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**ATTACHMENT A**

**NYSERDA  
COMBINED HEAT & POWER  
PERFORMANCE PROGRAM  
SYSTEMS MANUAL**

**LAST UPDATE:  
MARCH 2013**

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## **INTRODUCTION**

This document presents procedures for Combined Heat and Power (CHP) Systems participating in NYSERDA's *CHP Performance Program*. The CHP incentive offer is designed to achieve peak demand reduction during the summer capability period by providing performance-based incentives for efficient, clean, commercially available CHP Systems.

The document is divided into the following sections:

### **1.0 ELIGIBILITY**

### **2.0 INCENTIVES**

#### **2.1 TOTAL PROJECT INCENTIVE FOR CHP SYSTEMS**

### **3.0 PROGRAM PROCEDURES**

Details the required submittals and the procedures involved in preparing and reviewing them. Included are discussions about the Engineering Analysis requirements, reporting estimated and verified energy savings, and invoicing for payments.

#### **3.1 ENGINEERING ANALYSIS (EA) REQUIREMENTS**

#### **3.2 SCHEMATIC DESIGN REQUIREMENTS**

#### **3.3 COMMISSIONING REVIEW**

#### **3.4 INVOICING**

### **4.0 MEASUREMENT & VERIFICATION (M&V)**

Provides specifications for Applicants to follow during the M&V period. Reporting procedures, deliverables, and penalties for non-performance are also described.

#### **4.1 M&V SPECIFICATIONS**

#### **4.2 M&V REPORTING**

#### **4.3 M&V NON-PERFORMANCE AND INCENTIVE REDUCTIONS**

### **5.0 SEQRA AND PERMITTING**

Details potential air and noise impact screening procedures and Applicant responsibilities for environmental impact assessment and permitting.

**ATTACHMENT B: PROJECT SUMMARY APPLICATION**

**ATTACHMENT C: ENVIRONMENTAL ASSESSMENT FORM**

The terms of the Program Opportunity Notice (PON) in effect at the time the Application is received by NYSERDA shall govern this program and set forth the eligibility requirements for participants and CHP Systems, the incentive payments, and general requirements.

This manual will be updated from time to time by NYSERDA and posted on NYSERDA's web site under the corresponding Program Opportunity Notice (PON); currently the CHP Performance Program is PON 2701. No additional notice will be provided.

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## SECTION 1.0 ELIGIBILITY

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This Section describes the eligible CHP Systems.

Eligible CHP systems:

- The applicant and/or host facility must contribute to the Systems Benefits Charge (SBC) on their electric or gas utility bill.
  - For existing facilities, up to 12 months of utility bills may be requested to verify the host facility's annual SBC contribution.
  - All new construction applicants, including those in a negotiated rate class, must pay the SBC in order to be eligible for this program.
  - Proration of incentives based on SBC contribution is at NYSERDA's discretion.
- The CHP System must consist of commercially available gas-fired reciprocating engine(s) or turbine-based technologies that result in an electrical peak demand reduction during the summer capability period.
- The CHP System must have a 60% annual fuel conversion efficiency
- The CHP System must have a NO<sub>x</sub> emission rate ≤ 1.6 lbs/MWhr. Should NYSDEC establish a more stringent NO<sub>x</sub> emission rate the, it will supersede the 1.6 lbs/MWhr.
- The CHP System must have the ability to operate during a grid outage.
- If the site is located within a flood zone then the CHP system, including all components required for proper operation (pumps, controls, switch gear, etc) must be located above the expected flood level.
- The total incentive cannot exceed 50% of the project cost. Project cost may include equipment, labor, and engineering expenses.
- An Applicant or a facility may receive an incentive for a CHP System either through NYSERDA or one of the associated utility companies, but not both.

The following are ineligible:

Although not eligible under this program, these technologies may be eligible under other NYSERDA programs.<sup>1</sup>

- Fuel Cells
- Aggregate Nameplate systems 1.3 MW or less
- A CHP System currently contracted for installation under another NYSERDA program, or projects eligible to submit to the customer sited tier of the Renewable Portfolio Standard

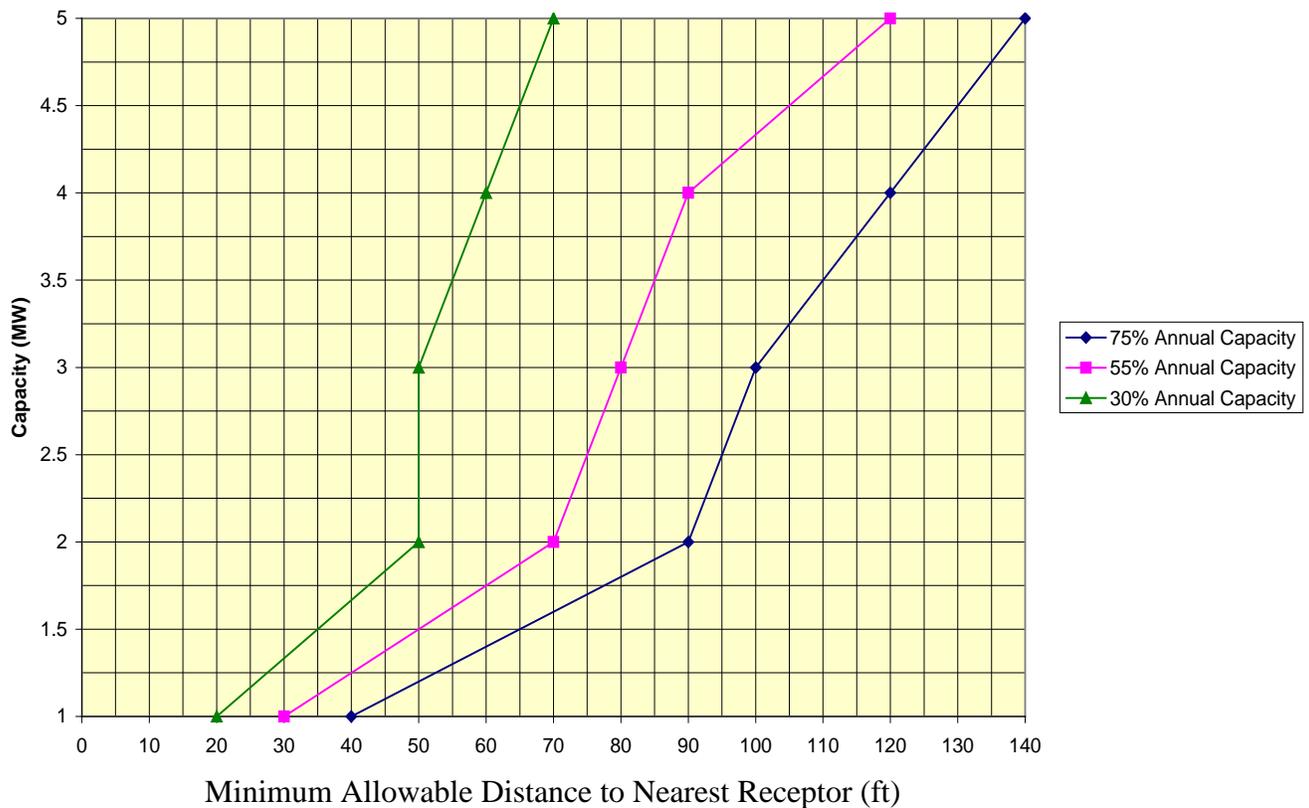
A CHP System is comprised of all electricity generating prime movers at a site and balance of plant equipment. Commissioned CHP System operations, emissions and efficiency must be documented and substantial reductions in incentives will occur for those CHP Systems that do not achieve required system efficiency, electric peak demand reduction or avoidance during the summer capability period, and the maximum allowable emissions.

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<sup>1</sup> Please see NYSERDA's RPS CST Fuel Cell Program PON 2157 or subsequent. Please see NYSERDA's CHP Acceleration Program PON 2568 or subsequent for CHP systems 1.3 MW or less.

