

Heavy Duty Cargo Handling Equipment:

SSA Marine's Movement towards Near and Zero-Emissions



History

SSA MARINE OVERVIEW

established in 1949



MOVING BUSINESS FORWARD

SSA Marine keeps business moving. As the world's largest privately held marine terminal and rail yard operator, we have the transportation experience, breadth and diversity to drive global shipping forward.

Since 1949, we have continuously expanded and developed our business in alignment with our customers' needs and interests. Through investments in our people, high-value locations, and technology-driven efficiencies, we have a proven track record of delivering exceptional service to our customers around the world.

3M+
MILLION

Automobiles handled annually

30+
MILLION

Marine and Rail handled TEUs

100M+
MILLION

Tons of conventional cargo annually

74+
YEARS

Experience

The Great Cargo
Handling Equipment
Transformation:
SSA Marine
Operations in
California



Landscape of Decarbonization in California

- **California Regulations:** California Air Resources Board (CARB) and South Coast Air Quality Management District (SCAQMD) continue to approve regulations for all modes of transport, now focused on forcing the industry to move towards fully electric operations.
- **Port Requirements:** port plans such as the San Pedro Bay Ports Clean Air Action Plan and Northwest Ports Clean Air Strategy establish ambitious goals for operations within their harbors. While previously focused on criteria pollutants (DPM, NOx), the focus is now on climate.
- **Environmental Justice:** activist organizations such as [ShipitZero](#) are calling out BCOs and carriers via media and grassroots protests, demanding they use zero-emissions transport.
- **BCOs (Shippers):** some of the largest BCOs have made public commitments to reduce freight emissions. However, no BCO currently makes logistics purchasing decisions based on sustainability – metrics are still focused on cost, time and reliability. Emerging collaborative initiatives such as the [Sustainable Freight Buyers Alliance](#) aim to change this and remove the barriers to medium and small BCO participation.

Landscape of Decarbonization in California

Carrix has been an industry leader in testing and deployment of low and zero emissions CHE

- **Renewable Diesel:** Implemented renewable diesel (R80/B20) at our container terminals at the Port of Long Beach in April 2021 and at Port of Oakland in July 2022; this accounts for approximately 3 million gallons of fuel per year. Renewable diesel reduces greenhouse gas emissions by 65% while not requiring equipment modifications or infrastructure improvements and, because of Low Carbon Fuel Standard (LCFS) credits in California, the cost of renewable diesel is comparable with regular diesel. In 2021, we used 1.2 million gallons of renewable diesel, and we are working to expand our use of this fuel throughout our California operations.
- This reduces 5,443 metric tons of CO₂ per year with no additional operating costs.
- **Carbon Offsets:** Purchase carbon offsets from the Bonneville Environmental Foundation for the GHG emissions generated from annual Scope 2 electricity usage at our PCT and Pier F terminals at the Port of Long Beach, per lease requirements.
- **Equipment Replacements:** 111 units of near-zero and zero-emissions equipment have been deployed in California operations (Container, Conventional, Shippers Transport Express).
- **Grant Funding:** Received \$54.5 million in grants from the ports and local and State California programs to support low and zero-emission equipment replacements.
- **Supporting Vessel Shore Power:** SSA Terminals has worked closely with our port and carrier partners to support the use of shore power by ships while at berth. We currently have 19 shore power capable berths available at 6 facilities on the U.S. West Coast.

\$62.5 M

Investment in Near-Zero or
Zero Emissions
Equipment in CA

19,324

Metric Tons of CO₂
Reduced in CA in 2021

6.2%

Reduction in CO₂e
from 2018 to 2021 in CA

What makes an Equipment Project "Shovel Ready"?

