Conference Summary

SAE Commercial Vehicle Engineering Congress (COMVEC) 2025

Sept 16 – 18, 2025, Schaumburg, Illinois, USA

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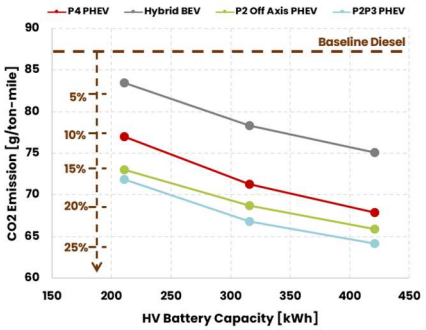
KEYNOTE TALK: "SHAPING THE FUTURE TOGETHER" – JOHN RICH, CTO PACCAR

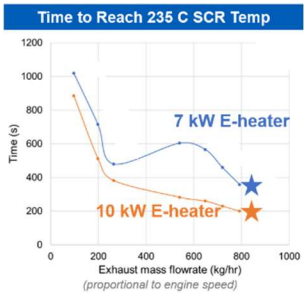
- These are unprecedented times - for the first time, the industry is seeing deregulations, leading to a relaxation of GHG standards. This has implications for powertrain strategies, these will be driven by consumer needs rather than policy push. Powertrain options include diesels, renewable fuels, electrics and plug-in hybrids.
- Hydrogen was missing from the chart, and is seen as a long shot given the current headwinds of fuel cost and lack of refueling infrastructure. Electricity is needed to make green H2, and it is increasingly being used to power data centers.
- Diesels are going strong. The EPA MY 2027 Low NOx standards might be re-evaluated and the industry believes they may be rescinded. But if they stay intact, then we could see a pre-buy in 2026 leading to a temporary boost to truck sales next year. Otherwise, the industry continues to be in a sales slump.
- Overall outlook for EVs is bleak. Europe is especially in a tough position with electric vehicles – it is the only place where per capita electricity has gone down.
- New technologies are being explored carefully. Software defined vehicles are "overhyped and underappreciated in terms of complexity" and can be a huge liability if not executed well. Self-driving technologies are getting real and entering validation phase. Connectivity is still in early stages and much more could be done with data. Predictive maintenance and diagnostics are getting better.
- OEMs are increasingly relying on unconventional partnerships (e.g. PACCAR working with Cummins and Daimler on batteries) – it is pragmatic to build the ecosystems required for new powertrains through partnerships as opposed to trying to do it all in-house.

PANEL: ADVANCES IN HYBRID POWERTRAIN TECHNOLOGY

1. Model-Based PHEV Optimization – Satyum Joshi, FEV North America: Hybrid and plug-in P2 – P4 architectures evaluated for Class 7 – 8 vehicle applications.
   - Battery pack sizing is a primary cost driver. Optimal battery size balances CO_2 reduction with cost, payload, and weight constraints.
   - Trade-offs for overall CO2 benefit were analyzed with respect to EV mode performance (time for 0 – 60 mph), cost and tractor weight.
   - Advanced model-based simulations allow trade-off evaluation across architectures, with optimization of controls (ECMS, machine learning) and thermal management strategies.

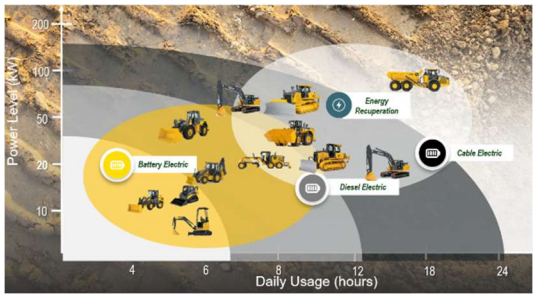


2. Eliminating Cold Start Emissions Using a Diesel Hybrid – James McCarthy Jr., Eaton: Hybridization with an electric drivetrain plus an auxiliary e-heater enables rapid heating of the SCR system (>235°C), significantly cutting cold-start NOx.
   - A 10 kW e-heater integrated with a diesel hybrid transmission reduced SCR warm-up from ~600 seconds (7 kW heater) to ~200 seconds.
   - Simulation and upcoming test data show potential to achieve near-natural gas levels of NOx while retaining diesel fuel infrastructure and performance.
   - Demonstrations are ongoing to validate benefits across city and CARB cycles.

