



Aggregating Distributed Generators

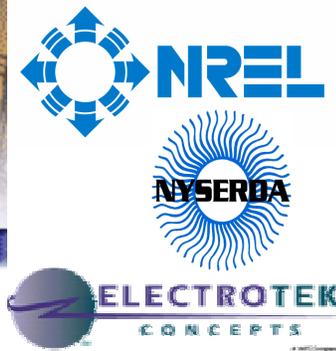
Subcontract Number: AAD-1-30605-08

Principal Investigators: J. Foster (NYSERDA), V. Gorokhov (Electrotek Concepts, Inc)

NREL Technical Monitor: Holly Thomas

Electric Distribution Transformation Program

**2004 Annual Program and Peer Review Meeting,
October 28-30, 2003, Coronado (San Diego), California**



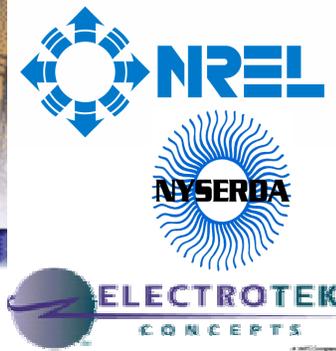
Technical Challenges

“Grid 2030” – A National Vision for Electricity’s Second 100 Years

Phase I (by 2010) includes “...research, development and demonstration programs for customer participation in power markets through demand-side management and distributed generation”

Components of the “Grid 2030” addressed in the current project:

- Distributed intelligence coupled with broadband communications and automated control systems
- Real-time market transactions and seamless interface among people, buildings, generation facilities and electric network
- New entrants into the market for distributed energy providers
- Profitable business models

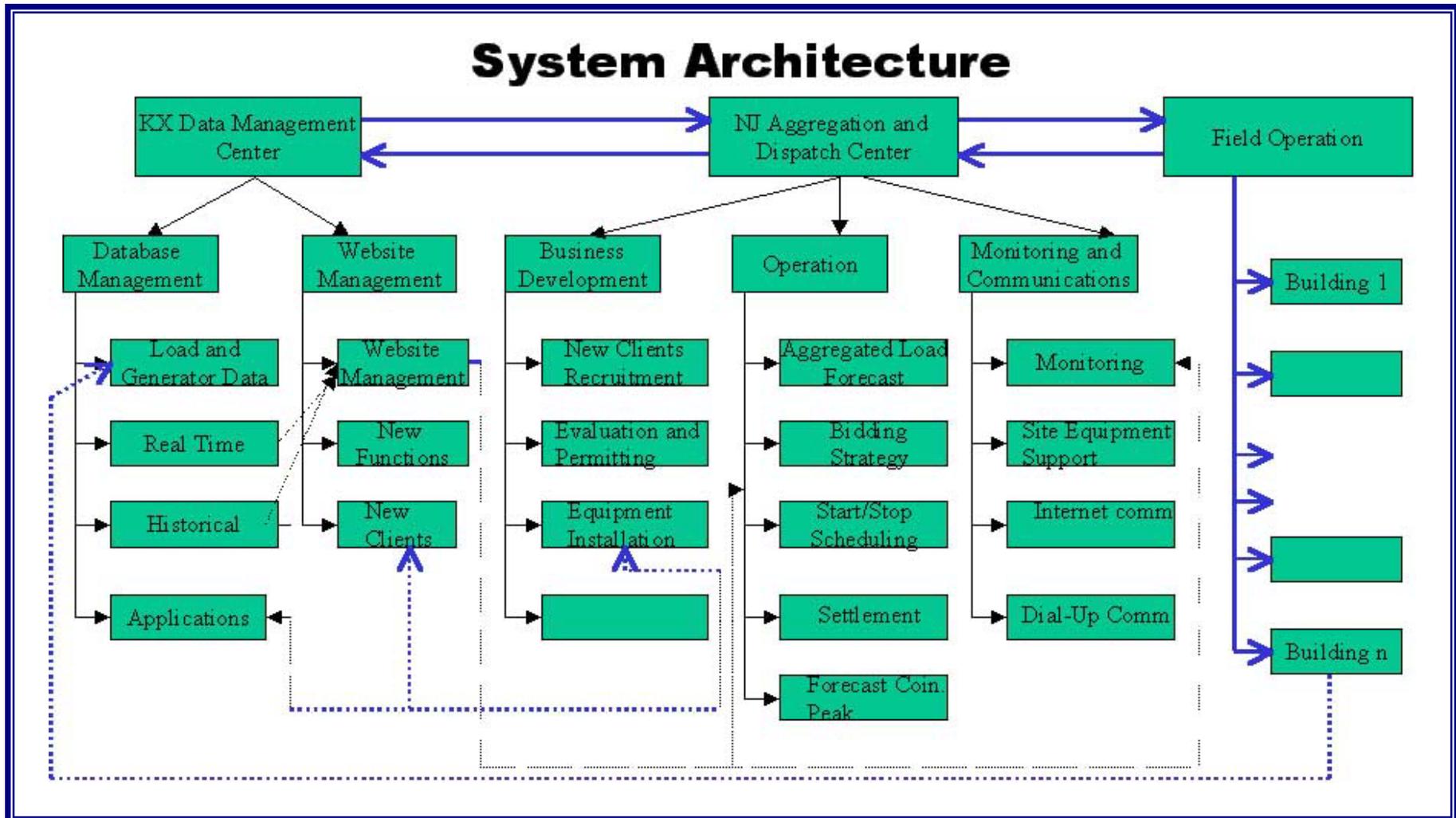


Project Objective - Aggregation of dispatchable backup generators by adding controls to provide spinning reserve, interruptible load and peak power.

