

PROCESS EVALUATION

Distributed Generation and Combined Heat and Power Demonstration Program

Final Report

Prepared for

**The New York State
Energy Research and Development Authority**

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ABSTRACT

This report summarizes the results of the process evaluation of the distributed generation-combined heat and power (DG-CHP) demonstration program, which is part of the **New York Energy \$martSM** programs. This evaluation addresses projects approved for funding within the DG-CHP demonstration program from 2005 through 2010 under the third round of systems benefit funding (SBC-3), and solicited through four PONs: 914, 1043, 1178, and 1241. The program focuses on combined heat and power applications of distributed generation technologies at end-user facilities. The goal of the demonstration projects is to contribute, through a greater understanding of the challenges and benefits of CHP, to the growth of combined heat and power installed as distributed generation in New York.

The DG-CHP demonstration program process evaluation relied on 102 in-depth interviews with market actors who included participating project developers and facility owners, representatives of projects that were approved for funding but that discontinued program participation, non-participating developers and facility owners, other market participants and stakeholders, and NYSERDA program staff. Research Into Action, Inc. and Navigant Consulting, Inc., which conducted a simultaneous market assessment, conducted the interviews. For the process evaluation, these interviews were designed to help NYSERDA staff understand developers' and end users' reasons for program participation and for program discontinuation, their perceptions of other NYSERDA CHP options, their experiences with the various program processes and with their CHP projects, and the value to participants of the program services provided to them.

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SUMMARY

The **New York Energy \$martSM** programs are funded by an electric distribution System Benefits Charge (SBC) paid by customers of Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc., New York State Electric and Gas Corporation, National Grid, Orange and Rockland Utilities, and Rochester Gas and Electric Corporation. All customers who pay into the SBC are eligible to participate in the programs, which are administered by The New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation established in 1975.

This evaluation addresses projects approved for funding within the Distributed Generation-Combined Heat and Power (DG-CHP) Demonstration program from 2005 through 2010 under the third round of systems benefit funding (SBC-3), and solicited through four PONs (914, 1043, 1178, and 1241). The program's evolution is evident in the changing project requirements described in those PONs. The program has always focused on DG-CHP system demonstrations. SBC-3 funded PONs added and discontinued re-commissioning studies, and added support for fleet demonstrations, and "bonus" funding for certain locations, technologies, and facilities.

PROGRAM PROCESSES

NYSERDA's DG-CHP demonstration program processes are generally working well from the participants' perspective. Specifically, the detailed project proposal development process is viewed as appropriate for these complex projects, and program processes from proposal development, through contracting and project commissioning, to data reporting via NYSEDA's CHP integrated data system were generally uneventful for the interviewed participants. Program staff and participants reported communications with staff are adequate and working well; and participants lauded staff's availability, responsiveness, and expertise. All interviewed facility owners, both participating and partially participating, are satisfied with the program.

For these contacts, one of the most problematic aspects of NYSEDA's DG-CHP initiatives is simply to understand eligibility requirements for funding. NYSEDA's program solicitations for distributed generation and combined heat and power were confusing to developers and facility owners whether they were demonstration program participants or not. The information on NYSEDA's website and its marketing collateral for CHP did not readily clarify this confusion.

Once having understood the program, its most troublesome process was the proposal review process. PONs typically indicate "NYSEDA expects to notify proposers in approximately ten (10) weeks from the proposal due date whether your proposal has been selected to receive an award." All participant contacts reported lengthier review times than 10 weeks, and were unprepared for the length of time required for review and notification of the approval of their projects.

Facility owners participated in the demonstration program for an array of reasons, but only two of their many reasons relate directly to the program; those two reasons are to obtain NYSEDA funding and to obtain NYSEDA's expertise and technical support for their projects. In descending order, the four most commonly reported participation reasons were to obtain NYSEDA's funding, to increase the owner's knowledge of the technology, to achieve energy and cost savings, and to obtain NYSEDA's expertise.

TECHNOLOGIES

Participants employed an ad hoc approach to technology selection that included a desire for stand-alone capability, maintenance considerations, a desire to be "green," the fuel source, a consultant's or sales representative's recommendation, previous experience with distributed generation technologies, and other considerations in addition to electrical and thermal load. Prime movers for these projects were typically available and delivered without undue delay. Some of the components required to complete the systems, particularly components related to heat recovery, were not as readily available.

EXPERIENCES WITH UTILITIES

Working with utilities was the most problematic step in implementing these projects. Difficulties occurred with all utilities with which program participants worked. However, the incidence of reported difficulties was far lower for projects served by Con Edison than it was for the other utilities. Accounts of experiences with utilities suggest three underlying factors for the differing experiences: different levels of contacts' experience with distributed generation projects, different levels of utility experience with distributed generation, and varying pre-existing relationships between the contacts and their respective utilities.

FINANCING, INSTALLATION, AND OPERATION

Most projects were financed in one of three ways: from internal funding, with borrowed funds, or through lease-purchase arrangements. The greatest challenges to design and installation of these projects were posed by retrofitting existing buildings to accommodate the systems. Participants encountered few other difficulties during the installation and commissioning of their projects, and those few difficulties were typically unrelated to the program.

Project developers and facility owners are generally pleased with the performance of their CHP systems, including with system payback. However, almost half of the systems that were operational had experienced difficulties or failures that caused downtime or added to the expense of the project. In addition, for a third of the projects with sufficient operating experience to gauge payback, unforeseen circumstances had marginalized or lengthened the projects' payback. System maintenance for these projects was typically contracted out to third parties.

LESSONS

Broadly, participants learned four lessons from their distributed generation projects. These lessons include expect delays, plan carefully, budget carefully, and hire knowledgeable staff.

The reasons partial participants discontinued pursuit of their projects speak to the economic fragility of CHP projects. Higher than expected bids, "risky" income and expense assumptions, excessive payback projections, developers going out of business, the economic "meltdown," and an inability to use all waste heat were among the reasons projects did not go forward. Notably, neither the lessons learned nor the reasons for project discontinuation reflect problems with the demonstration program.

Participants' most frequent suggestions for program improvement were to do more advertising and education about CHP.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion 1: As concluded during the 2004 process evaluation of the DG-CHP program, the program is working well, and program staff members are respected for their technical competence and their helpfulness to end-users and consultants who are working to design and install DG-CHP projects. It is clear the skill and flexibility of the staff in implementing the program is one of its greatest strengths. Staff's responsiveness to program participants is the principal reason participants described program communication as excellent. Nonetheless, it may be possible to enhance program communications with project developers and facility owners in two ways: one related to the proposal review process, and the other related to proposers' eventual interactions with utilities.

Recommendation 1A: To ensure demonstration program proposers have clear expectations about the impact of the proposal review process on project timelines, examine communications with proposers about the proposal review process with a view to conveying greater understanding of the steps in the process, and of the length of the process.

Recommendation 1B: To assist project developers and owners (especially first-time developers and owners) to minimize difficulties and misunderstandings with utilities, consider providing to project contacts greater advice and encouragement to communicate with their utility early and often about utility expectations and requirements for distributed generation projects. Additionally,

staff should explore even greater proactive intervention at the individual utility level (especially with National Grid) to expand relationships and enhance utility staff understanding of CHP and of owners' perspectives on the development of CHP projects. Finally, staff should continue its work with policy makers and other stakeholders to achieve policies and standards that provide even greater support for DG-CHP systems.

Conclusion 2: This process evaluation did not inquire into the metrics used by staff to determine when a demonstrated approach is ready for support through a deployment program. An understanding of these metrics would be useful in measuring the alignment of program goals and activities, and would support a more specific determination of the effectiveness of the program in demonstrating new approaches to DG-CHP installations and in advancing the market for DG-CHP.

Recommendation 2: To help to evaluate the effectiveness of the program's efforts to demonstrate new approaches to DG-CHP installations and to advance the market for DG-CHP, and to aid evaluating the alignment of program goals and activities, consider reviewing and further developing the program metrics used by staff to determine the point at which demonstrated approaches are ready for support through a deployment program.

Conclusion 3: Confusion about NYSERDA's CHP offerings is commonplace. Neither facility owners nor generally more technically sophisticated project developers are always clear about which systems are supported in which facilities under which PONs. However, because the demonstration program is oversubscribed, this confusion has no apparent, direct, negative impact on that program. Further, this confusion transcends the demonstration program in two ways. First, if confusion about CHP offerings has a dampening effect on the number of NYSERDA supported CHP projects in New York State, that dampening effect may be on CHP projects supported by other programs. Second, some of the activities required to dispel that confusion are marketing activities (deployment-program PONs, website navigability and content, CHP brochures) that are outside the purview of demonstration program staff.

Some amount of confusion may arise simply from the complexity of CHP projects. This is particularly true for demonstration projects, which are based on evolving experiences and conditions, and therefore, on evolving program criteria. CHP projects can span several years from preliminary design to operation. Thus, these projects may outlive not only the PON under which they were approved, but even the funding cycle in which they were approved. A result is that project developers sometimes work simultaneously on multiple projects approved under different criteria.

Recommendation 3: To minimize confusion about CHP offerings, NYSERDA should consider a review of the consistency of deployment-program project criteria for CHP projects. (In contrast, to respond to lessons learned and to meet changing market conditions, demonstration-program projects cannot be subjected to rigidly consistent criteria.) Further, NYSERDA should consider a review of the overall marketing of CHP offerings. Such a marketing review should at a minimum, explore inclusion of CHP and DG-CHP as website links, and review the currency and effectiveness of printed CHP marketing collateral.

INTRODUCTION

The New York State Energy Research and Development Authority (NYSERDA) began operating the **New York Energy \$martSM** programs in July 1998. The programs are funded by an electric distribution Systems Benefits Charge (SBC) paid by customers of Central Hudson Gas and Electric, Consolidated Edison Company of New York (Con Edison), New York State Electric and Gas (NYSEG), Niagara Mohawk (doing business as National Grid), Orange and Rockland Utilities, and Rochester Gas and Electric. NYSERDA is a public benefit corporation established in 1975. It administers the SBC funds and the **New York Energy \$martSM** programs under an agreement with the New York State Public Service Commission (PSC). Pursuant to the PSC Order, NYSERDA also oversees and coordinates evaluation of the programs on behalf of the SBC Advisory Group, the independent evaluator of the programs.

In June 2004, Research Into Action, Inc. completed the first process evaluation of the Distributed Generation - Combined Heat and Power (DG-CHP) Demonstration program. This second evaluation builds on the findings from that earlier evaluation and is being conducted in tandem with a market assessment study by Navigant Consulting, Inc.

This introduction provides a general description of the program, outlines the methods used in conducting the evaluation, and describes the contents of this report.

1.1 PROGRAM DESCRIPTION AND HISTORY

The DG-CHP demonstration program focuses on combined heat and power applications of distributed generation technologies at end-user facilities. The first Program Opportunity Notice (PON) for DG-CHP was issued in 2000 using statutory funds (PON 554). As part of the second round of public benefits programs (SBC-2), three additional PONs were released that supported DG-CHP. The SBC-2 PONs included 536, 669, 750, and 800. PONs released to support DG-CHP projects under a third round of funding (SBC-3) include PONs 914, 1043, 1178, 1241, and 1931¹.

The goal of SBC-funded DG-CHP demonstration projects is to contribute, through a greater understanding of the challenges and benefits of CHP, to the growth of combined heat and power installed as distributed generation in New York. The program provides funding for single-site and multi-site (fleet) demonstrations and seeks to improve end users' and project developers' awareness and knowledge of combined heat and power. In particular, through a competitive review process, the program selects projects to fund that are expected to provide lessons for dissemination throughout the market. As one staff contact reported, "The program transcends the notion of MWh reduction. Each project is intentionally selected to go beyond this, and to create lessons learned that will ultimately help the marketplace."

In general, projects selected for funding under the DG-CHP program are those that: 1) increase end-user awareness, 2) document performance (for example, hours of operation, or thermal and electrical power output), 3) provide learning or other benefits, 4) address institutional impediments, or 5) support the expansion of the industry. The program also seeks to address related issues such as distributed-generation permitting, standard interconnection requirements, utility standby service tariffs, technology risk, renewable fuel options such as biomass and landfill gas, and the impact of fluctuating natural gas prices.

The program funds projects that demonstrate leading-edge technological features, or address market barriers. It provides financial incentives to facility owners to demonstrate and validate customer-sited combined heat and power using: 1) commercially available technologies such as reciprocating engines and gas turbines with advanced features such as synchronous-parallel grid interconnection, and 2) emerging distribution-system technologies such as microturbines, fuel cells, and organic Rankine cycle systems.

¹ Projects approved for funding under PON 1931 are not part of this process evaluation because approval of those projects for funding was just occurring after the evaluation began.

Once combined heat and power approaches are validated commercially, they are supported by an application-based incentive approach through NYSERDA's deployment programs such as the Existing Facilities program and the Renewable Portfolio Standard's customer-sited, tier programs.

The DG-CHP program was initiated in 2000 and has evolved significantly, continually seeking important, new, learning opportunities to build on knowledge acquired and lessons learned through prior iterations of the program. This evaluation addresses projects approved for funding from 2005 through 2010 under four SBC-3-funded PONs. The program's evolution is evident in the changing project requirements described in those PONs.

- PON 914 (April 21, 2005) offered funding for DG-CHP demonstrations, feasibility studies, technology transfer studies, and for ease of joint marketing, non-program projects managed by NYSERDA's Power Systems Program, which included new product feasibility studies, and new product development projects.
- PON 1043 (August 22, 2006) deferred new product studies and development to a separate PON that supported power-generation product development, but continued the other PON 914 activities, while adding bonus funding for projects with stand-alone capability that operated in parallel with the grid, and a request for qualifications for contractor services to monitor and collect newly installed DG-CHP system-performance data.
- Among other things, PON 1178 (January 24, 2008) added re-commissioning studies for certain previously funded DG-CHP installations, and for projects that operate in parallel-grid mode, established new eligibility requirements that they must also be capable of operating in stand-alone mode with a "black start" capability and be designed to serve priority loads at the facility during a grid outage. This PON discontinued funding for DG-CHP feasibility studies because such studies began to be done through NYSERDA's Flex Tech program.² PON 1178 also created bonus funding adders for up to two of the following characteristics per project:
 - Location in Con Ed service territory
 - Connection to a "network" or "spot" grid, rather than a radial grid, outside of Con Ed service territory
 - Fueled by a renewable or opportunity fuel, or waste heat, and not eligible for funding under a Renewable Portfolio Standards program
 - Providing a seamless "flicker free" transition between grid parallel and stand-alone operation using the DG-CHP system to serve priority loads during grid outages
 - Being installed in and being part of a "facility of refuge"
- PON 1241 (August 14, 2008) added "fleet" demonstration projects to SBC-3-funded DG-CHP demonstration activities³, and with this PON, funding for studies other than re-commissioning studies was discontinued to focus the program on installations of DG-CHP technologies.

² PONs 1178 and 1241 also included solicitations for re-commissioning studies of previously funded CHP projects. However, no responses were received to that portion of the solicitations.

³ Fleet demonstrations are multiple-site, DG-CHP demonstration projects that have similar electric and thermal loads and common ownership or control, such as a chain of supermarkets. Both PONs 1241 and 1931 solicited proposals for demonstrations of "fleet" installations as well as for individual DG-CHP projects. Two fleet demonstration projects were approved for funding under PON 1241. However, both of those projects were discontinued during the development of their initial DG-CHP systems. The fleet approach included an important learning sequence. An idealized first generation design would be installed at a pilot site and operated through all seasonal conditions. Then an improved second generation design would be rolled-out at replication sites.

