Description of integrated pilots/demonstrations/field tests/existing practices

1. Name of the case:

New York State Energy Research and Development Authority and Electrotek Concepts (2003)

2. What is integrated with DSM

DG	X
Energy storage	
Smart grid technologies	X

3. What is the level of commercialization

Research project	X
Demonstration	X
Field test	X
Existing practice	

4. Where to find more information?
   - Contact person: Holly Thomas
   - Company: DOE
   - web-site: http://www.nrel.gov/docs/fy04osti/35046.pdf
   - Final technical report: Electrotek Concepts Inc. "Aggregation of Distributed Generation Assets in New York State." NREL/SR-560-34779. September 2003.

5. Objectives of the case

The objectives of this project were to develop and demonstrate the equipment and software necessary to aggregate, monitor, and dispatch multiple DG units. In this case, the DG units are local generators not interconnected with the bulk power system that provide curtailment to the NYISO markets. Under this scheme, Electrotek Concepts serves as a DG system aggregator and the agent for NYISO transactions.

The aggregation system collects operating data from field operations and the NYISO. In addition, the aggregation system is used to provide energy and capacity in NYISO electric markets. In other words, the proposed DG aggregation system will actually

create a virtual generator that can be monitored and controlled over the Internet. The project consists of tasks that develop the necessary system architecture and address and quantify the key technical and economic issues. Option Year one activity consisted of three project tasks;

1. In Task 6, the concept was tested via a pilot project on Long Island.
2. In Task 7, an evaluation of the available DG capacity in New York State was conducted, and 30 MW of DG capacities were recruited for commercial operation.
3. In Task 8, the DG aggregation system was designed and developed.

6. Business rationale/model

Independent system operators (ISOs) have developed demand response programs as a means to help them meet peak summer load. Distributed generation (DG) has the potential to compete in these and other regional competitive markets in the U.S., 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) worked with Electrotek Concepts to demonstrate the technical and economic feasibility of aggregated DG. The goal was to demonstrate a system that enables DG to participate in regional competitive markets like central-station power plants do.

Because the sites were located in the Long Island Power Authority (LIPA) service territory, LIPA insisted that the sites be equipped with its own metering and communications systems. LIPA then sought cost recovery from Electrotek for expenses that would be incurred for the implementation of equipment supporting its preferred protocol. These costs were more than $149,000, and there were annual recurring costs of more than $95,000. The imposition of these significant costs doomed the schedule and economic viability of the proposed project and terminated the technical implementation. However, to test the viability of the market transactions of such an arrangement, a shadow market operation was developed to simulate the market transactions of the proposed system resource.

7. Technologies used

Electrotek 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 the distributed generators to participate in NYISO wholesale markets.

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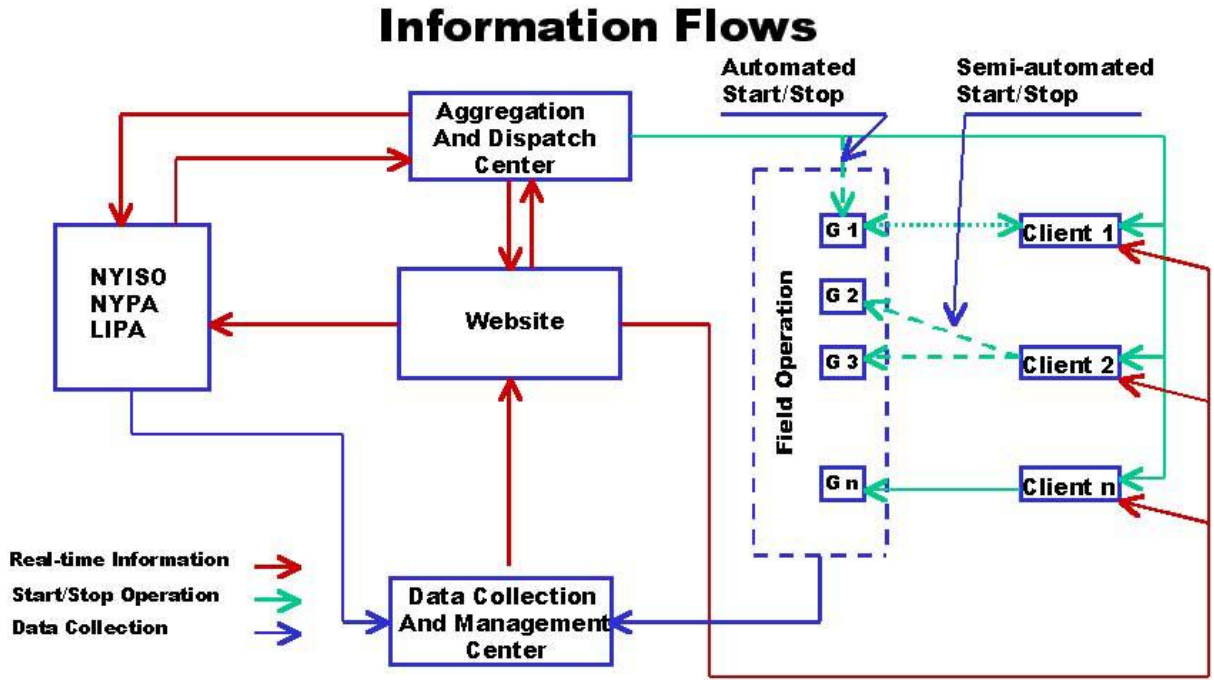
The first phase—the DG aggregation system, designed and implemented at 10 buildings—included power monitoring equipment, data transmitting equipment, and a data collection and management center as well as operating procedures.