The proposed CHP system must meet the Clean Distributed Generation (“Clean DG”) definition. This “Clean DG” definition can be found in the New York State Public Service Commission’s Order (Order) on Demand Management Action Plan (Case 04-E-0572), effective March 16, 2006 (<http://www.dps.ny.gov/fileroom.html>). CHP Systems must not exceed a NOx emission limit of 1.6 lbs/MWhr. The Order also includes a specification on the allowable distance between the CHP system exhaust stack and the nearest receptor<sup>2</sup> shown below in Figure 1.1.

**Figure 1. 1 Capacity vs. Minimum Distance to Avoid Significant Adverse Air Quality Impacts<sup>3</sup>**



In addition to meeting the eligibility requirements listed above, the Applicant is responsible for complying with all applicable Federal, State, and Local emissions limits and regulations for the proposed equipment type and locations.

For “Clean DG” historical reference, CHP Systems between 500 kW and 1000 kW installed capacity, no significant impacts are predicted at or beyond 40 feet from the exhaust stack to a sensitive receptor; for CHP Systems below 500 kW, no significant impacts are predicted at or beyond 30 feet from the exhaust stack to a sensitive receptor.

<sup>2</sup> A **receptor** could include operable windows, balconies, and air intakes on nearby buildings (residential and commercial).

<sup>3</sup> New York State Public Service Commission’s Order (Order) on Demand Management Action Plan (Case 04-E-0572), effective March 16, 2006.

## SECTION 2.0 INCENTIVES

CHP Performance Program incentives are designed to encourage the installation of gas-fired CHP systems. Applicants will work with NYSERDA or its Technical Consultant to establish a Base Incentive and determine the eligibility of Bonus Incentives.

### BASE INCENTIVES

CHP system Base Incentives include both an electricity generation and a peak demand reduction component.

Incentive Structure*	Upstate	Downstate**
<b>Electricity Generation</b>	\$0.10 x kWh	\$0.10 x kWh
<b>Peak Demand Reduction</b>	\$600 x kW <sub>spc</sub>	\$750 x kW <sub>spc</sub>
<p>*CHP Base Incentives are capped at the lesser of \$2,000,000 per CHP project or 50% of Total Project Cost.</p> <p>**Electric and/or Gas Utility customers paying into the SBC within the following counties: Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk and Westchester</p> <p><b>kWh</b> - The projected annual kilowatt hour production stated in the NYSERDA Agreement, as agreed to between the applicant and NYSERDA based on the Engineering Analysis.</p> <p><b>kW<sub>spc</sub></b> - The projected peak demand reduction stated in the NYSERDA Agreement, as agreed to between the applicant and NYSERDA based on the Engineering Analysis.</p> <p>The <b>summer capability period</b> is between the hours of 12 pm and 6 pm, Monday through Friday, from May 1 through October 31, excluding legal holidays.</p>		

Measurement & Verification performance payments of the Base Incentive will be determined by NYSERDA and its contractors based on metered data collected and transferred to the NYSERDA CHP Data Integration Website as defined below.

CHP Systems are subject to non-performance incentive reductions for not achieving minimum fuel conversion efficiency and air emissions requirements (*see Section 4.3*). NYSERDA reserves the right to adjust project incentives at its sole discretion.

Peak Demand Reduction and Electric Generation Payment Calculation	
Upstate	Downstate*
\$600 x kW <sub>p</sub> x [PR or 1, whichever is less]	\$750 x kW <sub>p</sub> x [PR or 1, whichever is less]
\$0.10 x kWh <sub>a</sub>	\$0.10 x kWh <sub>a</sub>

\*Electric and/or Gas Utility customers paying into the SBC within the following counties: Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk and Westchester

**kWh<sub>a</sub>** - Total electricity generated by the CHP system in a 12 month period net of parasitic electricity use. NYSERDA's incentive will not be paid for electricity generated beyond on-site electricity usage. The comparison between the electricity generated by the CHP System and that used on-site will be assessed on an hourly basis.

**kW<sub>p</sub>** - Average power produced by the CHP system during the summer capability period, net of parasitic electricity use. Electricity generated beyond on-site electricity usage will not be included in the calculation of kW<sub>p</sub>. The comparison between the electricity generated by the CHP System and that used on-site will be assessed on an hourly basis.

**PR** - Power ratio.  $PR = kW_p / kW_{SPC}$ .

## **BONUS INCENTIVES**

CHP Systems may receive up to 30% additional incentive above the Base Incentive as defined below:

- A maximum of 10% additional incentive is available to those projects serving Critical Infrastructure, including Facilities of Refuge.
  - Critical Infrastructure – Energy, Financial Services, Communications, Data Center/Information Technology, Hospitals, Emergency Service Facilities, Food Distribution, Prisons, Chemical Industry and Hazardous Material, Water and Wastewater, Transportation, Dams, Critical Manufacturing, Defense Infrastructure, and Nuclear Reactors (Materials and Waste).
  - Facilities of Refuge – As recognized by the American Red Cross or the local Office of Emergency Management, and the electric and thermal outputs of the CHP benefit the portion of the building designated as such.
- A maximum of 10% additional incentive is available to those projects that are within a Targeted Zone as established by a Utility as being a load service area of particular interest.
  - For information about Consolidated Edison Targeted Zones please check: [http://www.coned.com/dg/incentive\\_programs/incentivePrograms.asp](http://www.coned.com/dg/incentive_programs/incentivePrograms.asp)
- A maximum of 10% additional incentive is available to those projects that demonstrate superior performance as determined by the measured Fuel Conversion Efficiency.
  - For every 1% FCE above the 60% FCE achieved, a 1% additional incentive will be awarded
  - Each year of M&V is capped at a 5% additional incentive.
  - This incentive will be released at the completion of M&V Year 1 and M&V Year 2, as applicable.

### **2.1 TOTAL PROJECT INCENTIVE FOR CHP SYSTEMS**

The Total Project Incentive, the sum of the Base Incentive (the sum of the kWh incentive and kW incentive) and the Bonus Incentives, is included in the Agreement. Incentives paid to an Applicant are capped at the lesser of the Total Project Incentive or 50% of Total Project Cost.

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- A progress payment of 15% of the Base Incentive may be issued by NYSERDA upon the Applicant's request upon proof of purchase and delivery of the generation equipment and heat exchangers (i.e. bill of lading).
  - A second progress payment of 15% of the Base Incentive may be issued by NYSERDA upon the Applicant's receipt of the interconnection letter from their applicable utility.
  - An additional payment, the "project installation payment", of 10% of the Base Incentive may be issued upon request and NYSERDA approval to start the M&V period. Starting M&V is contingent upon third party commissioning, a NYSERDA post-installation site visit, and a verification of emission limits via testing by NYSERDA's Environmental Reviewer.
    - If the Project applied for and is serving Critical Infrastructure, the 10% Bonus Incentive will be released at the start of M&V.
    - If the Project applied for and is operating in a Targeted Zone, the 10% Bonus Incentive will be released at the start of M&V.
  - The first year M&V payment of up to 30% of the Base Incentive will be made after the successful completion of the first year M&V period.
  - The second year M&V payment of up to 30% of the Base Incentive will be made after the successful completion of the second year M&V period.
  - If applicable, the superior performance Bonus Incentive will be paid at the completion of M&V Year 1 and M&V Year 2.
    - Each year is capped at 5%. The sum of the first year and second year Superior Performance Bonus Incentive must not exceed 10% of the Base Incentive

Incentives will not be paid in excess of 100% of the total project incentive stated in the Agreement.

## **SECTION 3.0 PROGRAM PROCEDURES**

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**1. APPLICATION.** The first step is for the Applicant to submit a completed application for the proposed CHP system. Please refer to the current Project Summary Application located as Attachment B. Applicants must also submit an engineering analysis (electronic spreadsheet-based model), supporting utility bills at the time of application, and the Environmental Assessment Form located as Attachment C.

The following outlines the process for application review and approval:

**A. ELIGIBILITY REVIEW** - NYSERDA will first review the application for program eligibility. The Applicant may be contacted by NYSERDA or its Technical Consultant for application clarification. After eligibility review, NYSERDA will issue a letter to the Applicant either accepting or rejecting the application for further review. If accepted, the letter will specify which

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NYSERDA Technical Consultant(s) is assigned to the review. This usually takes 1 to 2 weeks.

