



Advanced Research Projects Agency • ENERGY

## GENI PROJECT

# SANDIA NATIONAL LABORATORIES

## PROBABILITY-BASED SOFTWARE FOR GRID OPTIMIZATION

<b>PROJECT TITLE:</b>	Improved Power System Operations Using Advanced Stochastic Optimization		
<b>ORGANIZATION:</b>	Sandia National Laboratories	<b>LOCATION:</b>	Albuquerque, NM
<b>PROGRAM:</b>	GENI	<b>ARPA-E AWARD:</b>	\$3,000,000
<b>TECH TOPIC:</b>	Electricity Transmission & Distribution	<b>PROJECT TERM:</b>	2/24/12 – 2/23/14
<b>WEBSITE:</b>	www.sandia.gov		

### CRITICAL NEED

The U.S. electric grid is outdated and inefficient. There is a critical need to modernize the way electricity is delivered from suppliers to consumers. Modernizing the grid’s hardware and software could help reduce peak power demand, increase the use of renewable energy, save consumers money on their power bills, and reduce total energy consumption—among many other notable benefits.

### PROJECT INNOVATION + ADVANTAGES

Sandia National Laboratories is working with several commercial and university partners to develop software for market management systems (MMSs) that enable greater use of renewable energy sources throughout the grid. MMSs are used to securely and optimally determine which energy resources should be used to service energy demand across the country. Contributions of electricity to the grid from renewable energy sources such as wind and solar are intermittent, introducing complications for MMSs, which have trouble accommodating the multiple sources of price and supply uncertainties associated with bringing these new types of energy into the grid. Sandia’s software will bring a new, probability-based formulation to account for these uncertainties. By factoring in various probability scenarios for electricity production from renewable energy sources in real time, Sandia’s formula can reduce the risk of inefficient electricity transmission, save ratepayers money, conserve power, and support the future use of renewable energy.



## Sandia National Laboratories

### IMPACT

If successful, Sandia’s software would encourage the spread of renewable energy throughout the electric grid by accounting for the uncertainties associated with its pricing and production.

- **SECURITY:** A more efficient, reliable grid would be more resilient to potential disruptions from failure, natural disasters, or attack.
- **ENVIRONMENT:** Enabling increased use of wind and solar power would result in a substantial decrease in carbon dioxide (CO<sub>2</sub>) emissions in the U.S.—40% of which are produced by electricity generation.
- **ECONOMY:** A more efficient and reliable grid would help protect U.S. businesses from costly power outages and brownouts that stop automated equipment, bring down factories, and crash computers.
- **JOBS:** Advances in grid software could result in new high-paying jobs in supporting sectors such as engineering and information technology.

### CONTACTS

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