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### Development of a Hybrid-Electric Powertrain Platform for Off-Road Heavy Equipment

Vehicle electrification is a proactive, positive strategy to improve fuel economy, reduce fossil fuel consumption and GHG emissions, create new marketplaces, and create new opportunities for consumer engagement. While electrification of light-duty and on-road, heavy-duty vehicles has been significantly developed during the last decade, electrification of off-road, heavy-duty vehicles for agricultural, construction, forestry, mining, and military applications is in the early stage of development. The goal of this project is to develop a hybrid electric powertrain platform for off-road, heavy-duty vehicles. The approach is to: 1) design a hybrid electric powertrain platform for off-road, heavy-duty vehicles; 2) develop a hardware test bed for the powertrain platform; 3) develop high-fidelity source and load simulators for the powertrain platform; 4) develop an optimal power management system for the powertrain platform; and 5) validate the powertrain platform by conducting hardware tests. The powertrain platform will provide a new facility and unique platform for studying various research problems on the electrification of off-road, heavy-duty vehicles and related fields. For example, off-road, heavy-duty, hybrid electric vehicles can be used as mobile electricity production and storage resources with considerable capacities to support electric power grid operation. This is particularly beneficial to rural agricultural areas where power outages are more likely to happen. The project results will advance the understanding of the critical issues and challenges in the electrification of off-road, heavy-duty vehicles; will help to stimulate interdisciplinary research in the fields of vehicle electrification, power electronics, electric machines, energy storage, smart grids, automated vehicles, biological and agricultural engineering, control, optimization, etc., to address the critical issues and challenges; and will provide a facility and develop university-industry partnerships that are necessary to enhance the competitiveness of UNL in pursuing funding from federal and private agencies in the field of electrification of heavy equipment and related fields.