**B. PRE-INSTALLATION INSPECTION** - The Technical Consultant conducts a pre-installation Project site inspection to verify the accuracy of the information in the application with regard to both existing conditions and the feasibility of installing the proposed CHP system. NYSERDA's Technical Consultant will schedule this site visit after an initial review of the engineering analysis.

**C. DETAILED APPLICATION REVIEW** – NYSERDA or its Technical Consultant will review the application and engineering analysis within 90 days and, if necessary, issue written comments to the Applicant requesting changes or clarification. The application and engineering analysis must be approved by NYSERDA.

**D. REVISED APPLICATION** – The Applicant submits a revised engineering analysis. Most likely, the application and engineering analysis will require clarification or updates.

**2. AGREEMENT AND PURCHASE ORDER (PO):** Upon approval of the revised application, NYSERDA will issue an Agreement to the Applicant. The Agreement, signed by both the Applicant and NYSERDA, specifies the Total Project Incentive. After the Agreement has been fully executed by both parties, NYSERDA will issue a PO. Funds are reserved only upon NYSERDA's written approval of the Applicant's application and issuance of the PO.

**3. CHP DOCUMENTS (SCHEMATIC DESIGN, AIR PERMITTING, INTERCONNECTION AND OTHER):** The Applicant has 90 days after receipt of the executed Agreement and PO to submit a copy of the schematic design, an instrumentation plan (IP) (described in *Section 4.1*), a copy of the air permit application, and documentation that the site has submitted interconnection approval. *Section 3.2 contains information on the Schematic Design requirements.*

At this point NYSERDA or its Technical Consultant will also begin discussions on commissioning plans. *Item 8 below and Section 3.3 provides further detail.*

The Applicant is responsible for ensuring that all the applicable State and Local permitting procedures are completed for the proposed Project. Most CHP Systems will require an air permit or permit modification with NYSDEC to ensure compliance with all State regulations. There are three (3) permit classifications depending upon the annual amount of each pollutant emitted: (1) Registration Permit (minor source); (2) State Facility Permit (minor source); (3) Title V Permit (major source). Typically, facility NO<sub>x</sub> emissions will dictate the appropriate permit for a given installation. The Applicant is responsible for ensuring that all the applicable local and State and Federal permitting procedures are completed for the proposed project.

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**4. MEASUREMENT AND VERIFICATION (M&V):** NYSERDA's Technical Consultant will work with the Applicant to develop a suitable M&V Plan. NYSERDA's Technical Consultant will provide specification language to the project's engineer of record for inclusion in the bid package. *M&V specifications and reporting requirements are presented in Section 4.0 of this document.*

The Applicant is responsible for the purchase and installation of sensors as described in *Section 4.1 M&V Specifications*. The site shall provide the necessary instrumentation and communications to monitor their CHP system including a phone line, internet access or other means of communication acceptable to NYSERDA and its Technical Consultant for remote data collection. Connecting sensors and meters to the data acquisition system will be the responsibility of NYSERDA's Technical Consultant.

The M&V data will be maintained within NYSERDA's CHP Data Integration Website ([NYSERDA DG/CHP Integrated Data System](#)). NYSERDA and its Technical Consultant will specify the savings analysis procedures and will provide data analysis services. This NYSERDA CHP Website will be used to prepare the M&V reports and determine the performance incentive for the Applicant.

**5. CONSTRUCTION DOCUMENTS:** Copies of the final design documentation shall be submitted to NYSERDA and should highlight any changes that have been made since the Schematic Design.

**6. OPERATIONS AND MAINTENANCE (O&M) CONTRACT:** NYSERDA requires that an O&M contract be in place for the duration of the M&V period to ensure that the CHP equipment is properly maintained. A copy of this agreement should be sent to NYSERDA.

**7. PROGRESS PAYMENTS:** Progress Payments may be requested after the issuance of an executed Agreement and PO at specified development times. Section 2.1 describes when such requests can be made.

**8. COMMISSIONING:** Third Party Commissioning is mandatory for all CHP systems. The Commissioning Agent must be under contract to the Applicant. *A detailed description of the deliverables is provided in Section 3.3.* The Applicant is responsible for submitting a Final Commissioning Report summarizing the results of the commissioning process. The report must include a summary discussion of the following items:

- The findings of the Construction Checklists
- The results of the Test Procedures and Test Data Reports
- Outstanding items in the Issues Log
- The results of the training process

**9. POST-INSTALLATION INSPECTION:** After review and approval of all required documents, the Applicant has 12 months to install the CHP system. After the CHP system has been installed (receipt of interconnection letter) and commissioned, the Applicant has 3 months to submit commissioning reports and contact NYSERDA and its

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Technical Consultant to conduct a post-installation inspection of the CHP system to verify that the system specified in the executed Agreement has been installed and is operating according to its design intent. The NYSERDA Technical Consultant will also conduct emissions testing at this point to ensure program compliance.

The NYSERDA Technical Consultant will provide a report summarizing the project and its ability to meet program performance requirements. The Applicant will sign the summary report and add the following statement: “Additionally, I certify that the installation and commissioning of the CHP System described above have been completed and all requirements of the *NYSERDA Performance Program* are being adhered to.”

This is the final opportunity for the Applicant to request a revision to the estimated peak demand reduction. Any revisions require NYSERDA approval.

The energy generated and demand reduction estimates in the post-installation report may fall short of the earlier estimated energy generated and demand reduction based on the engineering analysis for one of the following two reasons:

1. The Applicant has met all of its obligations by properly installing the CHP System specified in the engineering analysis; however, project performance does not initially appear to meet expectations (based on spot measurements, observed operating conditions, etc.), or
2. The Applicant has not fulfilled its obligation by failing to properly install the CHP System specified in the engineering analysis.

In both cases, the Project Installation Payment may be reduced accordingly. However, in the first case, the maximum potential incentive may remain unaffected following the M&V period if the CHP System performs as estimated in the engineering analysis.

In the second case, NYSERDA reserves the right to reduce the maximum potential incentive based on the portion of work that was not completed in accordance with the approved engineering analysis. If the majority of work was not completed in accordance with the approved engineering analysis and the Applicant failed to provide timely notice of the change, NYSERDA may withhold any incentive payment. The Applicant has 60 days from the date of the rejection to provide necessary information and resolve all outstanding issues with NYSERDA.

**10. M&V REPORTING:** After installation and commissioning the Applicant has a maximum of 3 months to begin reporting M&V data. 30 days from the end of Year 1 of M&V, NYSERDA’s Technical Consultant will prepare an M&V report. The M&V report will include clear and verifiable data and describe the baseline assumptions and calculations used to calculate actual energy savings. The M&V report results will become the basis for the performance payment amounts. The M&V data will be in NYSERDA’s CHP Website. NYSERDA’s CHP Website will be accessible by the Applicant. In addition, overview and summary information regarding the Applicant’s project may be publicly available on NYSERDA’s CHP Website.

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30 days from the end of Year 2 M&V, a second M&V report will be generated by NYSERDA's Technical Consultant.

**11. PERFORMANCE PAYMENTS:** NYSERDA will issue performance payments after reviewing, verifying, and approving the M&V report(s) of up to 30% of the total project incentive in the Agreement. Each payment will be based on the total verified electric energy generated and peak demand reduction during the summer capability period, after adjusting for differences between the estimated and verified energy savings. The sum of the progress payments and the performance payments may not exceed 100% of the total project incentive included in the Agreement. Performance payments are also subject to non-performance incentive reductions (*see Section 4.3*).

**12. BONUS INCENTIVES:** NYSERDA will issue two bonus incentives at the start of M&V Year 1, if applicable:

- A maximum of 10% additional incentive is available to those projects serving Critical Infrastructure, including Facilities of Refuge.
- A maximum of 10% additional incentive is available to those projects that are within a Targeted Zone as established by a Utility as being a load service area of particular interest.

and the third Bonus Incentive is available at the completion of each M&V Period (each year is capped at 5%.) .

- A maximum of 10% total additional incentive is available to those projects that demonstrate superior performance as determined by the measured Fuel Conversion Efficiency.

