BEV READINESS

ERIK NELLSTRÖM, SCANIA – 2020-10-28

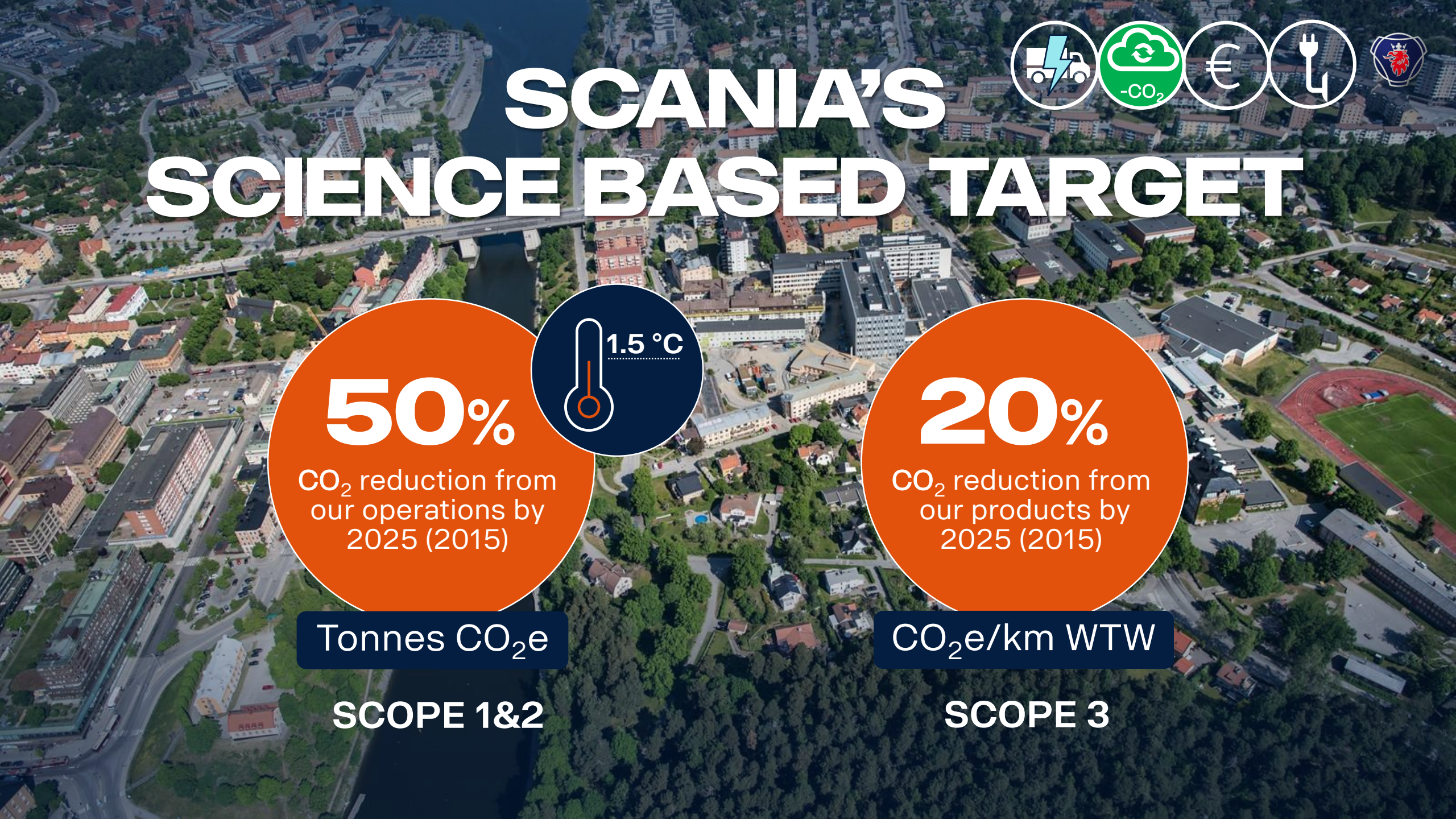
BEV scale up prerequisites and boosters

Agenda

Readiness

- BEV vehicles
- Climate impact reduction
- Cost and earnings
- Charging infrastructure

