Sustainable Freight Rail

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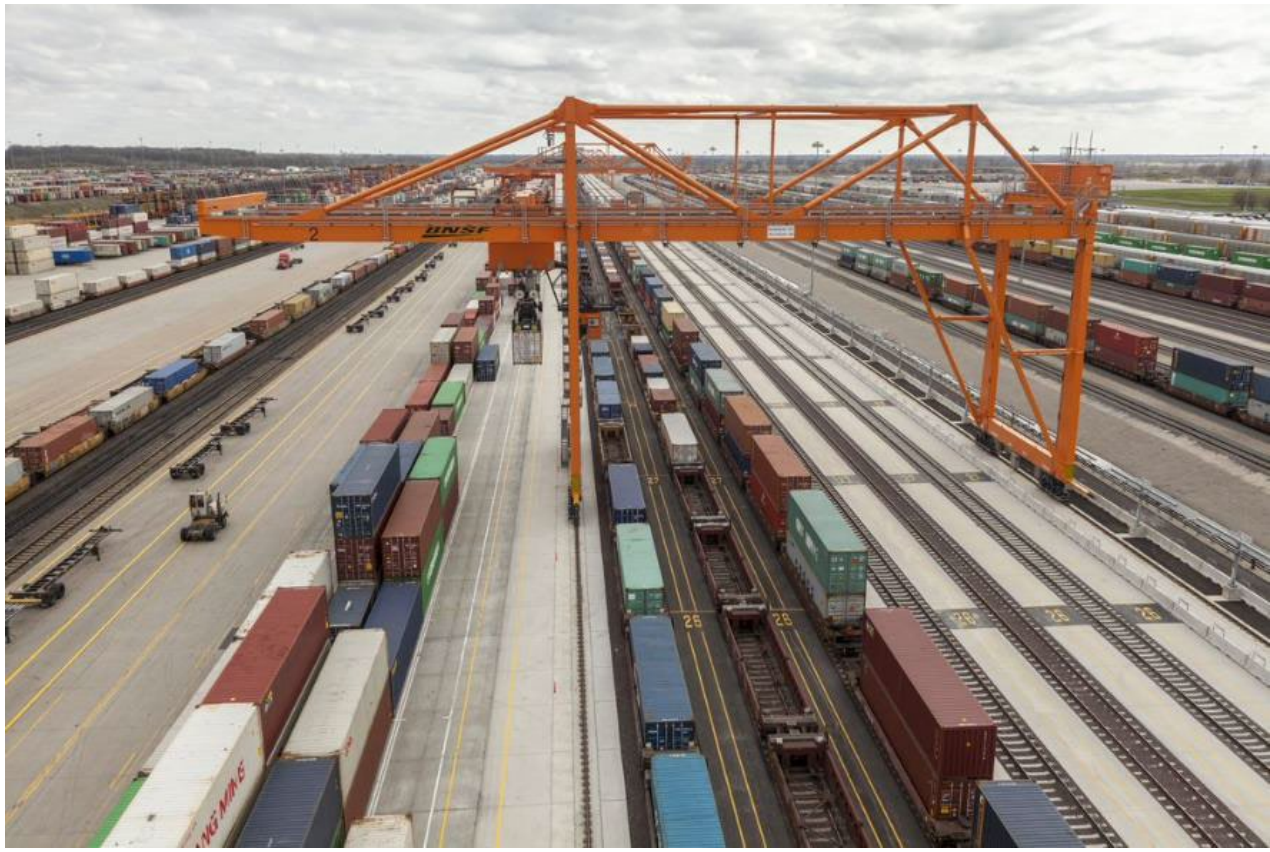
John’s Background

- Family of scientists
- “First-lung” experience growing up in Southern CA
- Sustainability evolution
- Transformational projects
  - INNOVATION - leader of advanced energy rail
  - GROWTH – executive advisor for sustainable business markets