### **3.1 ENGINEERING ANALYSIS (EA)**

This section includes a discussion of the requirements of the EA. The EA is submitted as part of the application and must be approved by NYSERDA. The estimated amount of electric energy generated and peak demand reduction or avoidance during the summer capability period in the approved EA will become the basis of the NYSERDA Incentive payable to the Applicant.

#### **SUBMITTAL AND NOTIFICATION SCHEDULE**

If an application is received without an EA, it will be rejected. An original and electronic version of the EA should be submitted to NYSERDA. The electronic copy shall include a spreadsheet-based model that describes system operation, including site-specific electricity produced and heat recovered on an hourly basis for one year.

**EA REQUIREMENTS:** The following information must be included in the EA:

#### **SYSTEM INFORMATION**

- Energy use profiles including electricity produced and heat recovered on an hourly basis for twelve months. Assumptions and description of the system operation

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used in the model should be clearly indicated in the EA.

- The type and rating of the prime mover, an energy balance around the prime mover, including the uses for the recovered heat must be applied to a schematic of the system. Annual totals for each energy input/output must be shown along with maximum, minimum, and average instantaneous values. Temperatures for each waste heat transfer fluid and sink must also be indicated.
- CHP system efficiency and emissions must be described.
  - Annual thermal utilization percentage must be given (i.e., the annual amount of heat that is recovered for space and/or process heating and/or cooling divided by the annual recoverable thermal output from the prime movers).
  - Fuel conversion efficiency (FCE) for the prime movers must be provided. FCE is defined as the ratio expressed as a percentage of the total usable energy produced by a technology to the sum of all fuel or other energy inputs to the technology measured at each fuel's heating value. Please specify using Higher Heating Value (HHV). Please refer to calculation on page 21.
  - The annual emissions of the proposed system must be provided.
  - Any additional emission control technology must be provided if necessary to meet emission regulations.
- A preliminary floor plan indicating equipment location.
- The pressure and availability of gas must be described in the study.
- An operational sequence must be included that specifies the control system to be used along with a discussion of its integration with other on-site control systems and who will have responsibility for system operation.
- A project schedule that includes durations for design (engineering & architectural), utility coordination and review, permitting (environmental and construction), construction, start-up and commissioning must be provided.

#### **ECONOMIC EVALUATION**

- Electricity, fuel, operation and maintenance costs before and after the proposed installation on a monthly basis along with a summary of project economics must be included.
  - Electricity and fuel costs should be broken down by on-peak and off-peak periods. Electricity usage and costs should be further broken down by consumption and average daily demand.
  - Economics must be presented in a simple payback format. Additionally, a cash flow analysis or life cycle cost analysis must be presented.
  - Operational costs must include any impact to the customer's energy tariffs.
  - Maintenance costs can be listed in \$/kWh, but must also be annualized. This should include Applicant M&V costs.

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Capital costs must include:

- Itemized equipment purchase and system installation
- Structural (new building, existing building modifications, etc)
- Interconnection and Utility Connection (construction & utility fees)
- Electrical distribution system changes
- Rigging, Permitting, Design fees, Commissioning

#### **MAINTENANCE**

- In addition to inclusion in the economic analysis described above, maintenance items must be described in detail. The source of the maintenance costs must be included along with a list of what would be covered (i.e. annual major overhaul of prime mover, oil changes, etc.).
- An estimate of downtime that would occur due to routine maintenance must also be included.

#### **TARIFF IMPACTS AND INTERCONNECTIONS**

- In addition to inclusion in the economic analysis described above, a detailed description of the relationship between the proposed CHP facility and the Customer's existing, or planned, energy tariffs must be included. Contract dates and dates of potential tariff rule changes must be included. In the case where such future changes would significantly impact the economics of the Project, sensitivity analysis must be presented assuming the potential tariff or contract changes occurred.
- Site-specific grid interconnection issues and costs must be discussed. A brief, clear plan for if and how the system will be properly interconnected to the grid, natural gas pipelines and/or the Con Edison steam system must be presented.

#### **PERMITTING**

- A brief description of the necessary environmental and building permits that the Customer needs to obtain must be provided. The permit determination should be based on the annual emissions potential for the size of the unit and the emissions of any existing equipment at the facility. Anticipated time frames and durations for environmental, utility and construction permitting should be incorporated in the Project schedule.

#### **SYSTEM RELIABILITY AND AVAILABILITY**

- The reliability and availability of the CHP System must be quantified (e.g. number of hours the system would be available at less than full capacity). This must be compared to service and discussed in the context of the Customer's core business and tolerance for risk.

### **3.2 SCHEMATIC DESIGN REQUIREMENTS**

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All Applicants are required to submit a copy of the schematic design to NYSERDA. The following provides a listing of specific information that must be included in the schematic design.

#### **EQUIPMENT OPERATING SPECIFICATIONS**

- Equipment capacity and predicted summer-peak demand reduction
- Annual:
  - Operating efficiency
  - Fuel input
  - Electric (kWh) output (less parasitic electric use)
  - Waste heat generated
  - Waste heat usable
- Operating noise level
- Emissions parameters
- Systems reliability and uptime requirements

#### **EQUIPMENT LAYOUT**

- Schematic Plans should be developed showing the following:
  - Floor plan showing equipment location within the building, or if an addition is required to house the equipment
  - Layout of major pieces of equipment location including, generator, stack, switchgear, gas booster and heat rejection equipment
  - Utility interconnection location including electrical, gas, and steam (if applicable)
  - Sensor locations to meet program M&V requirements
  - Any required changes to the building's structural components
- Indicate required maintenance and service clearances
- Discuss means of rigging for large components
- Indicate means of noise attenuation
- Indicate means of providing makeup air

#### **SITE WORK REQUIREMENTS**

- Any large scale trenching, additional utility poles, ground repairs, etc must be described and detailed.

#### **PERMITTING & INSPECTION**

- Responsibilities for permitting, inspections and signoffs must be specified.

### **3.3 COMMISSIONING REQUIREMENTS**

Construction phase commissioning is required for all CHP systems. The Commissioning Agent (CxA) must be under contract to the Applicant, and shall be a third party independent of the design team and the construction team. The commissioning process

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must include the following deliverables, which will be reviewed by the NYSERDA Technical Consultant.

#### **ISSUES LOG AND ISSUES REPORTS**

- A spreadsheet, database or text document tracking commissioning related issues throughout the Cx process must be maintained by the CxA. The Issues Log must include at a minimum a description of the issue, the date the issue was identified, the party responsible for resolving the issue, the documentation of the resolution, and the date of resolution.
- Issues Reports summarizing outstanding items in the Issues Log must be submitted monthly to the NYSERDA Technical Consultant.
- A final Issues Report summarizing any outstanding items, as well as a Resolved Issues Report summarizing all issues that were raised and resolved during the commissioning process must be included in the Final Commissioning Report described below.

#### **FINAL DESIGN REVIEW**

- A review of the final design documents must be performed by the CxA prior to issuance of bid/construction documents. The intent of the final design review is to ensure adherence with the EA and compliance with the CHP program requirements. Additionally, the review should verify that construction checkout documentation, system testing, staff training and close-out documentation is sufficiently specified. Issues identified during the design review should be listed in the Issues Log.

#### **CONSTRUCTION CHECKLISTS**

- The CxA must develop a detailed Construction Checklist for each primary piece of equipment. The purposes of these checklists are to (1) aid the NYSERDA Technical Consultants by providing specific information on the installation requirements for the equipment/assembly and (2) formally document for the NYSERDA Technical Consultant that the installation contractor has fully installed and calibrated the equipment. Each checklist must include:
  - Equipment/assembly verification (equipment make, model, capacity, etc. that was specified, then submitted and finally installed)
  - Pre-installation checks (equipment condition at delivery, equipment voltage, mounting point configuration, etc).
  - Installation checks (controls installed, equipment grounded, vibration isolation, piping complete, piping specialties installed, venting/ductwork installed, etc).
- The Start-Up Report should be attached to the Construction Checklist upon completion.
- The CxA must perform spot check verifications in the field of the items attested to on the Construction Checklists by the Technical Consultant(s).