NOW


SCANIA'S
SCIENCE BASED TARGET
1.5 °C
50%
CO_2 reduction from our operations by 2025 (2015)
Tonnes CO_2e
SCOPE 1&2
20%
CO_2 reduction from our products by 2025 (2015)
CO_2e/km WTW
SCOPE 3

e-Mobility scope is whole life cycle

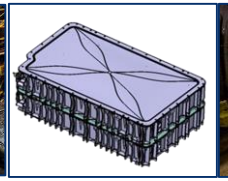
Life cycle Assessment (LCA)

Well-to-wheel (WtW)

Well-to-tank (WtT)

Tank-to-wheel (TtW)

Raw material extraction and refining



Battery production

Vehicle production

Fuel/electricity production, distribution

§Legal scope = tailpipe

Maintenance

End-of-Life: Reuse,remanufacture, recycle, reuse

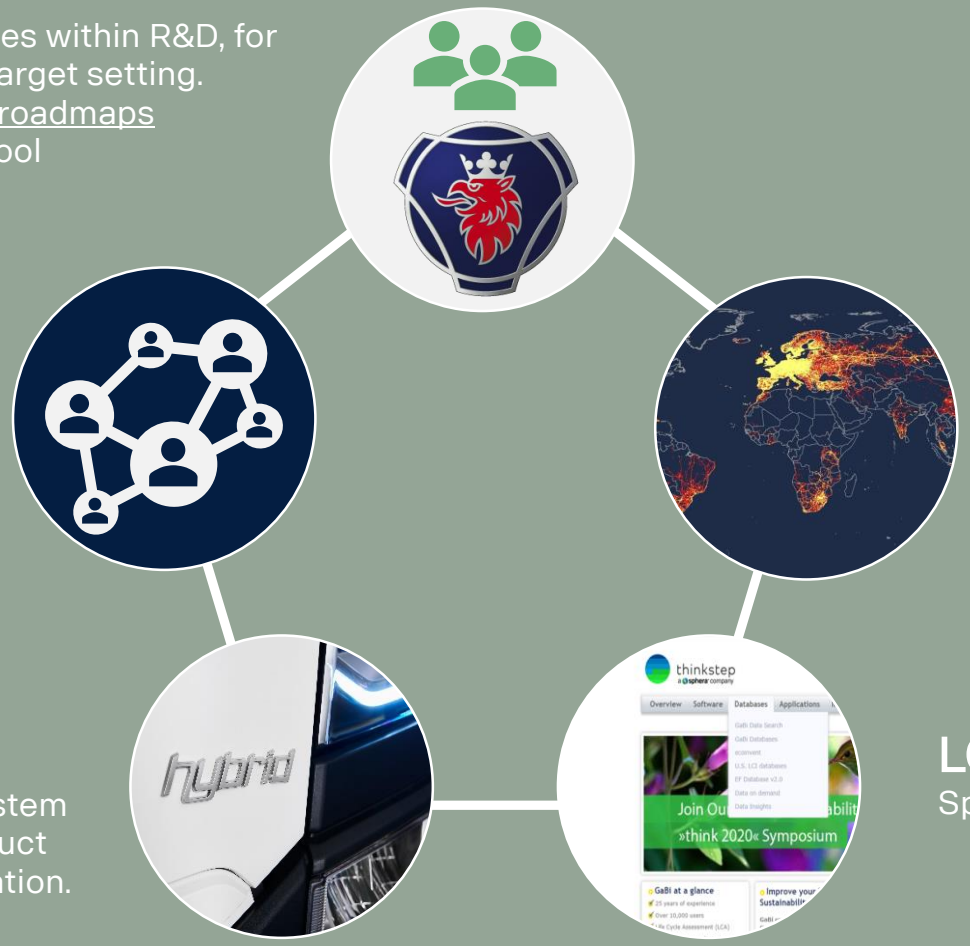
Biofuel comparisons

Accurate e-Mobility comparisons

LCA APPROACH @ SCANIA

In-house LCA
Competence and resources within R&D, for knowledge building and target setting.
⇒ affect product/service roadmaps
⇒ internal improvement tool

Cross-functional
Sales & commercial operations, purchasing (supplier collaboration and input), industrial operations.
Aim for increasing primary data.



Connected data
Operational data on fuel consumption and yearly mileage for all kinds of vehicles in all markets. New vehicles connected since 2011. 432 440 connected vehicles in 2019.

Material data
International Material Data System (IMDS) and use of Scania product structure based on modularisation.

LCA software and databases
Sphera datasets, and Gabi software.

