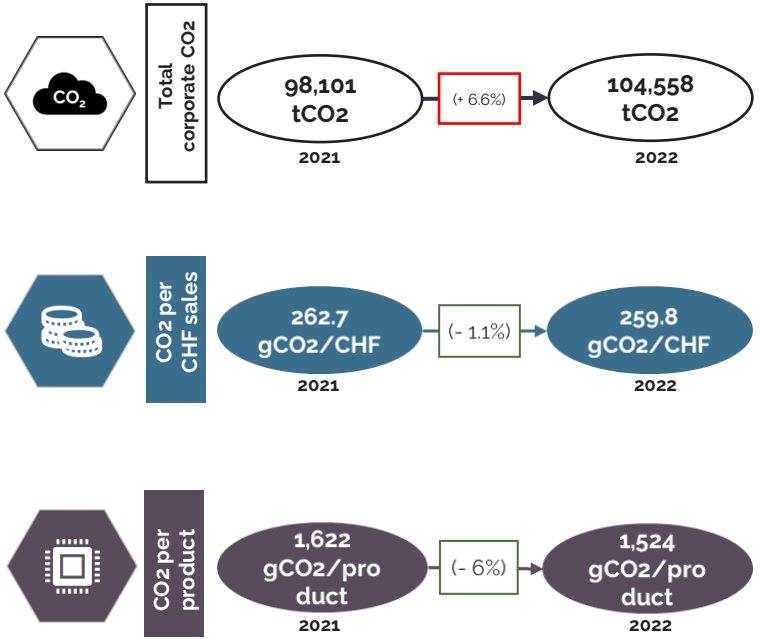
Component	Raw material CO_2e per sensor [kg CO_2e]	Transport from supplier CO_2e per sensor [kg CO_2e]	Production at supplier CO_2e per sensor [kg CO_2e]	Assembly at LEM CO_2e per sensor [kg CO_2e]
1 - PCBA	**3.41**	0.0046	0.0000	0.1200
2 - PCBA + Cygnus module	0.16	0.0000	0.0000	
3 - Magnetic core protection	0.05	0.0007	0.0034	
4 - Magnetic core	0.17	0.1503	0.0340	
5 - Case	0.57	0.0006	0.0410	
6 - Potting	**1.06**	0.0458	0.0000	
7 - Secondary winding	**1.14**	0.0207	0.0000	
Sub-Total (in % of total)	6.4770 **(93.9%)**	0.2228 (3.2%)	0.0784 (1.2%)	0.1200 1.7%
Total CO_2e	**6,8982 kg CO_2e**			

Confidential © 2023

Between 2021 and 2022 Corporate CO_2 Emissions Increased at a Lower Rate (7%) Than the Total Production Volume (13%)

Production volume by product category [mio. units]