#### **TEST PROCEDURES AND TEST DATA REPORTS**

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- The CxA must develop detailed procedures for testing the operational sequences (including safeties) of the CHP System. These Test Procedures are then executed by the site operator, in the presence of the CxA and owner, prior to turning the system over to the owner.
  - Note that this testing is not the same as system start-up, which is performed by the installation contractor or Project Developer as part of the tuning process.
  - The Test Procedures shall include testing, at a minimum, the following sequences:
    - System enable/startup including staging (if multiple prime movers are used)
    - Normal system shutdown
    - Emergency system shutdown
    - All safety sequences (low gas pressure, high gas pressure, overcurrent, over/under voltage, etc.)
    - Utility to CHP System power transfer and isolation
  - The CxA must develop Test Data Reports formally documenting the results of the Test Procedures. The reports must list the key design performance specifications of the installed equipment that will affect the system overall annual fuel utilization, list of the measured performance during the initial post-installation test and the test conditions, and list the measured performance after the system commissioning is complete, if any adjustments were made.
  - Emissions testing must also be documented by the CxA. Copies of test reports for all emissions testing must be compiled and included in the Systems Manual described below.
  - Settings and test procedures required by a Utility must also be documented and verified by the CxA.

### **3.4 INVOICES**

This section presents the procedures involved in the preparation, submittal, and processing of the invoices that Applicants must submit to receive incentive payments.

#### **SUBMITTING THE INVOICE**

An Applicant will use its own invoice form to request payment and will submit the following invoices to NYSERDA over the course of a Project. At any time, the total of all payments may not exceed 50% of documented costs incurred for the purchase of the CHP System.

- Progress Payment Invoice – Bill of Lading: It is for up to 15% of the Base project incentive stated in the Agreement. It is submitted after the equipment is delivered to the site.
- Progress Payment Invoice – Interconnection: It is for up to 15% of the Base project incentive stated in the Agreement. It is submitted after the interconnection approval is received by the site.
- Project Installation Payment Invoice: This invoice, based on energy generation and kW generation estimates, is for up to 10% of the Base project incentive stated in the Agreement. It is submitted following NYSERDA's approval of both the installation and the Applicant's request to start M&V.

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- **Bonus Payment – Critical Infrastructure:** If the Project applied for and is serving Critical Infrastructure, the 10% Bonus Incentive will be released at the start of M&V Year 1.
  - **Bonus Payment – Targeted Zone:** If the Project applied for and is serving within a Targeted Zone, the 10% Bonus Incentive will be released at the start of M&V Year 1.
  - **1<sup>st</sup> M&V Invoice:** Based on the approved M&V plan, there are two performance invoices. The 1<sup>st</sup> M&V Invoice is for the balance of up to 30% of the Base project incentive stated in the Agreement. It is submitted following NYSERDA's approval of the first M&V Report.
  - **2<sup>nd</sup> M&V Invoice:** The 2<sup>nd</sup> M&V Invoice is for the balance of up to 30% of the Base project incentive stated in the Agreement. It is submitted following NYSERDA's approval of the second (and final) M&V Report.
  - **Bonus Payment – Superior Performance:** If the Project meets the requirements of Superior Performance up to a 10% Bonus Incentive will be released. Each year of M&V is capped 5%.

The M&V performance payments may be reduced if the installed CHP System fails to achieve the energy savings as established within the Agreement or underperforms on emissions or fuel conversion efficiency (see *Section 4.3*).

## **SECTION 4.0 MEASUREMENT & VERIFICATION (M&V)**

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This section specifies the rules, procedures, roles and responsibilities of measurement and verification (M&V) for CHP systems.

The purpose of M&V is to quantify:

1. Generator power output (kW) at 15-minute intervals during key on-peak periods;
2. Cumulative energy generated and used on-site by the CHP System (MWh) on an annual basis;
3. Annual fuel conversion efficiency;
4. NOx emissions;
5. CO emissions.

All M&V data shall be transmitted to NYSERDA's CHP Website (<http://chp.nysERDA.ny.gov>). Incentives will be paid based on review and approval of the M&V data by NYSERDA or its Technical Consultant. Incentives shall be based upon generator output minus ancillary or parasitic loads.

### **4.1 MEASUREMENT & VERIFICATION SPECIFICATIONS**

M&V will involve the Applicant as well as several NYSERDA Technical Consultants. The Applicant is responsible for ensuring that data collected and transmitted to NYSERDA and its Technical Consultants accurately represents the operation of the CHP

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system.

NYSERDA and its Technical Consultants will:

- Provide oversight and quality control for the monitoring and verification efforts;
- Confirm the necessary data collection instrumentation is installed by the site and install any additional data collection systems (hardware and software) required to transfer data to NYSERDA's CHP Website;
- Verify sensor readings, document sensor locations, and develop a CHP system description (schematics, specifications, and narrative) to document that collected data meet program goals;
- Validate the monitored data and load it into NYSERDA's CHP Website;
- Confirm the validity of the collected data, define error checking procedures; and
- Integrate the site documentation to the NYSERDA's CHP Website.

### **THE M&V PROCESS**

The M&V process includes:

- Specification, approval, procurement and installation of the required instrumentation by the Applicant or Applicant representative;
- Installation and verification of monitoring equipment during the commissioning process by NYSERDA's Technical Consultant;
- Automatic loading and verification of the collected data into NYSERDA's CHP Website over the verification period, 2 years arranged by NYSERDA's Technical Consultant; and
- Periodic determination of performance based on the net measured power output, CHP efficiency, and NO<sub>x</sub> and CO emissions levels measured by NYSERDA's Technical Consultant.

### **SPECIFYING, PROCURING, AND INSTALLING INSTRUMENTATION**

The Applicant is responsible for supplying and installing the instrumentation necessary to characterize the energy flows of the CHP system (see requirements in Table 1) as well as a communication medium (phone, broadband or other medium as agreed to with NYSERDA or its Technical Consultant) at the site. Table 2 provides examples of instrumentation specifications. The Applicant shall submit an Instrumentation Plan (IP) that includes a list of proposed instrumentation, along with a system schematic or drawing showing the location of each instrument. The IP will be submitted by the site as part of the design document submittal. The list of instrumentation shall include manufacturer, model numbers, accuracy specifications, instrument range and other pertinent data.

Manufacturers "cut sheets" may also be provided. The system schematic must show a

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simplified representation of the CHP System along with pertinent information to demonstrate proper sensor placement and installation. NYSERDA will review and approve the IP. If submitted information is inadequate or incomplete, NYSERDA's Technical Consultant will work cooperatively with the Applicant to develop an acceptable IP.

Once the IP is approved, NYSERDA's Technical Consultant will prepare a draft M&V Plan that documents the measurements and how they will be used to calculate the required information. The M&V Plan will be provided to the Applicant for review and comment.

The Applicant will procure and install the specified instrumentation per the manufacturer's instructions and based on feedback from NYSERDA's Technical Consultant. Once the instrumentation is installed, NYSERDA will visit the site and confirm the specified instrumentation is properly installed.

### **INSTALLING AND VERIFYING THE MONITORING SYSTEM**

Before CHP System operation begins, NYSERDA's Technical Consultant will work with the Applicant to install a data collection system that uses the instrumentation and communications provided by the site. General monitoring guidelines in NYSERDA's Monitoring and Data Collection Standard for DG/CHP Systems [2] and the ASERTTI DG/CHP Long Term Monitoring Protocol [3] will be followed. The system will log or record data at least 15 minute intervals, averaging or integrating readings as required providing accurate and meaningful readings. Heat transfer calculations will be performed at a minimum of 15 second intervals. The resulting heat transfer values (BTU or equivalent) will be averaged and logged to at least 15 minute intervals. The monitoring system shall have on-board storage sufficient to retain a minimum of 14 days of data in the event that communications or site power is lost. The system will automatically transfer data to the NYSERDA's CHP Website at least once per day.

