Agenda Date: 6/30/17
Agenda Item: 9C

STATE OF NEW JERSEY

Board of Public Utilities
44 South Clinton Avenue, 3rd Floor, Suite 314
Post Office Box 350
Trenton, New Jersey 08625-0350
www.nj.gov/bpu/

MISCELLANEOUS

IN THE MATTER OF THE TOWN CENTER DER	)	ORDER
MICROGRID INCENTIVE PROGRAM AUTHORIZATION	)	
OF INCENTIVE FUNDING TO CAPE MAY COUNTY	)	
MUNICIPAL UTILITIES AUTHORITY FOR PHASE I	)	
FEASIBILITY STUDY	)	DOCKET NO. QO17060631

Party of Record:

Brad Rosenthalbt, Executive Assistant, Cape May County Municipal Utilities Authority

BY THE BOARD:

The 2015 New Jersey Energy Master Plan Update (EMP Update) established a new overarching goal to "Improve Energy Infrastructure Resiliency & Emergency Preparedness and Response" in response to several extreme weather events that left many people and businesses without power for extended periods of time. These new policy recommendations included the following:

1. Increase the use of microgrid technologies and applications for Distributed Energy Resources ("DER") to improve the grid's resiliency and reliability in the event of a major storm; and

2. The State should continue its work with the USDOE, the utilities, local and state governments and other strategic partners to identify, design and implement Town Center DER ("TC DER") microgrids to power critical facilities and services across the State.

At its November 30, 2016 agenda meeting Docket number QO16100967, the Board authorized the release of staff's Microgrid Report ("Report"). The following recommendations in the Report specifically address the development of a TC DER microgrid feasibility study incentive program and pilot:

1. Develop and implement a TC DER microgrid feasibility study incentive program as part of the current New Jersey Clean Energy Program ('NJCEP") budget. This TC DER microgrid feasibility

study incentive program should provide funding for the upfront feasibility and engineering evaluation project development costs of a Town Center TC DER microgrid at the local level. This incentive should be a phased approach beginning with an initial feasibility study, followed by detailed engineering design phase. Staff should implement a stakeholder process to determine the terms and conditions of the TC DER microgrid feasibility study incentive program. This incentive should be provided through an MOU structure.

2. Initiate a TC DER microgrid pilot within each electric distribution company ("EDC") service territory. This should initially be limited to the municipalities within the 9 Federal Emergency Management Agency ("FEMA") designated counties or municipalities that meet the same criteria identified in the New Jersey Institute of Technology ("NJIT") report. These pilots should include, at a minimum, an initial feasibility study of the TC DER microgrid. This process should assist in the development of a TC DER microgrid tariff.

On August 5, Board staff issued a TC DER microgrid feasibility study draft application for public comment. On August 23, 2016, a public meeting was held to discuss the draft application and written comments were received and considered in the final application. Board staff's responses to the comments were published as part of the release of final application.

At its January 25, 2017 agenda meeting Docket number QO16100967 the Board authorized the release of TC DER microgrid feasibility study application. Incentive funding was capped at $200,000 per feasibility study. The Board directed staff to release the application and to open a 60-day application submission window. Applications submitted during that period would be reviewed by Staff and selected on a competitive basis. Any application submitted after this time period would be accepted on a first-come-first-served basis subject to available fund. The 60 day period ended on March 27, 2017

Prior to March 27, 2017, Cape May County Utilities Authority ("CMCMUA") submitted an application to the Board.

CMCMUA is a microgrid project with syngas/biogas/natural gas fueled combined heat and power at CMCMUA Seven Mile Beach / Middle Wastewater Treatment Facility ("WTF"). Syngas / biogas will be generated on site and turned into electrical and thermal energy on site from the supply of wastewater bio-solids. Natural gas will be needed as a supplementary fuel. In addition to supplying electrical and thermal energy to the WTF, this project will also supply energy to several critical facilities in the Crest Haven Complex including County Prosecutor's Office, Correctional Center, Sheriff's K9 Unit, Police and Fire Academies, Administration Building, Health Department, Road and Bridge Department, Fueling Station, Crest Haven Nursing and Rehab Center, Special Services School, Technical High School, NJ Army National Guard Armory and few others. The preliminary estimate of energy production from a wastewater residual bio-solids digester is 2,258,362 kWh/year and 8,806 MMBTU/year. The estimated time to complete the feasibility study is fourteen months. The total project cost estimate will be developed during the feasibility study phase.

After review of the application Board Staff recommends that the Board approve the above-referenced application.

The Board **HEREBY ORDERS** the approval of the aforementioned application for the total incentive amount of $175,000 for Cape May County Municipal Utilities Authority and **AUTHORIZES** the President of the Board to sign and execute the MOU attached hereto which sets forth the terms and conditions of the commitment of these funds.

This effective date of this order is July 10, 2017.

DATED: 6\30\17

BOARD OF PUBLIC UTILITIES
BY:

RICHARD S. MROZ
PRESIDENT

JOSEPH L. FIORDALISO
COMMISSIONER

MARY-ANNA HOLDEN
COMMISSIONER

DIANNE SOLOMON
COMMISSIONER

UPENDRA J. CHIVUKULA
COMMISSIONER

ATTEST:
IRENE KIM ASBURY
SECRETARY

I HEREBY CERTIFY that the within document is a true copy of the original in the files of the Board of Public Utilities

IN THE MATTER OF THE TOWN CENTER DER MICROGRID INCENTIVE PROGRAM AUTHORIZATION OF INCENTIVE FUNDING TO THE CAPE MAY COUNTY MUNICIPAL UTILITIES AUTHORITY FOR PHASE I FEASIBILITY STUDY

SERVICE LIST

CCMUA
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Counsel's Office
james.boyd@bpu.nj.gov

Joseph V. Rizzuto, Executive Director

Cape May County Municipal Utilities Authority

Post Office Box 610 Cape May Court House NJ 08210
Telephone (609) 465-9026 Telefax (609) 465-9025
www.cmcmua.com email info@cmcmua.com
Overnight Deliveries 1523 Route 9 North Swainton New Jersey 08210

Cape May County Municipal Utilities Authority (CMCMUA)
Seven Mile / Middle Wastewater Treatment Facility
Crest Haven Complex
Town Center Distributed Energy Resource (TC DER)
Microgrid Feasibility Study Application

Applications Due by 5pm, March 27, 2017
Submitted Via Email To: TCDERmicrogrid@bpu.nj.gov

Applicant Contact Person: Brad Rosenthal
CMCMUA Executive Assistant
609-465-9026
rosenthalbt@cmcmua.com

TC DER Microgrid Program Technical Requirements

1. Project Name: Crest Haven Complex TC DER Microgrid Feasibility Study

2. Project Description: This project seeks funding for a Feasibility Study to determine the viability of establishing an Advanced Microgrid. The anchor of the Microgrid will be a Syngas / biogas / natural gas fueled Combined Heat and Power (CHP) plant at or near the CMCMUA Seven Mile Beach / Middle Wastewater Treatment Facility (WTF). This project will supply electrical and thermal energy to the WTF and several government buildings in the Crest Haven Complex considered to be critical infrastructure. In addition to establishing the project's economic viability, the Feasibility Study will identify the optimal technologies to be used in an eventual Advanced Microgrid project and provide a structure for administration of the produced energy. The Feasibility Study will provide complete answers to financial, operational, and technological questions and will provide a product that would enable the Project Partners (see Item 4) to easily determine their interest in further participation and enable a design consultant to quickly begin design of the Crest Haven Complex Advanced Microgrid.