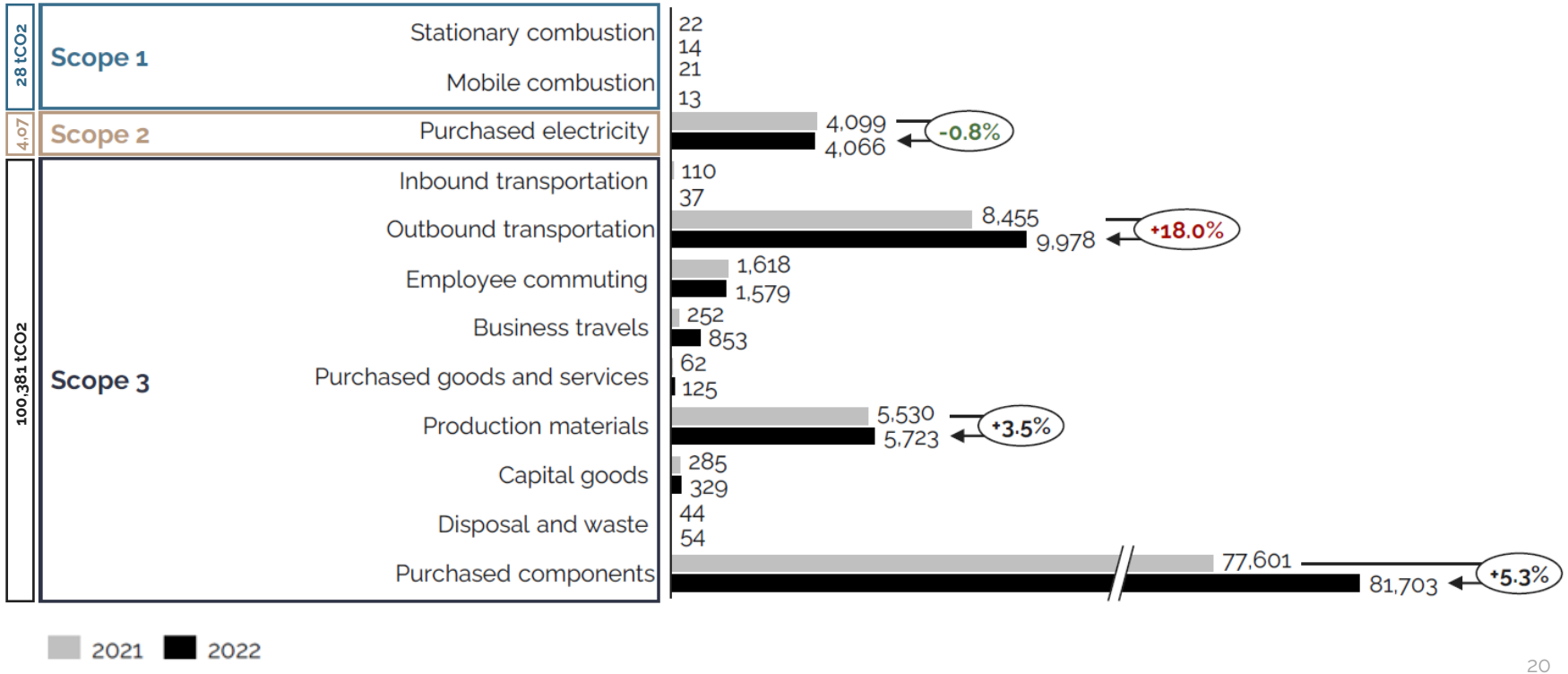




Confidential © 2023

Scope 3 Is Accountable for 96% Of the Total Emissions Driven by Purchased Components and Is Targeted to Be Carbon Neutral in 2040

Corporate CO2 Asessment: Emissions by category



Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

5 Action plan and quick wins

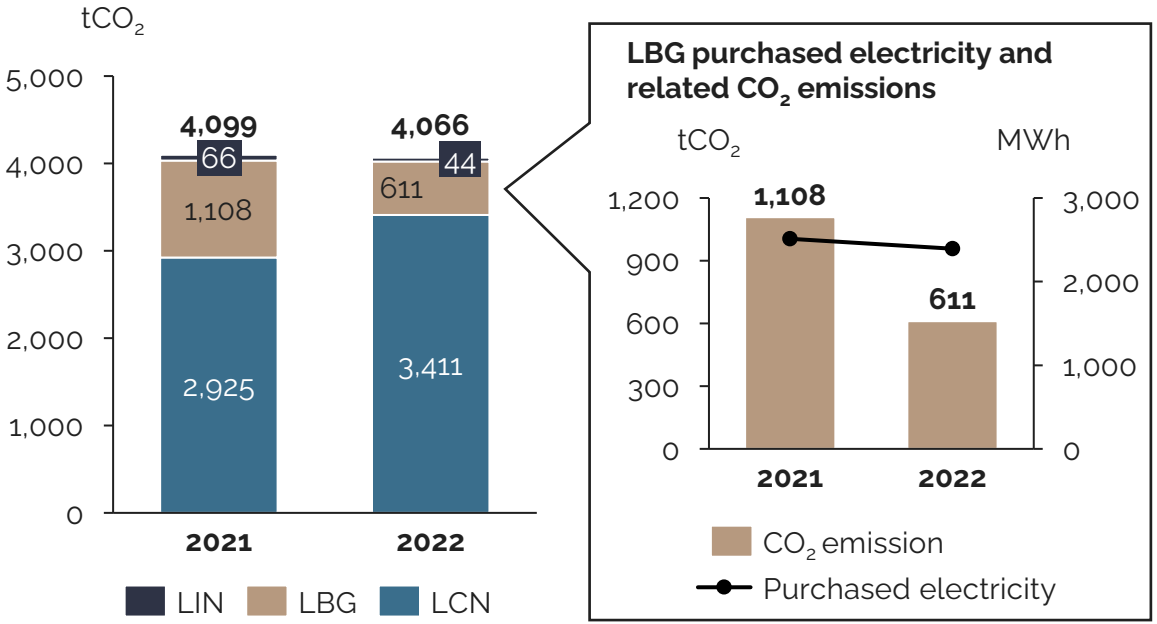
6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

As an Example, LEM Bulgaria Reduced Emissions by About 1000 TCO_2 by Switching to Green Energy and the Replacement of an Energy-Intensive Air Compressor

Deep Dive: CO_2 Reduction Action – LEM Bulgaria Purchased Electricity

Electricity CO_2 emissions by site [tCO_2] **and LBG purchased electricity** [kWh]



CO_2 Reduction Actions

- New air compressor using less electricity
- From mid 2022, LBG switched to green electricity => CO_2 reductions with similar energy consumption