Correct functioning of all instrumentation and sensors will be verified with handheld sensors or by another independent method during the CHP system commissioning process. NYSERDA's Technical Consultant will confirm that the installed system is capable of measuring the net power output, after considering parasitic or auxiliary power use of the system. Parasitic power may be determined by recording power or equipment runtime readings at least 15 minute intervals, and/or by taking one-time true power readings with handheld meters. NYSERDA's Technical Consultant may also provide and install additional instrumentation to measure equipment loading, speed, current draw or duty cycle for variable parasitic loads such as pumps and fans. Similarly, NYSERDA's Technical Consultant will confirm that the measured thermal output from the system used in the CHP efficiency calculations represents heat recovery that displaces fuel or energy consumption from a boiler, furnace, chiller or other system.

NYSERDA's Technical Consultant will update the M&V Plan based on the actual equipment installed at the site. The M&V Plan will include a schematic of the CHP

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System and instrumentation, provide verification details, instrument multipliers, and one-time readings; and provide calculation procedures for determining net power output and CHP efficiency. The M&V Plan will be posted on the NYSERDA CHP Website as part of the project documentation.

#### **LOADING AND VERIFICATION INTO THE NYSERDA CHP WEBSITE**

Once the on-site monitoring system is installed and verified, NYSERDA's Technical Consultants will work together to setup an automated process to load the collected data into the database at least daily. Automatic error checking and screening procedures will also be established to gauge the data quality and to notify appropriate Project team members if a sensor failure or other abnormality occurs at a site. NYSERDA's Technical Consultant will carefully analyze and review the first few weeks of data and the M&V Plan to confirm the validity of the collected data.

#### **ANNUAL EMISSION AND EFFICIENCY PERFORMANCE VERIFICATION**

The emissions performance of the CHP system will be checked by NYSERDA's Technical Consultant three times during the project: (1) prior to the start of M&V (2) at the end of the first M&V Period, and (3) at the end of the second M&V Period.

NYSERDA's Technical Consultant will calibrate and check onsite sensors. The annual performance validation will include:

- Emissions testing for NO<sub>x</sub>, CO, and non-methane HC using a portable analyzer or equivalent (EPA CTM 030, <http://www.epa.gov/ttn/emc/ctm/ctm-030.pdf>);
- Fuel meter calibration or function test; and
- Power meter and thermal metering field calibration checks.

#### **TABLE 1. PROVISIONAL INSTRUMENTATION REQUIREMENTS FOR CHP SYSTEMS**

This table defines the instrumentation requirements for the site. If the instrumentation is used by the on-site control system, provisions must be made to also provide additional outputs from each sensor as agreed to with NYSERDA. The following basic instrumentation shall be supplied, installed and commissioned by the site:

- a power meter with an accuracy of at least 1% that is capable of supplying either a kWh pulse output, 4-20 mA kW output, or other output as agreed with NYSERDA or its Technical Consultant for the following points:
  - generator output
  - facility power consumption
  - parasitic loads generator or heat recovery system loads (one time measurements with equipment runtime may also be acceptable)
- a fuel meter, other than the utility meter, with an accuracy of  $\pm 1\%$  to measure generator fuel consumption. The meter should be temperature and pressure

- compensated (if located outdoors or in an unconditioned space). Uncompensated meters may be permissible if located in conditioned space and if gas pressure is less than 1 psig,
- a liquid or steam flow meter, as applicable, with an analog output that is capable of measuring 120% of the nominal flow rate. The meter must be installed per the flow meter manufacturer’s instructions. For hot water flow meters, an accuracy of  $\pm 1\%$  is required. For steam flow meters, an accuracy of  $\pm 1\%$  is required with temperature (and pressure) measurements
  - At a minimum, ¼ inch thermowells must be provided by the site at appropriate locations in the system.
  - Instrumentation signal wiring pulled to a central location as agreed upon with NYSERDA or its Technical Consultant.

**TABLE 2. EXAMPLE INSTRUMENTATION SPECIFICATIONS**

<b>Measurement</b>	<b>Example Instrument Make / Model(s)</b>	<b>Recommended Accuracy</b>	<b>Instrument Output</b>	<b>Supplied by</b>
power generation	Wattnode WNA-3Y-480-P meter with CTS-1250-400A  SHARK-100  Schneider Electric Power Logic ME3	ANSI C12.1 and 1% full scale accuracy required  ANSI C12.20 and 0.2% full scale recommended	Solid state pulse output  or 4-20 mA  or MODBUS	Site
fuel flow rate	Roots Series B3 8C175	$\pm 1\%$ reading	Solid state pulse output	Site
CHP Loop flow rate	Onicon F1200 Insertion Turbine  Nice Titan Shedding Vortex	$\pm 1$ percent full scale	Scaled Pulse Output  or 4/20 mA	Site
supply and return water temperature	10,000 ohm 10k Type II thermisters	$\pm 1\text{ }^\circ\text{F}$	Resistance	NYSERDA Technical Consultant
heat recovery rate	Onicon System 10  Badger 380  Contrec 212	$\pm 2\%$ reading	Only BTU meters with extended output (MODBUS) providing flow and temperature readings along with thermal energy are acceptable	Site

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## DEFINITIONS AND CALCULATION PROCEDURES

Net power output in the on-peak period is defined as

$$kWp = \frac{\sum_{j=1}^T (kWh_{output,j} - kWh_{parasitic,j})}{T}$$

where T is the number of hours in the on-peak period. The cumulative annual energy output (kWh<sub>a</sub>) will be determined by the same method, but will be summed for all hours of the 12-month period.

The annual CHP efficiency (based on higher heating value) is defined by:

$\eta_{chp,HHV} = \frac{\left( \frac{\sum_{i=1}^{8760} Q_{useful,i}}{0.80} \right) + 3,412 \cdot \left( \sum_{i=1}^{8760} kWh_{output,i} - \sum_{i=1}^{8760} kWh_{parasitic,i} \right)}{HHV_{gas} \sum_{i=1}^{8760} gas_{input,i}}$	
$Q_{useful,i}$	Useful heat recovery provided for hour i (Btu)
$kWh_{output,i}$	Generator power output provided for hour i (kWh)
$kWh_{parasitic,i}$	Parasitic power consumption for CHP system for hour i (kWh)
$gas_{input,i}$	Generator gas input for hour i (cu ft)
$HHV_{gas}$	Higher heating value for natural gas supplied at site from utility bills, average of 12 months (Btu per cu ft)
0.80	nominal boiler efficiency
3,412	Conversion of kWh to Btu
8,760	number of hours in a year. For determining a monthly CHP efficiency, substitute the number of hours in the month

**Useful heat recovery** is:

- thermal output that displaces fuel use in a boiler, furnace or other system,
- thermal input into a chiller, desiccant system, or other system that provides a useful output or service such as cooling or dehumidification.

**Parasitic power** is electricity consumption by a component that, in the absence of the CHP system, would not be required at the facility. This includes controls, pumps, fuel compressors and fans associated with the generator, used to provide heat recovery to the load, or used to reject unneeded heat. Parasitic power can be the sum of several power measurements, or be derived from one-time power readings with component runtime information.

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## PROCEDURE TO ACCOUNT FOR LOSS OF MEASURED PERFORMANCE DATA

The formulas above are used to calculate the average on-peak power output ( $kW_p$ ), the annual energy output ( $kWh_a$ ), and the annual CHP efficiency ( $\eta_{chp}$ ). These values form the basis for determining the performance incentive. In some cases, a sensor or monitoring system failure or other problem at the site may result in data being lost or failing to pass the data validation process for part of the performance period (i.e., a M&V outage). If data loss occurs, the following procedures will be used to calculate the necessary performance information to determine the incentive:

- The ***net power output*** for the missing period, will be determined by taking the average output measured from similar length periods just prior and just after the M&V outage. This procedure will be used for up to two M&V outages for up to 36 hours each per 12 month period. If more than two M&V outages occur per 12-month period, then the site shall be required to provide independent cumulative meter readings or other documentation to demonstrate that the CHP system power output during M&V outage. Otherwise, the generator output will be assumed to equal zero for the outage period.
- The ***CHP efficiency*** of the system for an M&V outage period will be determined using measured performance from similar periods when the CHP system operated normally, as determined by the NYSERDA Technical Consultant. If thermal and power output varies with ambient temperature or other weather conditions, then temperature-dependent correlations or trends will be used to predict the performance during the M&V outage. If CHP system performance varies seasonally or weekly, appropriate similar periods will be used to predict performance during the M&V outage.

