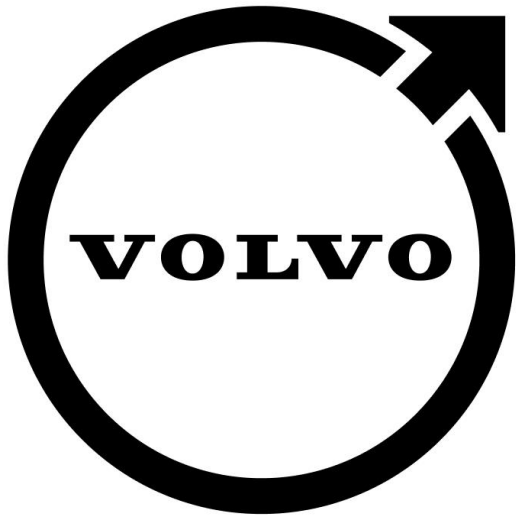

Freight
carbon
zero


VOLVO

Meet your hosts

Jonas Odermalm
Vice President Electromobility
Product Management
Volvo Trucks

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Managing Director
Freight Carbon Zero

VOLVO

FREIGHT CARBON ZERO

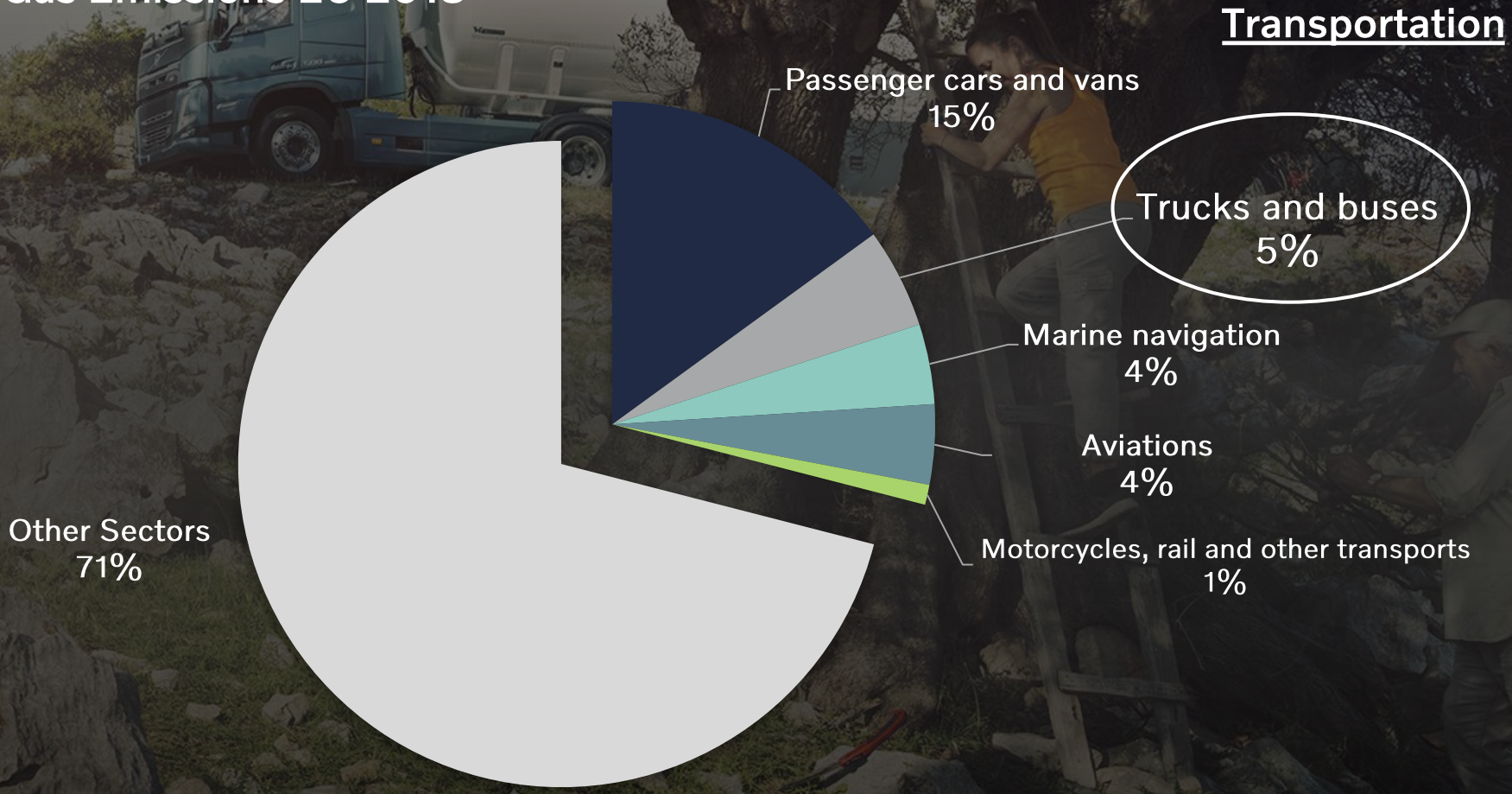
Jonas Odermalm

Vice President Electromobility Product Management

Volvo Trucks

Part of the Problem – Part of the Solution

