Challenges surrounding the electrification of the truck fleet

FPC2022 – 2nd March 2022

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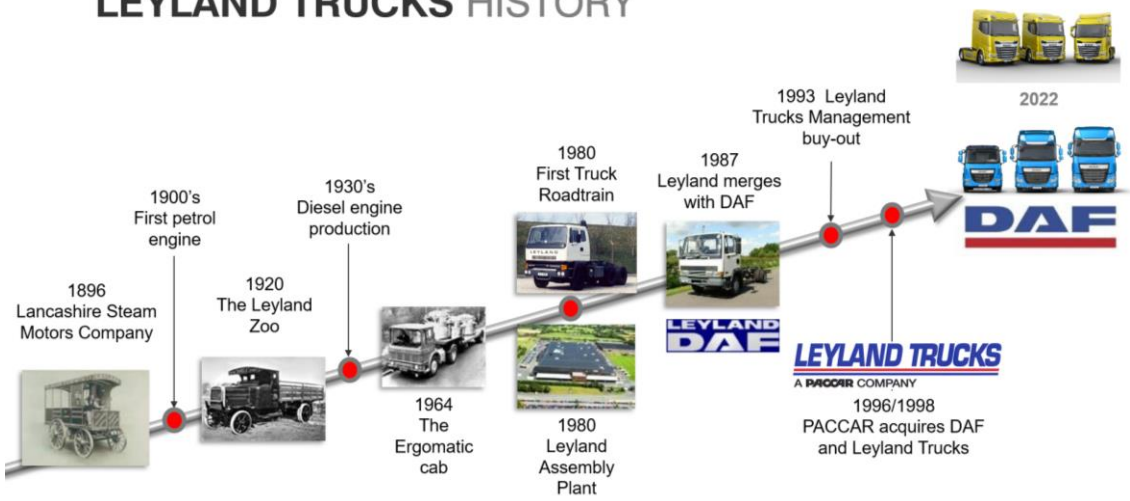
Leyland Trucks

Agenda

- Leyland Trucks Overview
- Future Legalisation Challenges
- The challenges of electrifying the truck fleet
- Leyland Trucks Electrification journey
- Overview of the BETT project
- Future Technology options being considered