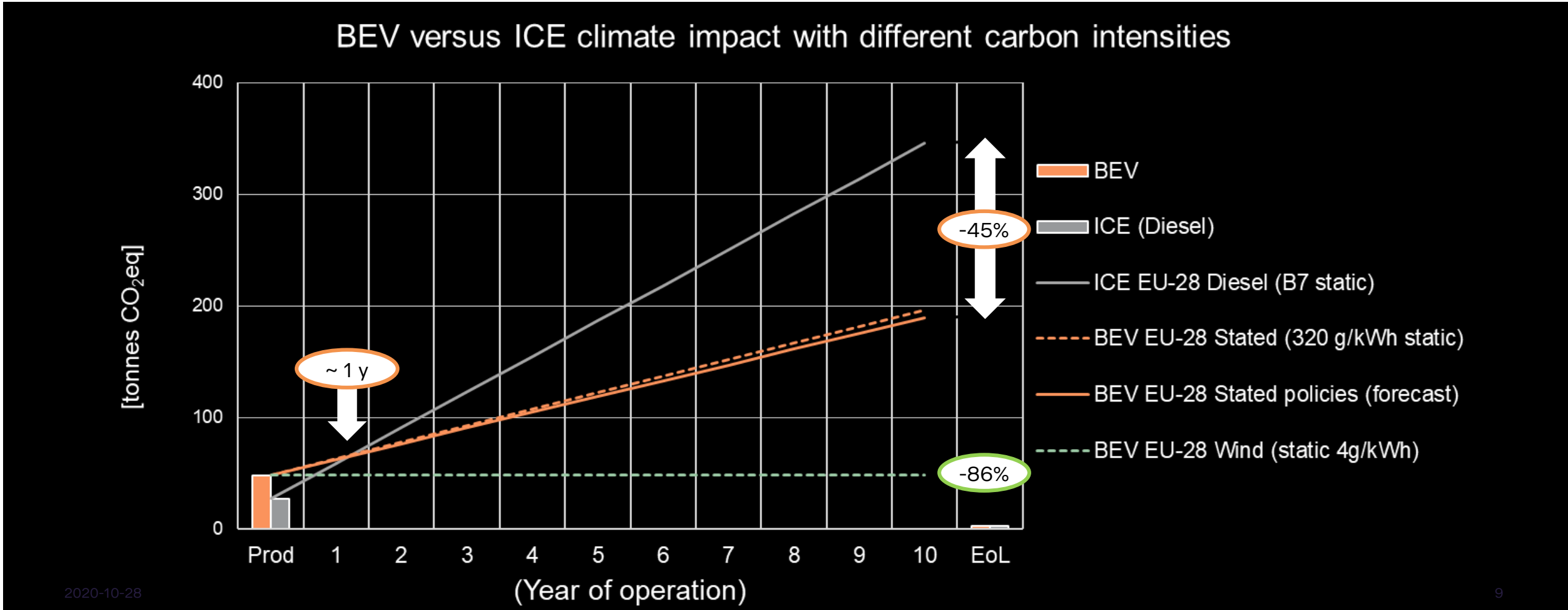
Assumptions - LCA

BEV (w/o box/trailer) - supply chain* + battery	[kg CO2eq]	22 000 + 21 000	24 000 + 49 000
ICE (w/o box/trailer) - supply chain*	[kg CO2eq]	24 000	24 000
Scope 1	[kg CO2eq]	730	730
Scope 2	[kg CO2eq]	340	340
Logistics (inbound and outbound)	[kg CO2eq]	2 200	2 200
Yearly distance	[km/year]	40 000	135 000
WtW-factor (B7, incl. Adblue and N_2O)	[kg CO2eq/l]	3,12	3,12
Diesel consumption	[l/100km]	25	28
BEV energy consumption	[kWh/100 km]	105	130
Carbon intensity in grid	[g/kWh]	WEO2019 + Gabi	WEO2019 + Gabi
Battery capacity installed	[kWh]	300	700
Charging losses	[%]	10	10
Number of tyres	[#tyres]	8 (6x2)	6 (4x2)
Lifetime in scope (functional unit)	[#years]	10	10
Tyre exchange interval	[km]	120 000	120 000
Calculated start year of operation		2021	2021 (example)
Battery impact (cell production)	[kg CO2eq/kWh]	70	70
Tyre impact	[kg CO2eq/tyre]	250	250
End-of-life (simple cut-off, no credits)	[kg CO2eq]	2 200	2 200