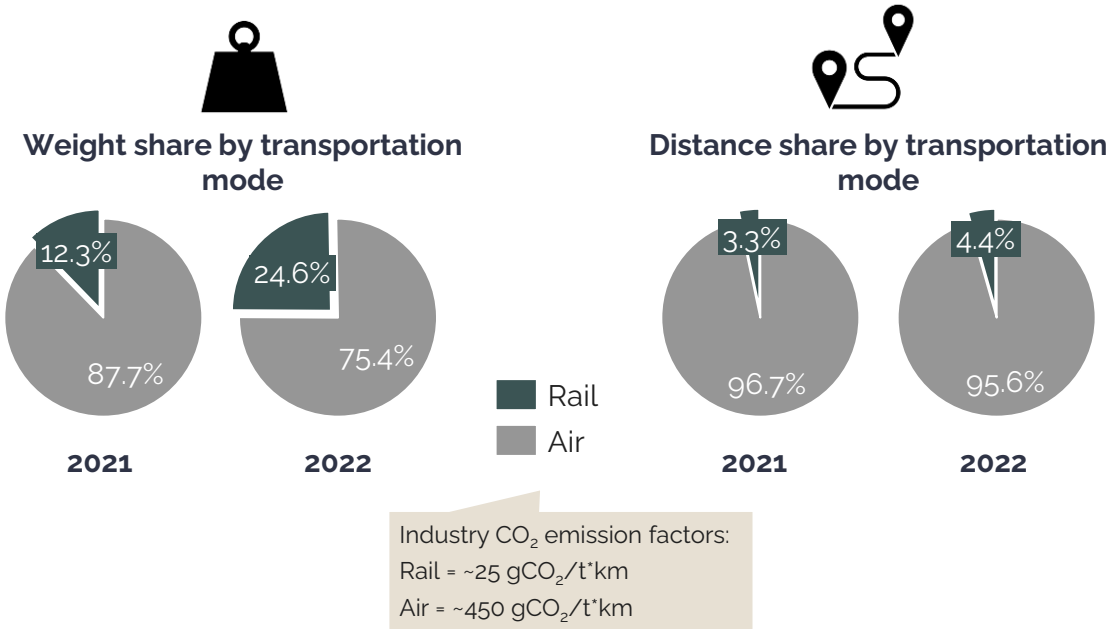
→ total value of the reduction measure: ~1,000 tCO_2

Confidential © 2023

Another Example Is the Reduction of Air Transportation and the Increase in Rail Transportation on a Global Scale

Deep Dive CO_2 Actions: Change of Intercontinental Transportation Mode

CO_2 measure impact



Industry CO_2 emission factors:
Rail = ~25 $gCO_2/t*km$
Air = ~450 $gCO_2/t*km$

CO_2 measure details

Ideas accepted and in progress

- Replacement of air shipments by train shipments (China to Europe excl. Switzerland)
- Transported rail tons ratio increased from 12% in 2021 to 41% in Sept. 2023 aiming the self-imposed target of 50% by FY 2023
- Replacement of air shipments by sea shipments (China to Japan - 0% to 10% in 2023)

Ideas accepted and in discussion

- Discussions with forwarders have started and first trials are planned for new routes between our different sites :
  - Sea China/US
  - Sea Europe/US

Source: EcoInvent, UK DEFRA
Side effects by replacing air shipments are increasing lead time and reducing costs.

Confidential © 2023

As a Third Example Cardboard Packaging Was Replaced by Re-Usable ESD Boxes – Integration of a Material Reducing Potting Machine Is in Progress

Deep Dive CO_2 Actions: Production Materials

ESD packaging

Potting machine

Idea implemented

- Implementation initiated to replace ESD cardboards by re-usable ESD plastic boxes for raw materials and finished goods

Idea accepted and in discussion

- Extension of the usage of the re-usable ESD boxes also to local supplier

Idea accepted and in progress

- Installation of a more modern potting machine into the production process to reduce material input and CO_2-intensive resin (by decreasing resin waste as a result of a smaller tank volume). Feb. 2024.

Many CO_2 emissions saving initiatives are discussed along with **cost savings** (e.g. caused by material reduction or process facilitation)

Source: encapsulant.com

Confidential © 2023

Agenda

1 Welcome and recap webinar episodes 1 and 2

2 Introduction LEM and initial situation

3 CO_2 measurement methods applied

4 Results and conclusions based on CO_2 emission measurement

5 Action plan and quick wins

6 Next steps in LEM's mission for CO_2 neutrality

Confidential © 2023

LEM Has Integrated Its CO_2 Reduction Strategy Within a Wider Sustainability Approach

LEM leveraged on the support of SE/AVL to embed CO_2 reduction elements into an ESG strategy and start its sustainable journey.

CO2 reduction elements

Vision
Overarching, long-term goal and commitment to CO2 reduction

Methods
Definition and acquisition of methods used for measuring and improving

Organisational anchoring
Clear responsibilities, availability of competences, culture

Communication strategy
Communication to stakeholders (customers, investors, staff)

Targets
Detailed targets over time for CO_2 emissions, CO_2 footprint, resources

Measurability
CO_2 emissions (in use), CO_2 footprint in value chain, resources used

Roadmap
Action plan for target achievements over time

« At LEM we help customers and society accelerate the transition to a sustainable future »

Confidential © 2023

Now we're happy to answer your questions

Confidential © 2023

Aiming for Carbon Neutrality: Experiences and Perspectives From a Current Sensor Maker

Webinar series episode 3

Confidential | © 2023