Agenda

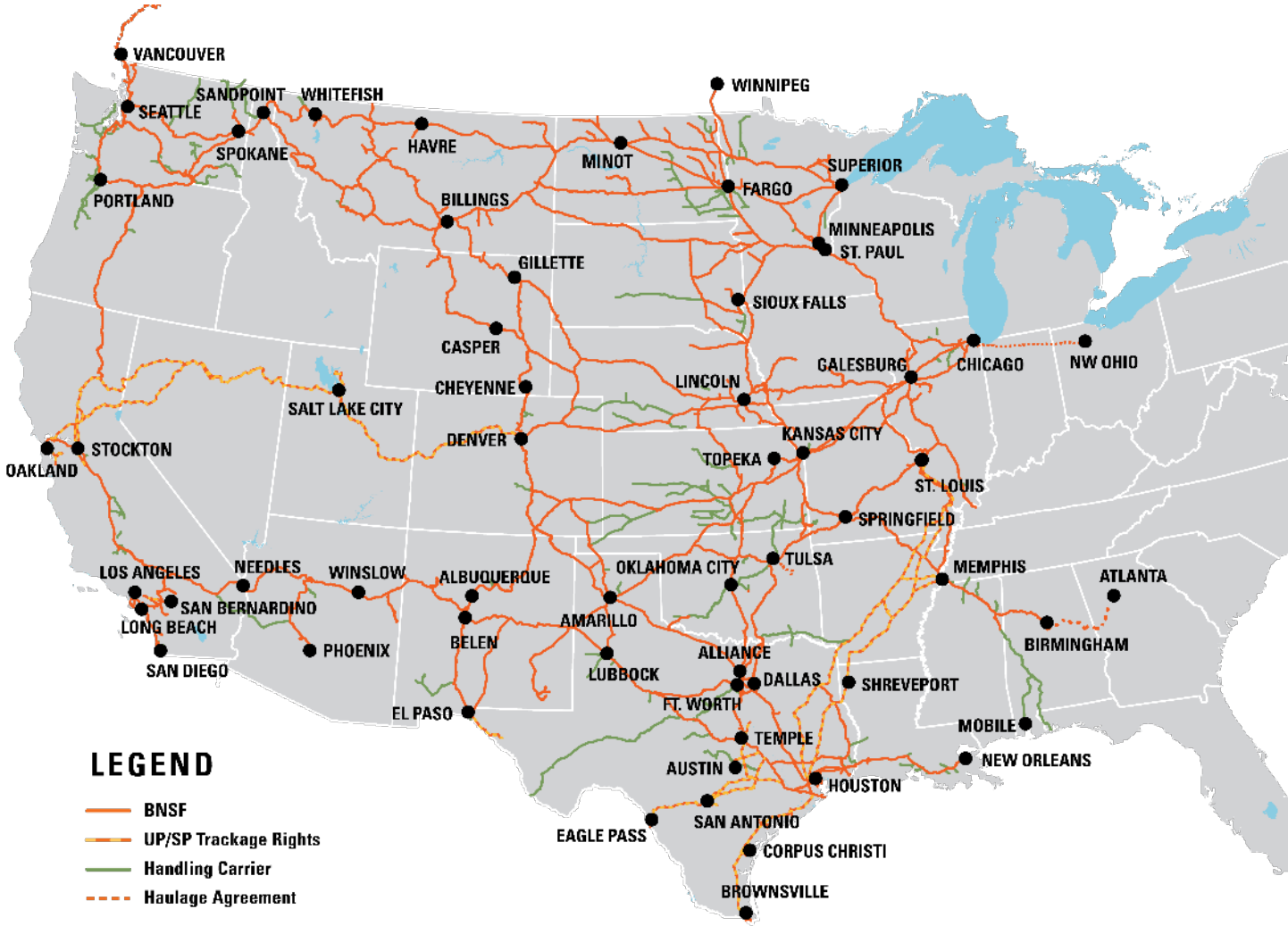
- About BNSF & Career Opportunities
- Climate Change Drivers for Business
- BNSF Sustainable Freight Updates
- Sustainable Business Markets
- “BIG” Project
- Q&A



Electric cranes moving containers and trailers between trucks and trains at intermodal yard

About BNSF Railway

- Owned by **Berkshire Hathaway**
- **~38,000** employees
- Average of **1,200** trains/day, approximately 10 million units per year
- **32,500 route miles** in 28 states and three Canadian provinces



