

eTRUC

Tier 1 and OEM Company Perspectives on High Power Charging

Background

- The medium and heavy duty transportation industry is boosting the market for zero-emission vehicles (ZEVs).
- The Electric Truck Research and Utilization Center (eTRUC) is a stakeholder-driven consortium of industry, government, academia, and community partners. This consortium seeks to accelerate the commercial adoption of the high-power, combined charging system (CCS) and megawatt-level technologies in medium- and heavy-duty (MHD) drayage trucks.
- To support this effort, eTRUC assessed the maturity of vehicle and component technology for megawatt and high-power charging systems.

What's High-Power Charging?

- High-power charging is capable of adding at least 100 miles of vehicle range every 10 minutes, and is expected to require charging levels of 1 megawatt (MW) unless MHD EV energy efficiency improves.

Approach

- Nine original equipment manufacturers (OEMs) that account for 96% of the North American HD truck sales, and six Tier 1 component suppliers, were interviewed and provided questionnaires.
- OEMs were asked to discuss topics ranging from current model offerings and architecture to future plans for enabling higher-power charging. Tier 1 suppliers provided an industry view on the development roadmap for trucks to be ready for megawatt charging.

OEM INTERVIEWS: Here's what truck manufacturers have to say.

- **Current Landscape:** 13 electric truck models (Class 7 & 8) are on offer in the U.S. market. Only one model is equipped to accept a charge above 1 MW.
- **Costs:** The cost of electric trucks typically falls between \$250,000 and \$550,000, averaging at \$375,000. This is approximately 2 to 3 times the price of comparable diesel tractors prior to applying incentives.

OEMs expect MCS integration in future vehicles is projected to add between \$3,000 and \$5,000 per unit.

- **Production:** For 2023, production forecasts indicate under 3,000 electric trucks nationwide. Notably, manufacturers have the capability to escalate production in response to market demand.
- **Technology Shift:** 67 percent of OEMs interviewed (representing over 96 percent of the current North American heavy-duty truck market) plan to integrate MCS into their trucks by 2030. CCS charging is expected to remain relevant for short-haul fleets beyond 2030.

TIER 1 SUPPLIER Perspectives

1. **Current Landscape:** All tier 1 suppliers are exploring or creating MW-level charging systems. One company has developed prototype MCS connectors.
2. **Market Overview:** The electric truck industry is in its infancy, but expected to boom with component sales projected between 20% - 45% of company revenue by 2030.
3. **Tech Advances:** MW-level charging components are expected to be introduced between 2027 and 2030. By this time, vehicle architectures might move above 1000 volts. This will necessitate developments in battery chemistries and thermal management.
4. **Cost Concerns:** High-power charging will bring about expanded infrastructure costs to accommodate additional power flows to fleets. Additionally, Tier 1 suppliers estimate MCS might increase costs from \$1,000 to \$10,000 compared to CCS.

KEY TAKEAWAYS:

- **Market Momentum:** There is strong anticipated growth in the industry, with major OEMs to launch new electric platforms within the next two years.
- **Growth Challenges:** Uncertainty over fleet needs has the potential to delay the development of vehicle and component technologies.
- **Unified Industry Direction:** There is broad consensus among OEMs towards adopting MCS for future high-power charging infrastructures. Two-thirds of interviewed OEMs plan to integrate MCS by 2030.
- **Cost Breakdown:** OEM and Tier 1 suppliers provided a different range of cost estimates for MCS (\$3000 to \$5000 versus \$1000 to \$10,000 in additional costs per unit).
- **Infrastructure Considerations:** Significant investment in electric infrastructure will be required to cater to accommodate the future charging needs of MCS capable Medium and Heavy-Duty Commercial Vehicles.

Data sourced from industry interviews conducted by eTRUC in collaboration with EPRI, Oberon Insights, CALSTART, Paul International, and the eTRUC Industry Technical Advisory Committee (ITAC).