High-Efficiency Control System Development for Connected and Automated Class 8 Trucks

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ABSTRACT: Purdue University, Cummins, and Peloton Technology are working together to develop an integrated, connectivity-enabled, vehicle-dynamic and powertrain (VD&PT) Control System for diesel-powered on-highway Class 8 trucks (CS-8) to achieve greater than 20% fuel and CO2 reductions relative to 2017 baseline Class 8 trucks. The team bases its work on a system-of-systems approach that integrates hardware and software components of the powertrain (engine, transmission, aftertreatment), vehicle-dynamic control systems (longitudinal), and Vehicle-to-Everything (V2X) communication, backed by cloud computing. System capabilities will include local and remote sensing and communications, data logging, real-time controls, and remote calibrations. The effort will support the co-optimization of these systems on single vehicles, and among multiple vehicles, in a variety of practical operating conditions, and will be demonstrated with simulations, hardware-in-the-loop testing, and road testing. All three stages will require the co-development and demonstration of control algorithms for vehicle-, engine-, and transmission-level functions.

BIO: Greg Shaver is a Full Professor, University Faculty Scholar, and College of Engineering Early Career Research Award recipient. His research focus is model-based design and control of clean, high efficiency engines and electrified powertrains. Greg’s students have published more than 100 peer-reviewed journal and conference papers. Thirty students (9 PhD, 21 MSME) have graduated from his group, 10 of which are women. He has demonstrated leadership in facilitating collaborative research, with examples including leading i.) Purdue’s DOE-funded Hybrid Vehicle Center of Excellence to fund more than 20 faculty-advised fellowship students from 5 different Schools of Engineering, ii.) development of a Hybrid Vehicle Systems Certificate (Purdue’s 1st multi-disciplinary certificate program), and iii.) an ARPA-E funded Purdue/Cummins/Peloton/Peterbilt project focused on decreasing class 8 truck fuel consumption by 20% using connectivity/automation-enabled vehicle/powertrain control systems. Greg is also a Purdue alum, receiving a BSME with highest distinction in 2000.