Although DG-CHP program funding predominantly supports installations of demonstration projects, program funds are also spent on technology transfer activities (for example, conferences, and performance-data collection and dissemination), and efforts to address market barriers (for example, staff communications with policy-makers and coordination with trade associations). This report addresses experiences with DG-CHP projects that were approved for funding by SBC-3 under one of the four foregoing PONs.

Regarding terminology, NYSERDA uses the term “applicants” to indicate those who request funds from an open-enrollment solicitation that funds all projects that meet the eligibility criteria and for which adequate funds are still available. The term “proposers” indicates those who request funds from a competitive solicitation, but whose acceptance into a program is contingent upon the proposal being judged meritorious by a technical evaluation panel as well as upon the continued availability of adequate funds. The DG-CHP program is the latter; hence, this report uses the term “proposer” throughout.

1.2 PROGRAM MARKETING

In addition to the PONs, awareness of NYSERDA’s DG-CHP demonstration program occurs through staff appearances at conferences, including annual CHP conferences sponsored by NYSERDA, State Emergency Management Office (SEMO) conferences to reach “facilities of refuge,” and hospital conferences. The Northeast Clean Energy Application Center routinely promotes the program, and the program coordinates with the Environmental Protection Agency’s Combined Heat and Power Partnership, which sends notification of NYSERDA’s PONs to its list-serve membership. NYSERDA staff members also serve as nonvoting Executive Committee members of the Northeast Clean Heat and Power Initiative, a policy advocacy organization that includes manufacturers, installers, and other CHP-industry advocates.

As an aid to promoting CHP installations, a NYSERDA sponsored project identified eight influential owners of commercial office buildings in New York City, and identified 10 flagship buildings in each of those owner’s portfolios. Beginning with telephone interviews, the project proponent screened those candidate buildings down to two buildings per owner. A walk-through audit of each of those 16 buildings looked at system sizing, construction costs, and identified common problems and challenges that might be faced by all office-building owners.

1.3 EVALUATION METHODOLOGY

The objectives of the process evaluation are to:

- Document program history and progress to assess:
 - a. Reasons for the current mix of program options
 - b. Steps taken to design and develop program components for DG-CHP
 - c. The role of NYSERDA’s DG-CHP program staff in relation to CHP funding by complementary deployment programs
- Assess the degree to which program activities are in alignment with program goals
- Assess the achievement of program goals including:
 - a. Awareness of NYSERDA CHP options
 - b. Developers’ and end users’ perceptions of other NYSERDA CHP options
 - c. Reasons for participation and for project discontinuation
- Assess the program processes for participants and partial participants for each program component including:
 - a. Experience of the solicitation and selection process

- b. Experience of the contracting process
- c. Experience of the project review and approval process
- Assess the value of services to program participants and partial participants including:
 - a. Developers’ and end users’ perceptions of program value
 - b. The roles developers and end users expect NYSERDA to play
- Assess the impact and value of the NYSERDA CHP websites

In order to ensure the process evaluation was unbiased, interviews were conducted with program staff and with randomly selected project owners and developers. Project owners included both owners with completed or ongoing projects, and “partial participants.” Partial participants are facility owners who had been selected for program funding, but who had withdrawn from the program without installing their project.

In developing the sampling approach, it was assumed that each project included a facility owner and a developer. This resulted in a sampling plan for participating and partially participating firms as detailed in Table 1-1 and submitted to NYSERDA in the evaluation work plan. The subsections presenting the interview findings provide details on the number of facility owners and project developers whom we interviewed.

Table 1-1. DG-CHP Process Evaluation Populations and Samples from Work Plan

Population Group	Data Collection Method	Estimated Population	Proposed Sample	Completed Interviews
Program staff	Phone	8	4	4
Participating owners	Phone	~37	24	24
Participating developers	Phone	~20	15	19
Partially participating owners	Phone	18	14	13*

* Includes four contacts identified as project developers rather than as facility owners.

We used structured interview guides when discussing projects with the facility owners and project developers. Copies of the interview guides for staff, participating owners and developers, partial participants, and nonparticipant owners and developers, who were interviewed by the market characterization team primarily for the market assessment, are provided in appendix A. We asked each contact a similar set of questions to ensure a comprehensive evaluation of the program was obtained—each interview began by assessing the scope of the contacts’ experience with their projects and then proceeded to questions relevant to their role and involvement.

1.4 INTERVIEW POPULATIONS AND SAMPLES

Information provided by NYSERDA resulted in lists of 31 unique participating facility owners and 28 unique participating project developers who represented 35 unique projects, approved for funding under one of the four SBC-3 demonstration-program PONS, that were complete or underway. An interview screening question identified three of these projects as discontinued, that is, as partial participants. We completed interviews with 22 of the remaining 28 facility owners and with 19 of the remaining 25 project developers. Combined, the interviews with participating owners and developers represent 30 projects.

NYSERDA information and interview data also resulted in a list of 21 DG-CHP demonstration projects approved for funding by SBC-3 that had been discontinued. We interviewed nine partial participant facility owners and three developers of those 21 discontinued projects. An additional project developer, interviewed as a nonparticipant, turned out to be the developer for one of the 21 discontinued projects,

bringing the nonparticipant sample size to 10. Interviews with staff occurred in March 2011; interviews with project owners and developers took place in May, June, and July 2011 (Table 1-2).

Table 1-2. Final DG-CHP Process Evaluation Populations and Samples

Group	Population		Completed Interviews	
	Projects	Unique Individuals	Projects	Unique Individuals
Participating owners	32	28	26 (79%)	22 (79%)
Participating developers	32	25	25 (78%)	19 (76%)
Partially participating owners	21	20**	10 (48%)	13** (65%)

* Three partially participating owners also had ongoing or completed projects. Those three contacts are not included in this partial-participant total.

** Includes four contacts identified during their interviews as project developers rather than as owners. Interviews with two of these four partially participating developers used the interview guide for participants, and one of them used the interview guide for nonparticipants.

A further word about the populations and samples: interviews with two “nonparticipant owners” revealed them to be representatives of facilities with completed or underway SBC3-funded demonstration projects, and an interview with one of the “nonparticipant developers” revealed he had a demonstration project approved for SBC-3 funding that had been discontinued. For this report, those two facility owners and that project developer are considered participants and partial participants respectively. Additionally, three “participating” facility owners also had SBC3-funded projects that were discontinued, that is, projects that “partially participated.” Contacts for three additional “participating” projects also reported their projects had been discontinued. However, the facility owner of one of those three projects, whom we then interviewed as a “partial participant,” reported his project is still alive and moving forward. Another “partial participant” also reported his project had not been discontinued. However, NYSERDA staff maintained that project had been terminated, and that contact was not interviewed as a participant.

In addition to these list inconsistencies, which in some cases resulted in different interview guides being used to interview members of the same population, contacts for both participating and partially participating projects experienced different project steps during their involvement with the many aspects of their DG-CHP projects. Further, three of the partial participant interviews were brief, revealing little more than the reasons the projects were terminated.

For the foregoing reasons, the sample sizes of the contacts in the following narrative vary from topic to topic. In spite of these variations, we have viewed the data cumulatively, and have taken pains not to double count or to under report the experiences of the contacts. Finally, in this report, we did not count any given contact as a representative of more than one population, regardless of the population from which they originated or of the instrument used for their interview.

1.5 REPORT CONTENTS

This report is a documentation of the process evaluation and includes conclusions and recommendations for program enhancement.

The next section provides a detailed description of the program and project experiences as provided by the various samples. In roughly chronological order, the section presents experiences beginning with program awareness, continuing through the various steps in the development and operation of a project, and concluding with lessons learned, future projects under consideration, and suggested program improvements among other topics. Responses of participants, partial participants, and nonparticipants are integrated to provide insights into comparative and contrasting experiences. Interview responses of NYSERDA staff and

other stakeholders are interspersed throughout the section as appropriate. Evaluation conclusions and recommendations are provided in section 4.

Section 2:

PROGRAM AND PROJECT EXPERIENCES

This section discusses the experiences of DG-CHP demonstration project developers and facility owners whose projects received approval under an SBC-3 funded PON. The discussion includes the experiences of contacts whose projects did not move forward or were discontinued, referred to in this report as “partial participants.” The research included interviews with proposers who were approved for funding under PONs 914, 1043, 1178, and 1241.

To provide a deeper understanding of the demonstration program’s background, processes, and effect on the marketplace, we also interviewed four NYSEERDA program staff. Interviews with representatives of 10 “other stakeholders” in New York State, whose activities touch some aspect of DG-CHP installations in the state, provide additional perspective throughout this section⁴.

For a companion market characterization report, a market assessment team from Navigant Consulting, Inc. interviewed a sample of 14 demonstration program nonparticipant facility owners and a sample of 16 nonparticipant project developers. Nonparticipant owners are owners of commercial property, including educational, healthcare, and government facilities in New York State, who have not had a DG-CHP project approved for funding under any of the four PONs listed above. Nonparticipant developers are DG-CHP project consultants who also have not worked with such projects.

Data from those nonparticipant interviews are interspersed throughout this section to provide insight into comparative and contrasting experiences. However, because nonparticipants by definition have had no experience with program processes, we refer to nonparticipants only in passing throughout this process evaluation report. For a full description of nonparticipants’ experiences with DG-CHP, and of their views of the marketplace for these technologies, the reader is referred to the companion market characterization report.

2.1 CHP AND PROGRAM AWARENESS

Interviews with participating project developers confirmed they are a marketing conduit for combined heat and power. Fourteen developers representing 17 projects reported they initiate discussions about incorporating combined heat and power during at least half of their new project conversations with clients (Table 2-1). This compares to four developers representing seven projects who reported their clients typically initiate such discussions.

⁴ “Other stakeholders” interviewed include Con Edison, National Grid, Central Hudson Gas & Electric, New York Power Authority, New York City Economic Development Corporation, New York City Department of Buildings, Northeast Clean Energy Application Center, BOMA, and a private lease-financing company.

Table 2-1. Developer Initiation of Discussions about Using CHP (n=18)

Who Initiates CHP Discussion	Developers	Projects
Usually by developer	4	5
Usually by client	4	7
Discussions initiated by both (developer/client)	Developers	Projects
50/50	7	7
60/40	1	1
67/33	1	1
75/25	1	3
Total	18	24

We also asked participant developers whether they or the facility owner initiated the discussions about their SBC-3 funded demonstration projects. Consistent with the predominance of participating developers who reported they typically initiate discussions about CHP with their clients, the developers reported they initiated most of the discussions about these projects. (Table 2-2).

Table 2-2. Initiation of Discussion about Demonstration Projects (n=18)

Who Initiated Demonstration Project Discussion	Developers	Projects
Developer	7	11
Facility owner	5	5
Mutually arose	2	2
Other third party	1	1
Don't know	3	5
Total	18	24

Participating facility owners' reports of the sources of their awareness of NYSERDA's CHP demonstration program are roughly consistent with the developers' reports regarding these demonstration projects. Specifically, the same number of participating owners (7) reported their developer or other third-party consultant first told them of the demonstration program as the number of owners who reported their program awareness resulted from their own experience or research (previous experience with NYSERDA programs, NYSERDA's website, and other unspecified research). Partial participant owners predominantly reported their awareness of the program came from third parties (Table 2-3).

Table 2-3. Sources of Owners' Awareness of Demonstration Program

Source of Awareness	Participating Owners	Projects	Partial Participants
Developer/consultant	7	8	3
Previous NYSERDA experience	3	3	1
NYSERDA's Website	2	2	1
Unspecified research	2	3	--
Colleague	--	--	1
NYPA	--	--	1
Don't know	6	6	2
Total	20	22	9

Large majorities of both nonparticipant groups reported awareness of the DG-CHP demonstration program. Eight of the 12 interviewed nonparticipant facility owners reported program awareness, and three of them reported they had applied for demonstration program funding. Ten of the 15 interviewed nonparticipant developers also reported familiarity with the program.

We found the other stakeholders to be least familiar with NYSERDA's DG-CHP program. Among the 10 contacts, only two reported familiarity with the program. Those two contacts represented New York Power Authority and the Department of Energy's Northeast Clean Energy Application Center.

2.2 PROGRAM CONFUSION

To aid identification of an appropriate funding source for prospective combined heat and power projects, NYSERDA's website provides a brochure entitled *Combined Heat and Power Program Guide*⁵. The brochure includes an overview list of NYSERDA's combined heat and power programs. The list comprises nine separate programs with varying purposes. Those programs are in addition to the programs described in the four SBC3-funded PONS that are the focus of this evaluation, and to PON 1931, a more recent demonstration program PON. These "programs" address or exclude various distributed generation technologies, sometimes in various combinations with other technologies, in various facility types, for different periods of time. We were unable to find website information for the demonstration program that was presented as straightforwardly as the CHP criteria described for deployment programs. With this variety and the absence of a website for the demonstration program, it is not surprising that all categories of contacts reported confusion about NYSERDA's programs that fund combined heat and power. In spite of the confusion, the demonstration program receives sufficient meritorious proposals that its funding has been oversubscribed year after year.

Program staff is aware of that confusion, as are other stakeholders, who also reported they believe there is program confusion. To help address this issue, NYSERDA will hold a CHP conference in New York City in June 2012 that will focus on clarifying and distinguishing the purposes and formats of NYSERDA's two CHP program streams.

However, some amount of confusion may simply be inherent in the process of implementing a CHP project. This is particularly true of demonstration projects. Specifically, CHP projects can span several years from preliminary design to operation. Thus, they may outlive not only the PON under which they were approved, but even the funding cycle in which they were approved. Funding for demonstration projects in particular is based on evolving experiences and conditions, which are reflected by changing funding criteria. One result is that project developers sometimes work simultaneously on multiple projects approved under different criteria.

⁵ <http://www.nyserda.org/Programs/pdfs/CHP%20brochure.pdf>

Among demonstration program participants, developers reported program confusion more frequently than did facility owners. Nine of the 19 (47%) interviewed developers reported the program offerings generate confusion, compared to reports of confusion by five of the 22 (22%) owners. Three additional developers who reported they are not confused by the various offerings, or who reported they did not know whether there is such confusion, elaborated with comments that suggested they believe others are confused about the distributed generation offerings. Thus, roughly two thirds of the developers (12 of the 19, 63%) indicated the offerings are or may be confusing. Three partial participants also reported confusion about distributed generation program offerings (Table 2-4).

Interviewed nonparticipants further illustrated CHP program confusion. Among these samples, six developers reported there is confusion about program offerings, and the comments of three nonparticipant facility owners indicated they are confused about NYSERDA’s distributed generation offerings. Generally, nonparticipant developers were unsure whether their projects had received NYSERDA funding, and in particular, did not know whether their projects had received demonstration program funding even though by subsequently cross-referencing project names with the program database, we determined several of these contacts had worked on DG-CHP demonstration projects in various capacities.

Table 2-4. Confusion about NYSERDA Funding for CHP

Confusion	Participating Developers	Participating Owners	Partial Participants
Yes	9	5	3
No	5*	13*	1
Don’t know/Unresponsive	4**	4	2
Total	18	22	6

* One developer and one owner for different projects reported no confusion for them, but mentioned possible confusion for those who are “less technically sophisticated.”

