Wabtec-EPA Technology Discussion

11 May 2023

Wabtec CORPORATION

WABTEC

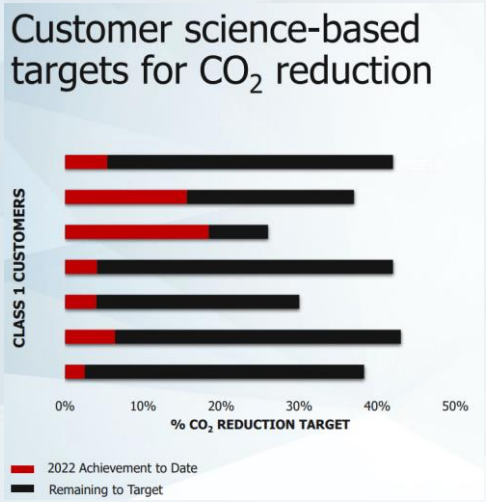
Heavy Haul Locomotive Landscape

Heavy Haul Locomotive at a Glance

- ❑ 432,000 lbs
- ❑ 75 mph top speed
- ❑ 4500 hp diesel engine
- ❑ 5000 gallons of fuel
- ❑ ~250k gallons of fuel per year
- ❑ ~29 years in service

Compared to a Typical EV or pass car

Line Haul Locomotive	Switcher Locomotive
~100x Heavier	~55x Heavier
~11x More Powerful	~6x More Powerful
~2530x Energy on Board	~1315x Energy on Board
~2.5x average age of a pass car	~3x average age of a pass car



Current NA Locomotive Landscape Summary

- ❑ EPA Tier 4 emissions for new and some modernizations
- ❑ All Class 1 railroads have set SBTi goals
- ❑ Biofuels are primary path today
- ❑ Battery locomotives are in pilot stages
- ❑ H2 fuel cells are homegrown pilots

LONG-TERM CLASS 1 SBTI GOALS ARE PROJECTED TO REQUIRE AN ENERGY TRANSITION AWAY FROM PETROLEUM DIESEL

WABTEC

Locomotive technology road map for sustainability

Dates shown are approximate and represent technical validation, not production readiness

DIESEL ELECTRIC

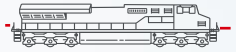
TIER 4

2015 — Launch

2021 — 1,100 in service

NOx and PM Emissions Reduction

2026 — EVO High Efficiency Loco

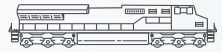


2030+ — Alternative Fuel Upgrades (H2)

MODS

FDLAdvantage Upgrade

EVO High Efficiency Upgrade



Alternative Fuel Upgrades (H2)

BIOFUELS ●

○ **Up to B5**
Up to R30
~20% CO_2 reduction

○ **Up to R80**
Up to B20
~60% CO_2 reduction

BATTERY ▲ ●

BEL Demo

2.4 MWh

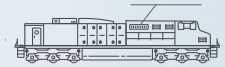
50 loco yrs

FLXdrive

Up to 8 MWh w/stationary charge

Equivalent to ~100 Tesla Model 3 Long Range

FLXdrive



Up to 10 MWh w/ moving charge

HYDROGEN ▲ ●

Wabtec R&D
H2 Single Cylinder Engine Testing
Hydrogen Fuel Cell Testing
CRADA's

FLX H2 Demo

Switcher / Short line

50 loco yrs

FLX H2 HHP/tender

Main line locomotive
ICE and Fuel Cell

DIGITAL

○ **Trip Optimizer**

○ **Smart HPT**

○ **FLX Optimizer**

○ **Network Optimization**

PORTFOLIO TO SUPPORT SUSTAINABILITY GOALS…
DEPENDENT ON SCALE OF INFRASTRUCTURE

Dependent on: ● Supply ▲ Infrastructure