

ORNL integrated energy demo connects 3-D printed building, vehicle

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Oak Ridge National Laboratory's Additive Manufacturing Integrated Energy (AMIE) demonstration connects a 3-D printed building and vehicle to showcase a new approach to energy use, storage and consumption. Credit: ORNL

A research demonstration unveiled today at the Department of Energy's Oak Ridge National Laboratory combines clean energy technologies into a 3D-printed building and vehicle to showcase a new approach to energy use, storage and consumption.

The Additive Manufacturing Integrated Energy (AMIE) demonstration, displayed at DOE's Office of Energy Efficiency and Renewable Energy Industry Day event, is a model for [energy](#)-efficient systems that link buildings, vehicles and the grid.

An ORNL team worked with industrial partners to manufacture and connect a natural-gas-powered [hybrid electric vehicle](#) with a solar-powered building to create an integrated energy system. Power can flow in either direction between the vehicle and building through a lab-developed wireless technology. The approach allows the car to provide supplemental power to the 210-square-foot house when the sun is not shining. Watch an animation of the energy flow here:

The demonstration also showcases [additive manufacturing](#)'s rapid prototyping potential in architecture and vehicle design; the car and house both were built using large-scale 3D printers.

The 38x12x13-foot building was designed by architecture firm Skidmore, Owings, and Merrill (SOM) through the University of Tennessee-ORNL Governor's Chair for Energy and Urbanism. It was assembled by Clayton Homes, the nation's largest builder of manufactured housing. Connecting the house to the 3D-printed vehicle demonstrates the concept of integrating two energy streams, buildings and transportation, which typically operate independently.

"Working together, we designed a building that innovates construction and building practices and a vehicle with a long enough range to serve as a primary power source," said ORNL's Roderick Jackson, who led the AMIE demonstration project. "Our integrated system allows you to get multiple uses out your vehicle."

Advanced building controls and power management maximize the

efficiency of the system's components. The project's energy control center manages the system's electrical demand and load by balancing the intermittent power from the building's 3.2-kilowatt solar array with supplemental power from the vehicle.

ORNL researchers hope their integrated approach to energy generation, storage and consumption will introduce solutions for the modern electric grid, which faces challenges ranging from extreme weather events to how best to incorporate growing renewable energy use, particularly as the transportation sector transitions away from fossil fuels.

"We're looking at large community issues from the single-unit level," said ORNL's Martin Keller, associate laboratory director for Energy and Environmental Sciences. "Our research provides solutions on a small scale, which will translate to a significant reduction in energy use and an increase in cost savings when ramped up to a national, and even global, level."

Partners on the project are: Alcoa/Kawneer; Clayton Homes; Cincinnati Incorporated; DowAksa; EPB; GE Appliances; Hexagon Lincoln; the Institute for Advanced Composite Manufacturing Innovation; Johnson Controls; Knoxville Utilities Board; Liberty Utilities; Line-X; Mach Fuels; NanoPore; Skidmore, Owings & Merrill LLP; Spiers New Technologies; Techmer ES; Tru-Design; and the University of Tennessee's College of Architecture and Design.

"The AMIE demonstration today is the perfect example of the kind of solutions that can come from true public-private partnerships," said U.S. Rep. Chuck Fleischmann. "With the great work being done between ORNL and our local private industry East Tennessee is poised to be a leader in additive manufacturing for years to come."

Provided by Oak Ridge National Laboratory

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