Greenhouse Gas Emissions EU 2018



https://theicct.org/transport-could-burn-up-the-eus-entire-carbon-budget/

Towards fossil free transports

50%

CO_2 reduction by

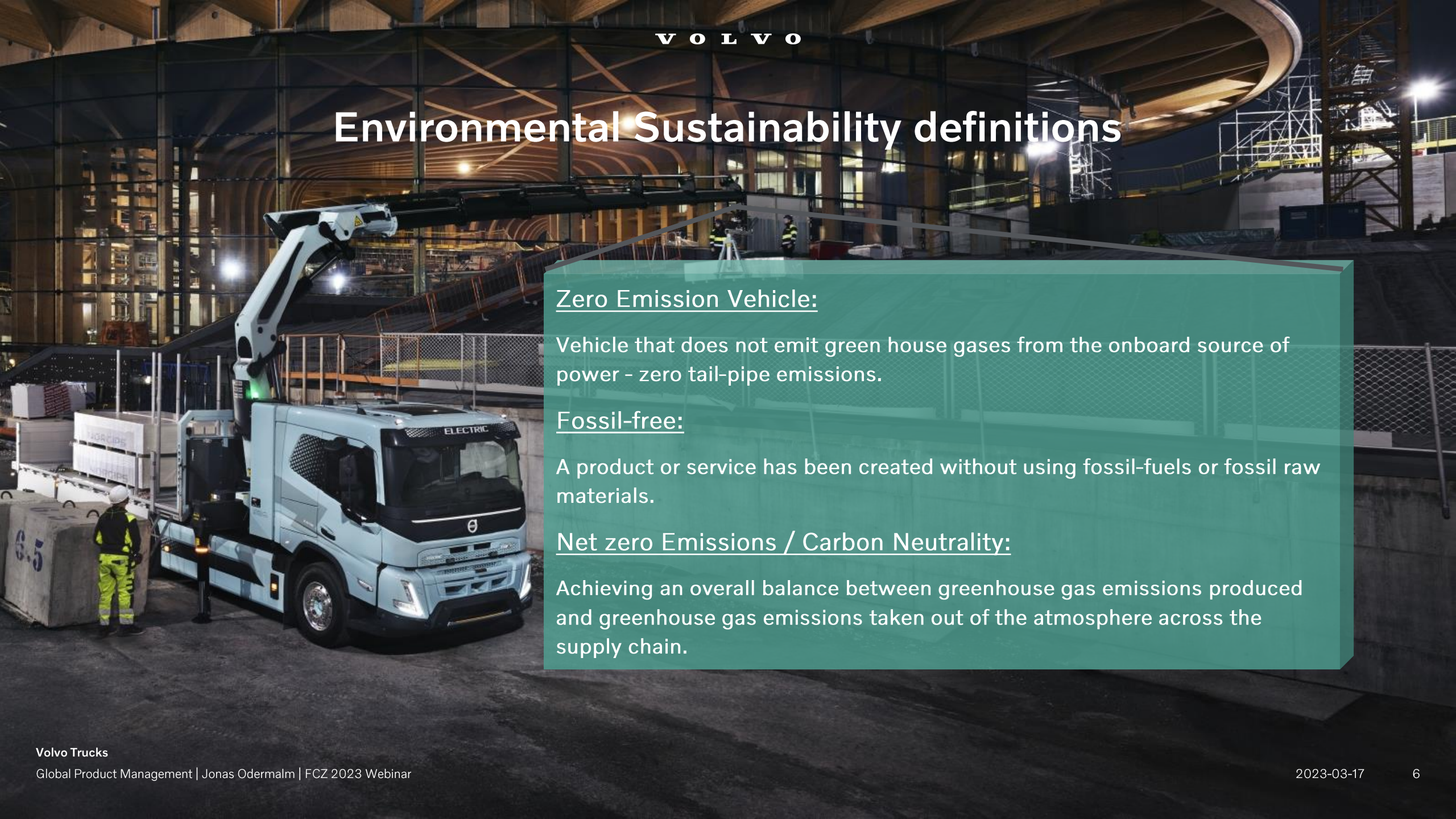
2030

100%

CO_2 reduction by

2040

Environmental Sustainability definitions



Zero Emission Vehicle:

Vehicle that does not emit green house gases from the onboard source of power - zero tail-pipe emissions.