** (Two comments) “But I hear from colleagues there is confusion, and that they need to do a lot of explaining to potential clients.” “There could be, the way NYSERDA issues its funds is kind of interesting. They don’t call it a rebate; it’s definitely a different process.”

Participating developers and owners also reported information on NYSERDA’s website, in “flyers,” and in its PONS does not sufficiently clarify their confusion about distributed-generation incentives. Two of the participating owners mentioned a need for an improved website, and in addition to the comments noted with Table 2-4, above, participating developers commented:

- “Even as an engineer I’m not always aware of what’s out there; they should have a CHP program all the time, not on an on-again, off-again basis.”
- “[T]here is a lot of confusion because NYSERDA programs, some are dated, some are competitive, some are open, some measurement driven, and some programs change their names.”
- “We get a lot of phone calls asking the difference between programs, and what [the caller] is eligible for; I refer [callers] to the NYSERDA website, which they tell me is confusing. NYSERDA could reduce confusion by reducing the amount of PON numbers and putting better descriptive information with the PONS; better titles would make them more intuitive.”
- “I don’t know what steps NYSERDA can take to minimize [the confusion]; perhaps clearer information on the website is needed; my colleagues often have to hunt down what they want.”
- “NYSERDA could improve its website by making it easier for non-experts to use.”
- “We get NYSERDA flyers. They are all confusing about how much is available, when, and so on. If it looks like it might apply, then we sit down with NYSERDA to find out the details.”

This last comment was echoed by a number of the participants regarding their approach to resolving confusion or uncertainty about NYSERDA programs in general. Fortunately, reports of communications with NYSERDA to resolve program issues were highly favorable.

2.3 COMMUNICATIONS WITH NYSERDA

Communications about DG-CHP demonstration projects between NYSERDA staff and the participating owners and developers were reported to be excellent. The interviewed facility owners and project developers unanimously lauded communications with NYSERDA staff, particularly communications following contract approvals. All 22 participating owners who were asked about communications with NYSERDA, and 16 of the 19 participating developers, reported positive experiences and described communications or staff in terms such as “excellent,” “timely,” “responsive,” and “knowledgeable.” The three remaining participating developers reported insufficient contact with NYSERDA during their CHP demonstration projects to have an opinion about communications with NYSERDA.

Partial participants generally concurred with the participants in their assessments of communications with NYSERDA. Six of the eight contacts who were fully interviewed reported positive experiences, saying NYSERDA staff members were available and responsive. One of the remaining two partial participants reported satisfaction with NYSERDA’s responses except that those responses were slow to be forthcoming. The final contact reported no communication with NYSERDA.

Additionally, staff reported communications within NYSERDA regarding distributed generation projects occur formally as well as informally, as needed, and are effective for the various staff members who work with distributed generation projects to stay abreast of their colleagues’ activities and to share experiences and lessons learned.

2.4 BENEFITS FROM PROGRAM PARTICIPATION

This subsection describes the benefits participating facility owners expected to realize through participation in the DG-CHP demonstration program. Along with these owners’ responses, we have included lessons that participating developers and owners reported they expected to learn from their projects. The most frequently reported benefit expected from program participation was the program-provided funding, mentioned by 12 participating facility owners and five partially participating facility owners. The next most frequently reported anticipated benefit was to obtain greater knowledge or to demonstrate the effectiveness of the technology employed by their respective projects, followed closely by expectations of energy and cost savings (Table 2-5).

Table 2-5. Benefits and Lessons Expected (Multiple Responses Allowed)

Benefit/Lesson	Participant Developers (n=19)	Participant Owners (n=24)	Partial Participants (n=10)	Total
NYSERDA Funding	--	12	5	17
Greater knowledge of technology’s effectiveness	1	7	2	10
Energy and cost savings	1	6	2	9
NYSERDA’s expertise/technical support	--	4	1	5
To be green (message or image)	--	4		4
Environmental benefits	--	3	1	4
Greater knowledge of project economics	1	1	2	4
Enhanced academic program/teaching tool	--	1	1	2
Electrical self sufficiency	--	--	2	2
Other	3	5	1	9

“Other” expected benefits and lessons include:

- Savings on system maintenance
- The ability to track all system-related data
- Knowledge about the stance of the utility toward CHP
- Greater energy reliability
- Load reduction
- Learning how much energy the organization can generate
- Greater economic control through forward-looking purchases of natural gas

A partial participant also reported use of the facility’s waste heat as an expected benefit of his project.

2.5 PROJECT DEVELOPMENT ACTIVITIES

Interviews with participating facility owners and developers identified and discussed the project steps in which contacts participated. Specific project steps included proposal development, contracting with NYSERDA, project design, equipment acquisition, project installation and commissioning, negotiations with the utility, and project operation. With the exception of the proposal review process and experiences with utilities, these steps presented few difficulties for participating owners and developers.

2.5.1 Proposal Development

To compete for demonstration project funding, a project proposal must be developed and submitted to NYSERDA. During proposal development, program staff members answer questions regarding eligibility and provide general advice about the wisdom of installing CHP. However, because staff members participate in judging the merits of the proposals, they do not preview or critique proposals while the proposals are under development. Upon receipt of a proposal, the proposer is notified, and the proposal undergoes review to determine its suitability for funding.

To review CHP proposals, staff members assemble a technical evaluation panel that includes experts consisting of both NYSERDA staff and external reviewers. More specifically, the panel includes more external members than NYSERDA staff, with one of those external members being a staff member of the New York State Department of Public Service. Proposals are distributed to the panel one month in advance of its meeting. Following the panel’s meeting, at which each proposal is discussed and ranked and a funding cut-off point determined, panel decisions go to a team-level review within NYSERDA and from there to a senior-level review. Thus, even though PONs typically indicate “NYSERDA expects to notify proposers in approximately ten (10) weeks from the proposal due date whether your proposal has been selected to receive an award,” several months typically elapse between submission of the proposal and receipt of notification of acceptance for funding.

Both developers and facility owners participated in proposal development for their demonstration projects. Among the 43 interviewed participants, 24 (8 developers and 16 owners) described the process of proposal development in terms such as “smooth” or “easy,” and reported proposal development times from less than a week to three months. Three additional developers reported times from six months to one year for proposal development. However, none of these three contacts expressed concerns about the process, and all three of those reported time periods included the time to draft feasibility studies as well as the time for proposal development.

In contrast to the preceding responses, eight contacts reported concerns with the proposal development process. Two of these eight participants were the project developer and the facility owner for the same project. Their concerns were about the expense (\$10,000) of the process, and about the length of time (one year) their proposal was under review before it received funding approval. However, in spite of these

concerns, these two contacts reported the proposal development itself “was not difficult” and took no more than four weeks.

Two other participants who reported proposal development concerns were the owner of two projects and the developer of two other projects. One of these contacts reported, “The process was difficult,” but could not remember details, and the other simply reported the process was “time consuming.” Two of the remaining three contacts were more specific, and their comments echo the concern about the length of time for proposal review and approval, rather than a concern about the proposal development process. One reported, “Both the review and approval process took a lot longer [6 months] than expected.” The other contact reported, “It took one year for final scope approval.”

Another facility owner reported the proposal involved “a lot of number crunching,” and “ultimately wasn’t clear.” However, that contact’s proposal was actually written by his developer, who reported the process “was fairly straightforward” and was completed in two to three weeks.

Seven partial participants reported involvement with the development of their project proposals. These contacts reported this step took from three weeks to six months, but was otherwise described as “fairly easy,” of “appropriate difficulty for the project,” “straightforward,” and without problems.

2.5.2 Contracting with NYSERDA

Three participating developers and 10 participating owners who had participated in the contract negotiation process with NYSERDA reported that process went smoothly or was easy. Only a single contact, a participating owner, expressed a concern about the process. That contact reported, “It took a long time [five months] after notification of selection to get a finished contract with NYSERDA.” For that project, the developer’s perspective on that process is unknown because the developer was unavailable during the time of the interviews. The duration of contract negotiations reported by all other contacts was three months or less.

Three partial participants whose projects progressed sufficiently for them to experience this contracting step also reported contracting with NYSERDA was “easy,” and took no more than “three or four weeks.”

2.5.3 Project Design: Reasons for Technology Selection

Participants offered an array of reasons for the selection of the particular technology employed as the prime mover for their projects. Although the most frequently mentioned reason was the match between the facility’s load requirements and the size of the chosen unit (nine mentions), the variety of reasons for technology choices reflects an ad hoc approach to technology selection that includes consideration of a combination of factors. These factors include a desire for stand-alone capability, maintenance considerations, a desire to be “green,” previous experience with the technology, the fuel source, a consultant’s or sales representative’s recommendation, and other considerations in addition to electrical and thermal load (Table 2-6).⁶

⁶ Duplicate mentions, by the developer and the facility owner, of the same reason for the same project have been excluded from these counts. Thus, each mention reflects a single project.

Table 2-6. Participants’ Reasons for Technology Selection (Multiple Responses Allowed)

Reason	Micro-turbine (n=10)	Reciprocating Engine (n=11)	Fuel Cells (n=6)	Organic Rankine cycle (n=1)	Combustion Gas Turbine (n=1)	Steam Turbine (n=1)	Total (n=30)
Unit matched load requirements/size of unit	4	2	1	--	1	1	9
Stand-alone/standby-power capability	3	3	1	--	--	--	7
Low maintenance	4	1	--	1	--	--	6
Reduce carbon footprint/go green	1	1	2	--	1	--	5
Consultant/manufacturer credibility	--	1	1	--	--	1	3
Previous experience	1	1	1	--	--	--	3
Simplicity/Ease of installation	3	--	--	--	--	--	3
Efficiency	--	1	--	1	--	--	2
Price	1	1	--	--	--	--	2
Reliability	2	--	--	--	--	--	2

Other reasons participants gave for selecting a particular technology, mentioned once each, included:

- To burn methane/digester gas (reciprocating engine)
- To control energy costs with long-term gas contracts (reciprocating engine)
- The fuel cell vendor discontinued involvement (microturbine)
- The location of the system (rooftop, reciprocating engine)
- To obtain the available incentives and tax credits (fuel cells)
- To operate both in parallel with the grid and as standby power (reciprocating engine)
- The quality of the power produced (microturbine)
- Proven technology (reciprocating engine)
- Quieter than a reciprocating engine (microturbine)
- Safety considerations (high-pressure steam use, organic Rankine cycle)

Partial participants’ reasons for selecting the technology for their projects were equally varied and are shown in Table 2-7.

Table 2-7. Partial Participants’ Reasons for Technology Selection (Multiple Responses Allowed)

Reason	Micro-Turbine (n=4)	Reciprocating Engine (n=4)	Organic Rankine Cycle (n=2)	Total (n=10)
Matched load requirements/size of unit	2	--	--	2
Stand-alone/standby-power capability	2	--	--	2
Proven technology	--	2	--	2
Fuel pressure requirement matched existing distribution pressure	--	1	--	1
Multi-unit flexibility	--	1	--	1
Off-grid project with source of natural gas	1	--	--	1
Price	--	1	--	1
To create a showcase green facility	--	1	--	1
To use waste heat	--	--	1	1
To meet renewable energy standards (biogas fueled)	--	1	--	1
To support academic program	--	1	--	1

2.5.4 Project Design: Challenges

As might be expected, more developers than facility owners reported design challenges. The most frequently mentioned design challenges for these projects arose from installing new equipment in existing facilities. Specifically, of the 14 contacts, including both participants and partial participants, who reported design challenges, eight reported retrofit-related challenges. Most frequently, those challenges were specified as space limitations (four mentions). Other remodel or retrofit challenges included identifying where and how to install a new high-pressure gas line, where and how to connect existing below-grade electrical service to a rooftop unit, and where to locate coils for waste heat. Four other contacts reported challenges dealing with their facilities’ thermal loads. Other reported challenges related to noise minimization and simply finding a firm to develop the system design (Table 2-8).

Table 2-8. Design Challenges (Multiple Responses Allowed)

Challenge	Developers (n=18)	Owners (n=24)	Partial Participants (n=3)
Retrofit space limitations	1	2	1
Other unspecified remodel/retrofit challenges	4	--	
Where/how to use all waste heat	3	--	1
Minimizing noise	1	1	
Finding a firm interested in designing the system	--	--	1

2.5.5 Equipment Acquisition Experiences

Most participant projects’ prime movers were readily available, and for projects employing microturbines or fuel cells, were often described as “off the shelf.” Even though interviewed participating developers and facility owners reported long lead times (8 to 10 months) for delivery of some prime movers, particularly combustion turbines, a foreign manufactured Rankine cycle system, and customized reciprocating engines, only a single project reported an unexpected delay in delivery of their prime mover. That project employed

a reciprocating engine that arrived after seven months instead of the expected three months. A single partial participant reported “a long lead time” for the delivery of microturbines for his project.

Acquisition of the various connected equipment and components, however, particularly equipment related to heat recovery, was more problematic for some of these projects. Contacts for two fuel cell projects and for a project with a reciprocating engine reported long lead times or delays in obtaining custom heat exchangers and storage tanks for their heat recovery systems. One microturbine project experienced difficulty obtaining equipment, such as pumps, required to connect to the microturbine to complete the CHP system.

2.5.6 Experiences with Utilities

We completed interviews with projects served by five utilities, Central Hudson Gas & Electric (Central Hudson), Consolidated Edison (Con Ed), National Grid, NYSEG, and Rochester Gas & Electric (RG&E). Projects served by Con Ed outnumbered the combined projects served by the other four utilities. Contacts reported difficulties working with all five utilities, but the incidence of such reports was far lower for projects served by Con Ed than it was for the other utilities (Table 2-9). In fact, as described further below, more contacts for more projects within Con Ed territory reported favorable experiences with Con Ed than the number of contacts and projects with unfavorable Con Ed experiences.

Seven partial participants reported their projects advanced sufficiently for discussions with a utility to occur. These projects were served by Central Hudson (one project), Con Ed (one project), National Grid (two projects), and NYSEG (three projects). With the exception of one contact who reported NYSEG was “slow,” those contacts characterized their experiences working with the utilities as good.

Table 2-9. Utilities Serving Interviewed Projects (n=37)*

Utility	Number of Projects	Projects with Reported Difficulties with Utility
Con Ed	18	5
National Grid	12	7
Central Hudson	2	1
NYSEG	4	2
RG&E	1	1

* Includes seven partial participants.

Difficulties with utilities reported by participants included lengthy negotiations (up to three years) and lengthy reviews, poor communication, adding or changing requirements, a less than welcoming attitude toward distributed generation, and excessive fees or charges (Table 2-10).

Table 2-10. Reported Difficulties with Utilities (Multiple Responses Allowed)

Difficulty	Central Hudson	Con Ed	National Grid	NYSEG	RG&E	Total (n=16*)
Delay/Slow	1	5	6	2	1	15
Communication	--	--	3	--	--	3
Changing/additional requirements	--	--	3	--	--	3
Extra equipment/design required	--	2	2	--	--	4
Discouraging attitude toward DG	--	2	--	--	1	3
High fees/charges	--	--	2	--	1	3

* This sample size represents contacts who expressed concerns.

Interconnection with the electric grid and standby charges were the most frequent sources of difficulties with utilities for the interviewed contacts’ projects. Contacts for 11 of the 15 projects about which difficulties were reported mentioned some aspect of grid interconnection or standby requirements. Difficulties arose for projects whether or not they were designed to feed power into the grid.⁷ The most frequently reported interconnection difficulty was delay, but grid interconnection underlay at least one complaint in every category of difficulty shown in Table 2-10, above. For a full discussion of the impact of standby charges and interconnection issues on the CHP market, see the companion market characterization report.

