NEXTCAR—**NEXT**-Generation Energy Technologies for **C**onnected and **A**utomated On-**R**oad Vehicles

PROJECT DESCRIPTIONS

University of California, Berkeley – Berkeley, CA

Predictive Vehicle Control – From ECU to the Cloud – $3,474,864

The University of California, Berkeley (UC Berkeley) team has developed an innovative vehicle dynamics and powertrain (VD&PT) control architecture based on a predictive and data-driven approach. In the NEXTCAR program, UC Berkeley optimized the performance of a plug-in hybrid electric vehicle (PHEV) in real-world conditions, improving efficiency up to 30% in urban driving and 14% on the highway. In the next NEXTCAR phase, UC Berkeley will adapt and expand its eco-route, eco-drive, and eco-charge controls to leverage connectivity and SAE (Society of Automotive Engineers) Level 4 (L4) automation to generate additional fuel efficiency benefits in electrified vehicles including EVs and PHEVs. UC Berkeley's NEXTCAR project resulted in a spin-off company, WideSense Inc., which will commercialize the technologies developed in both phases of the project.

Michigan Technological University – Houghton, MI

Connected and Automated Control for Vehicle Dynamics and Powertrain Operation on Light-Duty Electrified Vehicles - $4,498,650

In the NEXTCAR program, Michigan Technological University and its partners developed vehicle dynamics and powertrain model-based predictive controllers and optimizers using a variety of real-time information about vehicle, traffic, and roadway conditions, and route characteristics to improve PHEV energy efficiency. The team achieved a 21% reduction in energy use over a representative drive cycle demonstrated on road and in simulation. In the next phase of NEXTCAR, the team will expand its set of test vehicles to include a Chevrolet Bolt electric vehicle, Chrysler Pacifica PHEV, and a 48V mild hybrid Ram pickup truck. The team will leverage connectivity and L4 automation to identify additional opportunities for fuel savings and EV range optimization in partnership with the American Center of Mobility, Stellantis, and General Motors.

Ohio State University – Columbus, OH

Fuel Economy Optimization with Dynamic Skip Fire in a Connected and Automated Vehicle - $4,933,933

In the NEXTCAR program, the Ohio State University (OSU) team of BorgWarner, Transportation Research Center (TRC), and Tula Technology demonstrated a multi-horizon vehicle dynamics and powertrain control optimization algorithm that improves fuel economy on a light-duty vehicle by more than 20%. The solution integrates look-ahead control, mild hybridization, and advanced cylinder deactivation to increase efficiency in urban and highway travel. In NEXTCAR's next phase, OSU, BorgWarner, and TRC will integrate advanced system-level optimization and control technologies for a PHEV with L4 automation; the goal is to improve energy efficiency by more than 30%. BorgWarner has formed a key partnership with a commercial mapping provider in pursuit of a path for deploying its technology in production vehicles.

Southwest Research Institute – San Antonio, TX

Model Predictive Control for Energy Efficient Maneuvering of Connected Autonomous Vehicles –

$5,250,000

The Southwest Research Institute (SwRI) team developed VD&PT controls during the NEXTCAR program for a hybrid light-duty vehicle (HEV). Using a combination of eco-routing, eco-driving, and hybrid power split control strategies, the team demonstrated up to a 22% improvement in energy efficiency in real-world driving conditions. In the next NEXTCAR program phase, SwRI will adapt and expand its control strategies using vehicles with L4 automation. The team is offering its software as a fully integrated solution or driver advisory system to OEMs, Tier 1 suppliers, after-market companies, and fleets.