

# Delivering Innovation

## AMIE Demonstration Project

Access to reliable and affordable electricity is the basis for a modern society's economic stability, security, and overall quality of life. The electric grid, however, faces unprecedented challenges. Extreme weather events can leave homes and businesses without power for extended periods of time. Climate change, an increasing demand for renewable energy sources, and uncertainty in the balance of centralized versus distributed energy resources all impact the grid. In addition, more than 1.3 billion people worldwide have no access

to an electric grid, and for an additional billion people, grid access is unreliable.

A cross-disciplinary research team at Oak Ridge National Laboratory (ORNL) is tackling this challenge through an integrated approach to electricity generation, storage, and consumption. Through the Additive Manufacturing

Integrated Energy (AMIE) project, innovative solutions are being developed and demonstrated at the single-unit level as a model to be deployed in full-scale sustainable communities.

### An integrated solution

ORNL's AMIE demonstration leverages rapid innovation through additive manufacturing to connect a natural-gas-powered hybrid electric vehicle to a high-performance building designed to produce, consume, and store renewable energy. Components of the building and vehicle will be additively manufactured (3D printed) using the laboratory's advanced manufacturing capabilities. To offset the uncertainty of power, the vehicle's natural gas engine will provide complementary power to the building. When coupled with integrated demand-side controls to

enable responsive loads, and then scaled up, this concept can support worldwide electricity needs.

### A collaborative effort

Expertise in the following specialties is vital to this demonstration project:

- **Advanced manufacturing**— Building on the successful development of the additively manufactured Shelby Cobra car, the demonstration project's vehicle and building will be produced via ORNL's Big Area Additive Manufacturing (BAAM) system. The accelerated creation and printing of the car and house will further demonstrate the program's function as an applied science tool to get products to market more quickly than traditional manufacturing.
- **Vehicle technologies**—The printed vehicle features a hybrid electric powertrain with onboard power generation from natural gas. A single 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.
- **Building technologies**—Through the University of Tennessee-ORNL Governor's Chair for Energy and Urbanism, ORNL researchers and architects from Skidmore, Owings & Merrill have designed an innovative single-room building module to demonstrate new manufacturing and building technology pathways. The design incorporates low-cost vacuum insulated panels into an additively manufactured shell assembled at Clayton Homes, the nation's largest manufactured home builder.
- **Sustainable electricity**—A flexible 3.2 kW solar photovoltaic system paired with electric vehicle batteries will provide renewable power generation and storage. Advanced building control and power management strategies will be used to integrate the various energy systems while also using the building as a virtual battery through demand-side load management.



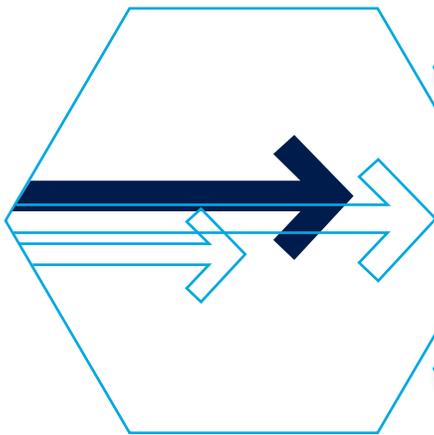
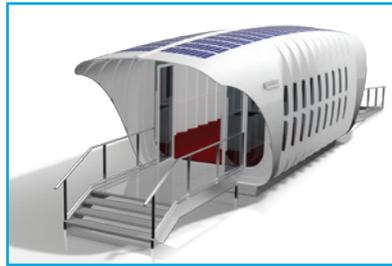
Rendering of the AMIE project to be demonstrated at the US Department of Energy's EERE Industry Day at ORNL, September 23–24, 2015.

Integrating  
how we  
generate,  
use, and store  
energy.

# Introducing AMIE at EERE Industry Day

## September 23–24, 2015

**Industry partnerships—**  
 Numerous industry partnerships are being leveraged to ensure market-appropriate solutions are developed and enabled



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