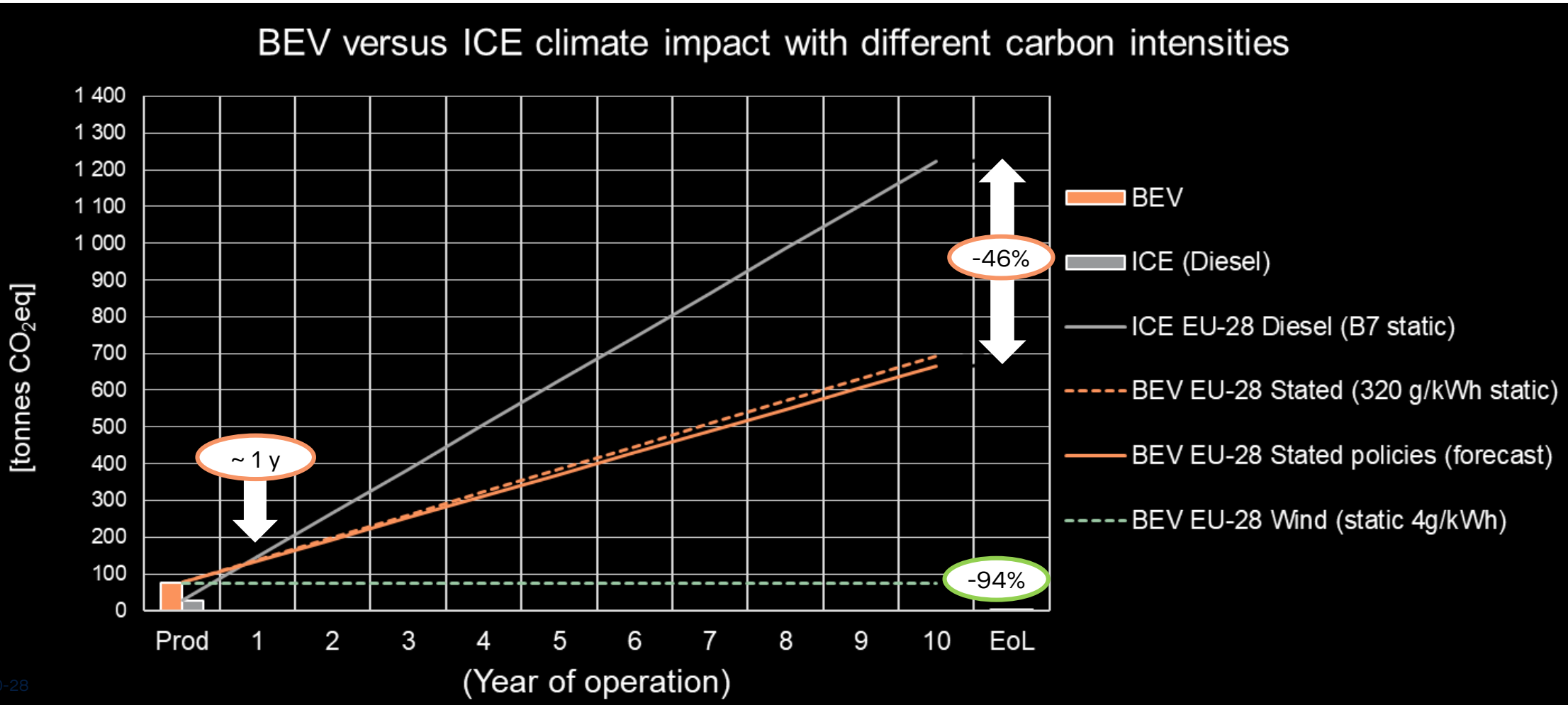
** Supply chain is with 1st set of tyres. Traction battery impact and maintenance tyres added separately*
General LCA Methodology: Attributional. GaBi Professional database. Recipe 2016 v1.1 Hierarchist methodology.

Note!
Preliminary and conservative assumptions.
3rd party verified LCA will be publicly available 2021 for Urban Distribution. Then for all new BEV introductions.