Infrastructure:

- Site assessment
- Initial design work
- Coordination with port authority
- Coordination with utility
- Permitting
- Cost match determination
- Budget and timeline

Equipment:

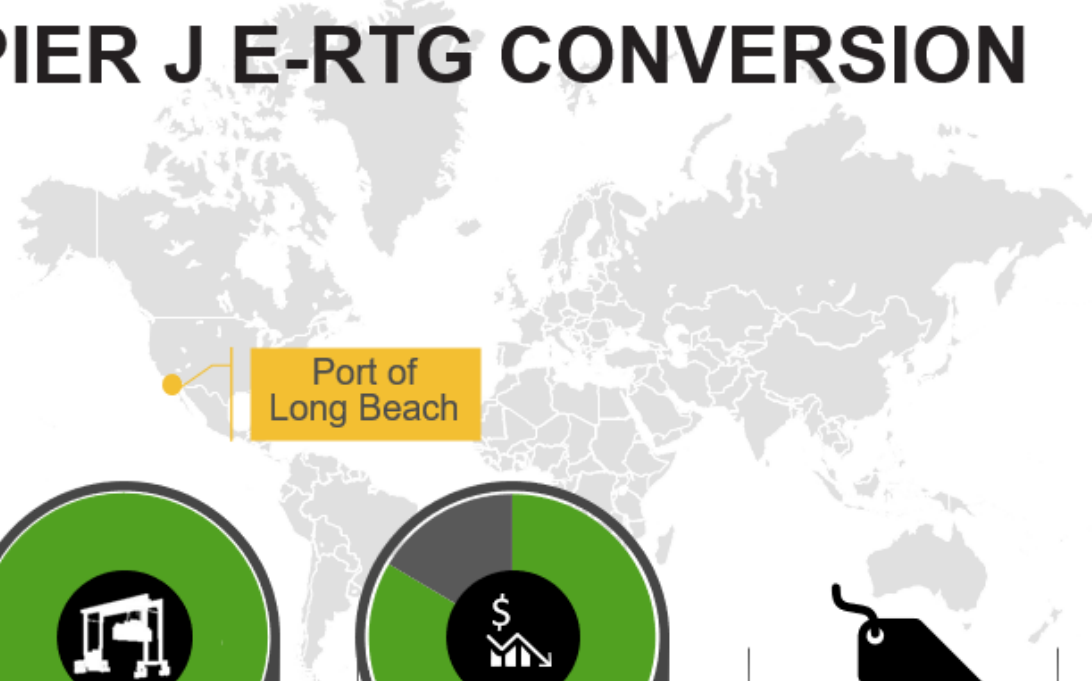
- Recent quote from equipment manufacture
- Buy America compliance or other certifications
- Plans for necessary fueling/charging infrastructure
- Plan for scrapping old equipment, if required
- Cost match determination
- Budget and timeline

Outreach Process:



California Partnering Projects

EXISTING AND ONGOING DECARBONIZATION PROJECTS: PIER J E-RTG CONVERSION



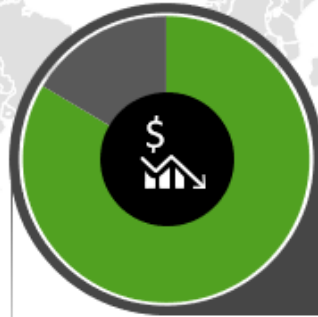
Port of
Long Beach



100%

Pier J Fleet

• 9 RTGs



83%

Publicly Funded

• \$9.84M from CEC



\$1.3M

Per e-RTG

• To convert one
RTG from diesel
to electric



Key Partners Port of Long Beach, Southern California Edison, [Cavotec](#), California Energy Commission

Scope Converted 9 ZPMC diesel-electric 1,000 hp RTGs to 100% electric grid-tied RTGs.

Project Cost \$11.82 million



Diesel Reduction: 225,000 gallons/year



Fuel Savings: \$1,240,000/year (current price October 2022)



Emission Reduction: 2,285 metric tons CO₂/year

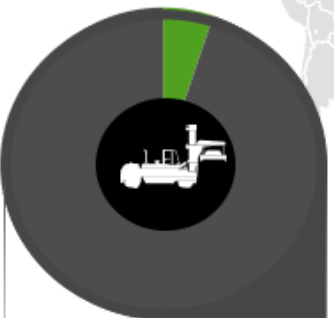


Largest Deployment of e-RTGs in North America



Infrastructure installations had major impacts on terminal operations. Conversion of older RTGs also posed many unforeseen challenges.

