



# Missouri S&T to Study Lead Battery Solar Microgrids in On-Campus Homes

**Project Overview** Members of the lead battery industry have joined a collaborative research alliance at Missouri University of Science and Technology (Missouri S&T) to provide resources for the construction of advanced lead battery microgrids at the Missouri S&T EcoVillage. The microgrids will power two existing on-campus solar homes designed by Missouri S&T students as part of the U.S. Department of Energy's biennial Solar Decathlon. In what is considered a first of its kind, students will reside in the "living laboratories." The uniquely immersive experience will allow students to study in real time the applications of renewable energy sources and storage for future communities.

## Goal

Members of the alliance, called the Missouri S&T Microgrid Industrial Consortium, aim to unlock the ability to supply reliable and environmentally sustainable energy to the residential market by using advanced lead battery solar microgrid systems.

## Objectives

1. Gather real-time insights 24/7 that inform further development of residential and community-based microgrids with lead battery storage.
2. Demonstrate the performance capability and long-term durability of advanced lead batteries as a critical component of maximizing renewable energy.
3. Provide students with hands-on training in renewable energy and microgrid technologies.

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“The solar panels paired with the advanced lead battery microgrids are expected to provide 50 percent of the homes’ electrical needs.”

— Stephane D. Menand, Missouri S&T Center for Research in Energy and Environment

## The Need

In 2018, a new solar project was installed in the U.S. every 100 seconds. The residential solar market, in particular, has seen years of 50-percent-plus annual growth. (Source: Solar Energy Industries Association). As California and other states adopt updated energy efficiency standards for residential and non-residential buildings, off-grid battery storage systems will be necessary to balance the additional energy load resulting from those mandates.

## Duration

Three years (2018 – 2021)

## Location

EcoVillage  
Missouri University of Science and Technology  
900 Innovation Drive  
Rolla, MO 65409

**For more information:**

<https://cree.mst.edu/laboratories/ecovillage/>

## Missouri S&T Microgrid Industrial Consortium

- + **Advanced Lead Acid Battery Consortium (ALABC)**
- + **Ameren**
- + **The Doe Run Company**
- + **Missouri Department of Economic Development Division of Energy (MO DED)**
- + **Missouri Public Utility Alliance (MPUA)**

ALABC members NorthStar Battery, EnerSys and The Doe Run Co. donated the batteries, equipment and funding to construct the new microgrids.

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## Technical Specifications

Each house will be individually supplied with stored electricity from its microgrid, which runs off charging algorithms from a 24-hour cloud-based control system. A microgrid management system will allow the homes to share power.

## Components

Each house has an AC combiner and critical load distribution load center panel board. The AC-coupled advanced lead battery back-up system consists of:

- + 7 strings in parallel = 48V, 28 cells, 67.5 kWh
- + Battery racks and cabling from batteries to inverter
- + Unique charge algorithms on how to control the batteries

Installations local to each house installed on existing 240/120V 2-pole single-phase utility feed include:

- + Battery shed with poured-concrete pad
- + Each shed has a glass front for public viewing of interactive screens that provide live power plant data
- + 2 Sunny Island 6kW inverters per house at 12kW
- + Sunny Island inverters were installed downstream of the main panel via 2 single-pole 50A CBs (one for each single 6kW Sunny Island)
- + 2-pole sub-panel 100A based on 12kW max load from Sunny Island inverters and photovoltaic (PV) arrays
- + Rewiring of critical loads to be fed from the new sub-panel



**“Lead batteries are more affordable, safer, more environmentally friendly, and lead is domestically sourced, which really helps our country.”**

— George Mues, Technical Transfer Manager, Ameren

## Contacts



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**Essential Energy Everyday** exists to increase awareness of the critical importance of lead batteries to power our daily lives. We encourage continued investment in sustainable lead battery technology to store and provide energy on demand. Our initiative is supported by the two global trade associations that represent the lead battery industry, **Battery Council International** and the **International Lead Association**.

Learn more at [EssentialEnergyEveryday.com](http://EssentialEnergyEveryday.com)