



FOUR QUESTIONS WHEN CONSIDERING AN ELECTRIC FUTURE FOR YOUR PORT EQUIPMENT

With a growing global focus on sustainability, the port and terminal industry faces significant pressure to pursue decarbonization. The electrification of container handling equipment at ports is in its infancy, but the landscape is evolving relatively quickly. Governments and companies are setting timelines for reducing emissions, and C-suite terminal executives with technology and sustainability responsibilities are considering the kinds of solutions that will be necessary to achieve those goals while satisfying the performance requirements of their operations. As you prepare for the future of clean power at your port, here are a few common questions to explore.

1 // WHERE IS THE INDUSTRY IN THE SHIFT TO ZERO-EMISSION EQUIPMENT AT PORTS?

The port industry is in the early adopter phases, with product development and pilots underway. Two major forces are the primary drivers for port operations increasingly evaluating and moving toward adoption of electric-powered equipment:

- Government action in the form of regulations and incentives
- Corporate sustainability initiatives



FOUR QUESTIONS WHEN CONSIDERING AN ELECTRIC FUTURE FOR YOUR PORT EQUIPMENT

Within the United States, the California Air Resources Board (CARB) is responsible for the most near-term zero-emissions timeline, with [regulation](#) that, if adopted, would require California ports to begin transitioning to zero-emission cargo handling equipment starting with new equipment in 2026 and targeting 90% penetration of zero-emission equipment by 2036. New grant opportunities are emerging, including the Environmental Protection Agency's [Clean Ports Program](#), which is awarding \$3 billion to fund zero-emission port equipment and infrastructure as well as climate and air quality planning at U.S. ports. Sustainability commitments made by the large, often international shipping and logistics companies that operate terminals are also motivating greater interest in port electrification across the country.

It takes time for manufacturers to demonstrate viable electric trucks for these applications can be produced in volume at an attractive price point, but there are promising pilots in planning and in progress, from [battery electric terminal tractors](#) destined for the Port of Mobile in Alabama to a [hydrogen fuel cell \(HFC\) ReachStacker](#) at the Port of Valencia in Spain. While there is currently a significant cost differential between container handling equipment fueled with diesel and alternatives powered by electric motors, as more electric-powered equipment enters the market, economies of scale will help drive parity. A recent discovery of what may be the [largest concentration of lithium in the world](#) could also significantly change the global supply and cost dynamics of this key chemical element used in lithium-ion batteries.

A typical container handler has a lifespan of about 10 years in a port setting, so if CARB's 2036 target becomes a mandate, operations in that state will still have an equipment lifecycle or two before needing to shift. Although deadlines aren't imminent, the current moment is an important time for ports to do research and understand the options, because a smooth shift to electric equipment involves significant preparation. Determining and implementing the right solution for each operation requires careful evaluation of power choices, charging or refueling equipment, along with utility grid changes or the production and transportation of hydrogen fuel.

Looking beyond ports specifically to broader regulatory trends in the U.S. for over-the-road vehicles – 11 states and the District of Columbia have passed or are considering some form of California's mandate for manufacturers to sell zero-emission vehicles, according to the [State of Sustainable Fleets 2024 Market Brief](#).



FOUR QUESTIONS WHEN CONSIDERING AN ELECTRIC FUTURE FOR YOUR PORT EQUIPMENT

2 // HOW CAN I START TO GET A BETTER UNDERSTANDING OF HOW CLEAN POWER CHOICES MIGHT WORK AT MY PORT?

Take this opportunity to gather information about the development and prospects of various power technologies and to test and iterate at a small scale before pursuing the adoption of entire electric fleets. For instance, terminals can pilot a single electric container handler or trial electric alternatives for some of their lower-capacity equipment before transitioning additional units. While most container terminals typically rely on only five heavy-duty forklifts for every 40 or so container handlers, this equipment can be a good starting point. That is because in some cases, electrification of this forklift equipment is more mature relative to container handling equipment with much higher capacities. In fact, more than one hundred large forklifts are already authorized for rebates in the [CARB Clean Off-Road Equipment \(CORE\) catalog](#), including forklifts with load capacities of 15,500 to 19,000 pounds and even ones in the 23,000 to 36,000-pound range.