The CMCMUA will act as lead agency in submitting an application and managing the project for a Town Center Distributed Energy Resource Microgrid Feasibility Study to determine:

a. the validity of establishing a Syngas / biogas / natural gas fueled Combined Heat and Power power plant at or near the WTF that would supply electrical and thermal energy to the WTF and several other government buildings in the Crest Haven Complex considered to be critical infrastructure; and,
b. the available technologies and define the optimal technological Microgrid solution from a financial and operational aspect; and,
c. necessary upgrades or changes to existing utility infrastructure and building systems and the costs thereof; and,
d. administrative models for the sale and distribution of electrical and thermal energy and the benefits and challenges thereof.

The Crest Haven Complex is a large complex of Cape May County Government Buildings and associated Agencies in Middle Township adjacent to the Garden State Parkway at Exit 11. Most, if not all, of these facilities have completed Local Government Energy Audits and are served by Atlantic City Electric and South Jersey Gas. The Crest Haven Complex houses the following Critical Facilities:

a. CMCMUA Seven Mile Beach / Middle Wastewater Treatment Facility
b. CMCMUA Crest Haven Wastewater Pump Station
c. CMCMUA/County Reclaimed Water for Beneficial Reuse Supply System (Fire Hydrants and other Non-Potable Water Uses)
d. Cape May County Prosecutor's Office / Crime Lab
e. Cape May County Sheriff's K9 Unit
f. Cape May County Correctional Center
g. Cape May County Police and Fire Academies (Public Safety Training Center)
h. Cape May County Administration Building
i. Cape May County Health Department
j. Cape May County Road and Bridge Department (Middle Section)
k. Cape May County Fueling Station (Diesel and Gasoline)
l. Cape May County Crest Haven Nursing and Rehabilitation Center
m. Cape May County Special Services School
n. Cape May County Technical High School
o. New Jersey Army National Guard Armory
p. Federal Aviation Administration Navigational Beacon
q. Various wireless communication carriers and emergency communication equipment is hosted on towers within the Complex

Please see Table 1 in the Attachments for further information about the critical facilities energy use, size, and installed conservation measures. Please see Figure 1 in the Attachments for a map of the project area and relative locations of the critical facilities.

3. Town Center Designation: The New Jersey Institute of Technology's October 2014 New Jersey Town Centers Distributed Energy Resource Microgrids Potential: Statewide Geographic Information Systems Analysis Technical Report, designates the Cape May County Municipal Utilities Authority Seven Mile / Middle Wastewater Treatment Facility as the anchor in Town Center CM1.

4. Partner List: The first five partners listed below have worked cooperatively in the past on energy related projects and other procurement issues. This application does not anticipate any difficulties in reconciling different legal and operational requirements. CMCMUA will act as lead agency in coordinating Microgrid Feasibility Study project activities, hiring consultants, financing, and grant management.
   a. Cape May County Municipal Utilities Authority (CMCMUA) - Lead Agency
   b. County of Cape May
   c. Cape May County Bridge Commission
   d. Cape May County Special Services School District
   e. Cape May County Technical High School District
   f. State of New Jersey Dept. of Military and Veterans Affairs, New Jersey Army National Guard
   g. Atlantic City Electric
   h. South Jersey Gas

5. General Description of Technology: The County of Cape May hired Concord Engineering to perform a Combined Heat and Power Feasibility Study (CHP Study) in 2010. The CHP Study served primarily as a high level financial feasibility analysis. For a power plant, the CHP Study used a natural gas fueled 1.4 MW CHP Plant providing electricity and thermal energy to the County Nursing Home, Correctional Center, Health Department, Special Services School, Technical High School, and Administration Building.

   This proposal, being put forward in 2017, would use wastewater residual biosolids derived Syngas or biogas as the primary fuel in a CHP Plant with natural gas available as supplementary fuel. The electrical and thermal load of the WTF and new biosolids processing would require a CHP Plant capable of producing more electricity and thermal energy than was originally analyzed in the CHP Study. Wastewater treatment residual biosolids are currently produced and dried to 25-30% dry solids by four CMCMUA owned and operated wastewater treatment facilities. Until recently, biosolids were composted at a site immediately adjacent to the WTF. The composted product was sold as a Class A Fertilizer called CapeOrganic. A fire at the Compost Plant late in 2015 rendered the plant ineffective as a solution to biosolids management. Though still capable of producing high quality compost, the capacity of the Compost Plant was reduced to a point below economic and operational viability. Biosolids are currently transported by truck to two locations outside of the County for disposal.

The CMCMUA has undertaken a BioSolids Study to provide guidance and analysis of the next generation solution to the disposition of wastewater biosolids. The possibility of implementing a Microgrid, together with the associated grant funding, creates a financially attractive long-term resilient solution to the disposition of CMCMUA wastewater biosolids. Biosolids can be processed to provide fuel (Syngas or biogas) for a CHP Plant that would provide electricity and thermal energy to the WTF and the other critical facilities in the Crest Haven Complex. Implementation of this project would create a closed loop system. Syngas / biogas would be generated on site and turned into electrical and thermal energy on-site, and all from an endless supply of wastewater biosolids. Natural gas will be needed as a supplementary fuel.

The CMCMUA Biosolids Study Consultant, Hazen and Sawyer, has provided a preliminary conservative estimate of energy production from a wastewater residual biosolids digester. Details are available in Attachment 7; a summary is bulleted below.

- 41,346,563 scf / year
- 2,258,362 kWh / year
- 8,806 MMBTU / year

6. <u>General Description of the Overall Cost and Potential Financing:</u> The 2010 CHP Study estimated the cost of equipment and construction to be $7,051,000 and did not include the alteration of HVAC equipment at the schools. Without including any incentives or grants, the simple payback for a 1.4 MW CHP System was calculated to be 9.89 Years.

   Wastewater residual biosolids management has costs associated with it, operational costs for which the CMCMUA has budgeted and capital costs anticipated for the eventual implementation of a solution to biosolids management.

   This Program requires the Feasibility Study to develop a detailed cost benefit analysis. At a minimum, this will include an initial assessment through the Rutgers' DER Cost Benefit analysis model. The Rutgers DER model provides analysis at the annual level and this analysis may need to be supplemented with a more detailed hourly cost benefit model.

   <u>One-Time / Capital Financing</u>

   Current New Jersey Clean Energy Program incentives for CHP for a unit in the power range likely to be installed for this project are $550 / kW. Keeping with the 1.4 MW Plant and the current CHP incentive equals a one-time $770,000 incentive. Demand response payments through PJM may also be available; in 2010 this one-time payment was estimated at $120,000. In addition to these incentives, it is anticipated that a TC DER Microgrid Implementation Grant would provide grant funding, as yet unknown and to be further investigated in this Feasibility Study. In the absence of a third party operator/investor, the partners involved in this project have attractive bonding capacity and cash reserves to meet the difference in actual project implementation costs and available grants and incentives. The CMCMUA has the financial capacity and desire to finance a long-term solution to wastewater residual biosolids management.

Recurring / Operational Financing
Using Syngas or biogas as the fuel source may generate Renewable Energy Credits (RECs) which can be sold, typically on a monthly basis, through existing CMCMUA contracts in a market managed by PJM. There is proposed legislation (A2417/S771) that would alter the definition of Class 1 REC to include "methane gas from a composting or anaerobic digestion facility that converts food waste or other organic waste to energy". The proposed changes supplementing Title 13 of the Revised Statutes, and amending P.L.1999, c.23 are aimed at Food Waste to Energy projects, currently a hot topic in New Jersey, but can be applied to wastewater residual biosolids as they are also an organic waste.

There is not currently a full understanding of how electricity and thermal energy billing would or could be performed through the implementation of a multi-entity Microgrid. Presumably the sale of electricity and thermal energy, either to the distribution grid and/or directly to the Microgrid partners, would provide significant operational support.