EXISTING AND ONGOING DECARBONIZATION PROJECTS: TAYLOR TOP HANDLER DEMONSTRATION



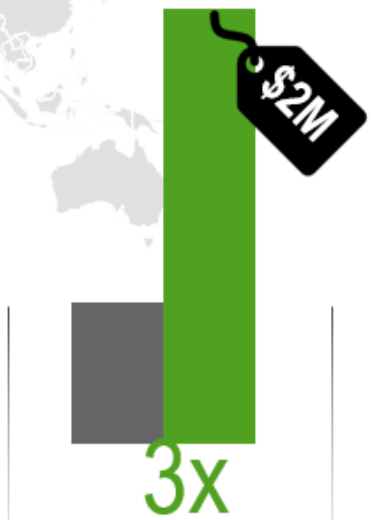
CA Top handler Fleet

- 4 e-top handlers
- 77 total top handlers in LB; 53 in Oakland



Publicly Funded

- \$3.6 million POLB
- \$3.6 million CARB



Cost of Tier 4 Diesel

- \$1.8M per new e-Top Handler
- \$650k per new Tier 4 diesel Top Handler



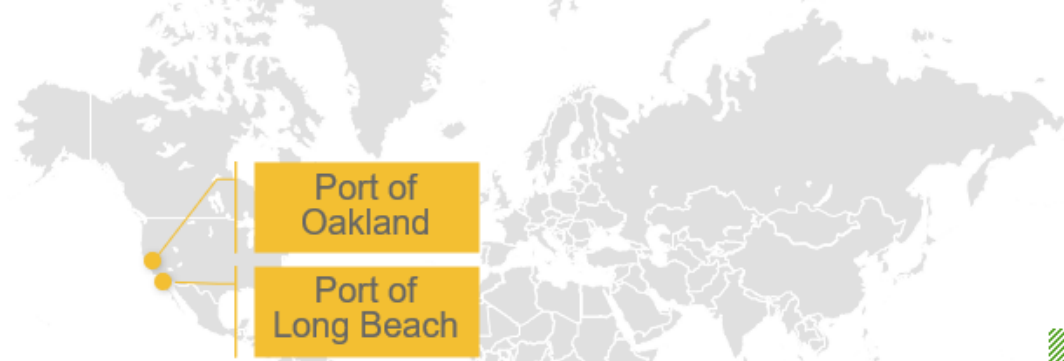
Key Partners Port of Long Beach, Taylor, BYD, CARB

Scope Deploy 4 zero-emission battery-electric top handlers, 2 at POLB (PCT) and 2 in Oakland (STE)

Project Cost \$7.2 million

- Diesel Reduction: 23,000 gallons/year
- Fuel Savings: \$56,000/year (current price October 2022)
- Emission Reduction: 234 metric tons of /CO₂/year
- Among the earliest deployments of eTop Handlers
- Not enough battery range to work 2 shifts without recharging

EXISTING AND ONGOING DECARBONIZATION PROJECTS: HYBRID RTG CONVERSIONS



Key Partners Port of Oakland, MI-JACK, Bay Area Air Quality Management District, South Coast Air Quality Management District, Port of Long Beach, CARB

Scope Converted 13 RTG engines from 1,000-hp diesel engines to 142-hp hybrid diesel-electric RTGs at OICT; 6 at Pier A at Port of Long Beach.

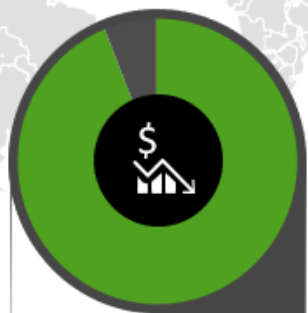
Project Cost \$8 million



100%

Fleet

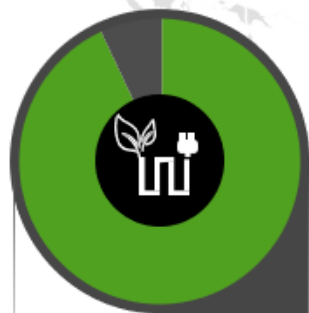
- 13 RTGs at OICT
- 6 RTGs at Pier A



95%

Publicly Funded

- \$7.6M from BAAQMD and CARB



95%

Fuel Savings

- Reduction in diesel
- Reduction in oil



1/3rd

Cost of e-RTG

- \$450k for hybrid conversion vs.
- \$1.3M for e-RTG conv

- Diesel Reduction: From 10.5 gallons/hour to 1 gallon/hour; annual reduction of 360,000 gallons
- Fuel Savings: \$2,000,000/year (current price October 2022)
- Emission Reductions: 3,654 metric tons CO₂/year
- Largest Deployment of Hybrid-RTGs in North America
- Converting to battery drive power in older machines proved challenging due to inverter sine wave vs. normal generator power

