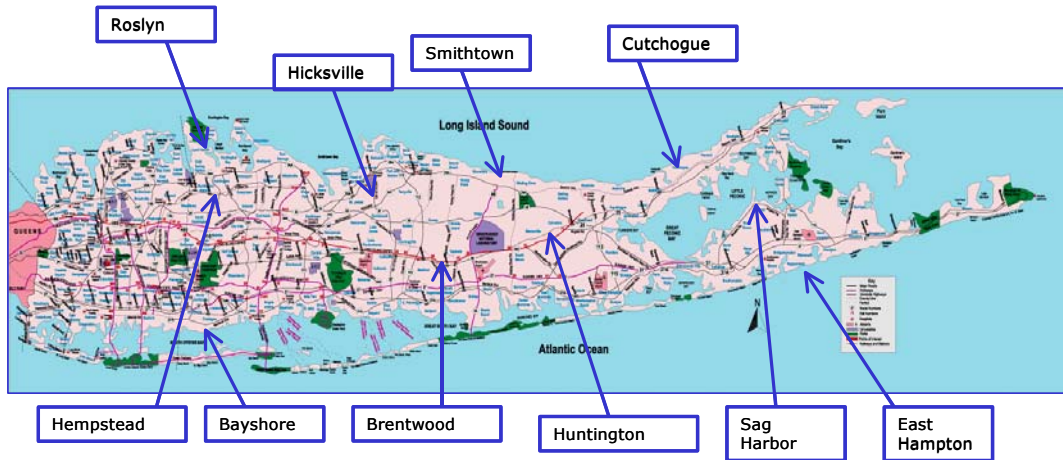# New York State Energy Research and Development Authority and Electrotek Concepts

Aggregating Distributed Generation


Roslyn
Hicksville
Smithtown
Cutchogue

Hempstead
Bayshore
Brentwood
Huntington
Sag Harbor
East Hampton

Participating distributed generation locations

Goals

In recent years, independent system operators (ISOs) have developed demand response programs to help them meet peak summer load. Distributed generation (DG) has the potential to compete in these and other regional competitive markets, but to do it, DG needs to be aggregated to a useful size, typically a megawatt or more.

The Department of Energy, the National Renewable Energy Laboratory, and the New York State Energy Research and Development Authority (NYSERDA) are working with Electrotek Concepts to demonstrate the technical and economic feasibility of aggregated DG. The goal is to demonstrate a system that enables DG to participate in regional competitive markets like central-station power plants do.

Energy

Generator 2 MW
Generator 1 MW
Generator 1 MW
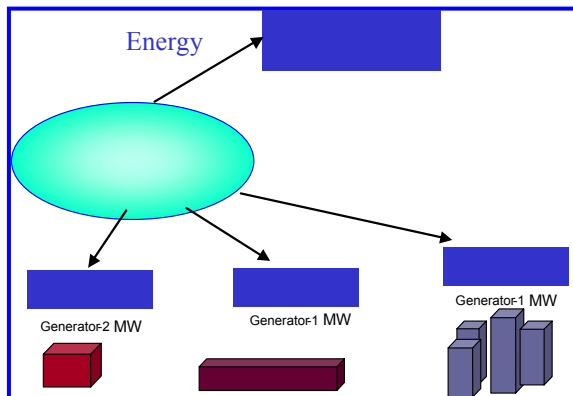
A virtual power plant created by connecting geographically diverse DG to the NYISO

Electrotek has developed and is testing a control and communications system that aggregates distributed resources to maximize benefits for all parties involved and makes DG immediately dispatchable from a single control point. This provides spinning reserve to the grid in peak situations and uninterruptible power supply to customers.

The objectives of this project are to:

- Design and build a monitoring and control system to facilitate the aggregation of multiple DG units
- Quantify the costs and values of services supplied by system aggregators.

The approach is to:

- Develop and conduct a field test
- Carry out a full demonstration.

Results

System Requirements
Electrotek developed the requirements for DG connections and controls to ensure that the system would work safely and effectively. The generator must be protected from external faults should the utility system fail, and the utility system must be protected from faults in the backup generator. In addition, DG needs to provide service to an ISO within 30 minutes of notification.

Market and Feasibility Analysis

Electrotek analyzed market conditions, rules, and operations in New York State. First, it estimated numbers, capacities, and generator types for the Long Island Power Authority (LIPA) territory. Then it estimated typical demand profiles. Using actual hourly load data for 10 participants, it profiled DG combinations using 2001 New York Independent System Operator (NYISO) day-ahead prices. This determined how much interruptible-load capacity could be offered during a 24-hour period. Later, Electrotek used the developed methodology to evaluate DG potential for the entire state.

Controls, Monitoring, and Communication

Electrotek has designed a system to control many distributed generators from one place. Its system revolves around a system aggregation center (SAC). Initially, the SAC will control 30 MW of backup generation and enable thee distributed generators to participate in NYISO wholesale markets.

The first phase—the DG aggregation system, designed and implemented at 10 buildings—included power monitoring equipment, data transmitting equipment, and a data collection and management center as well as operating procedures.

Phase II, designed in accordance with NYISO rules for energy and capacity markets, is more robust and will act as a single control point. It will be LAN-based, with redundant servers and multiple peripherals and enhanced communication support. It will have remote access to data acquisition devices located at the generating units.

This will enable participating generators to respond to calls from the NYISO. The SAC will provide real-time monitoring of loads and control on-site DG through local operators. Key modules include a load forecasting model, a peak-hunting tool, and a bidding tool. It will also have the capability to analyze the technical and economic efficiency of unit dispatch in the NYISO markets.
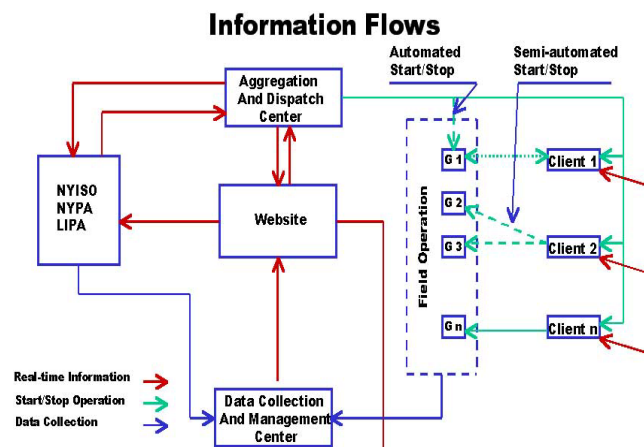
Next Phase

NYSERDA and Electrotek are proceeding with full-scale commercial demonstration using the DG in the NYISO markets. Fifty generators with an installed capacity of more than 30 MW have signed up for the next phase of the project.

These generators will participate in multiple load curtailment programs, including the Emergency Demand Response Program, the Special Case Resources Program, the New York Power Authority Load Curtailment Program, and the LIPA Peak Reduction Program.

These market programs have changed over time and may continue to do so. Metering and communications systems need to be modified accordingly. Supporting computer tools and programs need to be developed and modified to be effective for these changing markets.

Publications

Electrotek Concepts Inc. "Aggregation of Distributed Generation Assets in New York State." NREL/SR-560-34779. September 2003.

Publications are available on the NREL publications database, http://www.nrel.gov/publications/.

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Additional Distributed Power Information
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NREL/FS-560-35046   October 2003

Information Flows

Information flow in the DG aggregation system