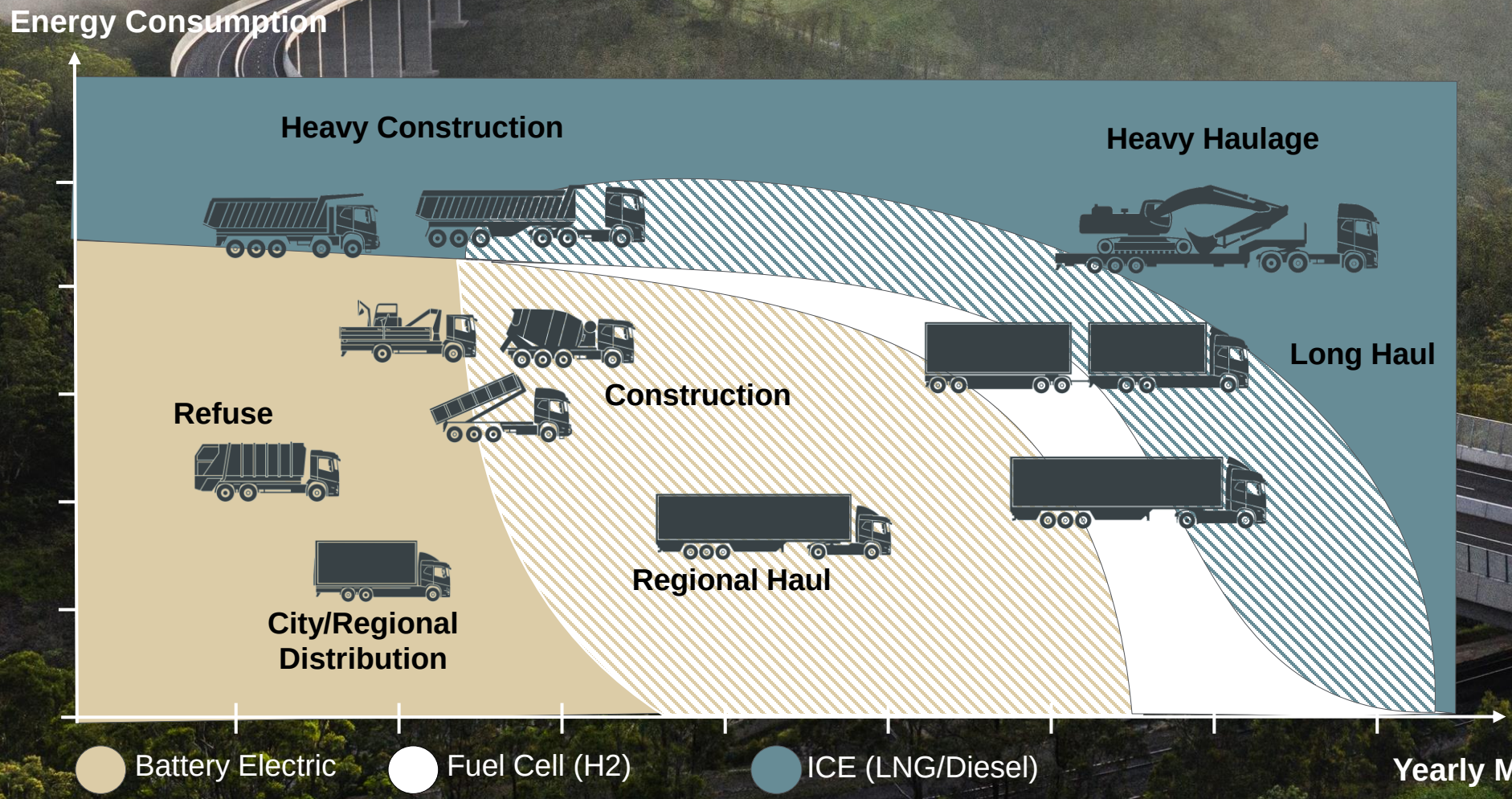
Fossil-free:

A product or service has been created without using fossil-fuels or fossil raw materials.