Careers can take many different paths at BNSF

Rail and Intermodal Career Opportunities

UNT TRANSPORTATION & LOGISTICS STUDENTS

Example employee career path at BNSF –

Transportation Team

Dir. of Locomotive Utilization (Transportation)

- Director of Service Excellence (Transportation)
- Manager II Service Excellence (Transportation)
- Senior Manager Service Design (Service Design)
- Manager Service Design (Service Design)
- Manager Corridor Operations (Transportation)
- Trainmaster (Transportation)
- Trainmaster Trainee (Transportation)
- **Management Trainee (Transportation)**

Climate Change Drivers for Business

Climate Disruption

- Flooding and wildfires

Supply Chain Requirement

- Customers with net zero supply chain carbon targets
- From “nice-to-have” to “have-to-have”

Technology Innovation

- Zero emissions tech with improved efficiency

Sustainable Business Markets

- Carbon subsidies and circularity among catalysts

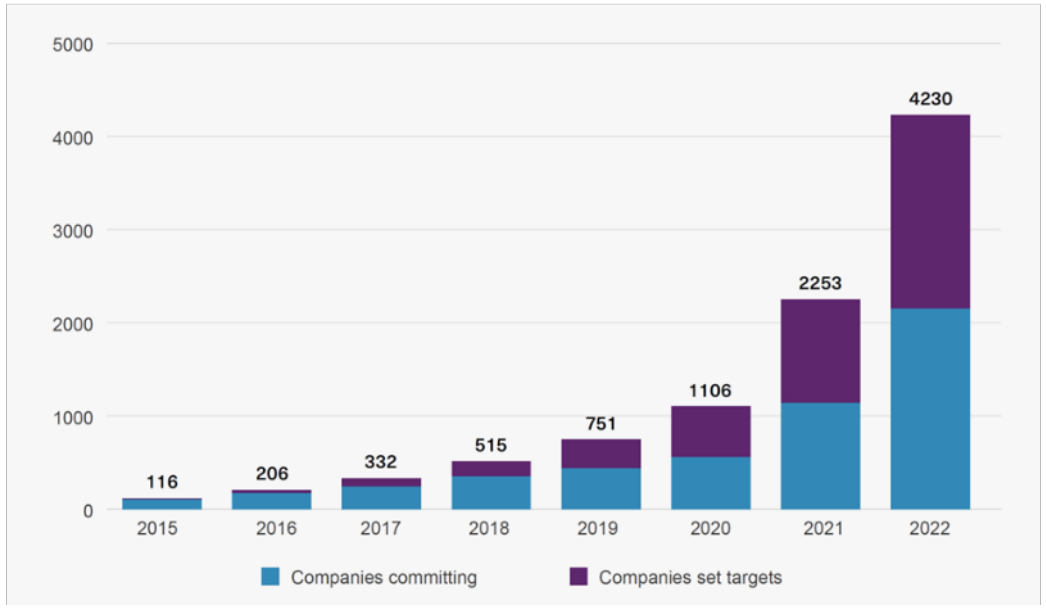
Dixie Fire in California

Why Delivering Sustainable Customer Solutions is Important

Demand for lower carbon freight transportation is increasing

SBTi targets cover over a third of the global economy by market capitalization; 96% cover supply chain emissions

Annual cumulative number of companies with approved targets and commitments



Significant number of BNSF customers have Scope 3 SBTi targets or are Climate Pledge signatories

BNSF Sustainable Freight Leadership

Sustainable Development and Communities

"Optimal siting to responsibly avoid impact to sensitive receptors and/or minimize permitting effort"

Sustainable Operations Program (SOP)

"Drive regulatory compliance and risk reduction through Sustainable Ops solutions"