Third Party
As part of the ongoing Biosolids Study, the CMCMUA is investigating the involvement of a third party vendor to provide biosolid management services. A Private Third Party would have access to additional financial instruments and tax breaks; and, coupled with the incentives and the potential for revenue from the sale of thermal energy and electricity, this project may be extremely attractive to a third party owner and/or operator.

7. General Description of the Benefits: This proposed project will address two distinct needs simultaneously. The first is that it provides a cost effective, in-county, method to significantly reduce the volume of wastewater residual biosolids while creating a valuable commodity or commodities (heat, electricity) dependent upon the installed technology. The second is the provision of resilient electrical and thermal energy to critical government infrastructure at all times, but especially when the main electrical grid has failed.

   The CMCMUA currently owns and operates a power plant at its landfill in Woodbine, NJ. The three PJM grid connected 1.0MW generators (two of which are operational at any one time) are fueled by landfill gas. The CMCMUA has experienced and knowledgeable staff already in place and is capable of planning, managing, and operating another generation station - whether it be done in-house or via a third party.

   Existing on-site diesel powered generators could be altered to provide blackstart capability to the Crest Haven Microgrid adding one of the key ingredients to creating a truly resilient Microgrid. Emergency generators are in place at the WTF, Nursing Home, Armory, Correctional Center, and Adminstration Building.

Societal Benefits Charge Compliance:
N.J.S.A. 48:3-60(a)(3) authorizes the use of money collected from the societal benefits charge for the "costs of demand side management programs," which consist of "energy efficiency" and "renewable energy" programs. This TC DER Microgrid Feasibility Study would investigate the use of biogas, Syngas, or equivalent, generated through the processing of wastewater residual biosolids, as primary fuel for a CHP Plant to be used as the primary driver of an Advanced Microgrid serving the Crest Haven Complex. According to the New Jersey Clean Energy Program Biopower website, "some of the biopower projects that have received incentives in recent years include those at wastewater treatment plants that generate electricity and thermal energy from the biogas produced by the anaerobic digestion of sewage sludge". The CMCMUA believes this proposed project is consistent with N.J.S.A. 48:3-60(a)(3).

8. Distribution Management Systems and Controls: Systems and controls will be determined by: the final technology to be implemented, existing technologies at the critical infrastructure sites to be served, and conversations and agreements with the EDC and GDC.

9. Timeframe for completion of a Feasibility Study:
   a. Notice that Funding has been Awarded = Day 0
      i. CMCMUA Procurement of Professional Services Consultants(s) Specific to this Project = 0+120 Days
      ii. Consultant Lead Project Kickoff Meeting with Stakeholders = 0+150 Days
      iii. Delivery of Draft TC DER Microgrid Feasibility Study = 0+330 Days
      iv. Consultant Presentation to Stakeholders = 0+345 Days
      v. Review and Comment by Stakeholders = 0+360 Days
      vi. Delivery of Final TC DER Microgrid Feasibility Study = 0+390 Days

10. Specific Microgrid Modeling to be Used: There are several possible Microgrid modeling programs currently available on the market. Some programs are free and some are not. Some programs concentrate on the financial and some on the operational design. The United States Department of Energy has developed a Microgrid Design Toolkit (MDT) that is freely available. Berkley Labs has developed the Distributed Energy Resources Customer Adoption Model (DERCAM) which also appears to be freely available after completing a registration process. A third model is made by HOMER Energy and is available for purchase. Whichever Microgrid modeling program (one of the above or other) is ultimately utilized by the chosen consultant, the Rutgers DER Cost Benefit Model will also be used.

11. Requested funding amount: $200,000

12. Lead Entity, or Stakeholder Cost Share: In-Kind
    a. The CMCMUA and other Stakeholders will provide an undetermined cost share in the form of staff time including grant management, procurement, and project management. This project will require significant amounts of CMCMUA staff time. Time spent on this project from all Stakeholders will be documented and applied towards an in-kind cost-share. This information will be valuable to future funding programs and their applicants by determining an expectation of the amount of time necessary to successfully manage a TC DER Microgrid Feasibility Study.

13. Listing of Consultants: Listed below are consultants currently engaged with CMCMUA for the specified services. This list may change as the project evolves and specific procurement actions are taken. Upon notice of award of grant funds, a project specific procurement process will be undertaken and Professionals with expertise in this area will be engaged.
    a. Biosolids Consultant: Hazen and Sawyer
    b. General Engineering Consultant: Mott MacDonald
    c. High Voltage Electrical Contractor: Scalfo
    d. Electrical Engineering Consultant: Buchart Horn
    e. Air Permitting: Cornerstone Environmental Group
    f. Environmental Permitting: Hazen and Sawyer / Mott MacDonald

14. EDC and GDC Letter of Support
    a. EDC: Atlantic City Electric - See Attachment 1.
    b. GDC: South Jersey Gas - See Attachment 2.

Attachments:

- Attachment 1: Letter of Support from Atlantic City Electric (EDC)
- Attachment 2: Letter of Support from South Jersey Gas (GDC)
- Attachment 3: Letter of Support from Technical High School
- Attachment 4: Letter of Support from Special Services School
- Attachment 5: Letter of Support from NJ Department of Military and Veterans Affairs, New Jersey Army National Guard
- Attachment 6: Letter of Support from County of Cape May
- Attachment 7: Preliminary Gas and Energy Production Estimate, Hazen & Sawyer
- Attachment 8: 2010 CHP Report, Concord Engineering
- Table 1: List of Major Buildings to be connected to the Microgrid and related energy use.
- Figure 1: Google Earth generated map of Crest Haven Microgrid Area and associated critical infrastructure.

atlantic city electric.
An Exelon Company

Vincent Malone
President
Atlantic City Electric Region

5100 Harding Highway
Mays Landing, NJ 08330

609.625.5864 – Telephone
609.625.5274 – Facsimile

vincent.malone@atlanticcityelectric.com

March 22, 2017

Joseph Rizzuto, Executive Director
Cape May County Municipal Utilities Authority
1523 U.S. Route 9
Post Office Box 610
Cape May Court House, New Jersey 08210

Re: Atlantic City Electric Company
Letter of Support for Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program

Dear Mr. Rizzuto:

On January 25, 2017 the New Jersey Board of Public Utilities ("BPU" or the "Board") approved the Town Center Distributed Energy Resource ("TC DER") Microgrid Feasibility Study Incentive Program (the "Program"). The BPU has recognized that significant information and data to evaluate and optimize the feasibility of a microgrid is needed from the utilities and, as part of the application process[1] for the Program, has required that Program applicants obtain a Letter of Support for the feasibility study from the electric and gas distribution companies that operate in the service territory where the proposed microgrid project will be located.

[1] There is a two-phase application process for the Program. The first phase is the feasibility study. The second phase is detailed engineering of the proposed microgrid project. The Board must approve an applicant's feasibility study in order for the applicant to move on to the second phase of the application process.

Representatives from Atlantic City Electric Company ("ACE" or the "Company") have met with the Cape May County Municipal Utilities Authority (the "Authority" or "CMCMUA") regarding a proposed TC DER microgrid project. ACE is pleased to offer this Letter of Support in connection with the Authority's proposed TC DER Microgrid Feasibility Study Application (the "Application"). ACE agrees to provide to the Authority with reasonable and relevant information regarding the Company's distribution and transmission infrastructure which exists, is available, and is not subject to an enhanced level of system/operational security (referred to in this letter as the "Information"), that is necessary for CMCMUA to complete a microgrid feasibility study. The Authority acknowledges and agrees that any Information provided by the Company shall be returned at any point in the process that the Application is withdrawn, rejected by the BPU or delayed for a period of six months or more. ACE will provide the Information with the understanding that the Authority will execute all Company required forms and agreements, including, but not limited to, confidentiality and/or non-disclosure agreements.[2]

Although ACE agrees to provide the Information to the Authority, to the extent that special studies are required, the Company reserves the right to bill CMCMUA for these special studies, according to ACE's tariff and/or customary practice. In addition, to the extent that interconnection applications are required for the distribution utility, PJM Interconnection, LLC or both, the Authority acknowledges and agrees that it will be responsible for all applications and associated fees. Nothing in this Letter of Support shall be interpreted as circumventing or accelerating well-established practices for processing interconnection applications.