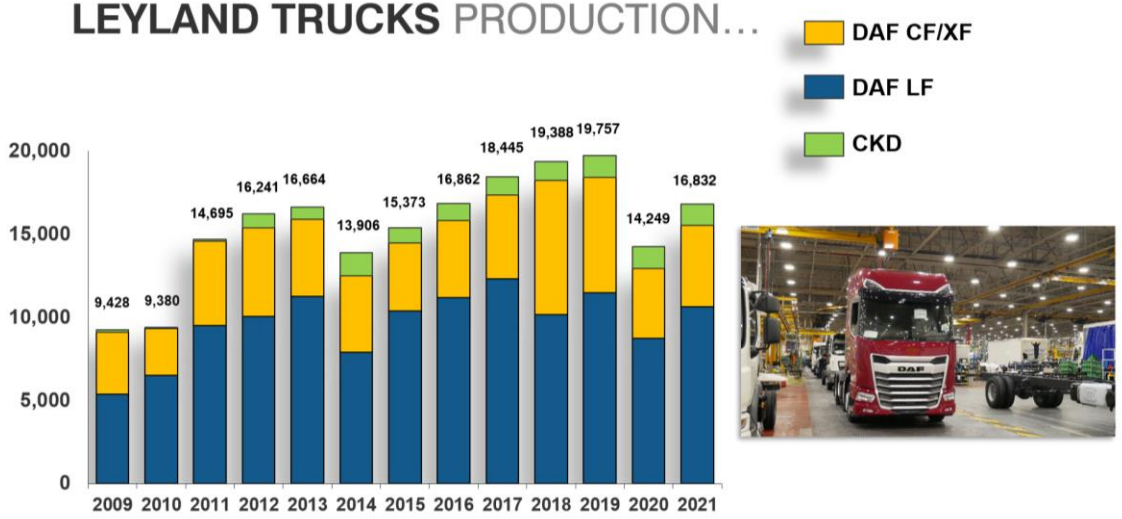
Leyland Trucks Overview

LEYLAND TRUCKS HISTORY

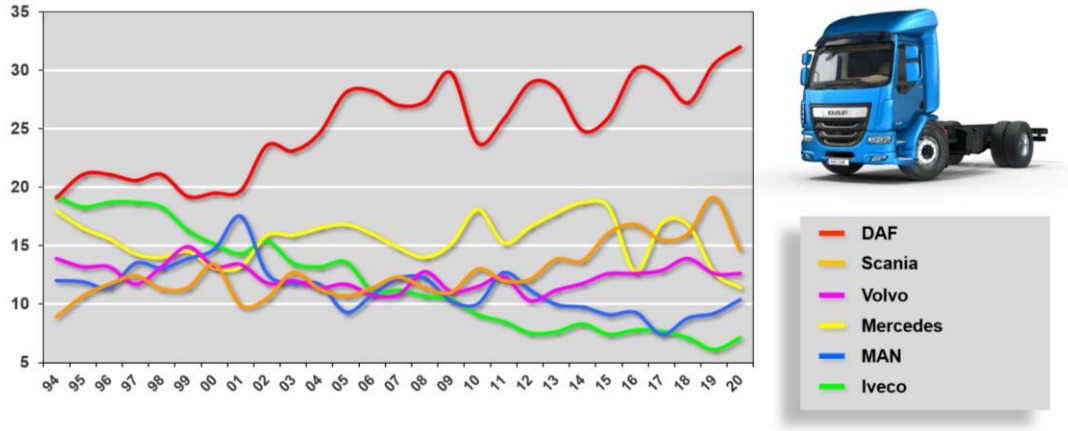


PACCAR A GLOBAL COMPANY...Since 1905

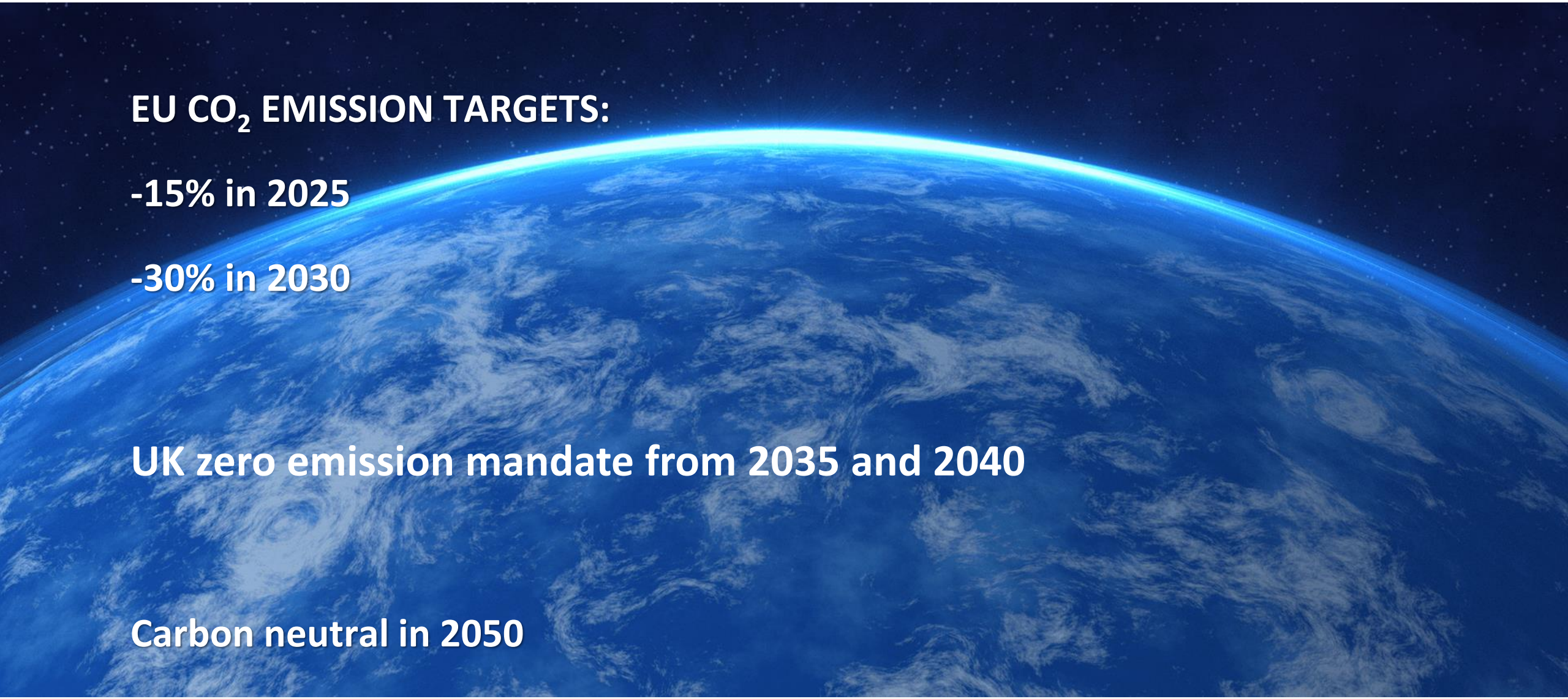
LEYLAND TRUCKS PRODUCTION…



MARKET SHARE – UK ≥ 6t GVW…



GLOBAL WARMING



EU CO_2 EMISSION TARGETS:

-15% in 2025

-30% in 2030

UK zero emission mandate from 2035 and 2040

Carbon neutral in 2050

GLOBAL WARMING FUTURE TARGETS

VECTO CO2

DECLARATION

4x2>16T 6x2

4x2 7,5-16T

6x4 8x4

CO2 LIMIT VALUES -/-15%

BENCHMARK 2% EV

CO2 2,4% BONUS IF 5% EV

CO2 LIMIT VALUES -/-30%

BENCHMARK 20% EV TBD

CO2 PENALTY/BONUS

2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031

EU REGISTRATIONS REFERENCE YEAR

EVALUATION LIMITING VALUES

ZERO EMISSION SOLUTIONS

FOR A **VARIETY** OF APPLICATIONS

LEYLAND TRUCKS

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ZERO EMISSION SOLUTIONS

FOR A **VARIETY** OF APPLICATIONS

COMBUSTION ENGINE

MILD HYBRID - BIO/RENEWABLE FUELS - HYDROGEN

HYBRID VEHICLE

FUEL CELL ELECTRIC

PLUG-IN HYBRID

BATTERY ELECTRIC VEHICLE

LEYLAND TRUCKS

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The challenges of electrifying the truck fleet

- Multitude of different truck applications:
  - Vehicle Electric range,
  - Recharge time,
  - “Power Take Off” requirements,
  - Reduction in vehicle payload,
  - Space to install required batteries.

- Operation of a fleet of electric trucks it will involve further challenges around
  - Lack of public charging infrastructure for HGV
  - Local grid capacity issues – both within and around operating bases

