American Recovery and Reinvestment Act (ARRA)

Community Energy Storage for Grid Support

Demonstrating advanced implementation of community energy storage technologies for grid support

U.S. DEPARTMENT OF ENERGY | Electricity Delivery & Energy Reliability

Energy Storage Program

Detroit Edison

Detroit Edison (DTE) will design, build, and demonstrate Community Energy Storage (CES) systems in their service territory, and two of the CES units will utilize secondary-use electric vehicle batteries. The CES system will use a number of battery energy storage units utilizing lithium batteries with the required electronics and energy conditioning devices to locate backup power near to the customer. The energy storage system consists of 20 separate 25 kW (50 kWh) CES units and a 500 kW lithium battery storage device integrated with a photovoltaic solar module. At just under 1 MW the CES units, coupled with the utility-scale photovoltaics (PVs) and storage devices, will demonstrate peak shaving, demand response, voltage support, and emergency load relief; integration of renewable generation; and islanding during outages.

The CES is designed to improve electricity service to customers whose circuits are often heavily loaded and would benefit from the power conditioning advantages provided from a CES. The performance data of the CES units and control systems will be analyzed under real-world operating conditions to standardize design, installation, and use across the United States.

Project Benefits

- Provides voltage/volt-ampere reactive (VAR) support
- Enables integration of solar power generation
- Allows islanding during outages
- Provides frequency regulation
- Demonstrates secondary use of EV batteries as CES devices
- Identifies deficiencies and improvements needed for CES devices and control algorithms to be used across the United States

Budget

Total Project Value:
$10,877,258

DOE/Non-DOE Share:
$4,995,271/$5,881,987

Community Energy Storage Devices

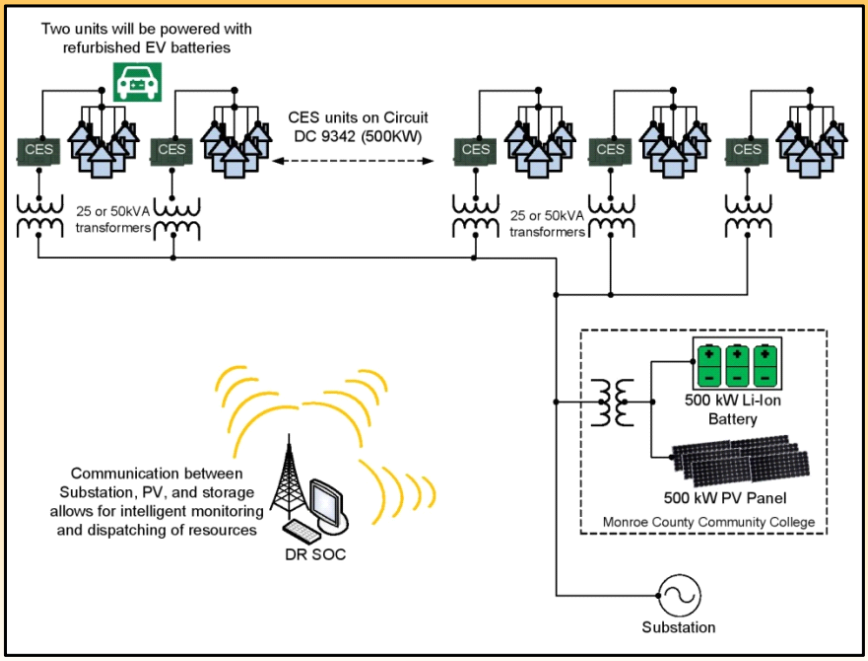
The CES devices are connected close to customers and can provide backup power, among other benefits.

DTE's Demonstration Project

DTE will implement the following equipment into its electric delivery system:

- A 500 kW solar array coupled with a 500 kW lithium storage battery
- 20 CES devices (25 kW, 50 kWh) at 120/240 V
- 2 CES devices refurbished Chrysler EV batteries
- A CES total of 500 kW
- Communication equipment

These devices will collectively create a CES system that will demonstrate various benefits and provide best practices that can be implemented around the country.



Timeline

June 2011:
Project definition and National Environmental Policy Act compliance

August 2012:
Design, procure and test prototype unit

March 2013:
Fabricate, Test and Install 5 CES Units
Complete Construction of PV storage system

June 2013:
Fabricate, Test and Install 13 CES Units

October 2014:
Fabricate, install, and operate secondary use battery CES units
Install, commission, and operate all CES units

Goals

- Demonstrate peak shaving, demand-response voltage, and emergency load relief of the CES devices when integrated into the utility grid
- Explore remote and automatic monitoring and control responses
- Develop and verify advanced modeling and simulation methods for system planning and operations based on existing utility practice and expanded to include photovoltaic systems integration
- Demonstrate intentional islanding of CES devices with a utility distribution circuit and how they can aid in frequency regulation

Project Partners

Team Member	Role	Website
	• Project lead • Utility participant for CES filed demo • Project reporting	DTE Energy www.dteenergy.com
S&C ELECTRIC COMPANY Specialists in Electric Power Switching and Protection	• CES Unit suppliers • Factory acceptance testing • Technical support	S&C Electric www.sandc.com
KEMA	• CES functional testing • Economic analysis and reporting • Technical support	KEMA www.kema.com
edd	• Circuit model devlopment for baseline • Reliability and economic dispatch algorithm	Electrical Distribution Design www.edd-us.com
CHRYSLER	• Durability and conditioning testing of EV battery • Secondary use EV battery supplier • Provide baseline data for EV battery	Chrysler Corporation www.chrysler.com
NEXTENERGY accelerating advanced energy technologies through collaboration	• Investigation of regulatory issues surrounding energy storage and renewables	NextEnergy www.nextenergy.org
nationalgrid	• Technical support	National Grid USA Service Company www1.nationalgridus.com

For More Information

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Related Reading

Sandia National Laboratories, "Energy Storage Systems Program (ESS)," http://www.sandia.gov/ess/.

Haukur (Hawk) Asgeirsson, "Detroit Edison's Advanced Implementation of Community Energy Storage Systems for Grid Support," poster presented at the 2012 DOE Energy Storage Program Peer Review, http://www.sandia.gov/ess/docs/pr_conferences/2012/papers/Thursday/PosterSession2/ARRAProjects/02_Hawk_CES_DOE_PeerReview_Poster.pdf.

Importance of Energy Storage

Large-scale, low-cost energy storage is needed to improve the reliability, resiliency, and efficiency of next-generation power grids. Energy storage can reduce power fluctuations, enhance system flexibility, and enable the storage and dispatch of electricity generated by variable renewable energy sources such as wind, solar, and water power. The Office of Electricity Delivery and Energy Reliability Energy Storage Program funds applied research, device development, bench and field testing, and analysis to help improve the performance and reduce the cost of energy storage technologies.

October 2012