In spite of the foregoing difficulties with utilities, there were many positive comments about the utilities as well. In fact, reported difficulties were often mitigated, if not contradicted, by comments of another contact for the same project, or even by the same contact who reported the difficulty. For example, the contact who reported lengthy negotiations with NYSEG also described utility staff as “helpful” and “professional.” As another example, the perception of a developer contact who reported, “The whole attitude of Con Ed is discouraging,” was countered by the owner of that project who reported, “Con Ed was very cooperative.”

The preceding offsetting comments are illustrative in another way as well. Owners generally reported positive experiences with utilities more frequently than did developers. Regarding Con Ed in particular, five other facility owners whose projects are within Con Ed’s territory made comments such as Con Ed was “very responsive, thorough, and meticulous,” “not a problem working with Con Ed,” “have had a good experience with Con Ed,” and “Con Ed is nice,” although the latter owner also described Con Ed as slow. Additionally, a project developer reported “good communications” and “no problems” working with Con Ed.

Some participants also described their interaction with National Grid in positive terms. For example, one owner reported, “We have a great relationship with National Grid; they were easy to work with.” Two other owners echoed this, one saying, “Overall National Grid has been good,” and the other reporting, “National Grid has been pleasant, no delays.” Even an owner who expressed concern about the length of time his project was under review (more than a year) also reported, “communications with National Grid were good.” In addition, a developer who reported he understood, “communications with National Grid were very difficult,” was contradicted by the project owner, who actually interacted with the utility, and who reported, “It went well including the interconnect agreement.”

NYSERDA staff reported seeing improvements at all utilities regarding the utilities’ “understanding, acceptance, and support” of combined heat and power projects, and confirmed participants’ mixed experiences with utilities, saying, “Utilities have split personalities. Sometimes they go out of their way to be helpful. Other times they go by the letter of law rather than acting more broadly within the spirit of the law.”

⁷ Almost all projects were designed not to feed power into the grid.

One of the other stakeholders suggested the DG-CHP program would be “dramatically more successful if there were a real partnership with utilities.” But that contact added it is beyond NYSERDA’s role to create such a partnership, saying it is a more appropriate role for the Public Service Commission or other state agency.

Viewing contacts’ varying accounts of their experiences with utilities overall, three reasons for their differing experiences are suggested. These reasons include 1) differing levels of utility experiences with distributed generation, 2) different levels of contacts’ experiences with such projects, and 3) differing pre-existing relationships between the contacts or their organizations and their respective utilities.

2.5.7 Installation and Commissioning Experiences

Except for their concerns about their interactions with utilities, the interviewed participants reported encountering few difficulties during the installation and commissioning of their CHP projects, and those few reported difficulties were typically unrelated to the program or to the type of CHP prime mover employed by the project. Reported difficulties included:

- Utility-caused delays (14 projects)
- Tenant-related delays (2 projects)
- Weather-related delays (2 projects)

Other reported difficulties each reported by a single project included:

- Complications from the project’s “required” time schedule
- Difficulties working with the general contractor
- Gas supply pressure issues
- “Hiccups” tying into the building’s chilling operations
- An issue about which a contact was unwilling to elaborate

The participant contacts’ commissioning experiences occurred without major difficulties. Sixteen contacts reported commissioning experiences with 13 projects. Contacts for all of these projects reported nothing more challenging during commissioning than “minor” engineering challenges due to a project’s complexity, having to “fine tune some things,” and equipment that did not at first perform to the manufacturer’s specifications. The most challenging commissioning experience described by these contacts was with a project that had to install valves related to chilled water issues, and to rewrite the sequence of controls to avoid damage to an absorption chiller. Even the contact for that project reported, “It was not major; it’s running fine now.”

2.5.8 System Operation and Performance

The scope of this evaluation did not include an in-depth performance investigation of CHP systems that have received program funding. However, during its interviews the team did ask CHP developers and system owners about the performance of their systems. Twenty contacts for 17 projects offered appraisals of their systems’ operation and performance. For the most part, the interviewed project developers and facility owners are pleased with the performance of their CHP systems. Nonetheless, 10 contacts representing eight different projects reported operating or performance issues with their systems that resulted in system downtime or lengthened the projects’ estimated payback. Reported difficulties arose with all types of systems except organic Rankine cycle systems, of which none were operational among the interviewed projects (Table 2-11).

Table 2-11. Problems with System Operation (n=8)

Prime Mover	Problem
Microturbines (three projects)	<ul style="list-style-type: none"> • System frequently goes down for unknown reasons that are suspected to originate with the control system • Seal failures; thunderstorms have caused shutdowns from which the unit will not automatically restart • Unspecified problems characterized by a microturbine’s manufacturer as “unusual,” and a problem of too much heat buildup in the room where the microturbine is located, impairing its performance
Fuel Cells (one project)	<ul style="list-style-type: none"> • Problems after three years of operation that the manufacturer had difficulty troubleshooting; the unit has been down several times, the longest of which was five weeks; problem components have included relays, connectors, pumps, and valves
Turbines (two projects)	<ul style="list-style-type: none"> • Unspecified issues with duct burners and heat recovery steam generators (steam turbine) • Gearbox failure, and generator and bearing failures (gas turbine)
Reciprocating engines (two projects)	<ul style="list-style-type: none"> • Bearing failures and failures of fasteners that hold magnets to rotors in generators • Cooling side has not met expectations requiring some redesign and new cooling towers

The foregoing problems notwithstanding, contacts for four of the preceding eight projects reported overall positive experiences with the operation of their CHP systems. Specifically, both contacts for one of the microturbine projects (frequently goes down) reported their system has performed “very well,” with no major mechanical issues, no noise or emissions, and greater efficiency than expected; both contacts for one of the turbine projects (issues with duct burners and steam generators) made positive statements about their system’s performance, and the contact who reported the operating problems also reported there have been no noise or emissions problems and payback is on track, while the project’s other contact reported the system’s performance has been “very, very good,” and “better than its specifications.” The contact for the other turbine project (gearbox, generator, and bearing failures) also reported that project is “doing very well on operational cost and reliability;” and one contact for one of the reciprocating engine projects reported the bearing and fastener failures were covered by warranty, while the project’s other contact reported the system has performed as expected. Ten other contacts for nine other projects reported their systems are performing at or beyond expectations.

Some contacts who had previous experience with distributed generation systems made comparisons between the performance of those systems and their current demonstration projects. Specifically, one contact compared his demonstration project microturbine to previously installed fuel cells, saying the microturbine was easier to install and is lower risk than the fuel cells. Another contact favored his demonstration project fuel cells because they require less maintenance than his previous reciprocating engines and gas turbines. In addition, a third contact preferred his demonstration project fuel cell because it was a newer model than was used in previous fuel cell installations. Finally, a contact reported his microturbine demonstration project is performing well as did his previous microturbine projects. Contacts for seven other projects were unable to make performance comparisons with their previous distributed generation projects.

2.6 INTEGRATED DATA SYSTEM

NYSERDA’s CHP integrated data system provides remote access to performance and reliability data collected on NYSERDA’s demonstration project sites. Among other things, the system’s database allows users to view, plot, analyze, and compare performance data from one or several different DG/CHP sites in the NYSERDA portfolio. Generation of data through this system is a project deliverable, and therefore, a prerequisite for incentive payment for CHP demonstration projects.

While somewhat technically challenging, the process of meeting the requirements for data generation is working well. Four developers and four owners representing eight different projects reported direct or indirect involvement in setting their projects up with NYSERDA’s DG-CHP Integrated Data System. Developers with some involvement included a developer who merely “helped coordinate” the process. Two of the remaining three developers described writing the specifications and submitting a monitoring plan, respectively, that were otherwise uneventful. The fourth developer reported “a lot of technical challenges with communications protocols.”

Two of the four owners reported their in-house staff set their projects up with the Integrated Data System. One of these two contacts reported, “It was a bit of a challenge, but it went pretty smoothly.” The other owner whose in-house staff performed that work reported, “It went fine.” Third-party contractors did this work for the two remaining owners, who reported differing experiences. One of these two owners, for whom the work was done by the manufacturer of their system, reported the process was “pretty straightforward.” The other owner reported the process was “a little confusing dealing with this other company,” and expressed a concern, saying, “Dealing with IT presents computer security issues for our company.”

2.7 MAINTENANCE

Maintenance on most (28 of 36) of the CHP systems that were the subject of an interview is, will be, or was to have been performed by third-party contractors, who most often are the manufacturer or the project developer (Table 2-12). Although contacts for some projects reported in-house staff members conduct “routine” maintenance such as oil changes, participating contacts reported only a single project for which CHP-system maintenance is conducted entirely in-house. A participating developer for one of the remaining eight projects for which the maintenance approach had not been decided, reported he had recommended the owner purchase a maintenance contract from a CHP-system provider. Reported lengths of maintenance agreements ranged from three years to 10 years.

Table 2-12. Maintenance Provider (n=36)*

Prime Mover	Manufacturer/ Developer	Unspecified Third Party	Unknown/ NA
Fuel cell	6	--	--
Microturbine	7	7	2
Reciprocating engine	3	2**	6
Organic Rankine cycle	1	--	--
Turbine	--	2	--
Total	17	11	8

* Includes six partial participants.

** Includes a partial participant’s project that was to have been owned and operated by a third party.

Fourteen participants reported 13 different previous maintenance experiences with distributed generation projects⁸. For seven of these contacts who represented six demonstration projects, the approach to maintenance of previous distributed generation systems was the same as for their demonstration projects, and all but one of these six contacts reported continuation of the use of third parties for all system maintenance. That one remaining contact reported a continuation of in-house staff for routine maintenance and a third-party for “major overhauls.” Considerations for approaches to system maintenance included

⁸ The developer and the owner for one project reported the same previous experience with distributed generation.

staffing (“Are your people qualified to do it?”), and financial (How good a deal are you getting with the maintenance contract?” and “Do you want to invest in training in-house staff.”)

2.8 PAYBACK

Participants’ estimates of the amount of time required to realize energy and cost savings equivalent to the cost of purchasing and installing their demonstration projects ranged from two to three years (one project) to just under 10 years (three projects). A plurality of the projects expected payback to range from four to seven years (eight projects). Interestingly, payback was not a consideration for all of these projects. For example, a contact for one project reported, “The issue was always finance, not payback; it was the equity participation that mattered. On this project the NYSERDA grant and the tax breaks helped move the project forward.”

Few of the SBC-3 demonstration projects had sufficient operating experience at the time of the interviews to have provided payback performance data to the project developers and owners. Contacts for six projects reported their projects were on track to meet or exceed their payback projections. However, one of those reports came with a caveat. Contacts for one of the preceding six projects, a project that was reported to be “on track,” were “not as happy as we thought we would be” because of utility standby charges and the need to continue “tweaking the thermal.” Thus, although that project appears to be meeting its payback projection, unforeseen events had made the payback more marginal.

Contacts for three additional projects also suggested their projects are having similar or even greater difficulty meeting payback projections. Like the project subject to the caveat in the previous paragraph, anticipated payback for two of these three projects had been negatively impacted, at least in part, by unforeseen utility charges. One of these three projects had “marginal” savings that were less than expected because of “demand charges” and high natural gas costs. For the second of these three projects, the payback period was originally five years, but that period had been increased to eight to nine years because of “penalties” associated with the utility’s “contract demand rate,” and additional redesign costs to address the issue of inadequate cooling.

Contacts for the third project, who did not explicitly address project payback, implied their payback projections may be in jeopardy because their fuel cell, after performing reliably for almost three years, had begun to experience unexpected and unexplained problems that had resulted in weeks of downtime for the system. However, like the project mentioned in the first paragraph, payback may not have been a consideration for this project. Specifically, one contact for the project reported, the project was not “economical” even with NYSERDA funding, other grants, and additional discounting from the manufacturer. In spite of that, the owner wanted to proceed with the project to learn whether the approach could work and be transferred to its other similar properties.

All in all, contacts for nearly half (three of eight⁹) of the projects for which contacts specifically discussed payback, reported utility charges had contributed to the marginalization or increase of their projects’ original payback projections. And together the preceding projects speak to the predominant risks to project payback that are inherent in DG-CHP projects, namely, unforeseen utility charges, fluctuating fuel costs, thermal load and use fluctuations, and technology performance issues.

Both participants and nonparticipants reported a variety of other payback experiences with non-SBC-3 funded projects both within and outside of New York State. Those comments are addressed in the companion market characterization report.

2.9 PROJECT FINANCING AND OWNERSHIP

Participants and partial participants reported an array of financing arrangements used or planned to fund a total of 33 projects. Most frequently, these projects were self funded, using operating budgets, capital reserves, or endowment funds. Two other financing methods were common among these projects described

⁹ Does not include the fuel cell project that experienced unexpected and unexplained problems.

by 14 developers, 19 owners, and 8 partial participants. Along with self funding, borrowing, including commercial loans and bond issues, and lease-purchase arrangements were also common methods of financing these 33 projects. Lease purchase agreements included power purchase agreements, and typically allow the facility owner to purchase the system for a nominal sum at the end of the lease term. In addition to NYSERDA funding, other financing also included public-private partnerships and grants (Table 2-13).

For-profit organizations self financed their projects more frequently than did government and nonprofit organizations. Three projects undertaken by government or nonprofit organizations were to have been funded and owned by third parties, an approach not taken by any of the for-profit organizations. All three of those projects were discontinued.

Table 2-13. Funding Arrangements for Demonstration Projects (n=33)

Funding Sources	Government/ Nonprofit Organizations	For-Profit Organizations	Total Projects
Self financed	5	6**	11
Loan	5*	4*	9
Lease-purchase	4	3	7
Third-party funding & ownership	3	--	--
Bond issue	1	--	1
Grants	1	--	1
Public/private partnership	1***	--	1
Total Projects	20	13	33

* Contacts for one for-profit organization and one nonprofit organization reported using a NYPA or NYSERDA program to lower their interest rates.

** Includes a project that also received grant funding as well as cost sharing by the system vendor.

*** The “public” part of this arrangement is self financing.

Nonparticipating developers’ and facility owners’ reports of financing arrangements for projects in which they have been involved echoed the variety of participants’ reports, specifically mentioning self funding, power-purchase agreements, leases, commercial loans, venture capital, bond issues, and grants.

With one exception, the participating facility owners do or will own their DG-CHP systems outright. The exception is a leased facility in which the combined heat and power system using a fuel cell is considered to be a fixture, and therefore, part of the building.

2.10 PREVIOUS EXPERIENCES WITH DISTRIBUTED GENERATION

Sixteen participating developers and eight participating owners reported previous financing and ownership experiences with distributed generation systems. Pluralities of both the developers (7 of 16) and the owners (3 of 8) reported the financing and ownership of their demonstration projects were typical of the previous distributed generation projects with which they had been involved. More specifically, those projects were the same in their various approaches to owner financing (borrowed, self-funded, lease-purchase), and in the facility owners’ outright ownership of the systems. Five of the participating developers and two participating owners reported financing and ownership vary from project to project depending on the client, the client’s goals, and the client’s ownership structure (Table 2-14).

Table 2-14. Previous DG and Demonstration Project Financing and Ownership

Comparison	Participant Developers	Participant Owners
They are the same	7	3
They vary by project	5	2
Demonstration project atypical	3	1
Don't know/NA	1	2
Total	16	8

One partial participant with previous distributed generation experience reported the approach to financing and ownership of his discontinued demonstration project, namely, third-party ownership, would have been consistent with other projects in which he has been involved. That contact's response is not included in Table 2-14.