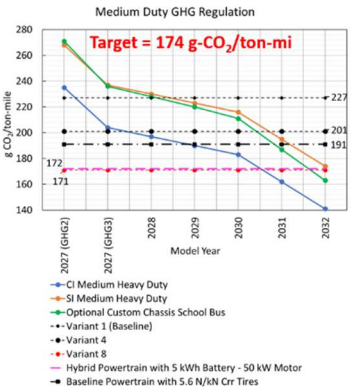


3. Hybrid Architecture Trade-offs – Chris Baillie, Allison Transmission: A market survey shows that Class 8 trucks need to achieve TCO parity with diesel within 2 years to secure market share.
   - This drives the need for component commonality between ICE, hybrids, and BEVs to reduce unit costs.
   - Modular design and reuse of components (e-motors, power electronics, batteries) across platforms can help achieve economies of scale and manage trade-offs between performance and cost.
   - Optimal hybrid architecture depends on duty cycle, weight, and annual mileage. Limited benefit for long-haul.
   - P2 hybrids benefit from leveraging conventional transmission volumes, offering wide applicability and lower cost, while power-split systems enable maximum fuel savings but at higher complexity and cost.

4. John Deere's Ongoing Electrification Journey: Delivering Customer Value – Kent Wanner, John Deere: For agriculture and construction, electrification must deliver customer value beyond CO_2 reduction: productivity, reliability, reduced maintenance, and noise reduction are key drivers.
   - Off-highway applications face harsher environments than on-road—extreme temperatures, dust, water, and vibration. Slow vehicle speeds result in very little cooling airflow. Energy storage systems must be rugged, reliable, and serviceable in remote conditions.
   - John Deere has deployed multiple hybrid and electric solutions. More than 3 million operating hours of diesel-electric wheel loaders (644 & 944 E-Drive) have been logged, demonstrating durability and field performance.
   - Electric Variable Transmissions (EVTs) with power off-boarding allow tractors to transfer power efficiently to implements, enabling features such as 8-wheel drive for greater traction and productivity.
   - Case studies include hybrid turf mowers (reducing noise and hydraulic leak risks), high-power agricultural tractors, and specialized applications like potato harvesting with electrified implements.
   - The company is pursuing a broad solution set: improving ICE efficiency, deploying hybrid and battery-electric vehicles, and integrating renewable fuels—reflecting the diversity of customer needs and operating contexts.



Cost Effective Pathways to Medium Duty Greenhouse Gas Phase 3 Compliance – Shubham Patil, SWRI*: The objective was development of Class 7 medium-duty vehicle meeting 2032 GHG target of 174 g-CO_2/ton-mi. Simulations were used to explore the reduction in CO_2 emissions with hybridization.
   - The combination of a low carbon fuel such as propane, with low resistance tires, was shown to lower GHG emissions to meet the 2031 target.
   - To further reduce CO_2 emissions, a P2 hybrid configuration was modeled, with a 5-kWh battery pack, and engine start stop functionality to eliminate idling emissions. This lowered the emissions to 172 g-CO_2/ton-mi.



**This was a separate talk and not part of the panel, but we include it here to show another study which discusses the use of hybridization along with a low carbon fuel – propane – and low resistance tires, to meet GHG Phase 3 standards.*

This is a partial version of the summary. Join as a premium member to access the expanded version, covering panels on hydrogen and high horsepower off-road engines and role of AI & simulations in powertrain development.

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