[2] In accordance with N.J.A.C. 14:4-7.8, the Company will also require signed consent forms before personally identifiable customer information will be released to any Program applicant.

ACE further reserves the right to review, comment, and take positions on the Authority's feasibility study throughout the BPU's review process, including, but not limited to, any final report that may be issued by the Board as well as the remaining phases of the Program.

The Company is pleased to provide this Letter of Support and looks forward to working with the Authority throughout this application process.

Respectfully submitted,

Vincent Maione

Vincent Maione
Regional President
Atlantic City Electric Company

cc: Irene Kim Asbury, Esquire, Secretary, BPU (First Class Mail and Electronic Mail)
Michael Winka, BPU (First Class Mail and Electronic Mail)

Attachment 2. GDC Letter of Support

South Jersey Gas

David Robbins Jr.
President

March 23, 2017

Irene Kim Asbury, Secretary
NJ Board of Public Utilities
44 South Clinton Avenue, 3rd Floor
P.O. Box 350
Trenton, New Jersey 08625-0350

Re: South Jersey Gas Company's Letter of Support of Cape May County Municipal Utilities Authority's Application for Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program

Dear Secretary Asbury:

On January 25, 2017, the New Jersey Board of Public Utilities ("BPU" or the "Board") approved the Town Center Distributed Energy Resource ("TC DER") Microgrid Feasibility Study Incentive Program (the "Program"). The BPU recognized that significant information and data to evaluate and optimize the feasibility of a Microgrid is needed from the utilities and, as part of the application process[1] for the Program, requires Program applicants to obtain a Letter of Support for the feasibility study from the electric and gas distribution companies that operate in the service territory where the proposed Microgrid project will be located.

South Jersey Gas Company ("SJG" or the "Company") has been notified by the Cape May County Municipal Utilities Authority (the "Authority" or "CMCMUA") regarding its proposed TC DER Microgrid project. SJG is pleased to offer this Letter of Support in connection with the Authority's proposed TC DER Microgrid Feasibility Study Application (the "Application"). In so doing, SJG agrees to provide the Authority with reasonable and relevant information regarding the Company's distribution and transmission infrastructure as it exists and is maintained by the Company, which is not subject to an enhanced level of system/operational security (collectively referred to hereafter as the "Information"), to the extent necessary for CMCMUA to complete a Microgrid feasibility study. The Authority must acknowledge and agree that any Information provided by the Company will be returned to the Company at any point in the process if the Application is withdrawn, rejected by the BPU, or delayed for a period of six months or more.

[1] There is a two-phase application process for the Program. The first phase is the feasibility study. The second phase involves a detailed engineering of the proposed Microgrid project. The Board must approve an applicant's feasibility study in order for the applicant to be eligible for the second phase of the Program process.

SJG will provide the Information with the understanding that the Authority shall execute all Company required forms and agreements, including, but not limited to, confidentiality and/or non-disclosure agreements.

To the extent that any special studies are required, the Company reserves the right to bill CMCMUA for these special studies according to SJG's tariff and/or customary practice. Nothing in this Letter of Support shall be interpreted as circumventing or accelerating the Company's existing practice for processing new gas service applications.

SJG further reserves the right to review, comment and take positions on the Authority's feasibility study throughout the BPU's review process, including its right to revoke support of the project pending receipt of additional information that may become available through the Program process.

The Company is pleased to provide this Letter of Support and looks forward to working with the Authority throughout this application process.

Sincerely,

David Robbins Jr.

David Robbins, Jr.

cc: Joseph Rizzuto, Executive Director of CMCMUA

Attachment 3. Letter of Support CMC Technical High School

188 Crest Haven Road, Cape May Court House, NJ 08210 (609)465-2161 Fax: 465-3069

Nancy M. Hudanich, Ed.D., Superintendent
Paula J. Smith, Business Administrator / Board Secretary

March 17, 2017

Mr. Bradley T. Rosenthal, Executive Assistant
CMC Municipal Utilities Authority
P.O. Box 610
Cape May Court House, NJ 08210

Re: TC DER Microgrid Feasibility Study

Dear Mr. Rosenthal:

In reference to your correspondence dated March 10, 2017, enclosed please find the Cape May County Technical School District's Letter of Support/Point of Contact, annual utility report, and Energy Savings Plan which is 95 percent complete.

The total conditioned square footage is 249,800. (Approximately 225,000 square feet is air conditioned).

If I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Nancy M Hudanich

Nancy M. Hudanich, Ed.D.
Superintendent

NMH/kcf

Enclosures
Letter of Support/Point of Contact
Annual Utility Report
CMCTSD Energy Savings Plan

c: James Owens, Director of Buildings & Grounds

188 Crest Haven Road, Cape May Court House, NJ 08210 (609)465-2161 Fax: 465-3069

Nancy M. Hudanich, Ed.D., Superintendent
Paula J. Smith, Business Administrator / Board Secretary

March 17, 2017

Mr. Bradley T. Rosenthal, Executive Assistant
CMC Municipal Utilities Authority
P.O. Box 610
Cape May Court House, NJ 08210

Re: TC DER Microgrid Feasibility Study
Letter of Support /Point of Contact

Dear Mr. Rosenthal:

The Cape May County Technical School District supports the Cape May County Municipal Utilities Authority (CMCMUA) application for a Town Center Distributed Energy Resource Microgrid Feasibility Study and will work cooperatively with the CMCMUA in the execution of this project.

I have designated the point of contact at the Cape May County Technical School District for this effort will be James Owens, Director of Buildings & Grounds who can be reached at jowens@capemaytech.com or 609.380.0200, ext. 622.

