



## BRINGING BIG TRUCKS INTO THE ELECTRIC AGE

**F**or businesses, pressure is mounting to move toward a more sustainable future. Green-focused targets have been embraced by governments worldwide, such as the U.S. aiming to cut greenhouse gas (GHG) emissions in half from 2005 levels by 2030, and the European Union raising their binding renewable energy target to a minimum of 42.5% by the same deadline. But emerging government targets and regulations are not the only forces at play. Corporate initiatives, employee health and safety concerns, supplier mandates, and the behavior of conscientious consumers and investors are all compelling operations to consider their impact on communities and the planet.

As the world collectively pursues reduced carbon emissions, supply chains have a critical role to play. According to research, an organization's supply chain often accounts for more than 90% of its GHG emissions. Electrification, the process of substituting electric power

in place of fossil fuel sources, is a particularly meaningful opportunity businesses can act on – in fact, supply chain professionals identify it as their top entry point for transitioning to a more sustainable supply chain.

Not only can electrification move the needle, the number of suitable electric options for materials handling equipment used in intense industries such as lumber, agriculture, steel and ports continues to grow. Viable electric alternatives are available for high-capacity equipment like heavy-duty forklifts and even container handling solutions. Before deciding whether to electrify, it's important to evaluate available clean power options and the priorities for your operation. This white paper surveys the landscape of powered industrial truck (PIT) electrification and explores what other factors may come into play when considering electric.



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### // GOING ELECTRIC WITHOUT COMPROMISING OPERATIONAL REQUIREMENTS

Leaving behind internal combustion engine (ICE) power in favor of electrification does not mean sacrificing productivity:

- **Performance** – Electric power can deliver the performance operations expect from a diesel, with charging capability to work effectively in applications that require long equipment runtimes.
- **Reliability** – Electric drivetrains have fewer components and less complexity than ICE options, which can offer similar or better reliability with reduced maintenance.
- **Infrastructure** – Governments and businesses are embracing electrification as a means to reduce emissions and investing in the infrastructure necessary to support it.
- **Cost** – Electric options can help reduce costs related to fuel consumption and engine maintenance. Incentives, grants and offset credit programs can make the business case even more attractive.

Of course, electric equipment may not make sense for every operation. Not only must businesses find an electric solution with the necessary performance to get the job done, factors like local utility grid capacity and run time requirements come into play, because time spent charging or refueling equipment must not compromise operational schedules. For example, more developed areas with weak electric grids can experience brownouts that can slow down operations and compromise carefully timed charging schedules.



### // ELECTRIC POWER SOURCES

Lithium-ion batteries are a strong contender for high-capacity applications because they are capable of delivering the ICE-like performance that high-intensity operations count on – a major step forward from lead-acid battery technology. This capability is possible because lithium-ion batteries can tolerate a high energy draw without overheating or dropping in efficiency. Lithium-ion technology also provides far greater energy density, power transfer and service life than lead-acid batteries.

Lithium-ion batteries are powering lift trucks of increasingly high capacity. For example, Hyster introduced the industry's first sit-down counterbalanced forklift with factory-integrated 350-volt lithium-ion power in the 15,500- to 19,000-pound (7,000 - 9,000 kilograms) capacity range several years ago and expanded integrated lithium-ion power to even heavier-duty applications with 23,000- to 40,000-pound (10,000 - 18,000 kilograms) capacity models the following year. Now, electric power sources are taking on even higher-capacity equipment, especially in port settings. There are electric container handlers, ReachStackers and terminal tractors in pilots



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or under development. Such equipment is powered by either a lithium-ion battery or hydrogen fuel cells (HFC):