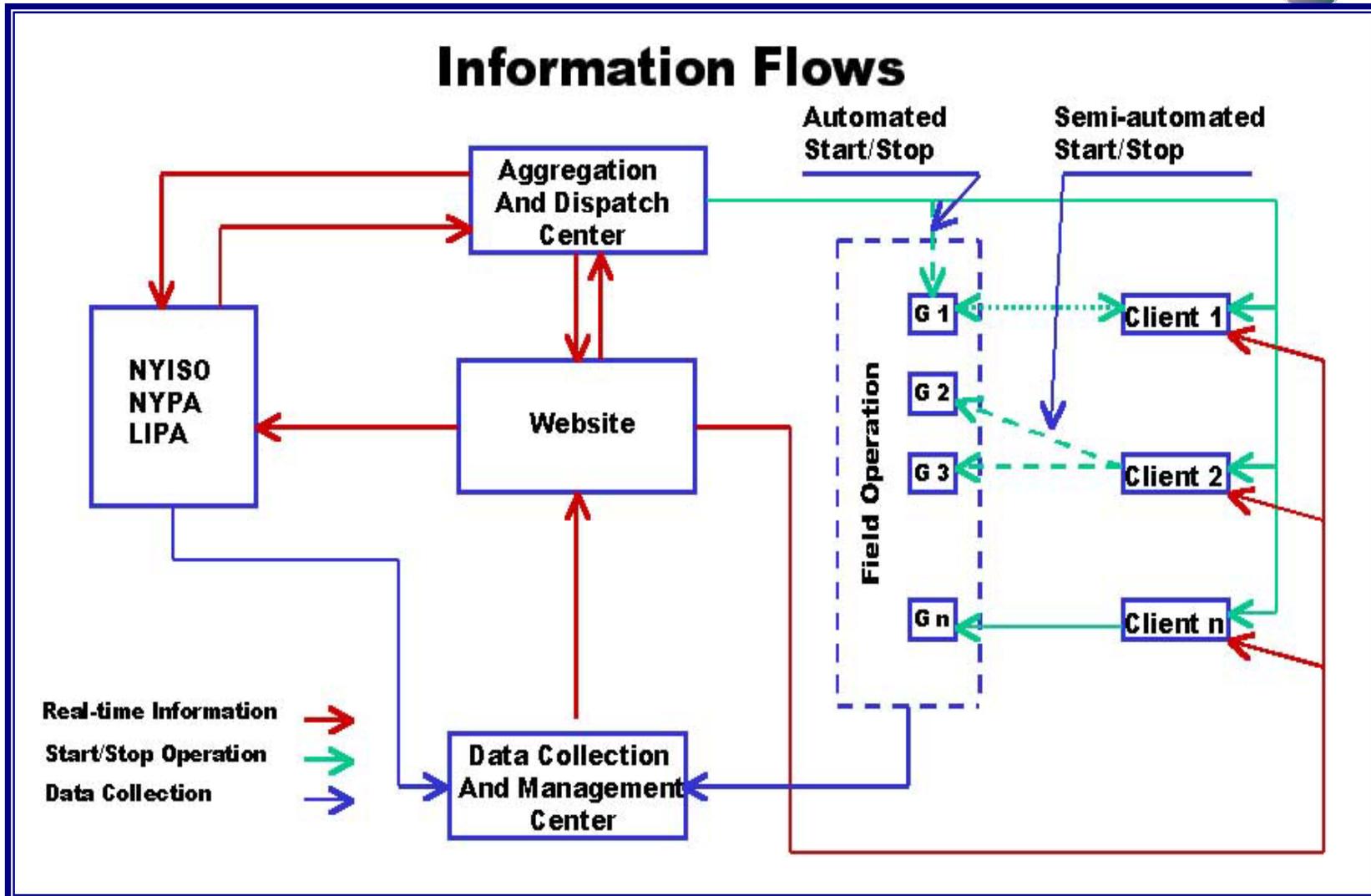
Project Components :

- Recruit 30 MW of backup generation capacity
- Aggregate distributed generators by adding controls to make them dispatchable for reduction in peak demand on the utility grid
- Procure and install the equipment needed to interconnect each participating generator and the system aggregator control room
- Analyze results including quantification of the economic and environmental benefits, focusing on interruptible loads, selling peak demand energy and spinning reserve