Sincerely,

Nancy M Hudanich

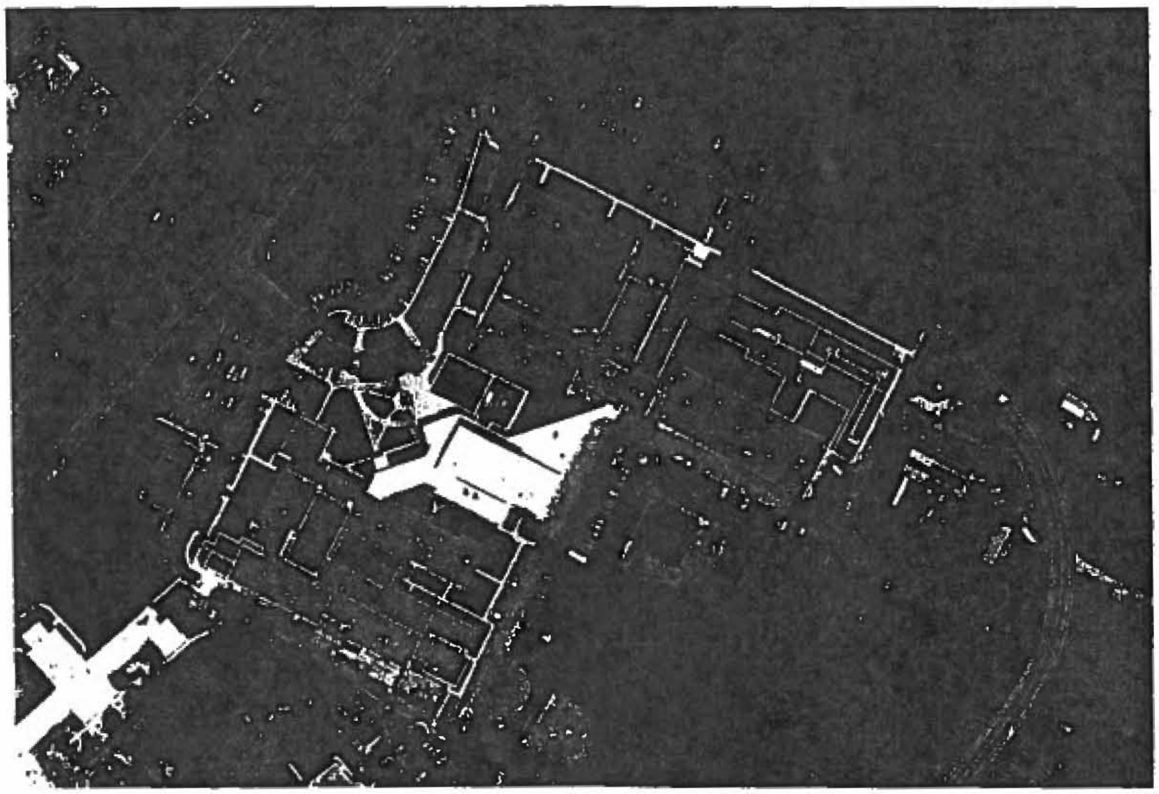
Dr. Nancy M. Hudanich
Superintendent

NMH/kcf

c: James Owens, Director of Buildings & Grounds

Customer: CAPE MAY VO-TECH

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD Total
TOTAL 2016 $	$70,097.06	$69,601.20	$58,080.09	$51,861.53	$49,179.65	$53,739.68	$48,616.03	$42,697.78	$43,716.66	$41,239.55	$57,667.82	$61,725.76	$636,323.81
Total Electric 2016 $	$15,316.78	$12,805.36	$13,942.08	$13,267.85	$14,764.24	$17,749.79	$17,743.29	$16,176.53	$17,328.27	$14,625.48	$16,256.27	$13,832.25	$183,717.18
Total Electric-3rd 2016 $	$18,939.09	$16,323.58	$17,811.22	$16,342.96	$18,320.32	$23,851.13	$25,221.26	$22,723.57	$19,265.50	$18,436.97	$23,926.16	$17,773.63	$236,937.38
kwh-3rd 2016 $	$18,939.09	$16,323.58	$17,811.22	$16,342.96	$18,320.32	$23,851.13	$25,221.28	$22,723.67	$19,265.60	$18,438.97	$23,926.16	$17,773.63	$238,937.38
kwh-3rd 2016	232,437	200,337	218,595	200,575	224,843	284,102	297,544	271,348	226,533	155,393	286,329	209,892	2,807,928
Cost per kwh-3rd 2016 $	$0.08	$0.08	$0.08	$0.08	$0.08	$0.08	$0.09	$0.08	$0.09	$0.12	$0.08	$0.09	$0.09
Demand 2016 $	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Demand kw 2016	422	699	616	590	671	832	735	711	794	762	646	653	832
kwh 2016 $	$21.58	$17.35	$16.86	$16.08	$12.82	$10.81	$10.22	$11.19	$12.99	$14.68	$15.63	$17.12	$177.31
kwh 2016	232,789	200,620	218,870	200,837	225,052	284,312	217,755	271,579	226,601	218,796	286,612	210,202	2,794,225
Cost per kwh 2016 $	$0.066	$0.064	$0.064	$0.066	$0.066	$0.062	$0.081	$0.060	$0.076	$0.066	$0.057	$0.066	$0.066
Other 2016 $	$15,294.20	$12,788.00	$13,925.22	$13,271.79	$14,741.42	$17,738.98	$17,733.07	$16,165.34	$17,315.28	$14,610.80	$16,240.64	$13,815.13	$183,539.87
FUEL OIL #2 2016 $	$1,441.27	$2,232.79	$1,990.65	$1,404.73	$1,434.99	$110.63	-	-	-	-	-	-	$8,616.08
GAL 2016 $	$1,441.27	$2,232.79	$1,990.65	$1,404.73	$1,434.99	$110.63	-	-	-	-	-	-	$8,616.08
GAL 2016	1,060	1,565	1,290	828	774	60	-	-	-	-	-	-	5,577
Cost per GAL 2016 $	$1.36	$1.43	$1.54	$1.70	$1.85	$1.84	-	-	-	-	-	-	$1.55
Total Gas 2016 $	$31,816.60	$25,464.66	$19,641.40	$14,816.22	$11,929.68	$5,538.80	$3,534.21	$1,895.70	$2,569.32	$5,249.28	$14,786.24	$24,809.87	$162,051.96
Utility Gas 2016 $	$15,132.48	$13,624.61	$10,531.87	$7,890.58	$6,295.01	$2,978.90	$1,934.82	$1,070.79	$1,420.71	$3,212.14	$8,474.91	$14,427.10	$86,993.92
mcf 2016	2,826	2,530	1,678	1,480	1,204	547	342	176	246	426	1,348	2,245	15,050
Cost per mcf 2016 $	$5.36	$5.39	$6.28	$5.33	$5.23	$5.45	$5.66	$6.08	$5.79	$7.50	$6.29	$6.43	$5.78
Brokered Gas 2016 $	$16,684.12	$11,840.05	$9,109.53	$6,925.64	$5,634.67	$2,559.90	$1,599.39	$824.91	$1,148.61	$2,037.14	$6,311.33	$10,382.77	$75,058.06
mcf 2016	28,254	25,298	19,484	14,798	12,039	5,470	3,417	1,763	2,454	4,353	13,465	22,184	152,977
Cost per mcf 2016 $	$0.59	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.49
Total Water and Sewer 2016 $	$2,584.32	$2,674.82	$2,694.74	$6,009.77	$2,739.42	$6,469.33	$2,119.27	$1,901.98	$4,563.57	$3,025.82	$2,699.16	$6,310.01	$43,002.21
mgal 2016	118	146	151	134	157	138	56	53	128	192	173	170	1,616
Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD Total



CAPE MAY COUNTY TECHNICAL SCHOOLS
ENERGY SAVINGS PLAN
188 CREST HAVEN ROAD
CAPE MAY COURT HOUSE, NEW JERSEY 08210

REVISION 3
JANUARY 15, 2016

PARTNER
Engineering and Science, Inc.

spiezle
ARCHITECTURAL GROUP

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Appendices:

- Appendix A: Baseline Energy Model Calibration
- Appendix B: ECM #1 – DDC Controls Upgrade
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- Appendix F: ECM #5 – Fuel Oil To Natural Gas Conversion
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I. Report Disclaimer

The information and attachments contained in this report is considered proprietary, confidential and privileged. This proposal includes data that shall not be duplicated, used or disclosed outside of the Cape May Technical School District for any purpose other than evaluation of this proposal.

The following report has been assembled to provide the following information as per the requirements of the "Energy Saving Improvement Program" and NJSA 40A:11-1

- Results from the energy audit
- Descriptions of the proposed energy efficiency measures
- Estimated greenhouse gas reduction
- Energy Star Portfolio Manager Results
- Outline of all design and compliance issues that require the services of an Architect and or Engineer.
- Assessment of risks associated with implementation of the Energy Savings Plan
- Outline eligibility of participation with the PJM Independent System Operator for Demand Response and Curtailable Service and possible cost and revenues associated with the program.
- Calculations of projected energy savings and the associated costs of implementing the energy conservation measures

II. Executive Summary

The Cape May County Technical School District's Board of Education (District) has procured the services of Spiezle Architectural Group, Inc. and Partner Engineering and Science, Inc. to assemble an Energy Savings Plan for the District's technical school campus.