Net zero Emissions / Carbon Neutrality:

Achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere across the supply chain.

Several technologies needed to meet target -50% CO2



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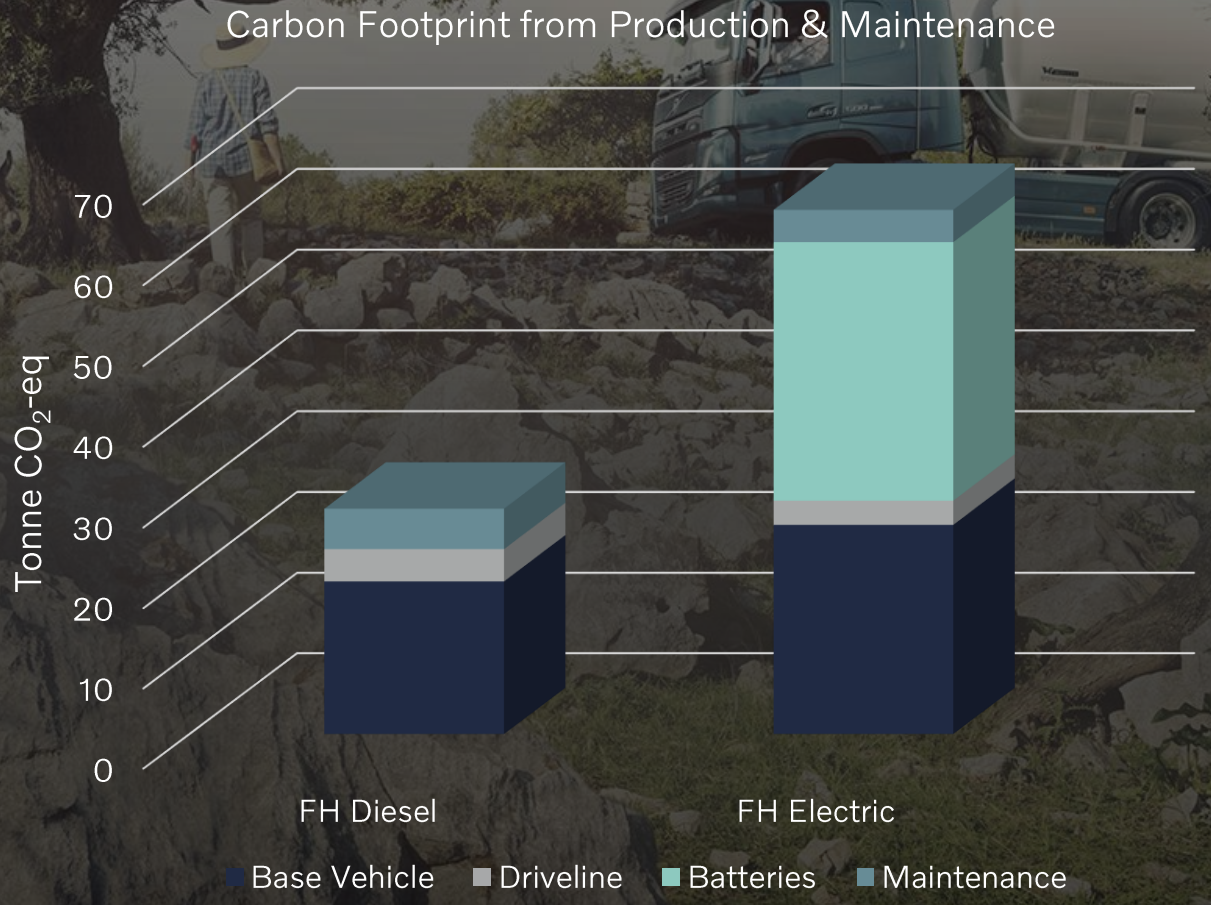
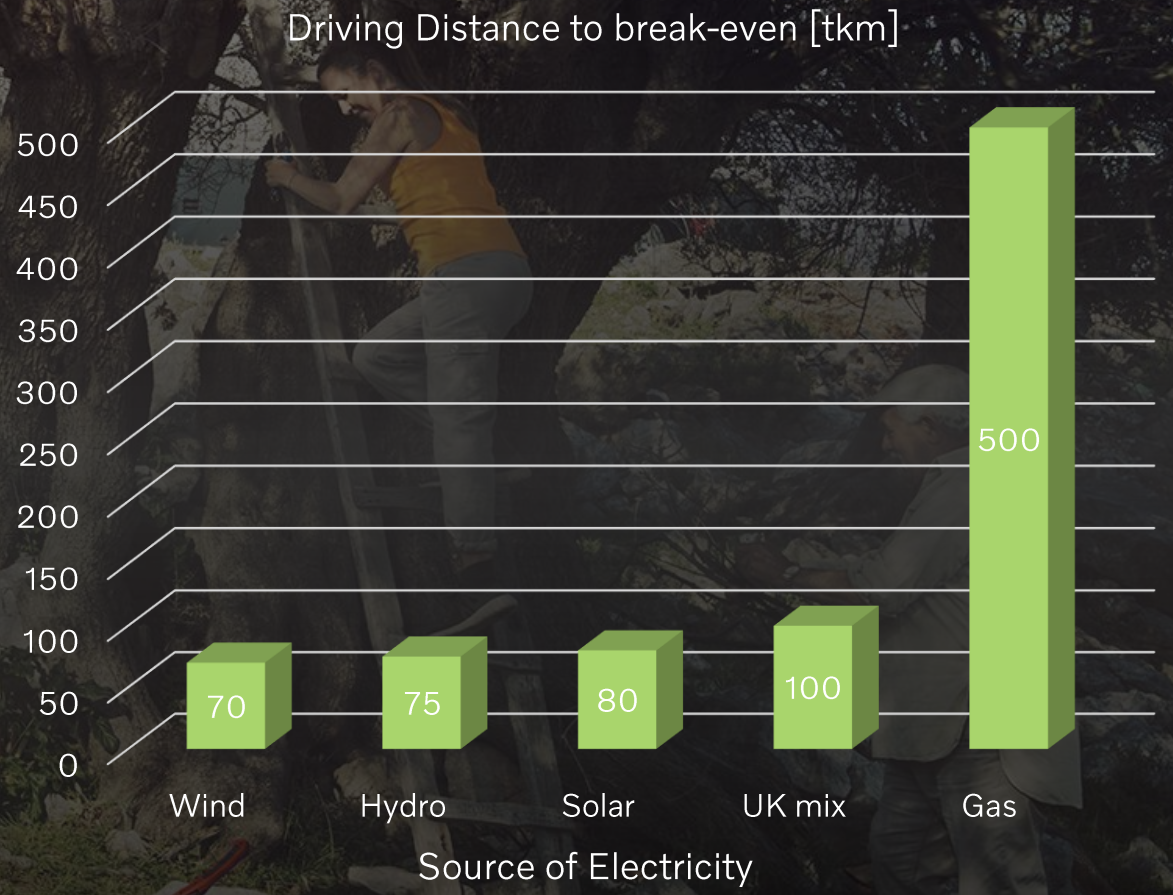
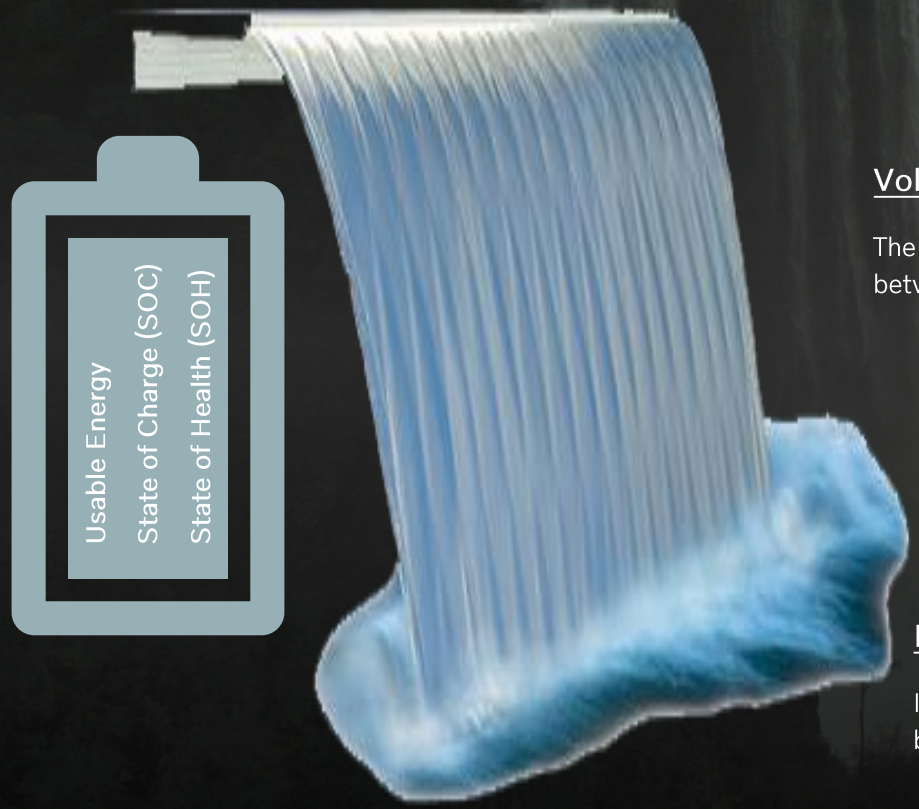