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.



Information flow in the DG aggregation system

8. Short description of the case

Electrotek has developed and tested 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.

9. Achieved/expected results (operational savings, CO_2, efficiency enhancement)

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.

LIPA did not support the metering and communications systems and protocols agreed on by the NYISO and Electrotek. LIPA insisted that only its own systems would be appropriate. LIPA's position made the establishment of the system resource impossible. LIPA sought cost recovery from Electrotek for expenses for installing equipment supporting its preferred metering and communications protocol and for providing the meter reading services to support the system resource. These costs were more than $149,000, with annual recurring costs of more than $95,000. These additional costs doomed the financial viability of the system resource. In addition, the scheduling of the installation of this equipment would not allow the project to be implemented during the summer 2002 capability period.

10. Lessons learned

With the technical success realized under this NYSERDA- and National Renewable Energy Laboratory-sponsored project, the viability of this approach on a commercial basis must be considered. Although Electrotek has clearly demonstrated the validity of the technical approach and the system design, implementation, and operation, the commercial success of this approach must also be addressed.

A number of recommendations can be made.

- For DG resources participating in the NYISO emergency programs (EDRP and SCR), the concept is viable by any measure, technical or economic. Particular credit for this should go to the NYISO for emergency programs that are well designed and targeted toward those locations (New York City and Long Island) that most are in need. Clearly, the market design of these emergency programs is a critical element of their success. The market design of the NYISO programs has proved to be an excellent model for other power pools to consider, particularly for the access to capacity markets for emergency resources.

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- The NYISO should also be cited for its progressive approach to the emergency program development process, as evidenced by the Price Responsive Load Working Group, which brought all of the parties (generators, LSEs, customers, regulators, environmentalists, etc.) together to forge a consensus on program development. This process was especially valuable in the continued evolution of these programs. Again, this approach is a good model for others.

- The imposition of delivery charges on curtailments—i.e., for energy that is not delivered—places a significant impediment on the development of curtailment resources. The costs of developing these resources is high because one is typically dealing with a multitude of relatively small sites—each of which must secure environmental permits, metering equipment and services, and communications equipment and services—as well as relatively high operating costs when compared with central site generators. Given the value of these resources to the bulk power system during system stress and high-cost periods, it is counter-productive to impose these burdens on resources that operate for a limited number of hours a year and that contribute significantly to system reliability.

- The concept of a system resource in the NYISO is sound. However, as this experience has shown, the unfortunate reality is that delivery companies retain the ability to thwart their development through the imposition of costly technical requirements that do little except increase the burdens on an aggregation concept. If the requirements were set by the NYISO, there would be significantly more development of system resources. Delivery companies retain the right to impose burdens through practices of questionable technical merit on what are, in effect, their competitors.

- Much of the success of the NYISO emergency programs can be attributed to the direct support provided by NYSERDA. This support is critical to the successful development of curtailment resources. In the interests of continuing the development of these resources, NYSERDA should continue its strong support.