### References

- [1]. *Interim Distributed Generation and Combined Heat and Power Field Testing Protocol*, Association of State Energy Research and Technology Transfer Institutions, Madison, WI, October 2004.
- [2]. *Monitoring and Data Collection Standard for Distributed Generation/Combined Heat and Power (DG/CHP) Systems*, [chp.nyserda.org](http://chp.nyserda.org) (under Links section), December 2002.
- [3]. *Distributed Generation and Combined Heat and Power Long Term Monitoring Protocol*, Association of State Energy Research and Technology Transfer Institutions, Madison, WI, April 2005.

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## **4.2 MEASUREMENT AND VERIFICATION (M&V) REPORTS**

This section presents a review of the submittal procedures and schedules and a discussion of the content of the reports.

### **SUBMITTING THE M&V REPORTS**

NYSERDA will prepare the M&V reports. NYSERDA will submit the M&V reports to the Applicant for approval and the Applicant may then submit an invoice based on the savings in the M&V report. The Applicant is responsible for ensuring that data collected and transmitted to NYSERDA and its Technical Consultants accurately represents the operation of the CHP system.

### **FIRST M&V REPORT**

The first M&V report shall be issued within 30 days after the first performance period ends. This report will include the results of the emission testing as well as the energy generated and the kW generated during the summer capability period. The required performance period will be defined in the approved M&V plan and may extend for up to 12 months.

### **SECOND M&V REPORT**

The second M&V report is due 30 days after the second performance period ends. This report will include the results of the emission testing as well as the energy generated and the kW generated during the summer capability period.

### **M&V INSPECTION**

Periodically, NYSERDA may choose to visit a project site to verify that the information provided is accurate with regard to Project equipment, site conditions, and monitoring configurations. These inspections may occur at any time after project installation, both prior to and after the preparation of an M&V report by NYSERDA. Should NYSERDA decide to inspect a site, NYSERDA, or its Technical Consultant may or may not contact the Applicant to schedule the inspection. In other words, an inspection may occur without advance notice given to the Applicant. If the M&V activities are found to be different from those represented in either the M&V plan or the M&V report, NYSERDA may refuse any further incentive payments. If NYSERDA deems an inspection necessary, an M&V report that is under development will not be submitted to the Applicant for approval until the inspection has been completed.

## **4.3 NON-PERFORMANCE AND INCENTIVE REDUCTIONS**

CHP system incentives are based on the Applicant's ability to generate electricity and provide peak summer demand reduction using clean and efficient CHP Systems. CHP System incentives are subject to incentive reductions for not achieving minimum fuel conversion efficiency and air emission requirements.

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## **NON-PERFORMANCE**

Incentives will be reduced if the CHP System does not meet the minimum performance requirements stated in this Section 3.3. The required actions of an Applicant and the reduction in incentives resulting from the failure to meet the requirements are as follows:

### **EMISSIONS**

- CHP Systems that do not achieve 1.6 lbs/MWh or lower in NO<sub>x</sub> emissions and 6.3 lbs/MWh or lower in CO emissions will be given a period of time to take corrective action. If the correction action fails to bring the Project into compliance or should the improvements be deemed invalid, then no further payments will be issued. Emissions testing will occur after commissioning and at the end of each year of M&V for a total of three times.

### **EFFICIENCY**

- FCE greater than 55 and less than 60%
  - The Applicant's M&V payment for the project will not be reduced.
- FCE between 50 and 55%
  - The Applicant's M&V payment for the project will be reduced by 50% for that year of M&V.
- FCE less than 50%
  - The Applicant will not be eligible to receive an M&V payment for that year of M&V.

### **POWER RATIO**

- The incentive for any project that achieves a Power Ratio ( $\text{kW}_p/\text{kW}_{\text{SPC}}$ ) of less than 1.0 will be prorated for that year of M&V.

### **CORRECTIVE ACTION (FOR EMISSIONS ONLY)**

NYSERDA will allow the Applicant to take corrective action for a system that does not meet the program's emission requirements. The following is the corrective action process:

- The Applicant will be required to submit a corrective action plan (CAP) to NYSERDA for approval within 30 days of notification of non-performance;
- Upon approval by NYSERDA, the Applicant has a further 60 days in which to implement the CAP; and
- The system modifications will then be inspected and measurements repeated to confirm that the corrective action has resulted in compliance.
- If the system fails to meet the Program emission requirements no further incentive payments will be administered.

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## **SECTION 5.0 STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQRA) AND PERMITTING**

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### **STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQRA):**

NYSERDA will carefully review the environmental impact of all potential CHP systems. NYSERDA is required under SEQRA to consider the environmental implications of all funded projects. All proposals must include a completed SEQRA environmental assessment form (EAF), along with supporting documentation.

This Section presents screening procedures to determine if a CHP system has the potential for significant air quality and noise impacts as defined in the New York State Public Service Commission's Order (Order) on Demand Management Action Plan (Case 04-E-0572), effective March 16, 2006. A project that is deemed to have the potential for significant environmental impact by the screening procedures or does not meet the screening criteria will require further analysis to demonstrate no significant adverse environmental impacts. This analysis may include dispersion modeling to demonstrate compliance with all appropriate air quality standards and criteria. The methodology used for such modeling analysis will follow the guidance published by the New York State Department of Environmental Conservation (NYSDEC) and, if applicable, guidance provided by the local regulatory agency.

### **SCREENING PROCEDURE**

The Applicant shall provide NYSERDA with the completed NYSERDA Environmental Assessment Form as part of the application. Each CHP system will be reviewed by the Environmental Technical reviewer to determine whether any potential significant adverse air quality or noise impacts exist.

### **PERMITTING**

Most CHP systems will require an air permit with NYSDEC to ensure compliance with all State regulations. There are three (3) permit classifications depending upon the annual amount of each pollutant emitted: (1) Registration Permit (minor source); (2) State Facilities Permit (minor source); and (3) Title V Permit (major source). Typically, facility NO<sub>x</sub> emissions will dictate the appropriate air permit for a given installation.

The Applicant is responsible for ensuring that the proposed project complies with all Federal, State and local codes and regulations, including, but not limited to those specifically identified on Page 43 of the PSC Order on Demand Management Action Plan (Case 04-E-0572) (<http://www.dps.ny.gov/fileroom.html>), effective March 16, 2006.

The Applicant is responsible for ensuring that the system receives all pertinent Federal, State and local permits.

**INSTRUCTIONS FOR COMPLETING THE ENVIRONMENTAL ASSESSMENT FORM:**

Line Number and Name		Specific Instructions
<b>Unit Data</b>		
1	Unit Manufacturer	Enter the name of the CHP Unit Manufacturer
2	Model Number	Provide the model number for the unit to be installed (this is provided by the manufacturer).
3	Model Year	Provide the model year for the unit to be installed (this is provided by the manufacturer).
4	Equipment Rating (MW)	Provide the size of the unit be installed, or equipment rating in Mega Watts (MW).
5	Fuel Type and Usage	Provide the type of fuel and the maximum hourly fuel consumption in cubic feet per hour or gallons per hour.
6	Distance of Exhaust Stack to Nearest receptor (ft)	Using the proposed location and height of the exhaust stack, find the horizontal distance, in feet, to the nearest receptor which is at a height similar to or greater than the stack. A receptor could include the nearest functional window or air intake shart/fan.
<b>NOISE</b>		
7	What is the equipment noise rating in dBA without noise attenuation equipment and the distance at which these measurements were made?	Provide the noise level (in dBA) for the equipment to be installed. This information is generally available from the manufacturer.
8	Noise Code Compliance	Does the unit comply with local noise codes or ordinances? (where there is no local noise code, the NYC noise code should be used). eg. In NYC, Noise Control Code Title 24, Subchapter 6, Section 24-243. New York City Zoning Resolution Article IV, Section 42-21. CEQR Technical Manual, 2001, Section 3R and Appendix B.  *All units must comply with local noise codes.
9	Will sound attenuation equipment (mufflers, silencers) be required to meet noise code?	Is the rated noise level of the equipment to be installed above that allowed by the local noise code? (where there is no local noise code use the noise levels from the NYC noise code).
10	What sound attenuation equipment will be installed?	Provide a description of the type of sound attenuation equipment that will be installed (e.g. silencer)
11	If sound attenuation equipment is required, what will be the resultant noise rating in dBA?	When the sound attenuation equipment is installed on the equipment what will be the final noise level?
<b>AIR QUALITY</b>		
12	Is the proposed unit between 0.5 and 5 MW?	Using manufacturer's information (line 10 above), if the proposed unit rating falls within the range of 0.5