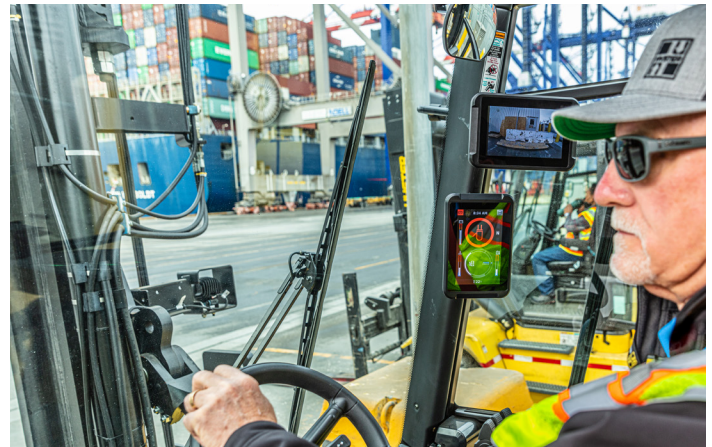
Li-ion

**Large lithium-ion battery** – This approach offers choice between conventional and opportunity charging and is designed for a medium-duty cycle

H<sub>2</sub>

**Hydrogen fuel cells** – This approach offers the ability to refuel the truck (fill the onboard hydrogen tanks) with hydrogen (similar to diesel) in 10-15 minutes, and stands up to a heavy-duty cycle – enabling operators to work a full shift without stopping to charge or refuel

Equipment powered by HFCs, such as those from Nuvera Fuel Cells, combines the simplicity and sustained performance of ICE with the zero harmful emissions and reduced maintenance of electric drivetrains. An added benefit is the speed with which they can be refueled, with no downtime for battery changing and charging, and no need for operators to remember to plug in during breaks to opportunity charge.



### // WHAT DOES ELECTRIC MEAN FOR OPERATORS?

Of course, emissions reduction and strong, sustained performance are not the only benefits for intense applications exploring electrification.

Many operations are struggling to recruit, train and retain sufficient labor. In fact, according to the [MHI Annual Industry Report](#), respondents continue to identify hiring and retaining talent as their greatest challenge, with a majority rating it as extremely or very challenging. And with demanding duty cycles and inhospitable environments pushing both equipment and operators to their limits, businesses need to find equipment tough enough to depend on, with the attributes to help operators perform at their best. Electric equipment can be part of the answer to maximizing the efficiency and productivity of operators *and* their time.

Reduced charging or refueling time, fewer maintenance requirements and easier serviceability can all add up to operators spending more time working and less time waiting. The reduced maintenance workload associated with electric trucks can also be an important aid for businesses struggling to source technicians from a tight skilled labor pool.



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Electric trucks can also support a work environment that can offer greater operator comfort and performance. With no internal combustion engine running, truck noise levels and vibration are reduced, and there are no tailpipe emissions.

Ergonomic fundamentals like visibility and operating position remain primary factors for electric lift trucks. Whether electric or ICE-powered, features like these indicate equipment designed to help support operator comfort and efficiency:

- **Visibility** – Scratch-resistant glass all around cabin, including an armored glass top window, curved front and rear windows and steel doors with tempered glass for visibility without straining and stretching
- **Easy entry and exit** – Spacious, cockpit-style cabins with ample space for operators to enter and exit easily and more comfortably
- **Comfortable, adjustable seats** – A variety of seat configurations, such as mechanical or air suspension, cloth or vinyl covers, lumbar support and ventilated or heated seats support a range of preferences for comfort; lateral seat sliders allow for easy positioning and even make room to accommodate an extra seat for trainers to supervise performance
- **Access to information** – Full-color displays present truck performance data in one clear screen and can be customized based on the operator's skill level

### // CHARTING AN ELECTRIC FUTURE

Electrification is a realistic option to not only satisfy the business requirements for heavy-duty applications, but help address other operational needs without losing sight of future impact. Many operations are already making the shift to electric. According to the Industrial Truck Association (ITA) factory booking data, the industry has seen a 12.5% increase in electric truck bookings over the past eight years. In 2024, adoption was at an all-time high, with electric truck bookings accounting for more than a third of all sit-down counterbalanced forklift purchases.

To learn more about electric powered material handling equipment for your heavy-duty application, visit [Hyster.com](https://www.hyster.com).