Electric Vehicle Terminology

Electric Current [Ampere (A)]

The stream of charged particles (electrons) moving between two points in an electrical circuit



Voltage [Volt (V)]

The electric pressure or potential difference between two points in an electrical circuit

Electric Energy [Watt-hour (Wh)]

Is the work done by the moving charged particles (electrons) in an electrical circuit.

Energy = Power * time

(1 kWh = 1000 Wh)

Electric Power [Watt (W)]

Is the rate at which electrical energy is transferred by an elecrical circuit

Power = Voltage * Current

(1 kW = 1000 W)

Lithium-Ion Batteries

Cathode Materials

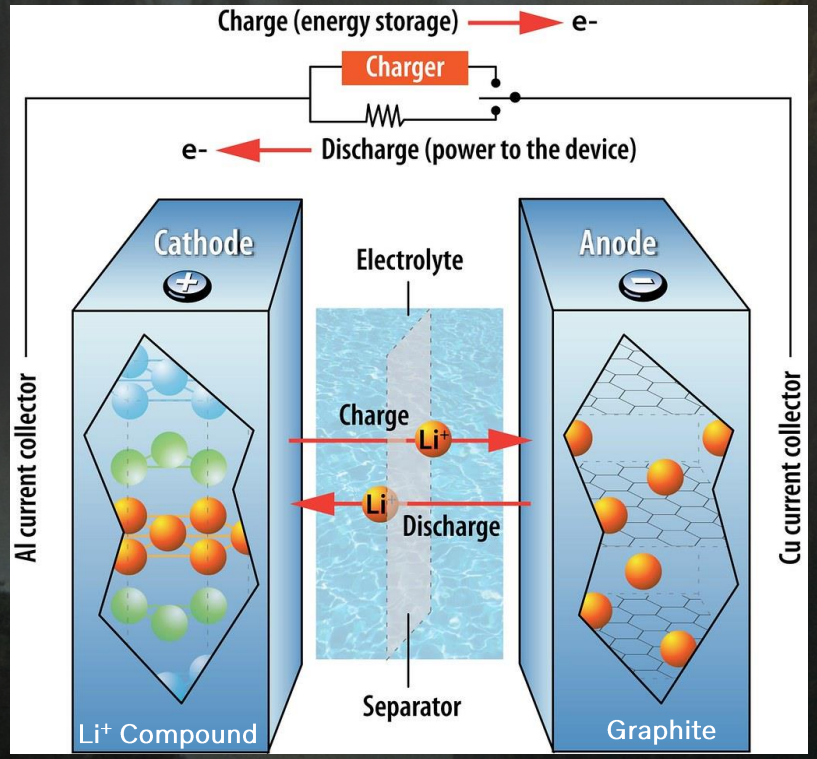
NCA – Lithium, Nickel, Cobalt, Aluminum

- Higher Power
- Higher energy density
- Better perfomance at sub-zero temperature

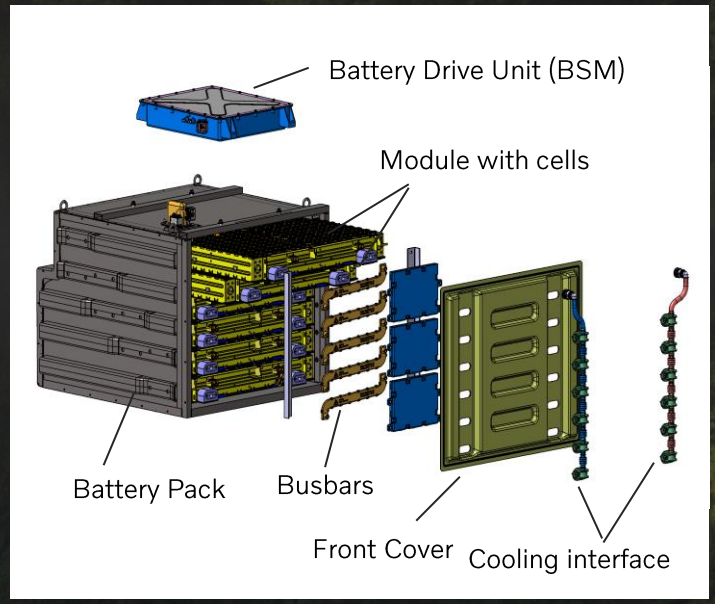
LFP – Lithium, Iron, Phosphate

- Higher cycle life
- Absence of scarce metals (Nickel & Cobalt)
- Lower cost
- Higher temperature tolerant cells
- Lower thermal run-away energetics cells