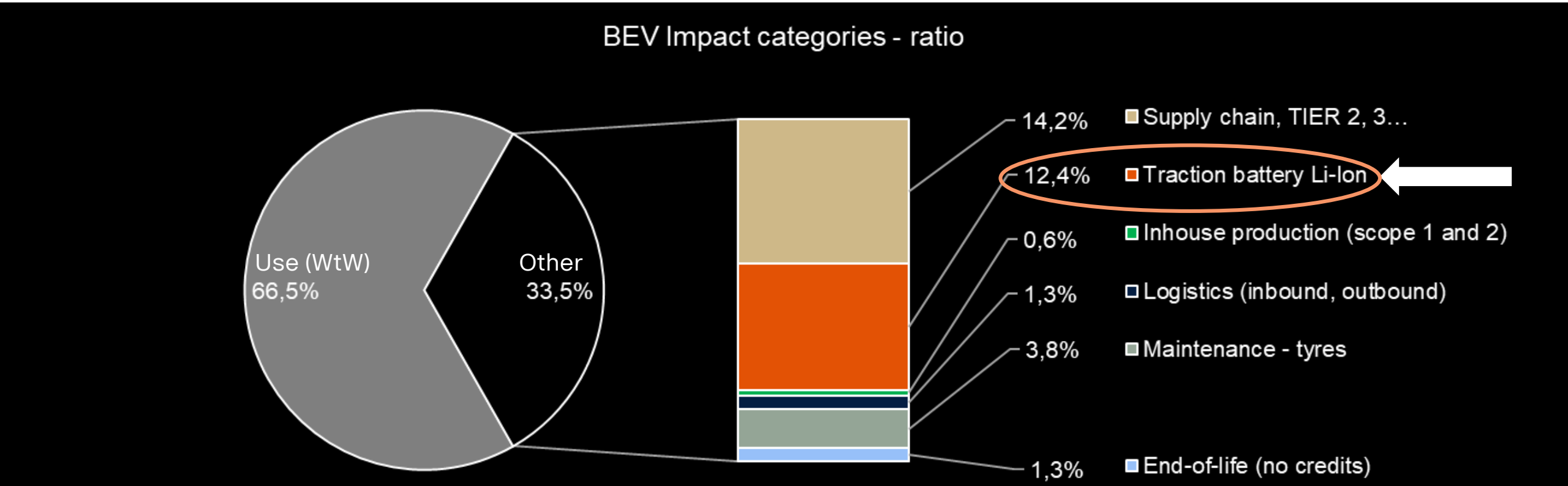
Scania LCA – Urban Distribution BEV



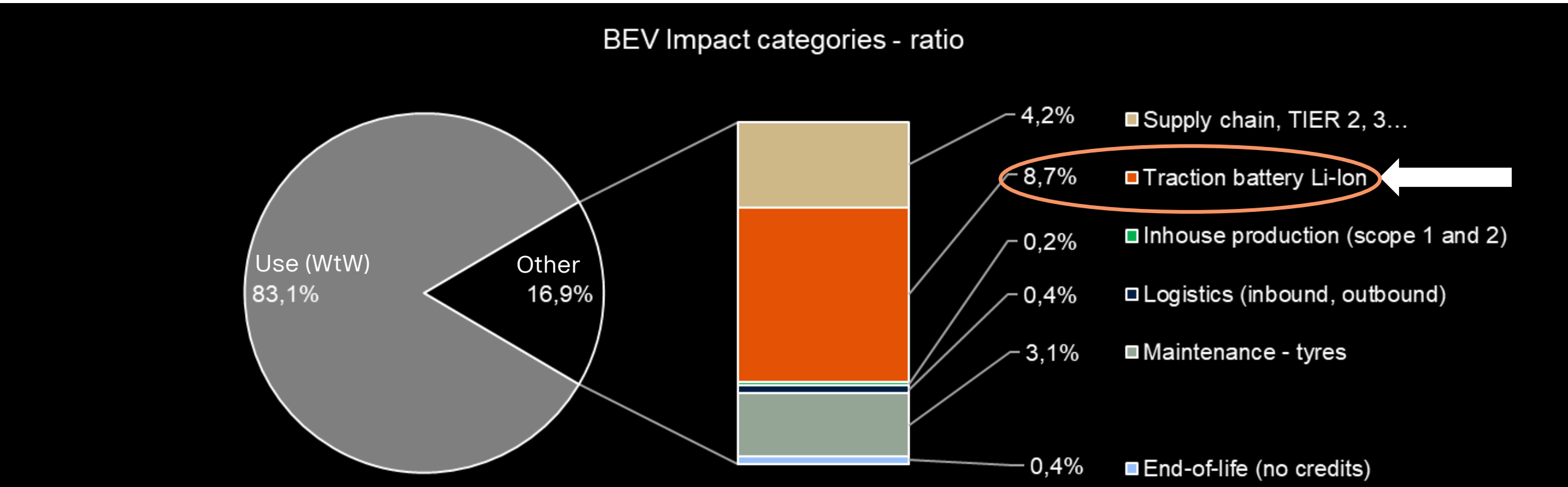
Scania LCA - Long Haulage BEV



Scania LCA – Urban Distribution BEV



Scania LCA - Long Haulage BEV



Scania LCA Key findings

- Heavy duty is <u>not</u> passenger cars
  - Used most of the time
  - heavy loads
  - mileage
  - Passenger cars have similar burden in all LCA phases
  - In HDV use phase is dominant in both ICE and BEV

=>

- Climate break even around one year
- Halving climate impact with EU average el-mix