This Energy Savings Plan utilizes the data collected from the Investment Grade Energy Audit performed by Spiezle Architectural Group, Inc. and Partner Engineering and Science, Inc. dated January 15, 2015. The energy audit of the main building and 3 smaller out buildings was performed to refresh the data collected during the previous LGA Audit performed by Concord Engineering in 2010 and compile data and produce a full building energy model to establish a baseline energy consumption. The normalized data from the this energy model has been used to evaluate the various energy conservation measures listed in Table 1 below and outlined in detail within this energy saving improvement plan (ESIP). In addition to performing a new audit the data associated with the Energy Star Portfolio Manager was updated to reflect the facilities current energy usage. Additional Information regarding Portfolio Manager can be found in Appendix "G"

Table 1: Energy Conservation Measures

Energy Conservation Measures		
ECM #	*ECM Description*	*Location*
ECM#1	DDC Controls Upgrade	Facility
ECM#2	Variable Speed Pumping	200/300 Wing
ECM#3	100 Wing Domestic Hot Water Upgrade	100 Wing
ECM#4	300 Wing Boiler Upgrade	300 Wing
ECM#5	Fuel oil to Natural Gas Conversion	Greenhouse/Gas Station
ECM#6	HVAC Air/Water Rebalance	Facility
ECM#7	Retro Commissioning	Facility
ECM#8	Plug Load Management	Facility
ECM#9	Transformer Replacement	Facility
ECM#10	LED Light Upgrades	Various Areas

The combination of implementing of these ECM's described in this ESP has been estimated to save The Cape May County Technical School District 5289.0 MMBtu of energy for an annual savings of $131,227.00 and provide a simple payback period of 11.3 years. The savings associated with each ECM is summarized in Table 2 and the cash flow analysis is detailed in Table 3.

Table 2: Summary of ECM Energy Savings

Summary of ECM Energy Savings						
ECM	Electric Energy Savings (MMBTU per Yr)	Electric Cost Savings ($)	Natural Gas Energy Savings (MMBTU per Yr)	Natural Gas Cost Savings ($)	Fuel Oil Energy Savings (MMBTU per Yr)	Oil Cost Savings ($)
ECM #1	110.2	*$4,385.00*	2646.0	*$32,273.00*	81.4	*$2,065.00*
ECM #2	264.2	*$10,532.00*	0	*$0.00*	0	*$0.00*
ECM #3	5.1	*$201.00*	292	*$3,562.00*	0	*$0.00*
ECM #4	0.6	*$21.00*	97.7	*$1,191.00*	0	*$0.00*
ECM #5	19.2	*$762.00*	-470.2	*-$6,608.00*	745.9	*$18,931.00*
ECM #6	346.2	*$13,740.00*	0	*$0.00*	0	*$0.00*
ECM #7	302.3	*$12,000.00*	0	*$0.00*	0	*$0.00*
ECM #8	21.1	*$3,435.00*	0	*$0.00*	0	*$0.00*
ECM #9	404.3	*$3,729.00*	0	*$0.00*	0	*$0.00*
ECM #10	530.2	*$31,008.00*	0	*$0.00*	0	*$0.00*
Sub Total	2,003.43	*$79,813.00*	2,565.50	*$30,418.00*	827.30	*$20,996.00*
Total Savings	Energy =	*5,396.23*	MMBTU Per Year	Monetary =	*$131,227.00*	Per Year

Table 3: ESIP Cash Flow Analysis

Cape May VoTech School District - ESIP Financial Scenario — **Scenario 1**

# of Measures Installed: 10

Project Costs	-	Incentives	=	Net Project Costs		
$ 1,496,378.00	-	$ 12,620.00	=	$ 1,483,758.00		
Electric Savings	+	**Natural Gas Savings**	+	**Other Savings**	=	**Net Utility Savings**
$ 79,813.00	+	$ 30,418.00	+	$ 20,996.00	=	$ 131,227.00

Interest Rate:	4.00%
Electric Escalation Rate:	2.00%
Natural Gas Escalation Rate:	2.00%
Percent Financed:	100.00%
Discount Rate:	8.00%
Amount Financed:	$ 1,483,758

Term Years	Additional Cash Outlay	Energy Savings	Maintenance Savings	Total Savings	Interest Expense	Loan Principal	Total Payments	Net Cash Flow	Cummulative Cash Flow
0									
1	$ -	$ 131,227	$ 3,002	$ 134,229			$ 133,451	$ 778	$ 778
2	$ -	$ 133,852	$ 2,883	$ 136,734			$ 133,451	$ 3,283	$ 4,061
3	$ -	$ 136,529	$ 2,764	$ 139,292			$ 133,451	$ 5,841	$ 9,902
4	$ -	$ 139,259	$ 2,645	$ 141,904			$ 133,451	$ 8,453	$ 18,355
5	$ -	$ 142,044	$ 2,526	$ 144,570			$ 133,451	$ 11,119	$ 29,474
6	$ -	$ 144,885	$ 2,407	$ 147,292			$ 133,451	$ 13,841	$ 43,315
7	$ -	$ 147,783	$ 2,288	$ 150,070			$ 133,451	$ 16,620	$ 59,935
8	$ -	$ 150,739	$ 2,169	$ 152,907			$ 133,451	$ 19,456	$ 79,391
9	$ -	$ 153,753	$ 2,050	$ 155,803			$ 133,451	$ 22,352	$ 101,743
10	$ -	$ 156,828	$ 1,931	$ 158,759			$ 133,451	$ 25,308	$ 127,051
11	$ -	$ 159,965	$ 1,812	$ 161,777			$ 133,451	$ 28,326	$ 155,377
12	$ -	$ 163,164	$ 1,693	$ 164,857			$ 133,451	$ 31,406	$ 186,783
13	$ -	$ 166,428	$ 1,574	$ 168,001			$ 133,451	$ 34,550	$ 221,333
14	$ -	$ 169,756	$ 1,455	$ 171,211			$ 133,451	$ 37,760	$ 259,093
15	$ -	$ 173,151	$ 1,336	$ 174,487			$ 133,451	$ 41,036	$ 300,129
Totals	$ -	$ 2,269,363	$ 32,528	$ 2,301,891	$ -	$ -	$ 2,001,762	$ 300,129	$ 300,129

III. Existing Building Summary

The Cape May County Technical School District serves students in grades 9 through 12 including a comprehensive high school, a share-time special needs vocational program, an evening adult high school program, and an adult post-secondary instruction as an evening/ continuing education division program. While school operates during daytime hours (6:00 AM to 2:00 PM) to support high school instructional programs, the school also runs various adult and continuing education programs in the evening with varied enrollments through the evening, operating up to 10:00 PM most weeknights.

Originally constructed in 1969, the High School is a single story facility comprised of various building tradeshops, classrooms, labs, small engine shops, conference center, media center, administration offices, cafeteria, kitchen, gymnasiums and an auditorium. In 1972, a culinary arts, health services area and classrooms were added. In 1979 various room where added such as classrooms, conference center, a graphic arts, etc. The 1993 addition consisted of a gym and several support spaces. The final addition in 2007 included a science wing, auxiliary gym and HVAC upgrades installed on numerous rooftops.

The current main building is approximately 241,000 sq. ft. Also included in this audit are the Administration office building (built in 1992; approximately 5,000 sq. ft.), the Green House (approximately 3,400 sq. ft.) and the Maintenance building (approximately 900 sq. ft.). The combined square footage of all buildings adds up to approximately 249,800 sq. ft.