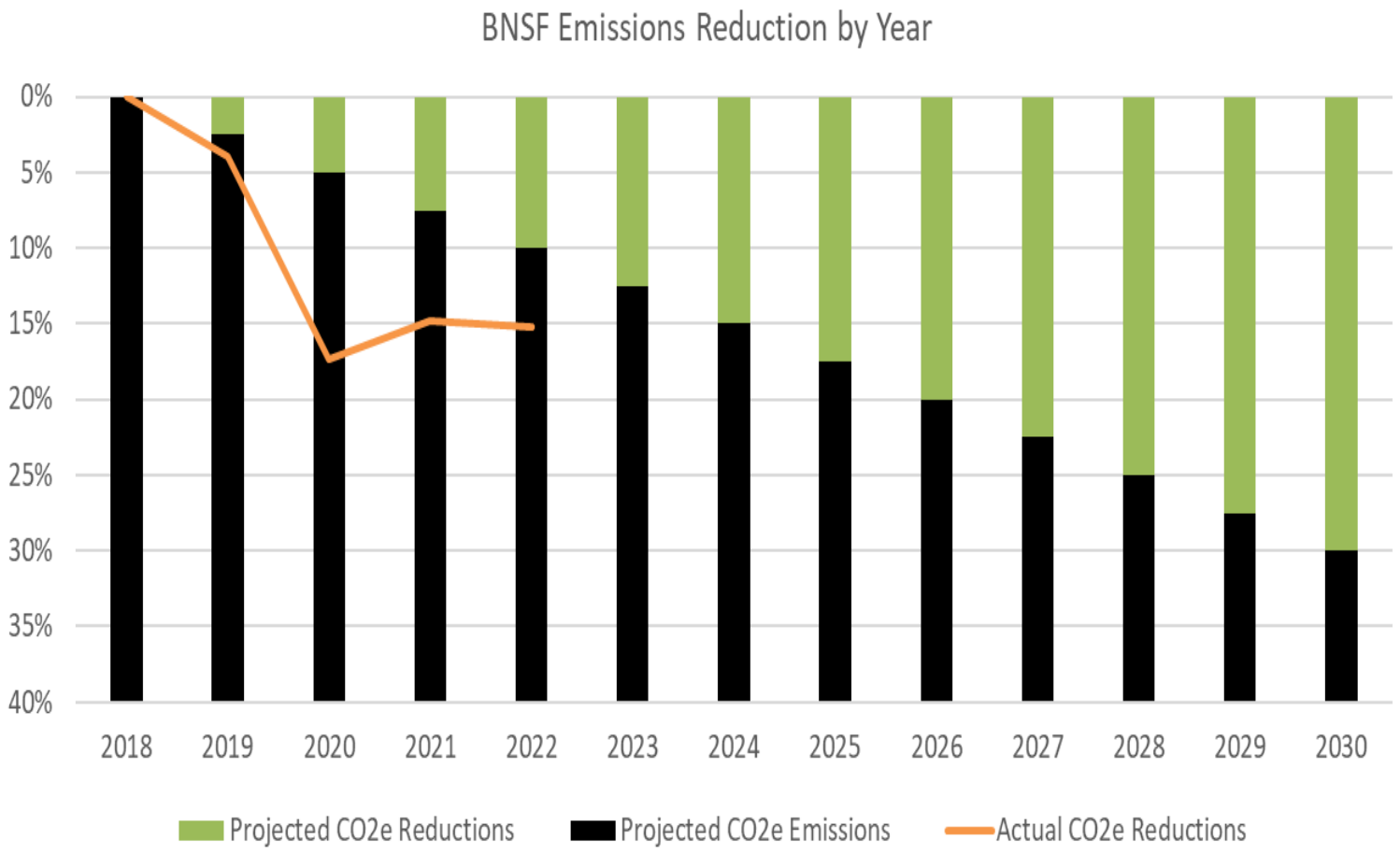
Advanced Energy Innovation

"Efficient use of energy innovation and technology to reduce Total Cost of Ownership"

Sustainable Customer Solutions

"Provide sustainable transportation solutions that meet the needs of our customers' supply chains and enables them to grow in core and emerging sustainable business markets"

BNSF's Commitment To Reduce Carbon Emissions



2030 Technologies

- Fuel efficiency
- Renewable fuels & power
- Intermodal hub electrification

Next Generation Locomotives

- Battery-electric
- Hydrogen
- Hybrid

Rail Decarbonization

- Association of American Railroads decarbonization working groups
- Building partners in technology development and financing
- Early integration of infrastructure & supply chain solutions