		to 5 MW answer Y, otherwise answer N.
13	Will the annual capacity be between 30 and 75%?	If the planned usage of the unit is within the range of 30 to 75 %, answer Y, otherwise answer N.
14	Is the proposed CHP exhaust stack located on the tallest building onsite where reasonable?	In addition to answering, please include nearest building distance and height
15	Exhaust Stack Height (feet) above Structure	Enter the height of the exhaust stack in feet above the structure
16	Exhaust Stack Height (feet) above Ground	Enter the height of the exhaust stack in feet above the ground
17	Exhaust Stack Diameter (in)	Enter the diameter of the exhaust stack in inches
18	Exhaust Gas Exit Velocity (ft/s)	Enter the velocity of the gas leaving the exhaust stack in feet/second
19	Exhaust Gas Flowrate (acfm)	Enter the flowrate of the exhaust gas in actual cubic feet per minute (acfm)
20	Exhaust Gas Temperature (deg F)	Enter the temperature of the exhaust gas in degrees F
21	Exhaust Gas NOx emission rate (lbs/MW-hr)	Enter the emission rate for the unit of NOx in lbs/MW –hr. This data can be obtained from the manufacturer.
22	Exhaust Gas CO emission rate (lbs/MW-hr)	Enter the emission rate for the unit of CO in lbs/MW – hr. This data can be obtained from the manufacturer.

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## CHP SYSTEMS MANUAL - DEFINITIONS

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**Applicant.** Entity responsible for fulfilling Program requirements as outlined in the CHP Systems Manual and that which receives incentive payments.

**Bill of Lading.** A document issued by a carrier to a shipper, listing and acknowledging receipt of goods and specifying terms of delivery.

**Clean DG.** The proposed CHP system must meet the Clean Distributed Generation (“Clean DG”) definition. This “Clean DG” definition can be found in the New York State Public Service Commission’s Order (Order) on Demand Management Action Plan (Case 04-E-0572), effective March 16, 2006 (<http://www.dps.ny.gov/fileroom.html>).

**Combined Heat and Power (CHP).** The simultaneous production of both electricity and thermal energy to be utilized at the host facility.

**CHP System.** A CHP System is comprised of all electricity generating prime movers associated with the Project and balance of plant equipment.

**Commissioning.** A systematic process of detailed documentation and verification designed to ensure that systems are installed and perform interactively according to the owner’s programmatic and operational needs and the design intent.

**Construction Documents.** Final design documents (drawings and specifications) fully describing and detailing all aspects of the project. Documents describe to the Technical Consultant what is to be built and the construction standards to be adhered to.

**Electricity Generated.** Electricity generated net of any system parasitic or ancillary equipment use.

**Engineering Analysis (EA).** Submitted with the application, it is the required detailed information about the Applicant’s proposed CHP System, including equipment surveys, projected electricity generated and peak demand reduction.

**Facility:** Owner or tenant of site at which the CHP project is implemented. The facility must contribute to the Systems Benefit Charge on their electric or gas bill.

**Fuel Conversion Efficiency (based on higher heating value) is defined by:**

$$\eta_{chp,HHV} = \frac{\left( \sum_{i=1}^{8760} Q_{useful,i} \right) + 3,412 \cdot \left( \sum_{i=1}^{8760} kWh_{output,i} - \sum_{i=1}^{8760} kWh_{parasitic,i} \right)}{0.80 \cdot HHV_{gas} \sum_{i=1}^{8760} gas_{input,i}}$$

$Q_{useful,i}$	Useful heat recovery provided for hour i (Btu)
$kWh_{output,i}$	Generator power output provided for hour i (kWh)

$kWh_{\text{parasitic},i}$	Parasitic power consumption for CHP system for hour i (kWh)
$gas_{\text{input},i}$	Generator gas input for hour i (cu ft)
$HHV_{\text{gas}}$	Higher heating value for natural gas supplied at site from utility bills, average of 12 months (Btu per cu ft)
0.80	nominal boiler efficiency
3,412	Conversion of kWh to Btu
8,760	number of hours in a year. For determining a monthly CHP efficiency, substitute the number of hours in the month

Installation Phase. The phase that includes preparation of the proposed CHP System designs and specifications, equipment procurement and installation, commissioning and completion of the Project Installation Report.

kW. One kilowatt of electricity.

kW nameplate. The full load net continuous rated generating capacity of the CHP system.

kWh. One kilowatt-hour of electricity.

$kW_a$  (Electricity Generated) Total electricity generated by the CHP system in a 12 month period net of parasitic electricity use. NYSERDA's incentive will not be paid for electricity generated beyond on-site electricity usage. The comparison between the electricity generated by the CHP System and that used on-site will be assessed on an hourly basis.

$kW_p$  (Peak Demand Reduction) Average power produced by the CHP system during the summer capability period, net of parasitic electricity use. Electricity generated beyond on-site electricity usage will not be included in the calculation of  $kW_p$ . The comparison between the electricity generated by the CHP System and that used on-site will be assessed on an hourly basis.

$kW_{\text{SPC}}$  - The projected peak demand reduction, as agreed to between the applicant and NYSERDA in the Agreement.

Measurement and Verification (M&V). The process of monitoring and measuring the performance of the CHP System. Such M&V shall be set forth in the M&V Plan.

Parasitic power. Electricity consumption by a component that, in the absence of the CHP system, would not be required at the facility. This includes controls, pumps, fuel compressors and fans associated with the generator, used to provide heat recovery to the load, or used to reject unneeded heat. Parasitic power can be the sum of several power measurements, or be derived from one-time power readings with component runtime information.

Performance Phase. The final phase of the Project that commences on the approval of the Project Installation Report.

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Power ratio (PR). The ratio of the achieved peak demand reduction to the projected peak demand reduction ( $kW_p/kW_{SPC}$ ).

Project. The CHP System contemplated herein and described in the PA. It consists of the CHP system and all associated equipment or improvements that are installed in a single building by the Applicant to achieve the Total Project Incentive.

Project Application (PA). The Applicant's initial submission to NYSERDA which includes a Project Summary Application (Attachment B), an Engineering Analysis (EA), an Environmental Assessment Form (Attachment C), and, if applicable, a copy of recent electric and fuel utility bills

Project Installation Report (PIR). The detailed description of the installed Project including an equipment inventory, the operating conditions and schedule, up-dated savings calculations, and a commissioning report for the installed CHP System.

Receptor. The locations where potential air emissions would have an impact, these could include operable windows, balconies, and air intakes on nearby buildings (residential and commercial).

Schematic Design. Preliminary design documents (drawings and/or specifications) describing the scope and primary components of the project. Documents identify the major design issues and layout how these issues will be addressed.

Site. One or several adjacent buildings, or group of buildings on a contiguous site, owned or operated by a single Entity.

Summer On-Peak or Summer Capability Period. The period May 1 to October 31, and the hours between 12 PM and 6 PM, Monday to Friday, excluding legal holidays.

Total Project Cost. All costs directly associated with the Energy Savings and Demand Savings of the Project, including, but not limited to: the cost of the EA; CHP system design, procurement and installation; associated overhead and profit; and costs of any sensors or meters installed by the Applicant for the purpose of M&V.

Useful heat recovery.

- thermal output that displaces fuel use in a boiler, furnace or other system,
- thermal input into a chiller, desiccant system, or other system that provides a useful output or service such as cooling or dehumidification.