Leyland Trucks Electrification Journey

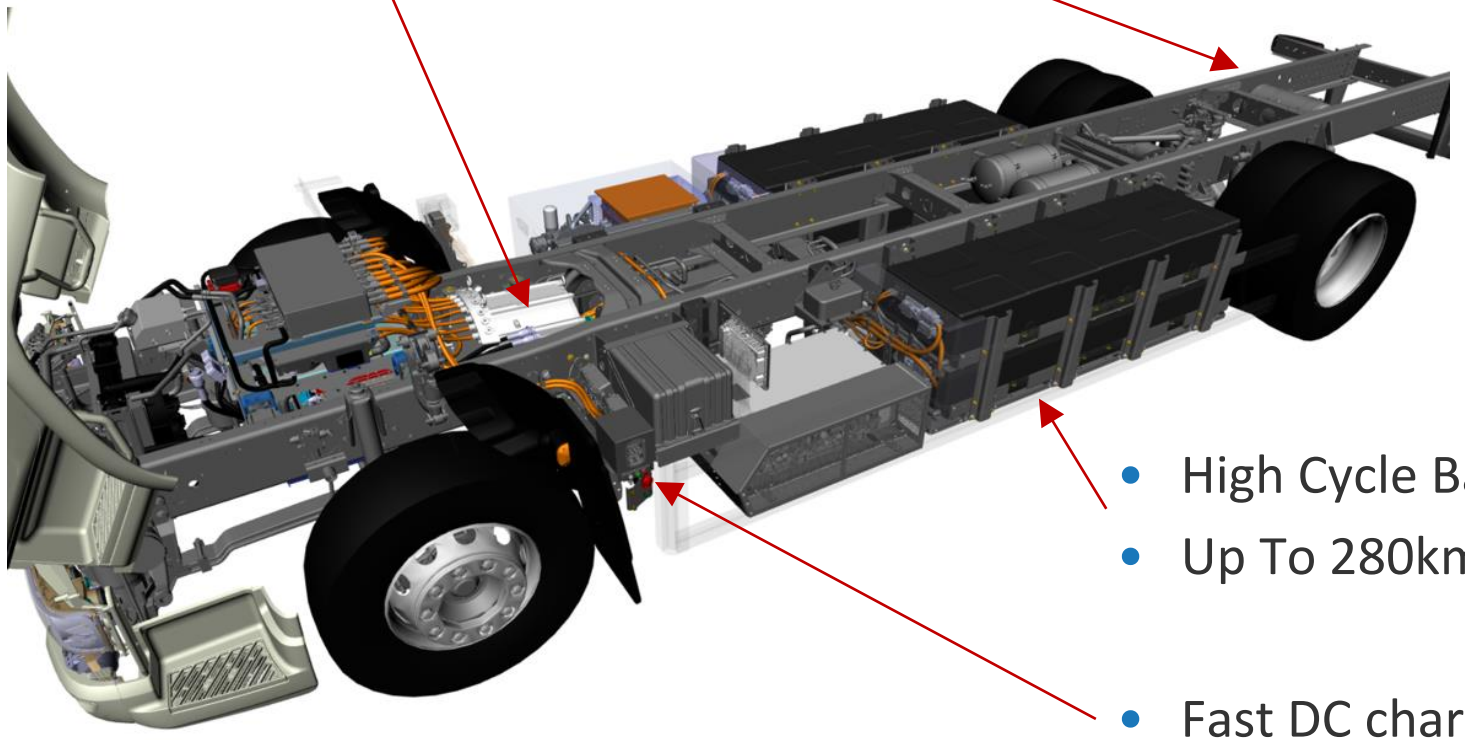
- 1930's Leyland Trolley Bus – Series build
- 1970's Leyland Terrier Truck concept
- 2000's DAF LF Hybrid
- 2010's DAF LF Battery Electric Research Truck
- **2021 DAF starts production of 1st LF Electric model**
  - Used to support BETT project

Overview of the BETT project

- **B**attery **E**lectric **T**ruck **T**rial based on 19T LF Electric - 250 kW [Cont.] / 282 KWh [Gross]
- 20 off vehicles operating with Government organizations to gather real life operational data
  - NHS
  - Various local councils
- Website will be created to share learning from project, to
- Assist truck operator with further zero emission truck purchases
  - Will provide vehicle operational cost
  - Challenges and Cost of installing charging infrastructure

LF Electric developments

- Based on Proven 19T DAF LF Chassis
- High Torque Permanent Magnet Motor fitted giving 3700Nm peak output



- High Cycle Battery chemistry used
- Up To 280km Electric range

- Fast DC charging up to 150kW
- Slow overnight 22 kW AC charging

GLOBAL DEVELOPMENTS FOR THE FUTURE

Battery Electric

- Zero tailpipe emission
- PACCAR Global
- 200->400 km of range

H_2 Combustion

- Limited tailpipe emission
- MX Based
- > 400 km of range

H_2 Fuel Cell

- Zero tailpipe emission
- PACCAR Global
- > 400 km of range

LEYLAND TRUCKS

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Any Questions?