EXISTING AND ONGOING DECARBONIZATION PROJECTS: DINA E-UTRS



65%

Fleet at Our CA Matson Terminals

- At C60 in Long Beach (33 of 36) and B63 in Oakland (5 of 23)



77%

Publicly Funded

- \$15.39M from California Air Resources Board



5x

Cost of Tier 4

- \$450k per new e-UTR + \$125k each for charging infrastructure
- \$115k per Tier 4 diesel



Key Partners Port of Long Beach, Port of Oakland, DINA, TransPower, California Air Resources Board

Scope Deploy 38 zero-emission electric yard tractors at Matson terminals (C60 and B63)

Project Cost \$20 million



Diesel Reduction: 130,000 gallons/year



Fuel Savings: \$715,000/year (current price October 2022)



Emissions Reduction: 1,532 metric tons CO₂/year

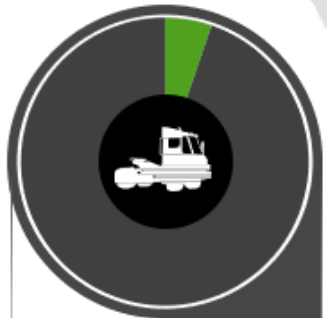
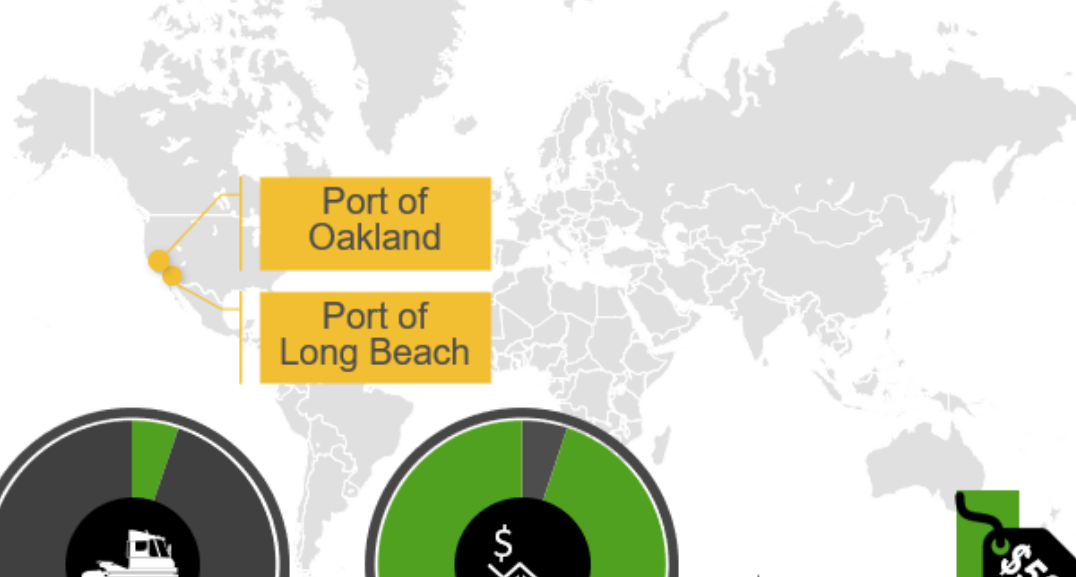


Largest Global Deployment of ZE Yard Tractors

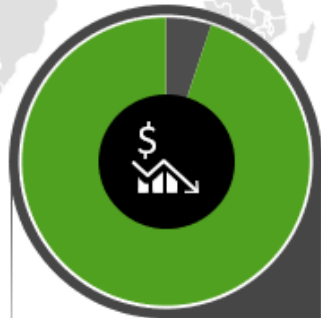


Project delayed by the electrical integrator and SCE; completion expected December 2022

EXISTING AND ONGOING DECARBONIZATION PROJECTS: STE CLASS 8 E-TRUCKS

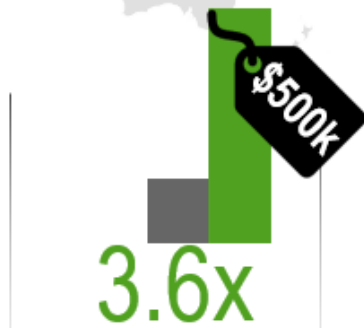


Fleet Conversion



Publicly Funded

- \$7.455 million from ZANZEFF grant program



Cost of Tier 4

- \$500k-\$550k per new e-Truck
- \$125k per new Tier 4 Truck



Key Partners Port of Long Beach, Port of Oakland, Peterbilt, California Air Resources Board