Building layout and envelope is comprised of a one-story structure with various roof heights. Exterior walls are masonry construction consisting of concrete masonry units with an assumed 2 inches of rigid insulation with an associated air space. The majority of the windows throughout the school are double pane aluminum units. The roofing system consists of modified built-up roof on metal deck with tapered insulation over 3" minimum base insulation in manageable condition.

The Cape May County Technical School's existing classroom and office lighting systems consist primarily of 2' x 4' (2, 3 and 4 lamp) linear fluorescent fixtures with electronic ballasts and energy efficient T8 lamps. The 100 wing corridor 2 x 2 light fixtures have been recently replaced with corresponding 2 x 2 LED fixtures. This upgrade increased the light quality and output with a significant decrease in energy consumption and maintenance as compared to the previous fluorescent fixtures. The remaining 2 x 2 corridor fixtures in the 200 and 300 wing are currently being replaced by the District.

Various HVAC systems are in place throughout the school. A number of classrooms are served by individual rooftop units with electric cooling and gas heating and the units are generally in good condition. The auditorium, media center, entrance lobby, corridor areas and faculty lounge are air conditioned by rooftop package units with electric cooling and electric heating. The gymnasium, music and vocal rooms are air conditioned by DX split system heat pump units. The spaces associated with the 2005 addition are served by either rooftop units and/or DX split systems with gas furnaces. An energy recovery systems is provided to supply tempered outside air to the split systems. The entrance areas are provided with ceiling mounted unit ventilators with electric heat. An electric unit heater is also provided for the storage space. All the equipment installed during the 2005 renovation is only 7 years old, in good working condition and can be retained.

Currently, the HVAC systems are controlled by a mix of pneumatic and DDC control systems. Most equipment is controlled manually or by standalone controllers integral to the equipment. A Johnson Controls Metasys DDC Control System was installed during the 2007 additions and upgrades.

The exhaust systems operate through typical centrifugal roof exhaust fans. These fans are manually controlled by local disconnect switches at the individual fans or are interlocked with the equipment that conditions or ventilates the space. The kitchen hood exhaust fan is also a typical centrifugal roof fan and is controlled by a remote switch located in the kitchen area. All exhaust fans are in good working condition.

Domestic hot water is generated by several storage type gas fired hot water heaters. The new science wing addition is equipped with a newer high efficiency gas fired water heater. The 300 wing systems produce domestic hot water through the use of boiler water and associated heat exchanger and storage tank.

IV. Energy Audit Results

In its continuing efforts to reduce energy costs and consumption, the Cape May County Technical School District's Board of Education (District) secured the services of Spiezle Architectural Group, Inc. and Partner Engineering and Sciences to perform an Investment Grade Energy Audit for the District's technical school campus.

The District had an initial energy audit prepared under the NJ Local Government Energy Audit (LGEA) program which was dated October 8, 2010 and prepared by Concord Engineering. The purpose of the effort documented in the Investment Grade Audit was to consider this initial LGEA audit as well as direct analysis and assessment of the District facilities to prepare an Investment Grade Energy Audit and identify in greater detail the Energy Conservation Measures (ECM or ECMs) appropriate for consideration by the District in potentially advancing an Energy Savings Improvement Program (ESIP).

In-depth analysis and an energy model for the building was assembled utilizing the Trane Trace software platform version 6.3.0. The collected data and model was used to produce the energy audit report and expand upon the initial LGEA audit. While many ECMs included in the Investment Grade Audit were identified in the original LGEA audit and while some are recommended to be advanced as part of an ESIP, a number of the original recommendations are not recommended due to the length of their payback. New ECMs have been added based on the analysis performed in the current Audit. In addition, the School Districts priorities were also considered in the evaluation and structuring of the recommended ECMs. This analysis was completed based upon generally accepted practices for an investment grade audit.

The Investment Grade Audit also took into consideration, the fact that the District has undertaken various improvements to lighting as well as improvements under the NJBPU Direct Install Program which have impacted operational and energy use since the original LGEA audit was performed. As a result, the parameters of operational costs and potential paybacks for consideration of an ESIP have also been affected.

Current market conditions were considered to compile preliminary construction costs estimates and estimates of projected annual energy savings for each ECM. The simple payback analysis for each potential ECM recommended appears to comply with the 15 year payback mandated by the NJ ESIP protocol. Note that while certain ECMs may not pay back within the required 15 years, all of the ECM's outlined in the audit have be considered in aggregate to determine compliance with the 15 year window.

V. Historical Energy Consumption Cost

The District's facility is currently utilizing electricity purchased from Atlantic City Electric via their third party supplier FirstEnergy Sol, as well as two other forms of fuel: natural gas purchased from South Jersey Gas via their third party supplier Woodruff Energy and fuel oil purchased from Riggins, Inc.

Two years of partial utility cost data was provided by the District for use in the initial analysis of the ECM's associated with this ESP. Since the District was unable to provide a complete years' worth of utility cost data on a month to month basis at the time of the audit, an estimated usage for the missing months was extrapolated from the data available as shown in the Tables 4 through 6 below. This data was then utilized in the energy analysis.

Table 4: Historical Electrical Energy Consumption

Historical Electricity Consumption						
Date	Cost	KWh		Date	Cost	KWh
7/17/2012	$30,237.44	190,196		7/16/2013	$37,286.64	234,536
8/21/2012	$30,371.78	191,041		8/20/2013	$39,214.71	246,664
9/18/2012	$28,625.91	180,060		9/17/2013	$33,535.59	210,942
10/16/2012	$34,865.93	219,310		10/15/2013	$36,662.71	230,612
11/16/2012	$33,113.17	208,285		11/19/2013	$33,223.27	208,977
12/18/2012	$26,153.93	164,511		12/17/2013	$28,565.30	179,678
1/15/2013	$27,996.15	176,098		1/21/2014	$31,513.58	198,223
2/19/2013	$28,181.73	177,266		2/25/2014	$29,760.92	187,199
3/19/2013	$27,625.20	173,765		3/18/2014	$29,407.41	184,975
4/23/2013	$28,240.09	177,633		4/15/2014	$30,244.34	190,240
5/21/2013	$28,484.18	179,168				
6/18/2013	$28,397.36	178,622				

Table 5: Historical Natural Gas Energy Consumption

Historical Natural Gas Consumption						
Date	Cost	Therms		Date	Cost	Therms
8/21/2012	$1,091.80	866.51		8/30/2013	$2,706.63	2,148.12
9/18/2012	$1,681.26	1,334.33		9/17/2013	$2,473.89	1,963.40
10/16/2012	$3,997.51	3,172.63		10/15/2013	$3,990.23	3,166.85
11/16/2012	$7,563.24	6,002.57		11/19/2013	$7,139.71	5,666.44
12/18/2012	$16,425.80	13,036.35		12/17/2013	$13,823.53	10,971.06
1/15/2013	$19,692.81	15,629.21		1/21/2014	$26,682.89	21,176.90
2/19/2013	$24,900.33	19,762.17		2/25/2014	$33,477.79	26,569.67
3/19/2013	$30,069.64	23,864.79		3/18/2014	$47,182.43	37,446.37
4/23/2013	$26,593.87	21,106.25		4/15/2014	$35,387.11	28,085.01
5/21/2013	$19,162.17	15,208.07				
6/18/2013	$10,869.27	8,626.40				
6/28/2013	$4,933.68	3,915.62				

Table 6: Historical Fuel Oil Energy Consumption

Historical Fuel Oil Consumption						
Date	Cost	Gal		Date	Cost	Gal
10/16/2012	$1,766.50	504.71		9/17/2013	$936.93	267.69
11/16/2012	$646.43	184.69		10/15/2013	$424.93	121.41
12/18/2012	$4,617.27	1,319.22		11/19/2013	$1,866.83	533.38
1/15/2013	$4,359.99	1,245.71		12/17/2013	$3,936.22	1,124.63
2/19/2013	$5,636.27	1,610.36		1/21/2014	$4,729.99	1,351.43
3/19/2013	$6,201.14	1,771.75		2/25/2014	$6,446.67	1,841.91
4/23/2013	$5,592.16	1,597.76				
5/21/2013	$3,106.90	887.69				
6/18/2013	$551.67	157.62				

Although additional cost data was received after the initial calibration of the baseline energy model, the fluctuations in the utility costs were not considered significant enough to justify the recalibration process. Table 7 provides a comparison between the two utility costs for equal yearly time frames. As evidenced by the table, the prices of electricity and natural gas have both slightly increased while the price of fuel oil has slightly decreased. However, since fuel oil accounts for only a small portion of the building's total fuel consumption, the decrease in monetary savings associated with implementing ECM #5 will be offset by the increase in savings that can be expected from the remaining ECMs. For this reason, the energy savings calculated using the original utility data can be considered to be conservative.