Battery Cell



Battery Pack



Electric Truck driveline basics

On-Board Chargers

Electric Drive Unit (MDS / Motors/Transmission)

Traction Batteries (2-6 BPs)

600 V

Obsolete systems/components

- ✓ Diesel Engine
- ✓ Muffler
- ✓ Aftertreatment System
- ✓ Fuel Tanks
- ✓ AdBlue Tank

Electrified Auxiliaries

- ✓ Air Compressor
- ✓ Cab Heater
- ✓ AC Compressor
- ✓ Servo Pump
- ✓ Power Take-off

Different ways to charge the vehicle

AC-charging

- Up to 43 kW from grid

CCS2 DC-charging

- Combined Charging System
- Up to 350 kW from grid

MCS DC-charging

- Megawatt Charging System
- Up to 3750 kW (3,75 MW) from grid

New standard for heavy duty commercial vehicles under development.

First deliveries expected 2024/2025

Truck Charging Options

Private

Vehicle dedicated charger

At vehicle ”home” base

Charging over night

8h+

40 -100kW

70 – 80% of Energy

Restricted Public

Shared charging HW

At customer premises

Loading/unloading, change of driver etc

1-3h

150kW+

15 – 20 % of Energy

Public

Shared charging HW

At public locations

During non-charging related standstill

0,5-1,5h and 8h+

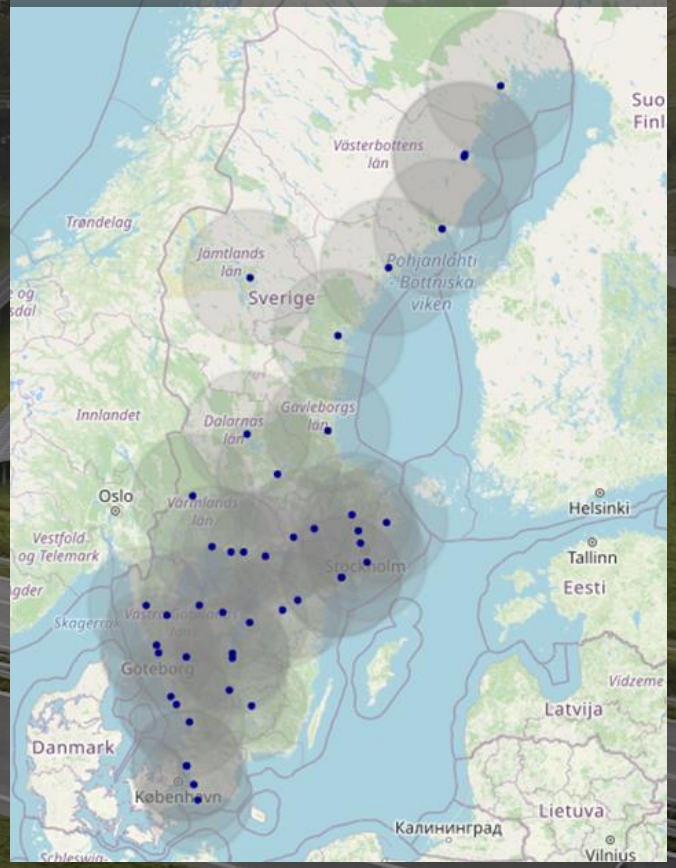
350kW+ and 40-100kW

5 – 10 % of Energy

Transition through collaboration and strategic partnership

Volvo, Traton & Daimler in joint aim to build 1700 chargers in Europe

Volvo Trucks & OKQ8 Charging network by 2023



OUR ELECTRIC LINE UP

FE Electric FM Electric FH Electric VNR Electric FMX Electric FL Electric

Volvo FH / FM / FMX Electric

- Tractor & Rigid - 2, 3, 4-axles
- Driveline Power: 330 - 490 kW
- Energy capacity: 180 - 540 kWh (2-6 BPs)
- Charging power AC/DC: 43 kW / 250 kW
- Combination Weights up to 44 tones
- Driving Range up to 300 km