Participating developers' previous experiences with distributed generation also provided comparisons between working in New York State and working on CHP projects in other states. Market comparisons between New York and other states are addressed in the companion market characterization report. The following paragraphs provide only a brief overview of the contacts experiences in other states.

Thirteen developers reported previous experience working with CHP projects in 19 states and several unspecified foreign countries in addition to their current and former projects in New York¹⁰. The length of developers' experience with CHP projects in other states ranged from eight to 35 years. Four of these 13 developers reported New York State is "easier," or "the best" place to work, or has "a more mature process," and all four of those contacts attributed those conditions to NYSERDA. One of these four developers added, "Standby charges have been an issue in New York," and, "Having the Public Service Commission decide which technologies are funded is a limitation."

None of these 13 developers offered the names of states or programs they believe could serve as a model for NYSERDA CHP programs, and three of the 13 reported NYSERDA is the model. One of these three explained her statement by saying, "They are the clearest as far as expectations; they put everything in writing; other states seem to make it up as they go along." Nonetheless, participants reported New Jersey has good incentives, and mentioned both Connecticut and Massachusetts programs as having "good things and bad things." Another participant reported, "There are some smaller very efficient technologies [fuel cells of ~100kW] only for sale in California because California designed an incentive program for it."

In other comparisons between project development in New York and in other states, a developer contact reported other states (Tennessee and Virginia) have lower standby charges, and are friendlier to CHP projects, although "interconnect issues are the same," but added, those states have no funding source like NYSERDA. One contact unfavorably compared the work for his demonstration project with his out-of-state work by describing difficulties arising from New York State's public agency bidding requirements. Two of these 13 developers reported their experiences in other states were too old to be relevant. As mentioned above, a complete discussion of the various contacts' experiences working with distributed generation in other states, and of barriers to the wider adoption of DG-CHP systems may be found in the companion market assessment report.

¹⁰ Other states where these developers have worked on CHP projects include California, Connecticut, Florida, Hawaii, Indiana, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Vermont, Virginia, and Wyoming.

2.11 LESSONS LEARNED

Unlike the participating developers’ previous experiences with distributed generation, which focused on direct comparisons with projects and programs with which they had worked, the participating owners’ experiences tended to offer insights into lessons they had learned for CHP projects.

Six participating facility owners shared lessons from their earlier experiences with distributed generation. Two of these contacts mentioned an issue addressed above in the subsection on design challenges, namely, the “major” issue of fitting projects into existing facilities and connecting them to existing systems. Related to that issue, another one of these owners advised, “A lot of preplanning is the key to success; ensure that when the design team is on site, they really think it through so that when construction starts there are no surprises.”

Broadly speaking, participating developers and owners learned four lessons from previous distributed generation projects and from their current demonstration projects. The most frequently mentioned lessons were the notions of unexpectedly lengthy project steps (nine mentions), and the cardinal importance of knowledgeable and adequate numbers of staff (eight mentions). Seven contacts mentioned the need for careful planning, while the importance of careful budgeting received six mentions (Table 2-15).

Table 2-15. Lessons Learned (Multiple Responses Allowed)

Lesson	Developers (n=14)	Owners (n=13)	Total
Project steps take more time than anticipated*	6	3	9
Adequate/knowledgeable staff/consultant is essential	1	7	8
Plan/design carefully	2	5	7
Budget carefully	5	1	6
Smaller systems are not cost effective (all microturbines)	3	--	3
Staff coordination is essential	--	2	2
Other	5	5	10

* Includes four developer and two owner reports of utility-caused delays described in “Experiences with Utilities” above. Other participants who reported utility delays did not express those delays in terms of lessons learned.

Particular advice comprising some of the categories in Table 2-15, above, is shown in Table 2-16.

Table 2-16. Specific Lessons Learned

Lesson Category	Specific Lesson
Project steps require more time than expected	<ul style="list-style-type: none"> • Execute power purchase agreements before construction starts • Allow more time for permitting than you think will be needed • Submit interconnect paperwork to the utility early • Patience is paramount
Adequate/knowledgeable staff/consultant	<ul style="list-style-type: none"> • Verify the accuracy of vendor and engineer information • Have the manufacturer do the install as a turnkey project • Hire sufficient construction-management and contract-administration staff
Plan/design carefully	<ul style="list-style-type: none"> • Witness and perform a technical assessment of an operational machine before you get involved in one of these projects • Too much piping adds unnecessary cost
Budget carefully	<ul style="list-style-type: none"> • Obtain budgetary estimates from multiple sources • Don't underestimate initial costs • Closely monitor utility bills to determine standby charges • Watch gas pricing carefully
Other	<ul style="list-style-type: none"> • Controls systems are critical • Cooperate with the utility and the building department • Digester gas production is often overestimated • Make sure the client is engaged, (energy generation is not part of their business model) • Obtain a comprehensive maintenance agreement that includes items outside the fuel cell cabinet • Newer systems are more complex, making maintenance contracts more essential • Avoid the temptation to overbuild just to put power back into the grid

NYSERDA staff and other stakeholders confirmed some of these important lessons. In particular, contacts from both groups reported awareness that smaller CHP projects have a longer payback than larger projects. Regarding the need for careful planning, a utility contact described the most important factor to assure a smooth interconnection experience as “planning ahead and then checking in for important milestones.”

2.12 REASONS FOR PROJECT DISCONTINUATION

Partial participants’ explanations for discontinuation of their demonstration projects emphasize certain lessons learned, particularly those about the need for careful planning and budgeting. Their explanations also provide insight into the fragility of CHP projects.

Ten partial participants described reasons their projects were discontinued, sometimes offering more than one reason for a project’s discontinuation. Specifically, two contacts reported their projects were discontinued when they received bids that were higher than expected or that did not meet their specifications, and a third contact reported preliminary equipment quotes from their engineer showed the project was not financially viable. Another partial participant reported the project’s income and expense assumptions were perceived as too risky, and yet another contact reported his project was no longer financially viable when the prospective fuel source changed from biogas to natural gas. Other reasons for project termination that were related to project economics included:

- Project payback exceeded the company’s internal, investment-payback benchmark of 18 to 24 months

- The economic “meltdown”

Difficulties with developers or equipment suppliers also plagued some projects. Different developers for two of the projects went out of business during project development. In another case, the facility owner and the developer were unable to reach an initial agreement, and for a fourth project, an equipment supplier demanded a change in the terms of an existing agreement.

Three other contributing factors reported by partial participants for the discontinuation of their projects included:

- An inability to use all of the waste heat
- Questionable claims of equipment efficiency by the manufacturer
- The design for a new building that was to be the project site became so efficient, the project’s extra power was no longer needed.

2.13 SATISFACTION WITH PROGRAM

With the possible exception of reports of project delays while awaiting NYSERDA’s review of project proposals, it is notable that neither the lessons learned nor the reasons for project discontinuation reflect problems with the demonstration program. The absence of program-generated problems is borne out by the unanimous and high levels of satisfaction with the program and NYSERDA reported by facility owners. All participating facility owners reported they are satisfied with the demonstration program, with some of them adding spontaneous comments such as “great program,” “the milestone invoice process is excellent,” and “it was a very positive experience.” Among partial participant owners, satisfaction was even higher. Only a single partial participant reported being merely “satisfied.” That contact would have liked, and even seemed to expect, more direct help from NYSERDA staff during the development (pre-contract) phase of his project. All other partially participating owners reported they were “very” or “highly” satisfied with the program in spite of having discontinued their participation.

2.14 FUTURE PROJECTS

Five participating developers reported they have discussed installing additional CHP systems with their respective clients. The clients of the five developers confirmed those discussions. Seven additional facility owners also reported they have considered installing additional CHP systems. In fact, three of these 12 owners have moved beyond the consideration stage, and are actively pursuing additional projects. The projects planned by these three contacts include a 250 kW biomass system, a large gas-fired turbine, and five fuel cell projects.

Other possible projects mentioned by the participating owners include a retail location and a large mixed use location, both in New York State, fuel cell installations in Brooklyn, New Jersey, and Connecticut, and dormitory systems at two unrelated university campuses. Another owner reported, “Every property we look at, we consider for CHP based on the property’s characteristics. To be a candidate a property must be over 200 units, with a master meter and good hot water demand.”

Four of these 12 participating owners are looking farther into the future. One of them is hoping his facility’s organic Rankine cycle system will be a model for statewide adoption. Another one of these four contacts is awaiting the resolution of “heat issues” with his microturbine project, at which time additional machines may be added at the same site. Finally, a facility owner reported delaying further projects for three or four years because of general economic conditions, and another owner reported her company has no current plans but is “looking at CHP for other projects as a wise long-term investment.

One partially participating owner reported consideration of another combined heat and power system, but provided no additional details about those plans.

2.15 VIEWS OF DEMONSTRATION PROGRAM EFFECTIVENESS

Almost all of the participating project developers and facility owners reported they believe NYSERDA’s demonstration program has been effective in advancing the market for combined heat and power in the state. More specifically, we asked these contacts whether they thought the program had increased awareness among its target markets, addressed market barriers, and documented systems performance. Seventeen of the 19 interviewed developers reported they believe the program has been effective in advancing the CHP market, although not all of them were knowledgeable about all three of the specific areas included in the question. Two of these 17 developers added comments. One reported the program “has been effective at advancing the market in all areas except addressing market barriers vis-a-vis the utilities.” Another developer said, “More could be done on increasing awareness.” This latter sentiment was echoed by the two developers who did not explicitly concur with the other 17 developers about the program’s effectiveness. Similarly, 16 of the 22 interviewed participating facility owners reported they believe NYSERDA’s demonstration program has been effective in advancing the market for combined heat and power, although they were generally vague regarding specifics.

Few of the interviewed partial participants had anything to say about the effectiveness of NYSERDA’s Demonstration program in advancing the market for combined heat and power in New York State. However, four of these 13 contacts reported the program has been effective in raising CHP awareness.

2.16 SUGGESTED PROGRAM IMPROVEMENTS

Participants’ most frequent suggestions for program improvement were marketing and outreach suggestions (Table 2-17). In addition to generalized suggestions simply to do more advertising or education to promote program awareness, participants’ suggestions for enhancements to marketing and outreach included case studies, creation of an “ad council on behalf of the state to target commercial buildings,” making consultants “fully fluent in NYSERDA’s programs,” and more personal contact even to the extent of a “dedicated NYSERDA liaison” for large or multiple property owners or managers (two mentions).

Table 2-17. Suggestions for a More Effective CHP Program (Multiple Responses Allowed)

Suggestion	Participants
Additional marketing or outreach	12
More funding	4
Website improvement	3
Shorter review process	3
Establish financial partner(s)	3
Work more with utilities	3
PON/program consistency	2
Other	2

“Other” participant suggestions included creation of a demonstration program for gasification projects, and creation of a special program track for microturbine projects, perhaps with prescriptive incentives.

The few program improvement suggestions made by partial participants and nonparticipants echoed the participants’ suggestions. Partial participants suggested increasing incentive levels (more funding), and addressing the barrier of utilities’ stranded costs. Nonparticipants suggested greater program certainty (PON/program consistency), and improvement of the “un-user friendly” website.

Finally, five participating developers had suggestions for types of DG-CHP systems that if promoted more, could help to advance the market for CHP in New York. Two developers mentioned biomass, two mentioned turbines, with one of these two specifying microturbines, and the fifth contact mentioned reciprocating engines because they can operate both in parallel with the grid and as standby power. A

complete discussion of technologies that can advance the CHP market in New York is included in the companion market characterization report.

2.17 SUMMARY

A summary of our findings from the interviews with the various contacts described in this section, and our conclusions and recommendations, are set forth in the following section.

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

3.1 EVALUATION FINDINGS

NYSERDA's DG-CHP demonstration program focuses on combined heat and power applications of distributed generation technology at end-user facilities. The first Program Opportunity Notice (PON) for DG-CHP was issued in 2000 (PON 554). Since then, the DG-CHP program has evolved significantly, continually seeking important, new, learning opportunities to build on knowledge acquired and lessons learned through prior iterations of the program. This evaluation addresses projects approved for funding from 2005 through 2010 under the third round of funding (SBC-3) and solicited through four PONs (914, 1043, 1178, and 1241). The program's evolution is evident in the changing project requirements described in those PONS, but the program has always focused on DG-CHP system demonstrations. SBC-3 funded PONs added and discontinued re-commissioning studies, and added support for fleet demonstrations, and for "bonus" funding for certain locations, technologies, and facilities.

3.1.1 Program Processes

NYSERDA's DG-CHP demonstration program processes are generally working well from the participants' perspective. Specifically, the detailed project proposal development process is viewed as appropriate for these complex projects, and program processes from proposal development, through contracting and project commissioning, to data reporting via NYSERDA's CHP integrated data system were generally uneventful for the interviewed participants. Program staff and participants reported communications with staff are adequate and working well; and participants lauded staff's availability, responsiveness and expertise. All interviewed facility owners, both participating and partially participating, are satisfied with the program.

For these contacts, one of the most problematic aspects of NYSERDA's DG-CHP initiatives is simply to understand eligibility requirements for funding. NYSERDA's program solicitations for distributed generation and combined heat and power were confusing to developers and facility owners whether they were demonstration program participants or not. The information on NYSERDA's website and its marketing collateral for CHP did not readily clarify this confusion.

Once having understood the program, its most troublesome process was the proposal review process. Proposers were unprepared for the length of time required for review and notification of the approval of their projects.

Regarding program awareness, interviews with participating project developers confirmed they are a marketing conduit for combined heat and power and for the demonstration program. Large majorities (two thirds) of both of the nonparticipant samples also reported awareness of the DG-CHP demonstration program.

3.1.2 Reasons for Participation

Facility owners cited an array of reasons for participation in the demonstration program. Notably, only two of their many reasons relate directly to the program; those two reasons for participation are to obtain NYSERDA funding and to obtain NYSERDA's expertise and technical support. The remaining reported participation benefits are project-specific rather than specific to the program, and include greater knowledge of a chosen technology's effectiveness, energy and cost savings, to be green, environmental benefits, and greater knowledge of project economics, among others.

3.1.3 Technologies

Participants also gave a variety of reasons for their choices of a particular prime mover, reflecting an ad hoc approach to technology selection that includes consideration of a combination of factors. These factors include a desire for stand-alone capability, maintenance considerations, a desire to be "green," the fuel

source, a consultant's or sales representative's recommendation, previous experience with distributed generation technologies, and other considerations in addition to electrical and thermal load.

Prime movers for these projects were typically off-the-shelf, available, and delivered without undue delay. However, some of the components required to complete the systems, particularly components related to heat recovery, were not as readily available. The most common challenges to the design and installation of these CHP projects were those posed by retrofitting existing buildings to accommodate the systems and their fuel sources.

3.1.4 Experiences with Utilities

While not strictly a program process, working with utilities was the most problematic step in implementing these projects. Difficulties occurred with all utilities with which program participants worked. However, the incidence of reported difficulties was far lower for projects served by Con Ed than it was for the other utilities. Difficulties with utilities included lengthy reviews and negotiations (up to three years), poor communication, adding or changing requirements, excessive fees or charges, and a generally unwelcoming attitude toward distributed generation. Interconnection issues and standby charges were the greatest sources of difficulties.

