Advanced Research Projects Agency • ENERGY

GENI PROJECT

CALTECH

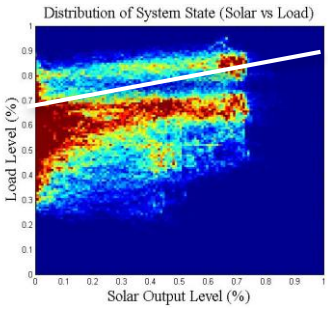
SCALABLE DISTRIBUTED AUTOMATION SYSTEM

PROJECT TITLE:	Scalable Real-time Decentralized Volt/VAR Control		
ORGANIZATION:	California Institute of Technology (Caltech)	LOCATION:	Pasadena, CA
PROGRAM:	GENI	ARPA-E AWARD:	$1,350,000
TECH TOPIC:	Electricity Transmission & Distribution	PROJECT TERM:	3/1/12 – 3/1/15
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/GENI.aspx		

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The U.S. electric grid is outdated and inefficient.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



Caltech is developing a distributed automation system that allows distributed generators—solar panels, wind farms, thermal co-generation systems—to effectively manage their own power. To date, the main stumbling block for distributed automation systems has been the inability to develop software that can handle more than 100,000 distributed generators and be implemented in real time. Caltech's software could allow millions of generators to self-manage through local sensing, computation, and communication. Taken together, localized algorithms can support certain global objectives, such as maintaining the balance of energy supply and demand, regulating voltage and frequency, and minimizing cost. An automated, grid-wide power control system would ease the integration of renewable energy sources like solar power into the grid by quickly transmitting power when it is created, eliminating the energy loss associated with the lack of renewable energy storage capacity of the grid.

IMPACT

If successful, Caltech's distributed automation system would allow power to be controlled at individual endpoints, providing real-time information on energy supply and demand that can be used to optimize power transmission across the grid.

- 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_2) 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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