Supplying electric power, whether from the grid or hydrogen, is a responsibility that port authorities must anticipate, not only for the demands of a single truck but multiple units or even a full fleet. Neither electricity nor hydrogen are primary fuels, so understanding the complete carbon impact requires looking at the feedstocks from which they are produced. In 2022, 21.5% of electricity was generated from renewable sources like wind, hydro, solar, biomass and geothermal – up from only about 12% of utility-scale electricity generation in 1990. The share of hydrogen that is green is lower, but clean-hydrogen production has the highest amount of announced investments, including \$8 billion allocated by the Bipartisan Infrastructure Law to create regional hydrogen hubs.





FOUR QUESTIONS WHEN CONSIDERING AN ELECTRIC FUTURE FOR YOUR PORT EQUIPMENT

3 // WILL ELECTRIC STAND UP TO THE RUN TIMES OF OUR WORKDAYS?

Zero-emission options are being designed to provide enough capacity to keep operations moving and avoid the need to stop in the middle of a shift to recharge, or in the case of hydrogen fuel cells, refuel. But the required time and frequency of recharging or refueling are very important considerations and highly variable based on the application requirements. An operation's duty cycle, the charging strategy, battery size, charger size and charge rate of the truck all influence how quickly a battery electric solution can be recharged and how long it can operate between charges. Powering equipment with HFCs can mitigate many of the questions or concerns about the ability of electric alternatives to stand up to demanding run times, as operators refuel a tank of hydrogen similar to the process for refueling

with diesel. For large equipment like container handlers, it can take as little as 15 minutes to fill the empty tanks with hydrogen – providing enough energy for up to 10 hours of continuous run time. And while green hydrogen is not yet universally available, there is a growing number of locations where the access to this energy source makes it a very viable solution.

While recharging batteries and refueling with hydrogen pose a new set of challenges compared to internal combustion engines (ICE), electric drivetrains have fewer moving parts and less complexity, which can reduce the downtime required for maintenance. With electric equipment, batteries and certain wearable components, like switches, require replacement over time. But many time-consuming maintenance tasks are eliminated, such as taking the head off a diesel engine and rebuilding it every 15,000 hours or so.





FOUR QUESTIONS WHEN CONSIDERING AN ELECTRIC FUTURE FOR YOUR PORT EQUIPMENT



4 // DO I HAVE THE NECESSARY EXPERTISE AND SUPPORT FROM A LOCAL DEALER TO NAVIGATE THE SHIFT?

As with other material handling equipment decisions, a strong relationship with a supportive dealer is very important. Working with the manufacturer, a dealer should have the experience and expertise to help you assess various power technologies and provide a solution that helps meet your goals for emissions reduction and performance. Because dealers not only sell critical equipment but provide training, parts and service, it is important to verify that the dealer you choose to work with is well-capitalized and trained. While the operator controls for electric equipment are intentionally similar to those of diesel equipment, operators need to be trained on best practices for recharging or refueling electric forklifts or container handlers.

Not all electric equipment is high-voltage, but electric equipment that is high-voltage also requires special technician training and certification to adhere to safety standards and prevent electrical danger or injury when performing maintenance. Many terminals have high-voltage electric ship-to-shore cranes already, but technicians who are certified to service that equipment may not have the product training that is required for high-voltage forklifts or container handlers. When equipment needs service, the resources and staffing of your dealer can be the difference between a rapid response or waiting three weeks for a necessary part or technician availability. As your terminal looks toward adopting electric equipment in the future, prioritize the maintenance support of skilled technicians or training support for your in-house technicians.

For more information on electrifying your fleet, talk to your local Hyster® dealer or [contact an electrification expert](#).