Even so, participants' views of their experiences with utilities were mixed, with several contacts making positive statements about various utilities' staff or the contacts' experiences with utilities. Contacts' varying accounts of their utility experiences suggest three underlying factors for their differing experiences. These factors include different levels of contacts' experience with distributed generation projects, different levels of utility experience with distributed generation, and varying pre-existing relationships between the contacts or their organizations and their respective utilities.

3.1.5 Financing, Installation, and Operation

Most projects were financed in one of three ways: from internal funding, with borrowed funds, or through lease-purchase arrangements. The greatest challenges to design and installation of these projects were posed by retrofitting existing buildings to accommodate the systems. Participants encountered few other difficulties during the installation and commissioning of their projects, and those few difficulties were typically unrelated to the program.

Project developers and facility owners are generally pleased with the performance of their CHP systems, including with system payback. However, almost half of the systems that were operational had experienced difficulties or failures that caused downtime or added to the expense of the project. In addition, for a third of the projects with sufficient operating experience to gauge payback, unforeseen circumstances had marginalized or lengthened the projects' payback. System maintenance for these projects was typically contracted out to third parties.

3.1.6 Lessons

Broadly speaking, participating developers and owners learned four lessons from their previous and current distributed generation projects. These broad lessons include the importance of careful planning, and of careful budgeting, and the importance of having knowledgeable and adequate numbers of staff. One or more of those three lessons may also have been at the core of the most frequently mentioned lesson, which was to expect delays.

The reasons partial participants discontinued their projects echo some project lessons learned and speak to the economic fragility of CHP projects. Higher than expected bids, "risky" income and expense assumptions, excessive payback projections, developers going out of business, the economic "meltdown," and an inability to use all waste heat were among the reasons projects did not go forward. With the possible exception of delays to projects occasioned by NYSERDA's lengthy proposal-review process, it is notable that neither the lessons learned nor the reasons for project discontinuation reflect problems with the demonstration program.

Neither of the two fleet demonstration projects approved for SBC-3 funding had moved forward, and one of them had been discontinued. Thus, DG-CHP fleet demonstrations remain an untested concept.

3.1.7 Suggestions for Improvement

Participants' most frequent suggestions for program improvement were suggestions to do more advertising or education to promote program awareness. More program funding for projects, website enhancements, a more streamlined proposal review process, the establishment of partnerships with financial institutions to make project funding more readily available, more work to pave the way with utilities, and fewer PONs were among contacts' other suggestions.

3.1.8 Future Projects

Looking to the future, five participating developers reported they have discussed installing additional CHP systems with their respective clients. Seven additional facility owners also reported they have considered installing more CHP systems, and three of those owners have already moved beyond the consideration stage, and are actively pursuing additional projects.

3.2 CONCLUSIONS AND RECOMMENDATIONS

Conclusion 1: As concluded during the 2004 process evaluation of the DG-CHP program, the program is working well, and program staff members are respected for their technical competence and their helpfulness to end-users and consultants who are working to design and install DG-CHP projects. It is clear the skill and flexibility of the staff in implementing the program is one of its greatest strengths. Staff's responsiveness to program participants is the principal reason participants described program communication as excellent. Nonetheless, it may be possible to enhance program communications with project developers and facility owners in two ways: one related to the proposal review process, and the other related to proposers' eventual interactions with utilities.

Recommendation 1A: To ensure demonstration program proposers have clear expectations about the impact of the proposal review process on project timelines, examine communications with proposers about the proposal review process with a view to conveying greater understanding of the steps in the process, and of the length of the process.

Recommendation 1B: To assist project developers and owners (especially first-time developers and owners) to minimize difficulties and misunderstandings with utilities, consider providing to project contacts greater advice and encouragement to communicate with their utility early and often about utility expectations and requirements for distributed generation projects. Additionally, staff should explore even greater proactive intervention at the individual utility level (especially with National Grid) to expand relationships and enhance utility staff understanding of CHP and of owners' perspectives on the development of CHP projects. Finally, staff should continue its work with policy makers and other stakeholders to achieve policies and standards that provide even greater support for DG-CHP systems.

Conclusion 2: This process evaluation did not inquire into the metrics used by staff to determine when a demonstrated approach is ready for support through a deployment program. An understanding of these metrics would be useful in measuring the alignment of program goals and activities, and would support a more specific determination of the effectiveness of the program in demonstrating new approaches to DG-CHP installations and in advancing the market for DG-CHP.

Recommendation 2: To help to evaluate the effectiveness of the program's efforts to demonstrate new approaches to DG-CHP installations and to advance the market for DG-CHP, and to aid evaluating the alignment of program goals and activities, consider reviewing and further developing the program metrics used by staff to determine the point at which demonstrated approaches are ready for support through a deployment program.

Conclusion 3: Confusion about NYSERDA's CHP offerings is commonplace. Neither facility owners nor generally more technically sophisticated project developers are always clear about which systems are

supported in which facilities under which PONs. However, because the demonstration program is oversubscribed, this confusion has no apparent, direct, negative impact on that program. Further, this confusion transcends the demonstration program in two ways. First, if confusion about CHP offerings has a dampening effect on the number of NYSERDA supported CHP projects in New York State, that dampening effect may be on CHP projects supported by other programs. Second, some of the activities required to dispel that confusion are marketing activities (deployment-program PONs, website navigability and content, CHP brochures) that are outside the purview of demonstration program staff.

Some amount of confusion may arise simply from the complexity of CHP projects. This is particularly true for demonstration projects, which are based on evolving experiences and conditions, and therefore, on evolving program criteria. CHP projects can span several years from preliminary design to operation. Thus, these projects may outlive not only the PON under which they were approved, but even the funding cycle in which they were approved. A result is that project developers sometimes work simultaneously on multiple projects approved under different criteria.

Recommendation 3: To minimize confusion about CHP offerings, NYSERDA should consider a review of the consistency of deployment-program project criteria for CHP projects. (In contrast, to respond to lessons learned and to meet changing market conditions, demonstration-program projects cannot be subjected to rigidly consistent criteria.) Further, NYSERDA should consider a review of the overall marketing of CHP offerings. Such a marketing review should at a minimum, explore inclusion of CHP and DG-CHP as website links, and review the currency and effectiveness of printed CHP marketing collateral.

APPENDIX A:

INTERVIEW GUIDES

NYSERDA DG-CHP PROGRAM STAFF INTERVIEW GUIDE

Name:

Title:

Date:

Interviewer:

Introduction (Based on Pre-Scheduled Interview Time)

Hello, this is Nicole Wobus with Navigant Consulting and Robert Scholl with Research Into Action, calling to interview you about your involvement and experiences with the DG-CHP demonstration program. Is this still a convenient time for you to talk with us? [Proceed or re-schedule as required.]

Role

1. To begin, what are your role, responsibilities, and activities with the DG-CHP Demonstration program?
2. Has this changed over time? If so, how?

Program History and Focus (MCA)

3. Are there any technology-transfer or policy studies that are particularly relevant to our market research (e.g., findings are still very current and relevant) that we should review? [list of studies provided in appendix C1 to PON 1178?]

Communications (Process) -

Internal

4. With whom at NYSERDA do you work most frequently on DG-CHP matters? What are their roles? [Probe for frequency and for coordination or interaction with CHP activities funded by deployment programs.]
5. [If not addressed] What is your assessment of the quality and adequacy of communications among NYSERDA staff regarding CHP projects? [Probe for effectiveness, contact's satisfaction.]

External

6. How are DG-CHP demonstration projects promoted to developers and end users? [Probe for media and frequency, and for different approaches toward developers and end users.]
7. [If not addressed] Are there ways in which these communications could be improved? [Probe for need for and effect of improvements, overall effectiveness, and contact's satisfaction with external communications.]
8. Given the fact that there are multiple NYSERDA deployment programs supporting DG-CHP installations (EFP, Multi-family performance program, RPS Customer Sited Tier- fuel cells/ADG) has there been confusion about program distinctions and applicability among prospective participants?

Administration (Process)

9. [If not addressed under Role] What is your involvement with the DG-CHP demonstration project-tracking database? [If any] Are you aware of ways in which the database could be improved or be made more useful? [Probe for specific improvement suggestions and reasons.]
10. Have you received any feedback from developers or end users about the project-application, or incentive-payment processes? If so, what have you heard?

General Market Questions (MCA)

11. Who are the most prominent players in the New York DG-CHP market (probe: is it a relatively large or small population of market actors)? Could you list a few of the most active and successful manufacturers, developers, and consulting engineers working in this market?
12. To what extent are these players' activities New York or regionally focused vs. national or international in scope?
13. Have you observed any major changes in the supply chain for DG-CHP in recent years (e.g., company acquisitions, increase in the number of companies offering similar services, changes in types of companies offering services, etc.)?
14. What are the most notable technology-related changes that have occurred in the market during the past 5 years?
15. What are the most notable policy and regulatory-related changes that have occurred in the market during the past 5 years? [Probe: Did the PSC Order in 2003 regarding standby charges resolve issues with standby charges or do significant issues remain? Is it correct that this issue has been mostly addressed in Con Edison territory, rather than in other utility territories?]
16. How have project economics changed during the past 5 years, and what factors have played the greatest role in bringing about these changes (e.g., have equipment costs dropped at expected rates, and how has this varied by technology)?
17. [If not addressed in prior question] What types of financing and ownership arrangements are most typical among participating projects?
18. Has access to capital been a significant issue during the economic downturn?
19. [If not addressed] What other market forces have had an impact on market conditions aside from DG-CHP program efforts? [Probe for possible roles of: industry association efforts, political leadership/demand, reorganization of supply chain, growth in availability of qualified technicians to maintain systems, technology breakthroughs, utility experience / awareness, etc.]
20. What do you consider to be the top three barriers to DG-CHP development in New York?

Program Activities (Process)

21. [If not addressed under COMMUNICATIONS] To what extent and in what ways have you seen the DG-CHP program coordinate with other energy efficiency programs outside of NYSERDA? If any, which programs (e.g., "Con Ed System-wide DG Program" referenced in PON 1241 and 1043) ?
22. In what ways are the program and NYSERDA working with utilities to encourage their acceptance and facilitation of DG-CHP projects?
23. Which utilities have been most supportive of integrating DG-CHP into their grid? [Probe: Do you see that changing in the future?]
24. Which utilities have been least supportive? [Probe: Do you see that changing in the future?]

25. What program efforts have been made to address DG-CHP regulatory issues? [If any] How effective were those efforts?

Project Characteristics (MCA)

26. About what percentage of systems installed through the program have been awarded extra funds for fulfilling one or more of the special criteria categories?
27. Which criteria category has been most commonly fulfilled? [Probe: Why do you think this is?]
28. Which has been least fulfilled? [Probe: Why do you think this is?]
29. Which types of systems are best / worst –positioned to meet program requirements?
30. What, if any, steps has the program taken to advance promising technologies or DG-CHP applications that have not been successful in securing funding through the program?
31. Have any observations been made from a review of data collected from program participants (e.g., trends in performance / reliability, and how this differs across project types)?
32. Are facility owners actively engaged in the efforts to install and maintain the DG-CHP systems? [Probe: Do projects ever fall apart after the developer’s work is done?]
33. Do you think there are a sufficient number of trained technicians working within facilities or available for hire who can effectively maintain and operate the DG-CHP systems installed through the program?
34. To what extent are system owners relying on internal staff vs. hiring outside resources to maintain their DG systems?
35. What reasons, besides program funding, do you see for developer and end-user participation?
36. Are there particular types of project developers or end users (e.g., project types / market sectors) to whom program participation seems to be more appealing?
37. What changes have you seen in program activities over the past two years, if any, in terms of rates of project applications, sizes, and discontinuations or completions? [Probe for reasons for changes.]
38. How common is it for CHP systems operating through the program to participate in demand response programs?
39. How common are synchronous generators operating in parallel with the distribution system among CHP systems in NY (through the program or otherwise)? If uncommon, why so?

Overview of Program Activities

40. [If not addressed] What is your assessment of the DG-CHP program’s overall effectiveness? [Probe for changes in number, size, or type of projects.]
41. Have there been any surprises to date in implementing the program?
42. [Other than previously discussed matters] What are the most important changes that still need to be made?
43. Looking ahead, what do you expect will be the most notable developments in the DG-CHP markets during the next 5 years?
44. Are there other similar programs offered elsewhere in the country that you would consider “peer” programs?

45. What would you most like to learn from project developers and owners about their experiences with the program and with DG-CHP installations? [Probe especially for market issues.]
46. Are there any other program changes or issues that we have not discussed that you would like to mention?

Thank you for your time.

DG-CHP PARTICIPATING OWNER INTERVIEW GUIDE

Introduction

My name is _____. NYSERDA (the NY State Energy Research and Development Authority) has contracted with us to conduct an evaluation and market assessment for its Distributed Generation-Combined Heat and Power Demonstration program. As part of that work, we are interviewing facility owners with CHP projects that have received funding through the program.

According to the information NYSERDA provided to us, your facility has a [X MW] [prime mover type] system that was installed in [X year].

Are you the person at your company who is most familiar with that system? [If not, ask for the name and phone number of the better contact.]

Project Processes

1. [If not previously updated during Developer interview] According to the records we received from NYSERDA, your project is in the _____ phase. Is that correct? [If not obtain update.]
2. What is your job title?
3. And what project-related activities have you had responsibility for, or are you familiar with? [Ask only about those steps that have occurred for this project]
4. [If **proposal-development**] Please describe your experience with the proposal process. [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
5. [If **contracting**] What was the contract negotiation process like? [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
6. What were the reasons for the design approach and selection of the technology used for this project? [Probe for whether program requirement for systems capable of running independent of grid was a major factor in design decision-making.]
7. [If **equipment acquisition, and if not answered by Developer**] Was the equipment required for this project readily available? [Probe for customized versus off-the-shelf equipment, unforeseen delays and reasons for them, unexpected cost, perception of amount of time required for equipment delivery]
8. To the best of you knowledge, did the installation and commissioning go as expected? [If not, probe for details]
9. What has been your experience with the system's operation and performance? [Probe for generation performance, noise, emissions, operating cost, reliability, meeting **payback projection**]
10. Have you had previous involvement with distributed-generation systems? [If so, probe for technologies, when and where (states) installed, whether NYSERDA-funded, and client's satisfaction with them.]
11. [If previous involvement with DG] How does the performance of this system compare to the performance of the other system(s) you've installed? [If other project(s) fell short of expectations, ask following subset]
 - a. Could you briefly describe technical challenges you've encountered in your other project(s)? [Probe: Are these problems isolated to a particular type of equipment?]

- b. How have actual project payback results been comparing to expectations for your project(s) overall [Probes: What have the payback(s) typically been (# of years)? How carefully is this being tracked?]
- 12. Is your in-house staff maintaining the system, or have you contracted with another company for system maintenance?
- 13. Have there been any unexpected maintenance issues? [If so, probe for details of maintenance issues and responses to them]
- 14. [If previous involvement with DG] Has/have your other CHP installation(s) had the same approach to maintenance responsibilities as this demonstration project? [If not] What types of maintenance plans are in place for your other system(s)?
- 15. How would you characterize your experience working with the electric utility on this project? [Time permitting, probe for the stages during which the communications occurred, who communicated, purposes of communications, and the utility's responses]
- 16. Did you have a range of utility tariff (rate) options to choose from?
 - a. [If yes] How did you go about deciding which option to choose?