Scope Deploy 15 Peterbilt Class 8 battery plug-in drayage trucks (5 in Carson, 10 in Oakland)

Project Cost \$8,195,000 (not including charging infrastructure)



Diesel Reduction: 118,560 gallons/year



Fuel Savings: \$655,000/year (current price October 2022)



Emissions Reduction: 1,204 metric tons CO₂/year

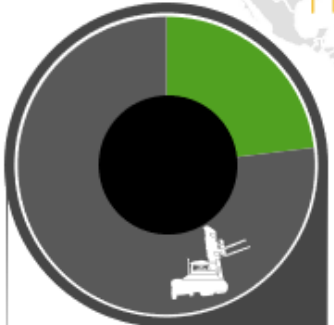


Battery capacity expected to allow a range of over 120 miles per charge which will cover a full shift

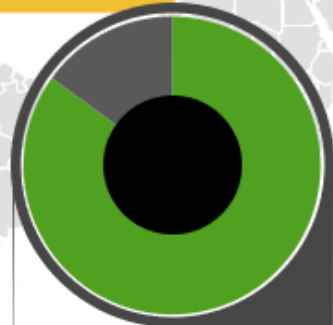


Experiencing several operational and infrastructure challenges

EXISTING AND ONGOING DECARBONIZATION PROJECTS: WIGGINS E-BULL FORKLIFTS



Stockton and West Sacramento Fleet



Publicly Funded

- \$6.93M from CARB; chargers and infrastructure installed by City of West Sacramento and Port of Stockton



Cost of Tier 5

- \$400k per new e-Forklift
- \$275k-\$300k per new Tier 5 diesel



Key Partners Port of Long Beach, Port of Oakland, Port of Stockton, Port of West Sacramento, XL Lifts, Wiggins, California Resources Board (CORE vouchers, START project)

Scope Deploy 26 zero-emission all-electric heavy-duty 36,000 forklifts (12 Port of Stockton, 14 Port of West Sacramento) with units expected to be in service by the end of 2022.

Project Cost \$7.2 million



Diesel Reduction: 50,000 gallons/year



Fuel Savings: \$275,000/year (current price October 2021)



Emissions Reduction: 507 metric tons CO₂/year



First Deployment of 36,000-lb ZE Forklifts Glob

What Did We Learn?



Lessons learned during decarbonization of marine terminals- Equipment

- Maturity and availability of technologies
- Cost (equipment is 3x+ more expensive, cost of ownership is 2x+ more expensive)
- Charging time/processes result in the need of $\geq 2:1$ replacement
- Duty cycles of engines
- Availability of equipment



Lessons learned during decarbonization of marine terminals- Infrastructure

- **Reduced throughput potential due to space required for $\geq 2:1$ equipment replacement and charging infrastructure**
- **On-terminal charging infrastructure**
- **Off-terminal infrastructure needs**
- **Capacity of municipal grids to provide the necessary electrical loads**
- **Existing grid capacity may not support electrification goals**



Lessons learned during decarbonization of marine terminals-Partnerships and Training

- Projects are not easily replicated from one facility to another
- Strategic Planning
- Labor considerations
- Workforce development



Lessons learned during decarbonization of marine terminals- Grant funding and obstacles faced

- Eligibility requirements
- Short timelines (for application and for spending)
- Zero-emission equipment not yet 1:1 replacement
- Long lead times for equipment purchases
- Buy America requirements
- Infrastructure improvements, permitting for electrification and refueling stations
- Lead times for electrification or hydrogen fueling – unclear roles for port, terminal operator and utility



The Great Cargo
Handling Equipment
Transformation:
SSA Marine
Operations in
California

Videos Please

<https://www.youtube.com/watch?v=Uoe1m5HIX44&feature=youtu.be>

<https://www.youtube.com/watch?v=yA0RFHWDrbl>

Thank You

Joe Carrillo

Joe.Carrillo@SSAMarine.com