Technical Approach



Technical Approach



Technical Approach

Electrotek DG Portfolio

- 51 total participants located in New York, Long Island and Westchester County
- Total installed capacity – 37.8 MW
- Single generator installed capacity from 200 kW to 2500 kW

Participation in Curtailment Programs

	NYISO SCR	NYISO EDRP	Load Serving Entity		
			LIPA	NYPA	ConEd
Capacity (MW)	30.4	7.4	4.5	3.0	9.4
Participants	32	19	18	1	4

Life-Cycle Project Timeline Milestones

- Task 1 - Develop backup generator connection and control
- Task 2 – Design of controls, monitoring equipment and communications needed for backup units
- Task 3 – Conduct analysis of cost, benefits and market opportunities for the dispatch system
- Task 4 – Survey of backup units in Nassau and Suffolk Counties and recruitment of four participants
- Task 5 - Design of field test with four participants
- Task 6 - Field testing of aggregated backup generators control system
- Task 7 - Survey of backup units in New York State and recruitment 30 MW of backup generation
- Task 8 - Design of commercial demonstration
- Task 9 - Construction of 30 MW commercial demonstration
- Task 10 - Test of 30 MW commercial system

Life-Cycle Project Timeline

Budgets

	Total (\$K)	DOE/NREL	Subcontractor
Base Year (11/13/00 - 12/13/01)	583	110	473
Option Year 1 (12/14/01- 03/31/03)	481	241	241
Option Year 2 (04/01/03 – 02/28/04)	2,043	243	1,800
Total	3,107	594	2,514



FY03 Progress and Accomplishments

- Commercial DG Aggregation System was developed and commissioned
- The System consists of more than 50 DG with over 30 MW of installed capacity
- The System has expanded new web capabilities with more information now available
- The System has been adapted to 5 different LSE and NYISO curtailment programs
- The System reliability was significantly improved and availability rate of Electrotek's SCR participants is now over 94%
- A new Engine Management Strategy (EMS) was developed for a potential LSE arrangement. Negotiations with LIPA for Electrotek serving as a LSE are currently underway.
- Two NREL publications were completed:
 - "Aggregating Distributed Generation for Demand Response" – DOE/GO 102003-1689
 - "Aggregation of Distributed Generation Assets in New York State" – NREL/SR-560-34779



Planned Activities for FY04

- Accomplish operation of the commercial system during fall-winter season
- Continue to collect information for the 6-month operation for:
 - Better evaluation of economic implications of DG participation in different curtailment programs
 - Further evaluation of the DG System reliability and its impact on operation of major client's equipment involved in industrial and commercial operations
- Continue to increase DG Aggregation System by recruiting new customers/DG
- Implement and test newly developed Engine Management Strategy
- Improve DG Aggregation website by increasing amount of information available to to Electrotek's dispatchers and clients

Impacts and Benefits - Reliability

Measures

- Switchgear and other equipment testing and maintenance funded by the program
- Additional control equipment installation
- Personnel training for participation in load curtailment programs

Results

- Increased reliability and infrastructure security
- Increased Equivalent Demand Forced Outage Rate (EFORd)– availability ratio

June 2002	Oct 2002	June 2003	Sept 2003
70.3%	53.4%	92.7%	94.1%

Impacts and Benefits – Profitability

Measures

- ICAP capacity sale
- Payments for energy generated during curtailments
- Payments for service as Load Serving Entity –LSE (future)

Results for 2003

Capacity sold (\$)	1.5 Million
MW of ICAP	37 MW
MWH curtailed	150

Impacts and Benefits – Infrastructure Security

Measures

- Weather and System Load forecasts
- System Coincident Peak hunting
- Personnel and equipment readiness for potential curtailment

Results

- Electrotek's DG System performance during August 14 2003 blackout
 - 3 generators were started between 12:00 and 14:00 for coincident peak hunting
 - 52 generators were started upon blackout inception (~4:09 PM)
 - all generators were running on August 15 and 16 for different amount of hours to help restoration efforts in NY City



Interactions and Collaborations

Support and Assistance

- National Renewable Energy Laboratory (US DOE)
- New York State Energy Research Development Authority
- New York Independent System Operator
- Long Island Power Authority
- ConEdison
- New York Power Authority
- Installation and Consulting Companies

Leverage of Funds

- NREL –
- NYSERDA –
- Electrotek Concepts, Inc -



Contact Information

Holly Thomas
National Renewable Energy Laboratory
1617 Cole Blvd. MS 1614, Golden, CO 80401
Ph: 303-275-3755 FAX: 303-275-3835 <holly_thomas@nrel.gov>

James M. Foster
Project Manager - Transportation and Power Systems Research
New York State Energy Research & Development Authority
17 Columbia Circle, Albany, NY 12203
(518) 862-1090 ext 3376, Fax (518) 862 -1091, <jmf@nyserda.org>

Victor Gorokhov
Senior Project Manager
Electrotek Concepts, Inc
2111 Wilson Boulevard, S.323, Arlington, VA 22201
(703) 351-9942 x 133, FAX (703) 351-4495, <vgorokhov@electrotek.com>