Other Program Processes

- 17. How did you first become aware of NYSERDA's CHP Demonstration program?
- 18. Do you think there's confusion about the different programs under which NYSERDA provides funding for CHP projects? [If yes] What steps could NYSERDA take to minimize this confusion?
- 19. How would you characterize your communications about your project with NYSERDA staff? [Probe for staff availability, responsiveness, and contact's satisfaction]
- 20. [If system is operational] Were you involved in setting the project up with NYSERDA's DG-CHP Integrated Data System? [If so, probe for ease or difficulty, satisfaction]
- 21. What benefits did you expect from participation in the NYSERDA demonstration program?
- 22. What (have you learned/do you expect to learn) from your project?

Economic / Finance / Policy Issues

- 23. Please describe the project financing for your demonstration project. To what extent did the developer or equity investors play a role in project finance? [Probe for participation in obtaining financing, reasons for using a particular financing arrangement, its advantages and drawbacks]
- 24. [If other than fully financed by the facility owner] Could you describe the ownership structure for your demonstration project. [Probe for reasons for ownership structure, its advantages and drawbacks. If party other than the site host owns the system, ask if ownership will revert to the site owner in the future. Note: In some cases, the ownership question may be answered in the response to the previous question. It's possible developers are taking initial ownership of the systems and selling power / thermal energy back to the site host.]
- 25. [If previous involvement with DG, and if not addressed] Are this project's financing and ownership arrangements generally consistent with (the) other CHP project(s) you've completed? [If not] In what ways are they different?
- 26. [If ever involved with a CHP installation at a facility in another state] How did your experience installing CHP in [other states] compare with your experience installing a system in New York? Were the state policies and utility interactions more favorable in the other state or in New York?

Market Barriers to the DG-CHP Program and the Market

27. The number of CHP installations in New York falls far short of the estimated market potential despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
28. Have you considered installing any additional CHP systems? [If yes, probe for type of system, prospective project date, facility type, and location]
 - a. [If considered installing additional systems] Looking ahead, what other risks to CHP project development in New York do you see over the next five years?
 - b. [If considered installing additional systems, and if not addressed] How would you rank those risks and reasons in terms of their relative importance in discouraging CHP development?
 - c. [If considered installing additional systems] How do you plan to address those risks for your projects? [Probe for possible long-term natural gas contracting, other hedging strategies.]
29. Do you think NYSERDA's demonstration program has been effective in advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?

Closing

30. What is your overall satisfaction with your participation in the CHP demonstration program?
31. [If not addressed] Is there anything you would do differently if you were starting your project all over again? [If so] What would that be?
32. Do you have any other thoughts or comments you think might be useful to NYSERDA staff in developing more effective CHP programs?

Thank you for your time.

DG-CHP PARTIAL PARTICIPANT OWNER INTERVIEW GUIDE

Introduction

My name is _____. NYSERDA (the NY State Energy Research and Development Authority) has contracted with us to conduct an evaluation and market assessment for its Distributed Generation-Combined Heat and Power Demonstration program. As part of that work, we are interviewing facility owners with CHP projects that have received funding through the program.

According to the information NYSERDA provided to us, NYSERDA approved your application for a CHP project at _____ using a _____ system, but we understand your application for funding has been discontinued. Is that correct?

[If so] Are you the person at your company who is most familiar with that project? [If not, ask for the name and phone number of the better contact.]

Project Steps and Involvement with Project Activities

1. To begin, what is your job title?
2. At what point in your project did you discontinue involvement with NYSERDA's program?
3. And what project-related activities did you have responsibility for, or familiarity with? [This may be obvious from the answer to the preceding question. Ask only about those steps that occurred for this project]
4. [If **proposal-development**] Please describe your experience with the proposal process. [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
5. [If **contracting**] What was the contract negotiation process like? [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
6. What were the reasons for the **design approach** and selection of the technology used for this project? [Probe for whether program requirement for systems capable of running independently of grid was a major factor in design decision-making.]
7. [If **equipment acquisition, and if not answered by Developer**] Was the equipment required for this project readily available? [Probe for customized versus off-the-shelf equipment, unforeseen delays and reasons for them, unexpected cost, perception of amount of time required for equipment delivery]
8. To the best of your knowledge, did the **installation and commissioning** go as expected? [If not, probe for details]
9. What has been your experience with the system's operation and **performance**? [Probe for generation performance, noise, emissions, operating cost, reliability, **meeting payback projection**]
10. Were you expecting in-house staff to maintain the system, or were you planning to contract with another company for **system maintenance**? [Probe for details of plans to contract work out, if known]
11. [If not obvious from the foregoing] Did you have an opportunity to work with the utility in regard to this project? [If so] How would you characterize your experience working with the electric utility? [Time permitting, probe for the stages during which the communications occurred, who communicated, purposes of communications, and the utility's responses]

12. [If **worked with utility**] Did you have a range of utility tariff (rate) options to choose from?
 - a. [If yes] How would you have decided which option to choose?

Previous Involvement with Distributed Generation

13. Have you had previous involvement with distributed-generation systems? [If so, probe for technologies, when and where (states) installed, whether NYSERDA-funded, and client’s satisfaction with them.]
14. [If previous involvement with DG and not addressed] How did your experience with this system compare to the experience(s) with the other system(s) with which you’ve been involved? [If other project(s) fell short of expectations, ask following subset]
 - a. Could you briefly describe technical challenges you’ve encountered in your other project(s)? [Probe: Are these problems isolated to a particular type of equipment?]
 - b. How have actual project payback results been comparing to expectations for your project(s) overall [Probes: What have the payback(s) typically been (# of years)? How carefully is this being tracked?]
15. [If previous involvement with DG] Has/have your other CHP installation(s) had the same approach to maintenance responsibilities as had been planned for this demonstration project? [If not] What types of maintenance plans are in place for your other system(s)?

Other Program Processes

16. How did you first become aware of NYSERDA’s CHP Demonstration program?
17. Do you think there’s confusion about the different programs under which NYSERDA provides funding for CHP projects? [If yes] What steps could NYSERDA take to minimize this confusion?
18. How would you characterize your communications about your project with NYSERDA staff? [Probe for staff availability, responsiveness, and contact’s satisfaction]
19. What benefits did you expect from participation in the NYSERDA demonstration program?
20. What did you hope to learn from your project?
21. [If not addressed] Under what circumstances might your project be restarted?

Economic / Finance / Policy Issues

22. [If not apparent from the foregoing] Did your project go forward without funding from NYSERDA?
23. [If **proceeded with project without NYSERDA funding**] Why didn’t you take advantage of NYSERDA’s support for the project?
24. [If not addressed] Please describe the plans for the project financing for your demonstration project. To what extent were the developer or equity investors to play a role in project finance? [Probe for participation in obtaining financing, reasons for pursuing a particular financing arrangement, its advantages and drawbacks]
25. [If other than fully financed by the facility owner] What would have been the ownership structure for your demonstration project. [Probe for reasons for ownership structure, its advantages and drawbacks. If party other than the site host was to own the system, ask if ownership would have reverted to the site owner in the future.]

26. [If previous involvement with DG, and if not addressed] Were this project's financing and ownership arrangements generally consistent with (the) other CHP project(s) you've completed? [If not] In what ways were they different?
27. [If ever involved with a CHP installation at a facility in another state] How did your experience installing CHP systems in [other states] compare with your experience installing a system in New York? Were the state policies and utility interactions more favorable in the other state or in New York?

Market Barriers to the DG-CHP Program and the Market

28. The number of CHP installations in New York falls far short of the estimated market potential despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
29. Have you considered installing additional CHP systems? [If yes, probe for type of system, prospective project date, facility type, and location]
- a. [If considered installing additional systems] Looking ahead, what other risks to CHP project development in New York do you see over the next five years?
 - b. [If considered installing additional systems, and if not addressed] How would you rank those risks and reasons in terms of their relative importance in discouraging CHP development?
 - c. [If considered installing additional systems] How do you plan to address those risks for your projects? [Probe for possible long-term natural gas contracting, other hedging strategies.]
30. Do you think NYSERDA's demonstration program has been effective in advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?

Overview

31. What is your overall satisfaction with your participation in the CHP demonstration program?
32. [If not addressed] Is there anything you would do differently if you were starting your project all over again? [If so] What would that be?
33. Do you have any other thoughts or comments you think might be useful to NYSERDA staff in developing more effective CHP programs?

Thank you for your time.

DG-CHP NONPARTICIPATING OWNER INTERVIEW GUIDE

Introduction / Screening for Correct Contact

[Initial screening]

My name is _____. The NY State Energy Research and Development Authority (NYSERDA) has contracted with my company, Navigant Consulting, to evaluate a program that offers incentives to install high efficiency, onsite electricity generating equipment, called the CHP Demonstration Program. As part of this evaluation effort, we're speaking with a wide range of market stakeholders, including representatives from facilities that have not participated in the incentive program to date. I'd like to speak with your [building /company] facility manager, or the person responsible for making decisions about capital investments and operating expenses for your facility to ask about some topics that can help NYSERDA better serve the needs of facilities like yours in the future.

[Once get access to appropriate contact, proceed with the following.]

My name is _____. The NY State Energy Research and Development Authority (NYSERDA) has contracted with my company, Navigant Consulting, to evaluate a program that offers incentives to install high efficiency, onsite electricity generating equipment, called the CHP Demonstration Program. As part of this evaluation effort, we're speaking a wide range of market stakeholders, including representatives from facilities that have not participated in the incentive program to date. [Executive from firm] referred me to you, indicating you're responsible for making decisions about capital investments and operating expenses for your facility(ies).

I have a few questions I'd like to ask you that should take about 10-15 minutes to complete. Your input will help NYSERDA better serve the needs of facilities like yours in the future. Would you be willing to take some time to answer this brief set of questions? Is now a good time to talk or would you like to schedule a later time?

Intro a. What is your job title?

Intro b. Could you briefly describe your role in making decisions about capital investments and operating expenses for your facility(ies)?

Intro c. Do you manage one facility or multiple facilities?

[If multiple facilities, probe about state locations.]

Intro d. Are you familiar with the term "combined heat and power" (CHP), or "cogeneration?"

[If no] Combined heat and power (CHP) systems consist of an electricity generator that provides reliable power for your facility and reduces your need to purchase electricity from your utility. The system also produces heat that can be used for various purposes such as supplementing your facility's domestic hot water needs, or running an absorption chiller, or supporting other thermal energy needs at your facility. CHP systems are much more efficient than conventional approaches to producing energy. Would you like to learn more about potential CHP options for your facility?

[If yes, provide respondent with link to program information via email.]

Intro e. Are you familiar with the NYSERDA Demonstration program?

Intro f. Have you ever installed a CHP system at one of your facilities, or have you considered installing one?

[If **HAVE INSTALLED CHP**, ask “Track 1” questions.]

[If **HAVE CONSIDERED INSTALLING CHP**, but have not, ask “Track 2” questions.]

[If **NEVER CONSIDERED INSTALLING CHP**, ask “Track 3” questions.]

Track 1 Questions [Those who HAVE installed CHP]

Project Experience

1. I'd like to know a bit about the CHP system(s) you installed. What type of system(s) did you install? [Probe for prime mover type- steam turbine, reciprocating engine, microturbine, etc.]
2. What were the key factors that led to your company's decision to install the system(s)?
3. Where was/were the system(s) installed? [Probe for **state(s)**, type of facility.] **[If respondent already indicated non-NY project location, still ask a). – about familiarity with NY market.]**

[If **no CHP systems installed in NY**, ask a & b]

- a. Why is it that you installed a system in a different state and not at a facility in New York?
- b. How familiar are you with the market for CHP in New York State? [Probe for knowledge about interconnection, standby rates and other policies that support or detract from project development in the state.]

[If unfamiliar with NY CHP market, thank respondent for time and terminate interview.]

[Questions from here forward should pertain to NY CHP system experience only.]

4. In what year was/were the system(s) installed?
5. Who were the main contractors you worked with for system design and installation? [Probe for types of companies active in driving project activity.]
6. Did you or your contractors apply to NYSERDA's CHP Demonstration Program for any funding assistance for the project(s)?
 - a. [If yes] What was your experience, or your contractor's experience with that process? [Probe for reasons application was discontinued or project was not funded, and under what circumstances, if any, the contact would apply for NYSERDA CHP funding again]
 - b. [If no] Is this because:
 - i. you or your contractors applied for funding from a different NYSERDA program,
 - ii. you were unaware of the CHP Demonstration program, or
 - iii. some other reason for not applying for funding from NYSERDA (e.g., wouldn't have qualified for the program, timing of the project didn't correspond with timing of program funding solicitations, etc.)?

7. How would you characterize your experience working with the electric utility on interconnection-related issues for this project? [Probe for which utility they worked with]
8. Did you have a range of utility tariff (rate) options to choose from?
 - a. [If yes] How did you go about deciding which option to choose?
9. What has been your experience with the system's operation and performance?
10. How have actual project payback results compared to expectations for your project(s) overall? [Probes: What has the payback been (# of years)? What accounts for differences from expectations? How carefully is payback being tracked?]
11. Is your in-house staff maintaining the system, or have you contracted with another company for system maintenance?

Economic / Finance / Policy Issues

12. Could you describe your system(s) financing and ownership structure? Was it fully financed by your company, or did the developer or equity investors play a role in project finance? [**If have installed multiple CHP systems in NY, adapt question accordingly.**] [Probe for reasons for using a particular financing arrangement, its advantages and drawbacks.]
13. [**If have installed CHP systems both inside and outside of NY**] Are this project's financing and ownership arrangements generally consistent with (the) other CHP project(s) you've completed? [If not] In what ways are they different?
14. [**If ever involved with a CHP installation at a facility in another state**] How did your experience installing CHP in [other states] compare with your experience installing a system in New York? Were the state policies and utility interactions more favorable in the other state or in New York?

Market Barriers to the DG-CHP Program and the Market

15. The number of CHP installations in New York falls far short of the estimated market potential, despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
16. Looking ahead, what other risks or challenges to CHP project development in New York do you see playing a role over the next five years?
 - a. How do you think facility owners and developers should address those risks [Or if contact manages multiple facilities, ask how they plan to manage risks for their own future projects.] [Probe for possible long-term natural gas contracting, other hedging strategies.]
17. [**If familiar with NYSERDA CHP Demonstration Program**] Do you think NYSERDA's demonstration program has been effective in advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?
18. What additional steps could NYSERDA and the state take to improve the market for CHP in New York?

Track 2 Questions [HAVE CONSIDERED INSTALLING CHP, but have not]

1. How carefully did you research a possible investment in CHP? Did you complete a comprehensive study or did you rely more on basic assumptions?
2. Why did you decide not to install a system?

3. When you were considering the CHP system, did you contact your utility to inquire about technical requirements and potential rates that would affect your system?
 - a. [If yes]. What did you learn from the utility? [Probe on interconnection- and tariff-related issues, and for which utility they worked with]
4. How familiar are you with the market for CHP in NY State? [Probe for knowledge of interconnection, standby rates and other policies that support or detract from project development in the state.]

[If not familiar with NY market, but are somewhat familiar with CHP Demonstration Program, skip to #7.]
5. **[If familiar with the NY CHP market]** The number of CHP installations in New York falls far short of the estimated market potential, despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
6. Looking ahead, what other risks or challenges to CHP project development in New York do you see playing a role over the next five years?
 - a. How do you think facility owners and developers should address those risks [Or if contact manages multiple facilities, ask how they plan to manage risks for their own future projects.] [Probe for possible long-term natural gas contracting, other hedging strategies.]
7. **[If familiar with the NYSEDA CHP Demonstration Program]** Do you think NYSEDA's CHP Demonstration Program has been effective in advancing the market for CHP in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?
8. **[If familiar with the NYSEDA CHP Demonstration Program]** What additional steps could NYSEDA and the state take to improve the market for CHP in New York?