Opportunities

- Battery-electric: simpler, more efficient, zero emissions

Challenges

- Technology limits – battery energy density/transfer/weight; hydrogen thermodynamics
- “The Great Implementation”

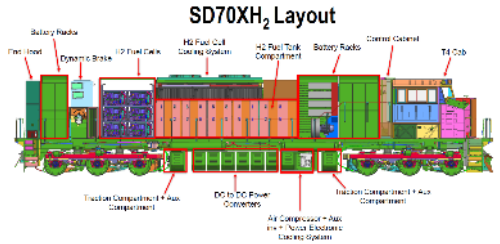
BNSF Railway Advanced Energy Innovation

- Objective: test, develop, and scale ***sustainable solutions*** – ***safety, operational fit, lowest total cost of ownership***

- **Hub Electrification**
  - Completed battery-electric ***hostler fleet conversion*** in Stockton, CA
  - Additional ***projects underway*** in San Bernardino, Los Angeles and Seattle

- **Locomotive Development**
  - Pilot grant-funded **yard and local service demonstrations**

- **Other Technology**
  - Lithium-Ion locomotive starter batteries
  - Vehicle fleet electrification in response to ***CA regulatory requirements***



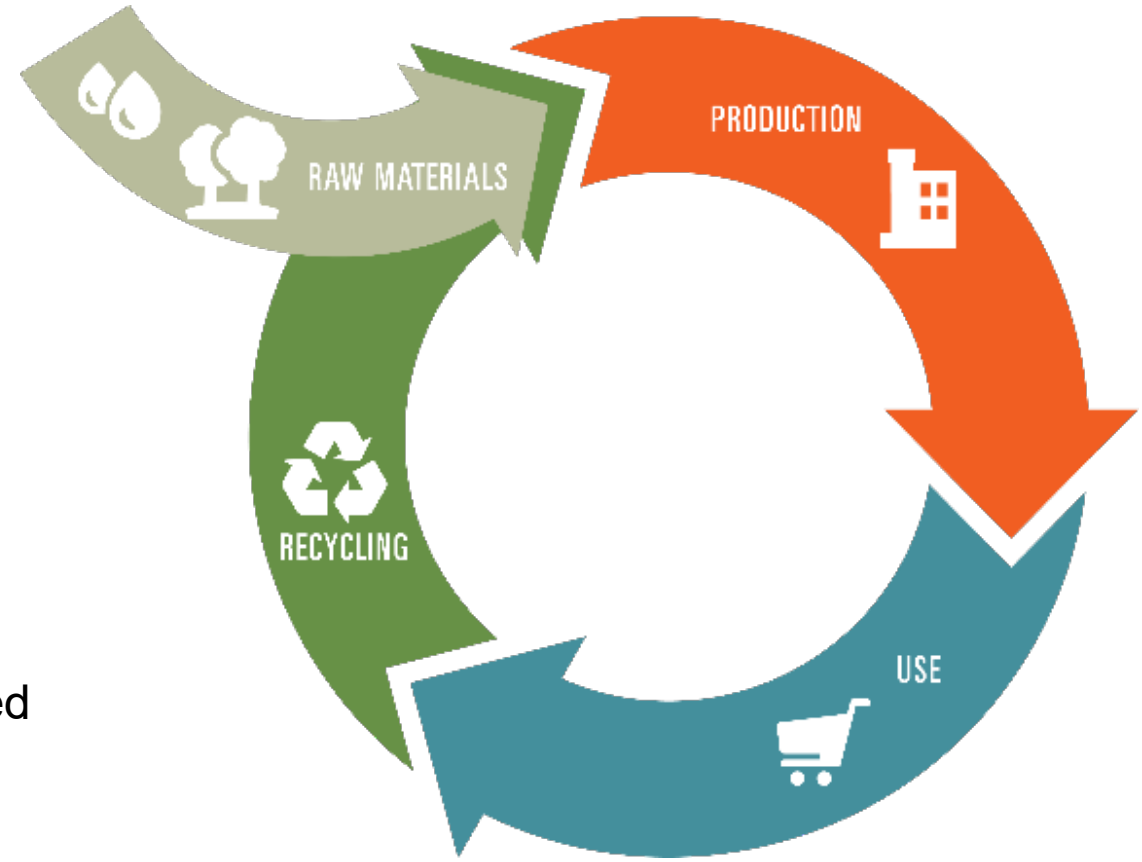
Sustainable Business Markets

Sources of Market Insights

- Industry associations
- Businesses

Common elements

- Life-cycle carbon is measured, and carbon is priced
- Circular supply chains
- More minerals & electrons
- Social license implementation challenges



