

# BNSF Railway Introduction

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# BNSF is a Leading U.S. Railroad



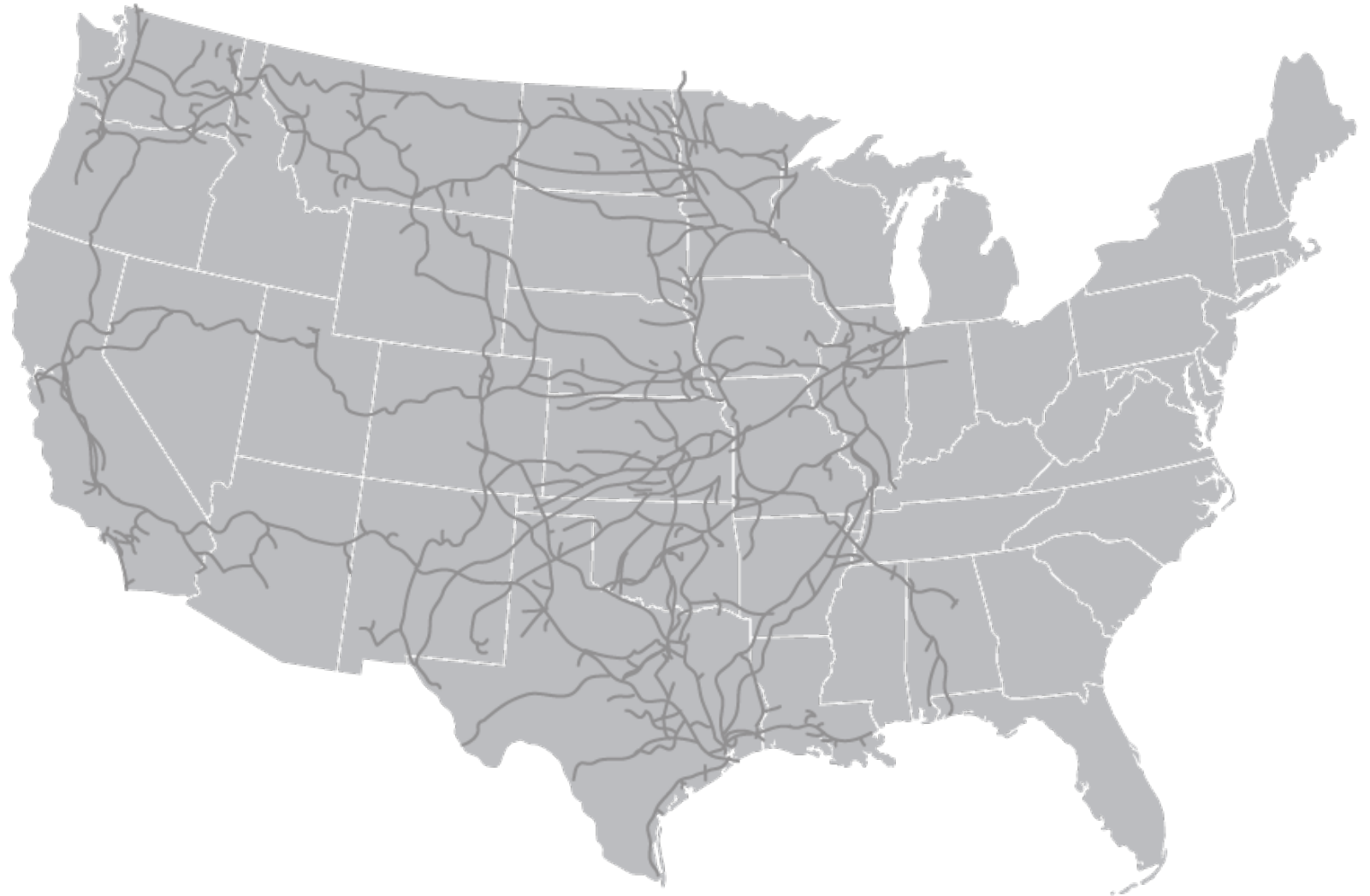
BNSF is a Berkshire Hathaway company that:

- Employs approximately **36,000** employees
- Operates more than **8,000** locomotives
- Moves **one-fourth** of the nation's rail freight
- Operates more than **1,200** freight trains per day
- Leads rail industry in **technological innovation**



# BNSF is a Leading U.S. Railroad

- **32,500 route miles** in 28 states and three Canadian provinces
- **13,000** bridges and **89** tunnels
- Serves **over 40 ports**





# Our Vision



Our vision is to realize the tremendous potential of BNSF Railway by providing transportation services that consistently meet our customers' expectations.



# Battery Electrification Initiative Overview

Initiative: Leverage battery storage and electric power/motor technologies to reduce total cost of ownership and environmental impact

## Technology Opportunities:

- Hybrid locomotive consist with a battery-electric and standard diesel locomotives
- Battery and electric trucks, cranes and other cargo handling equipment at intermodal hubs
- Onsite power and battery storage

## Market Dynamics:

- Opportunity to improve efficiency, but challenging current economics
- Battery energy density improving while battery cell price dropping with increasing production volumes
- Manufacturers seeking long-term assurances to invest in technology
- Adjacency development and application opportunities

BNSF Requirements: Safety, Return on Investment, Reliability, Maintainability



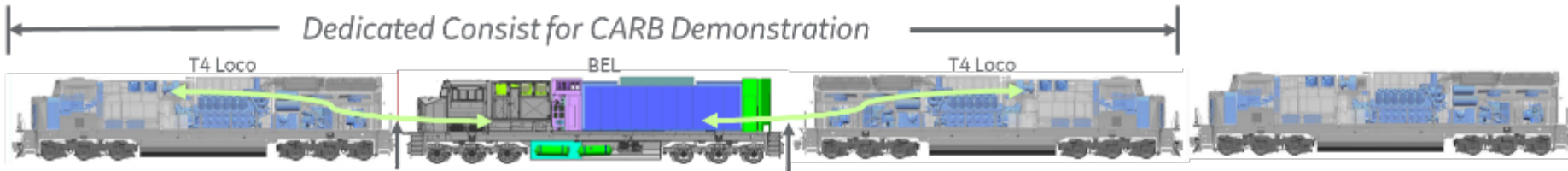


# Locomotive Areas

- Line-Haul Freight
  - Service: Inter-city, regional
  - Power Level: ~4400HP
  - Energy Level: 6+MWh
  - Technology approach: Diesel & Battery Electric (Hybrids)
- Intermediate
  - Service: Intra-city, local, switcher
  - Power Level: ~3000HP
  - Energy Level: <~5MWh
  - Technology approach: Battery Electric / Range Extenders
- Passenger
  - Service: Commuter rail
  - Power Level: ~3000HP + HEP
  - Energy Level: 2-12MWh
  - Technology approach: Battery Electric, Diesel HEP



# CARB Demo – Wabtec Hybrid Consist



## *Mainline Mode: Service Operation*

- Between Stockton & Barstow
- Revenue service operation
- Total fuel/emissions reduction

## *Yard Mode: Consist & Train*

- Stockton yard
- Yard train movement
- Near-zero emissions operation; diesel units idle
- Treats as one "green zone"