Service Contracts

Truck & Battery Monitoring

Range & Route planning

Energy & Environment

Financing

Volvo Trucks

All Ready Electric – The widest offer available

2022

FH, FM, FMX Electric
Europe


Regional Distribution


Urban Construction


Regional Haul

2020

VNR Electric
North America


Local Distribution


Regional Transports

2019

FL & FE Electric
Europe


City Distribution


Refuse Collection

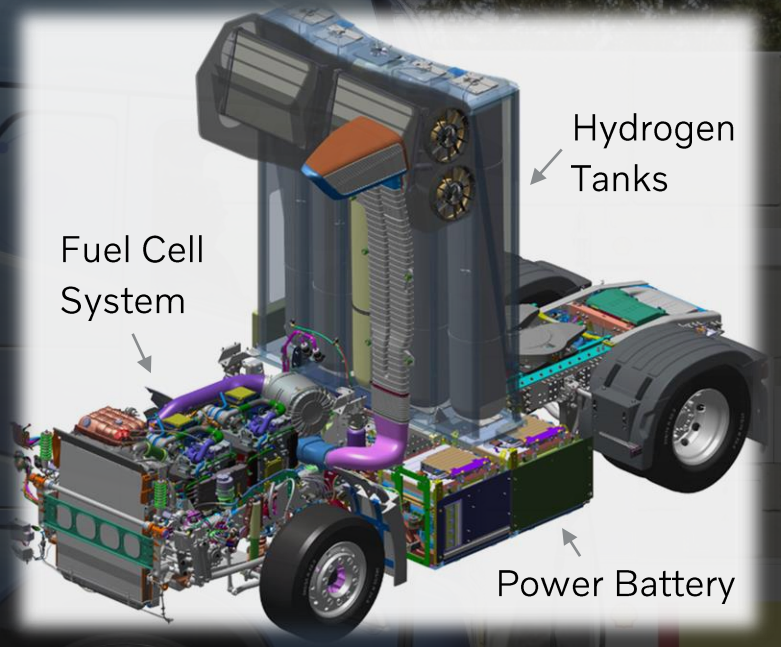

Light Construction

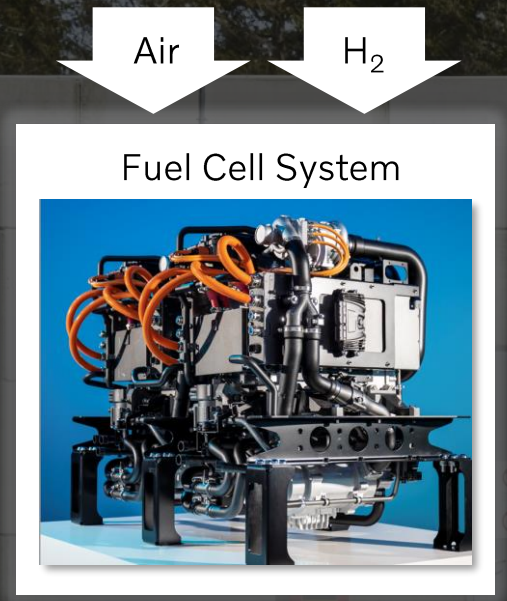
Energy Efficiency
Vehicle Range
Charging Speed
Total Cost of Ownership
Load Capacity
Markets
Segments
Applications

Hydrogen-powered Fuel Cell Electric Vehicle (FCEV)

Why Hydrogen (H2)

- CO2 free fuel.
- Produce H2 when sun is shining, wind is blowing and store.
- Less time for charging.
- Grid limitations.
- Wide industry adoptation will drive H2 availability and surplus.





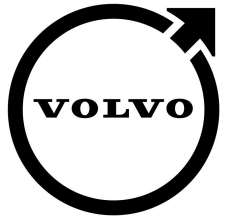
Accelerating sustainable transport solutions

<u>A team effort:</u>

- Industrialization of electric commercial vehicles – more product on the market
- Continued performance steps in electromobility propulsion technology
- Scale up the industrial systems – reduce cost
- Secure availability of fossil-free fuels
- Invest in electric grid capacity
- Building dedicated public fast-charging infrastructure for trucks
- Coherent policies and taxations promoting sustainable transport.


VOLVO
THANK YOU!

Questions



Thanks for watching

Keep up to date with all the latest decarbonisation news and information

Register today at
www.freightcarbonzero.com