Carbon Subsidies Expanding

- **Federal – Infrastructure Investment and Jobs Act (IIJA)**
- **Federal – Inflation Reduction Act (IRA)**
  - Renewable fuel standard
  - Green hydrogen
  - CO2 capture & sequestration
  - Battery-electric vehicles requirements
- **States**
  - Cap & trade
  - Low carbon fuel standards

Observations:

- US-based requirements
- Domestic supply chains being built
- Delays, increased prices for batteries

Example Sustainable Business Markets

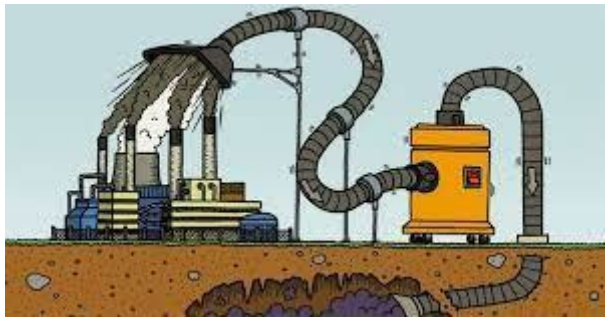
Renewable Energy

Energy Storage

Renewable Fuels

Advanced Recycling of Plastics

Low Carbon Cement, Concrete and Steel



Carbon Capture, Use and Storage

Inefficient Goods Movement

The Ports of Los Angeles and Long Beach are the largest in the nation, 40% of goods entering the U.S. Record demand coupled with inefficiencies has put a strain on the ports' goods movement network.

CURRENT PROCESS

1. International cargo arrives in 40-foot containers that are then trucked from the ports to warehouses in Los Angeles or Inland Empire
2. Containers are unloaded, classified, and re-loaded onto 53-foot domestic containers
3. Domestic containers are either transported by truck to a railyard and loaded onto trains headed for destinations across the United States; or are trucked across the country

Credit: Nick C Prior, Wikipedia

Impacts of Inefficiency

- **Increased congestion** and traffic on highways, impacting air and quality of life
- **Longer, multi-hour commutes** for residents in the high desert who travel to and from the Inland Empire and elsewhere for employment
- **Supply chain** delays/inefficiencies

Barstow International Gateway

BNSF proposes building the Barstow International Gateway that will allow for fast, efficient rail service, moving goods on trains directly from the ports of Los Angeles and Long Beach through the Alameda Corridor to integrated intermodal and transload facilities near Barstow, CA.

- $1.5 B+ state-of-the-art master-planned intermodal facility
- Facility to include railyard and transload warehouses on more than 4,500 acres
- Located approximately 130 miles from the Ports of Long Beach and Los Angeles

Solution: How It Works

1. Cargo containers arriving at the San Pedro Bay ports will be **transferred directly from Ports to trains** for transport to Barstow

2. Containers will then be handled with **zero- and near-zero-emission cargo-handling equipment**

3. Containers will be transloaded at the **on-site warehouses** with minimal truck movement

4. Containers will be **sorted by destination** and loaded on trains moving east to maximize rail and distribution efficiency

BIG Benefits

Economy

- Brings thousands of **direct** and **indirect jobs** to high desert communities
- Keeps the Ports of Los Angeles and Long Beach **competitive**

Supply Chain

- Allows for more efficient **transfer of cargo** directly between ships and rail
- Maximizes rail and distribution efficiency **regionally** and across the **U.S.** supply chain
- Improves fluidity and reliability of rail corridor

Environment

- Reduces port **congestion**
- Reduces truck and **freeway** congestion in the Los Angeles Basin and Inland Empire

Discussion