Additive Manufacturing for Integrated Energy Systems Demonstration Project

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ABSTRACT: Inspired by the power of asking “what if,” the Additive Manufacturing Integrated Energy (AMIE) demonstration project (www.ornl.gov/amie) not only asks the tough and non-obvious questions, but showcases an innovation platform to develop, integrate, and demonstrate solutions at game-changing speed and scale. Research teams at Oak Ridge National Laboratory and about 20 industry partners and organizations ventured to ask, “what if” our vehicles could be used to power our buildings and our buildings could be used to power our vehicles? When combined with solar power, energy storage, energy management, and available grid services, could this shared energy vision provide an affordable, reliable, and connected energy system to answer the energy challenges of today? Electricity outages caused by extreme weather events, energy poverty around the globe, and intermittent renewable generation are all issues that are addressed by AMIE. This novel concept leverages rapid innovation through additive manufacturing to connect a natural-gas-powered hybrid electric vehicle to a home designed to produce, consume, and store renewable energy. The building and vehicle components were additively manufactured (3D printed) using ORNL’s advanced manufacturing capabilities. The printed utility vehicle’s (PUV’s) natural gas engine extends vehicle range and produces power for both vehicle and building. Energy flows between the two using fast, efficient bi-directional wireless power transfer—a first for level 2 charging. Finally, energy is stored in the home in recycled batteries that were once used to power an electric vehicle. In this presentation, Dr. Green will detail the story of AMIE and how this revolutionary project was successfully accomplished in just nine months.

BIO: Dr. Green joined Oak Ridge National Laboratory in 1995 conducting automotive research focused on engine and vehicle experiments, combustion modeling, and the control of combustion instabilities. During the course of that research, he joined a team working with the Ford Motor Company seeking ways to extend exhaust gas recirculation (EGR) limits in diesel engines to simultaneously reduce nitrogen oxide and particulate matter emissions. The following year, he continued this research collaboration, working on-site at Ford’s Scientific Research Laboratory on modeling and experimental research for advanced diesel engines designed for light-duty vehicles. He earned his bachelor of science degree in mechanical engineering from the University of Memphis and his master’s and Ph.D. degrees in mechanical engineering from the Georgia Institute of Technology. In 2003 Dr. Green completed a year-long off-site assignment in Washington, D.C., at the Department of Energy’s Office of Vehicle Technologies serving as technical coordinator for the 21st Century Truck Partnership, which seeks to develop advanced technologies for increasing the efficiency of heavy-duty trucks and buses.

For more information: Reinhard Radermacher (raderm@umd.edu)