Wabtec CORPORATION

FLXdrive

BATTERY-ELECTRIC LOCOMOTIVE

Wabtec's Battery-Electric Locomotive (BEL) pilot is part of a $22.6-million grant project with BNSF and the San Joaquin Valley Air Pollution Control District.

The company is designing and building a full-size, 100-percent battery-electric freight locomotive featuring an overall energy-management system, including approximately 20,000 battery cells onboard, which coupled with advanced system-optimization controls (ie Trip Optimizer) will improve performance.

This prototype will be used for proof-of-concept and performance testing. The BEL will operate in a hybrid consist with conventional diesel-electric locomotives on BNSF's 350-mile Barstow-to-Stockton, CA route.

While in the rail yard, the consist will shut down or idle the other locomotives (when possible) and use the BEL to reduce local emissions and noise. Once on the road, the locomotive consist will work behind the scenes to determine the best way to use the battery power. The consist also could choose to "graze" on battery power when the train is cruising through open landscape, saving hundreds of gallons of diesel. The locomotive will recharge in operation through the energy generated from dynamic breaking.

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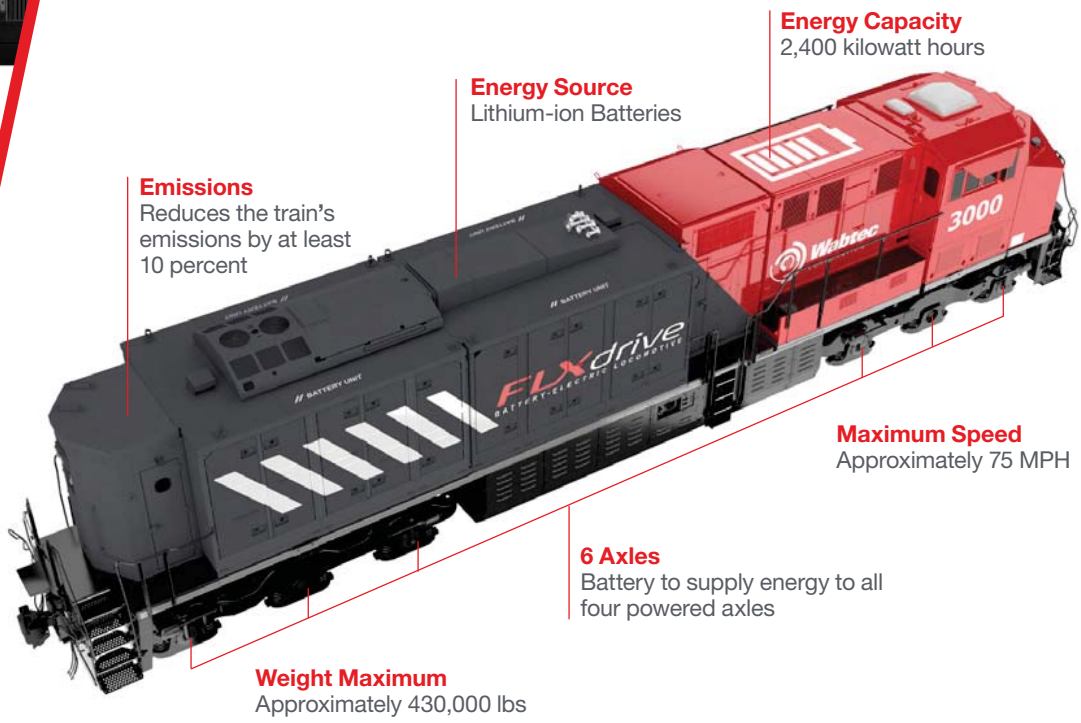
Wabtec's Battery-Electric Locomotive

The BEL is expected to generate 2,400 kilowatt-hours of power and reduce a freight train's total fuel consumption by at least 10 to 15 percent. It also reduces greenhouse gases, particulate matter and NOX by at least 10 percent.

Wabtec and BNSF will begin proof-of-concept and performance testing in late 2020.

BEL is part of California Climate Investments, a statewide program that puts billions of cap-and-trade dollars to work reducing greenhouse gas emissions, strengthening the economy and improving public health and the environment— particularly in disadvantaged communities.



Specifications

Energy Source	Lithium-ion Batteries
Size of Battery Unit	20 racks, which consist of approximately 20,000 battery cells ** HVAC system to keep batteries at room temperature in all environments* ** Energy-management system to monitor battery health, charge rates and other conditions*
Energy Capacity	2,400 kilowatt hours
Duration of Full 4400 HP output	30-40 minutes ** Recharges during operation through dynamic braking*
Emissions	Reduces the train's emissions by at least 10 percent.
Charging	There are two ways the locomotive is charged: • Wayside charging station, Stockton, CA • Dynamic braking during operation
Weight Maximum	Approximately 430,000 lbs
Maximum Speed	Approximately 75 MPH
Number of Axles	6 ** Battery to supply energy to all four powered axles*
Grant Partners	BNSF and the San Joaquin Valley Air Pollution Control District and the California Air Resources Board
Test Date	Late 2020
Test Route	Barstow-to-Stockton Route
Route Length	350 miles

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