Track 3 Questions [Familiar with CHP concept, but NEVER CONSIDERED INSTALLING CHP]

1. Why have you never considered installing CHP at your facility(ies)? Is it:
 - a. Because you don't have solid understanding of the technology options
 - b. You assumed it would not be economically feasible
 - c. It has just never been a priority for you
 - d. Other factors (specify)
2. How familiar are you with the market for CHP in NY State? [Probe for knowledge of interconnection, standby rates and other policies that support or detract from project development in the state.]

[If not familiar with NY market, but are somewhat familiar with CHP Demonstration Program, skip to #5.]
3. **[If familiar with the NY CHP market]** The number of CHP installations in New York falls far short of the estimated market potential, despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
4. Looking ahead, what other risks or challenges to CHP project development in New York do you see playing a role over the next five years?

- a. How do you think facility owners and developers should address those risks [Or if contact manages multiple facilities, ask how they plan to manage risks for their own future projects.] [Probe for possible long-term natural gas contracting, other hedging strategies.]
5. **[If familiar with the NYSERDA CHP Demonstration Program]** Do you think NYSERDA’s demonstration program has been effective in advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?
6. **[If familiar with the NYSERDA CHP Demonstration Program]** What additional steps could NYSERDA and the state take to improve the market for CHP in New York?
7. Would you like to learn more about CHP options for your facility? **[If yes, provide respondent with link to program information via email.]**

Thank you for your time.

DG-CHP PARTICIPATING DEVELOPER INTERVIEW GUIDE

Name

Date

Interviewer

Introduction

My name is _____. NYSERDA (the NY State Energy Research and Development Authority) has contracted with us to conduct an evaluation and market assessment for its Distributed Generation-Combined Heat and Power Demonstration program. As part of that work, we are interviewing developers of CHP projects that have received funding through the program.

According to the information NYSERDA provided to us, you have worked on a project(s) for _____ using a (prime mover). [Note: the previous sentence will need to be modified as appropriate to reflect whether the individual developer contact has worked on multiple SBC-3-funded projects or only on a single project.]

Are you the person at your company who is most familiar with that project? [If not, ask for the name and phone number of the better contact.]

Project Processes

1. According to the records we received from NYSERDA, your project is operational. Is that correct? [If not obtain update.]
2. What project-related activities have you had responsibility for? [Ask only about those steps which have occurred for this project]
 - a. Proposal development
 - b. Contracting with NYSERDA
 - c. Project design
 - d. Equipment acquisition
 - e. Project installation
 - f. Project commissioning
3. **[If proposal-development]** Please describe your experience with the proposal process. [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
4. **[If contracting]** What was the contract negotiation process like? [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
5. **[If project design]** What were the reasons for the selection of the technology and design approach used for this project?
6. **[If project design]** What was most challenging about designing this project? [Probe for reasons]
7. **[If equipment acquisition]** Was the equipment required for this project readily available? [Probe for customized versus off-the-shelf equipment, unforeseen delays and reasons for them, unexpected cost, perception of amount of time required for equipment delivery]
8. **[If project installation]** Did the installation go as expected? [If not, probe for details]
9. **[If project commissioning]** Were there any surprises that arose during commissioning? [If so, probe for details]

10. What has been your experience with the system's operation and performance? [Probe for generation performance, noise, emissions, operating cost, reliability, meeting payback projections]
11. How does the performance of this system compare to the performance of the other systems you've installed? [If other projects fell short of expectations, ask following subset]
 - a. Could you briefly describe technical challenges you've encountered in your other projects? [Probe: Are these problems isolated to a particular type of equipment?]
 - b. How have actual project payback results been comparing to expectations for your projects overall [Probes: What have the paybacks typically been (# of years)? How carefully is this being tracked?]
12. What is your firm's role in providing system maintenance?
13. Have there been any unexpected maintenance issues? [If so, probe for details of maintenance issues and responses to them]
14. Have your other CHP installations had the same approach to maintenance responsibilities as this demonstration project? [If not] What types of maintenance plans are in place at your other clients' sites? [Probes: Are they under long-term maintenance contracts with your company, another company, or do their clients' in-house staff maintain the systems?]
15. Did you or your client communicate with the utility about this demonstration project at any points during your involvement with it? [If so, probe for the stages during which the communications occurred, who communicated, purposes of communications, and the utility's responses]
16. Did your client have previous involvement with any distributed-generation systems that you know of? [If so, probe for technologies, when installed, and client's satisfaction with them]

Other Program Processes

17. How would you characterize your communications with NYSERDA staff? [Probe for staff availability, responsiveness, and contact's satisfaction]
18. [If system is operational] Were you involved in setting the project up with NYSERDA's DG-CHP Integrated Data System? [If so, probe for ease or difficulty, satisfaction]
19. What (have you/do you) or your client (learned/expect to learn) from this project?

Company Background

20. Could you describe how CHP fits into your company's broader business structure (e.g., does the company install EE measures or other DG technologies as well)?
21. Could you briefly summarize the nature of the CHP work you've done in New York? That is, do you typically install a certain type or size of system, or work mostly in a certain region of the state, or with certain types of clients or buildings?
22. [If firm has a particular focus] Why have you chosen to focus on this particular subset of the CHP market?

Firm's CHP Experience and Processes

23. For how many years has your company been installing CHP systems in New York?
24. Roughly how many systems have you installed in New York during that time?
25. Why did your company decide to make New York a focus for CHP business activity?

26. Does your company install CHP systems in states other than New York? [If yes, ask following sub-set]
 - a. In what other states do you install CHP?
 - b. For how long have you been installing CHP in those states?
 - c. How does your experience working in New York differ from your experience working in other states? [Probe for differences in areas of standby charges, grid-interconnect or off-grid-operability requirements, experience working with funding agency]
 - d. Are there any CHP funding programs in other states that you think could serve as a good model for NYSERDA?
27. What changes have you noticed in the New York CHP market in the past five years in terms of competition among project developers and installers? [Probe for mergers, acquisitions, bankruptcies, sector/equipment specialization]. What do you think has primarily contributed to those changes?
28. Are your clients typically the ones who approach you with an interest in CHP, or is it more common for you to take the lead and propose CHP to potential clients?
29. [If not addressed] For this project, did you inform your client about the NYSERDA opportunity, or did your client come to you with the project idea?
30. What strategies does your company use to gain a competitive advantage in the market? [Probe for repeated work with the same sub-contractors, offering packaged units, having long-term procurement contracts with certain equipment suppliers, or offering unique contract terms]

Economic / Finance / Policy Issues

31. Please describe the project financing for your demonstration project. To what extent did the site owner or equity investors play a role in project finance? [Probe for participation in obtaining financing, reasons for using a particular financing arrangement, its advantages and drawbacks]
32. Please describe the ownership structure for your demonstration project. [Probe for reasons for ownership structure, its advantages and drawbacks. If party other than the site host owns the system, ask if ownership will revert to the site owner in the future. Note: In some cases, the ownership question may be answered in the response to the previous question. It's possible developers are taking initial ownership of the systems and selling power / thermal energy back to the site host.]
33. [If not addressed] Are this project's financing and ownership arrangements are generally consistent with other CHP projects you've completed, and other similar CHP projects in New York in general? [If not] In what ways are they different?
34. Have you observed any changes in the market during the last five years with regard to ownership and financing arrangements? [If so] What changes? [Note: This question could be skipped if time constrained.]
35. What are the most critical economic drivers for the CHP market as a whole? [Not inquiring about project economics specifically, as much as about equipment costs, availability of financing, volatility of natural gas and electricity prices, financial health of end-user companies, etc.]
36. In the past five years, have there been any notable changes in federal, state, or local policies or regulations that have improved the CHP market in New York? [Probe for changes to interconnection requirements, standby charges, NYC initiatives, and federal investment tax credits]

37. What about any changes that have hurt the market?

Technology and System Performance Trends

38. What refinements are you making in your CHP installations to address lessons learned from past experiences?
39. Are there other technology-related developments that are changing the CHP market, or that you expect will come about in the next few years? [Probe: Are you seeing technology solutions to help facilitate grid interconnection and make it easier for systems to operate independently during grid outages?]
40. What steps do you think the NYSERDA DG-CHP program should take to prepare to address these changes in the market?

Market Barriers to the DG-CHP Program and the Market

41. The number of CHP installations in New York falls far short of the estimated market potential despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
42. Looking ahead, what other risks to CHP project development in New York do you see over the next five years?
43. [If not addressed] How would you rank those risks and reasons in terms of their relative importance in discouraging CHP development?
44. How do you plan to address those risks for your projects? [Probe for possible long-term natural gas contracting, other hedging strategies.]
45. Do you think NYSERDA's Demonstration program has been effective at advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?
46. [If not previously addressed] Are there certain types of DG-CHP systems that you think could help advance the CHP market in New York but that have had difficulty securing funding through the program? [Probe: Is the program's requirement that systems be capable of operating independently during a grid outage an impediment?]

Relationship to Other Programs

47. Do you think there's confusion about the differences between NYSERDA's DG-CHP demonstration program (a research and development program) and other NYSERDA programs that fund proven CHP installations (e.g., the Existing Facilities Program and the Flex Tech Program)? [If yes] What steps could NYSERDA take to minimize this confusion?

Closing

48. Have you and your client discussed installing any additional CHP systems? [If yes, probe for type of system, prospective project date, facility type, and location]
49. [If not addressed earlier] What, if any, changes should NYSERDA's DG-CHP program make to serve the market better in the future?
50. Do you have any other thoughts or comments you think might be useful to NYSERDA staff in developing more effective CHP programs?

Thank you for your time.

DG-CHP NONPARTICIPANT DEVELOPER INTERVIEW GUIDE

Introduction

My name is _____. My company, Navigant Consulting, has been hired by NYSERDA (the NY State Energy Research and Development Authority) to evaluate its Combined Heat and Power demonstration program. As part of that work, we are interviewing developers of CHP projects that have not received funding through the program to date in order to gather a range of perspectives on the program and the market. Do you have about 15 minutes to answer some questions that will help guide the future of NYSERDA's CHP demonstration program? Your responses will be kept confidential.

[If records do not indicate respondent has submitted a funding application through the program] Are you familiar with NYSERDA? [If no, provide brief summary of NYSERDA.]

[If records do not indicate respondent has submitted a funding application through the program] Are you familiar with NYSERDA's Distributed Generation-Combined Heat and Power demonstration program? [If no, provide brief explanation.]

Program Experience for Unsuccessful Participants [Ask only if records show respondent submitted a funding application but did not establish a contract with NYSERDA or was not selected for funding]

1. According to the records we received from NYSERDA, your company [submitted a funding application under the program and was selected, but never established a contract with NYSERDA -OR- submitted a funding application but was not selected.] Can you confirm that this is correct?
2. [If project not selected for funding] Were you ever told why the project was not selected for funding? [Probe for reasons.]
3. Was the system ultimately installed without NYSERDA funding?
4. What activities related to that project were you responsible for? [Do not read options, but make note based on response.]
 - a. Proposal development
 - b. Contracting with NYSERDA
 - c. Project design
 - d. Permitting or Utility Interconnection
 - e. Equipment acquisition
 - f. Project installation
 - g. Project commissioning
5. [If proposal-development] Please describe your experience with the proposal process. [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement]
6. [If contracting] What was the contract negotiation process like? [Probe for ease or difficulty, unexpected steps, perception of amount of time required, areas for improvement.]
7. [If project was installed and if not addressed yet] What has been your experience with the system's operation and performance? [Probe for generation performance, noise, emissions, operating cost, reliability, meeting payback projections.]

Company Background

8. [If familiar with DG-CHP program but have never submitted application] Why have you chosen not to submit an application for funding through the DG-CHP demonstration program for one of your New York projects that fall within NYSEERDA's jurisdiction?
9. Could you briefly summarize the nature of the CHP work you've done in New York? That is, do you typically install a certain type or size of system, or work mostly in a certain region of the state, or with certain types of clients or buildings?
10. [If firm has a particular focus] Why have you chosen to focus on this particular subset of the CHP market?

Firm's CHP Experience

11. For how many years has your company been installing CHP systems in New York?
12. Roughly how many systems have you installed in New York during that time?
13. Why did your company decide to make New York a focus for CHP business activity?
14. Does your company install CHP systems in states other than New York? [If yes, ask following sub-set]
 - a. In what other states do you install CHP?
 - b. For how long have you been installing CHP in those states?
 - c. How does your experience working in New York differ from your experience working in other states? [Probe for differences in areas of standby charges, grid-interconnect or off-grid-operability requirements, experience working with funding agency and utilities.]
15. What, if any, changes have you noticed in the New York CHP market in the past five years in terms of field of companies serving the market and the services they're providing? [Probe for mergers, acquisitions, bankruptcies, sector/equipment specialization]. What do you think has primarily contributed to those changes?

Economic / Finance / Policy Issues

16. How are your clients' CHP systems typically financed? To what extent do site owners and equity investors play a role in project finance? [Probe for participation in obtaining financing, reasons for using a particular financing arrangement, its advantages and drawbacks.]
17. In cases where the site owner does not fully finance the system, what types of ownership structures are typically used for your projects? [Probe for reasons for ownership structure, its advantages and drawbacks, whether such ownership arrangements are a recent development.]
18. For the projects you have installed, how have actual financial paybacks compared to expectations? [Probes: What have the paybacks typically been (# of years)? How carefully is this being tracked?]
19. In the past five years, have there been any notable changes in policies (either government or utility policies) that have improved the CHP market in New York? [Probe for changes to interconnection requirements, standby charges, NYC initiatives, and federal investment tax credits]
20. What about any changes that have hurt the market?
21. [For projects in New York] What utilities have your CHP systems interconnected with? How would you characterize your dealings with the utilities? [Probe for how experience has varied by utility, and nature of the issues they have with specific utilities.]

Technology and System Performance Trends

- 22. What refinements are you making in your CHP installations to address lessons learned from past experiences?
- 23. Are there other technology-related developments that are changing the CHP market, or that you expect will come about in the next few years? [Probe: Are you seeing technology solutions to help facilitate grid interconnection and make it easier for systems to operate independently during grid outages?]

Market Barriers to the DG-CHP Program and the Market

- 24. The number of CHP installations in New York falls far short of the estimated market potential despite the fact that the state is considered one of the strongest in the nation for CHP policies and financial incentives. Why do you think this is the case?
- 25. Looking ahead, what are the most critical risks to CHP project development in New York over the next five years?
- 26. How do you plan to address those risks for your projects? [Probe for possible long-term natural gas contracting, other hedging strategies.]
- 27. [If familiar with DG-CHP program] Do you think NYSERDA's Demonstration program has been effective at advancing the market for combined heat and power in the state, specifically in the areas of increasing awareness among target markets, addressing market barriers, and documenting system performance?

Relationship to Other Programs

- 28. [If familiar with NYSERDA programs] Do you think there's confusion about the different programs under which NYSERDA provides funding for CHP projects? [If yes] What steps could NYSERDA take to minimize this confusion?

Closing

- 29. Do you have any other thoughts or comments you think might be useful to NYSERDA staff in developing more effective CHP programs?

Thank you for your time.