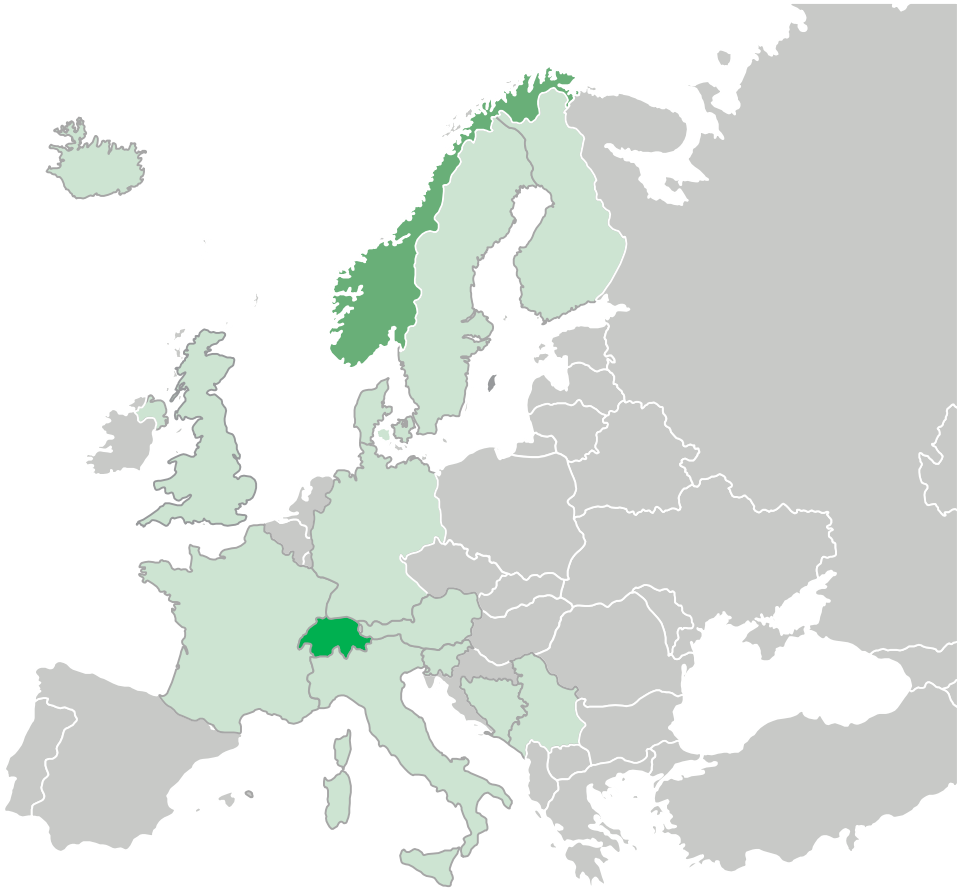
- Battery impact continues down. Batteries won´t be a major climate issue in 2030+
- Decided and future ”green” policies leading to significant climate impact effect for HDV

Total cost of operation and earnings

- **Energy (cost) savings** for both *customer* and *society* is *the driver* for BEV

- Government incentives - big impact on TCO
  - ✓ Norway example: -40% on Capex delta >250 employees
    -50% on Capex delta <250 employees
    100% reduced road tax
    No city tolls in big cities

- More ”correct” price on CO_2 needed!



BEV Long Haulage volume scale up is highly dependent on megacharger network

Indicative Scania study 2020-10-15

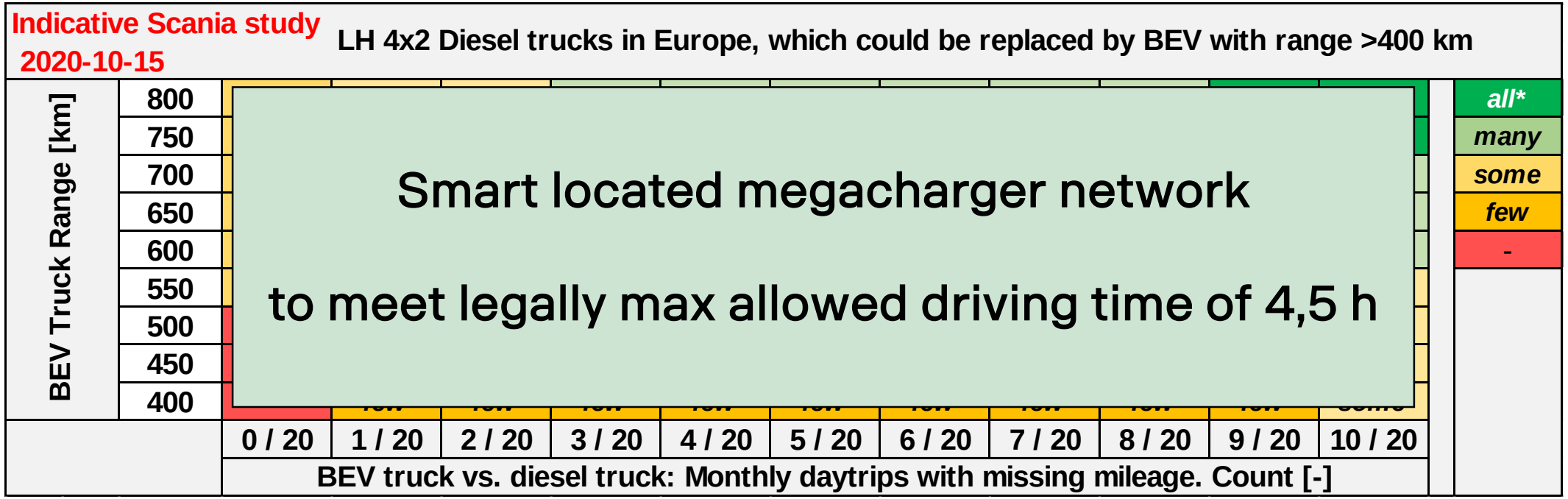
LH 4x2 Diesel trucks in Europe, which could be replaced by BEV with range >400 km

BEV Truck Range [km]	0 / 20	1 / 20	2 / 20	3 / 20	4 / 20	5 / 20	6 / 20	7 / 20	8 / 20	9 / 20	10 / 20	
800	few	some	some	many	many	many	many	many	many	all*	all*	all*
750	few	some	some	some	many	many	many	many	many	many	all*	many
700	few	some	some	some	some	some	many	many	many	many	many	some
650	few	some	some	some	some	some	some	many	many	many	many	few
600	few	few	some	some	some	some	some	some	some	many	many	-
550	few	few	few	few	some	some	some	some	some	some	some	
500	-	few	few	few	few	few	some	some	some	some	some	
450	-	few	few	few	few	few	few	few	some	some	some	
400	-	few	few	few	few	few	few	few	few	few	some	

BEV truck vs. diesel truck: Monthly daytrips with missing mileage. Count [-]

** All can still mean a few exceptions*

BEV Long Haulage volume scale up is highly dependent on megacharger network



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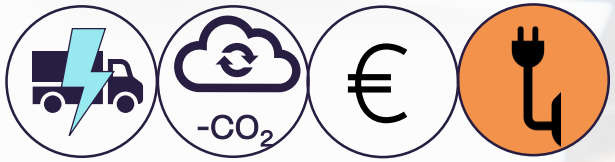

Charging investment challenges and solutions

Market driven charging infrastructure only after reaching substantial number of BEVs is a major challenge:

- **Support to cover cost of overcapacity until sufficient number of vehicles**

Before substantial number of BEVs is a reality:

- **Start solving grid capacity bottle necks**

Summary

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- BEV vehicles
- Climate impact reduction
- Cost and earnings
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SCANIA