Table 7: Original and Updated Utility Rate Comparison

Original Utility Data					
	Start Date	End Date	Number of Months	Total Cost	Average Cost Per Month
Electricity	July 2012	July 2013	12	$352,293	$29,358
Gas	October 2012	July 2013	9	$164,208	$18,245
Oil	October 2012	July 2013	9	$32,478	$3,609
Updated Utility Data					
	Start Date	End Date	Number of Months	Total Cost	Average Cost Per Month
Electricity	July 2014	July 2015	12	$384,541	$32,045
Gas	October 2014	July 2015	9	$206,340	$22,927
Oil	October 2014	July 2015	9	$23,613	$2,624

The baseline energy model for the school was calibrated within +/- 10% of its actual utility bills so that the energy savings associated with the various ECMs could be accurately determined by the simulation software. This calibration was performed for each individual building and the results were compiled into summary Table 8.

Table 8: Baseline Energy Model Calibration

Baseline Energy Model Calibration Summary						
Building	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3598.7	*$143,401.00*	6111.3	*$74,558.00*	0.0	*$0.00*
200 wing	1906.4	*$75,963.00*	2729.2	*$33,296.00*	0.0	*$0.00*
300 wing	2970.6	*$118,372.00*	2729.8	*$33,303.00*	0.0	*$0.00*
Admin Bldg	482.7	*$19,234.00*	137.1	*$1,743.00*	0.0	*$0.00*
Greenhouse	222.1	*$8,847.00*	0.0	*$0.00*	630.5	*$16,002.00*
Gas Station	171.1	*$6,817.00*	0.0	*$0.00*	196.8	*$4,994.00*
Sub Total	9,351.6	*$372,634.00*	11,707.4	*$142,900.00*	827.3	*$20,996.00*

Total Modeled Utility Cost	*$536,530.00*
Facility 2 Year Average Utility Cost	*$598,516.00*
Percent Difference	10%

VI. Energy Efficiency Measures

ECM #1 Direct Digital Controls:

<u>Existing Equipment Description:</u>

The current Building Management System consists of a desktop operator interface connected to limited electronic controls throughout the campus, as well as digital to pneumatic controls for a majority of the spaces and equipment. Many of the indoor temperature controls reliant on pneumatics are inaccurate due to temperature drift, age, and lack of constant calibration.

<u>Scope:</u>

Perform a limited upgrade to specified controllers, actuators, and programming to direct digital controls (DDC) reporting to a central Building Management System. Under this ECM, multiple strategies will be implemented to realize energy savings. Increased control over HVAC equipment will yield increased savings through efficient operation, as well as scheduling capabilities to deactivate areas and equipment when not occupied or in use. Changes to the system will include the following items;

- Replace standard pneumatic thermostats with addressable DDC/Pneumatic wireless thermostats
- Upgrade non-pneumatic standalone thermostats to addressable and programmable thermostats in applicable locations
- Institute outdoor air (OA) control programming and economizer modes, where applicable. Tight control over the OA will reduce unnecessary pre-heating, cooling, and dehumidification of OA to be supplied to the buildings.

This upgrade is a limited controls system change out and improvement, as opposed to a full demolition and replacement. The upgraded control system shall be non-proprietary, infinitely expandable, and capable of multiple control input and output signals for all equipment types. The system shall have web access, for remote controllability by building staff and management during off hours or in the event of an emergency. A single control front end shall be located in the Building & Grounds office. Programming shall provide access to individuals with a user name and password, and provide a log of activity while signed in, accessible for troubleshooting purposes. Programming should include the capability to schedule all zones and equipment, with a full range of temperature and equipment operational settings

A/E Scope:

- Survey site and existing conditions
- Prepare contract documents
- Prepare written specifications
- Provide updated ventilation schedules for areas contained within the ECM scope of work
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Obtain owners schedules, set points and setbacks for system programming
- Provide system programming, start-up, testing and training
- Provide support for commissioning

Energy Saving Calculation:

The savings estimated for this ECM was derived through the development of a detailed energy model to reflect the baseline energy usage, physical building characteristics, and operational parameters of the existing building. The ECM was then modeled to assess its impact, along with other ECMs, on building energy use. The effective impact on the building and the savings generated are considered cumulatively, with the compounded impact of the various ECMs considered.

An energy model was assembled utilizing the Trane Trace software platform version 6.3.0. Due to the size of the facility, the energy analysis was conducted by populating an individual energy model for each building section on campus (e.g.: 100, 200, 300, admin, greenhouse, and gas station). Each space throughout the campus has been extensively surveyed to provide an accurate representation of the space. Factors such as: occupancy, plug loads, equipment, roof insulation, wall insulation, vertical fenestration, HVAC equipment and usage schedules were incorporated. The energy use associated with each of the building model files have been calculated based on published ASHRAE weather data and the simulation has been run based on a full year of 8760 hours to produce an estimated value for electric, natural gas, and fuel oil use. Equipment in the baseline model was set to operate according to the school's existing pneumatic control scheme while the proposed model incorporated the use of new electronic controls and time schedules. The energy savings associated with this ECM are listed in Table 9. Supplemental modeling results and information can be found in Appendix "B".

Table 9: ECM #1 Modeled Energy Savings

Energy Efficiency Measure #1 (DDC Controls Upgrade)						
Building	OA Dampers & Controls					
	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3,569.7	*$142,246.00*	4,693.4	*$57,259.00*	0.0	*$0.00*
200 wing	1,869.6	*$74,497.00*	2,290.8	*$27,948.00*	0.0	*$0.00*
300 wing	2,937.6	*$117,058.00*	1,992.6	*$24,309.00*	0.0	*$0.00*
Admin Bldg	475.4	*$18,944.00*	84.6	*$1,111.00*	0.0	*$0.00*
Greenhouse	215.9	*$8,600.00*	0.0	*$0.00*	575.3	*$14,602.00*
Gas Station	173.2	*$6,904.00*	0.0	*$0.00*	170.6	*$4,329.00*
Sub Total	9,241.4	*$368,249.00*	9,061.4	*$110,627.00*	745.9	*$18,931.00*
Total	19,048.7	*$497,807.00*		Savings	*2,837.6*	*$38,723.00*

ECM #2 Variable Speed Pumping:

Existing Equipment Description:

The current hydronic pumping system utilize constant flow hot water pumps and differential bypass to control the flow of heating hot water to the hydronic heating equipment. The current pump configuration for the facility utilizes the following pumps:

- 100 Wing: (2) @ 7.5 HP
- 200 Wing: (2) @ 7.5 HP
- 300 Wing (2) @ 5 HP

Scope:

Install variable speed drives and controls on the hot water heating pumps. The installation will include an electronic drive for each pump tied into the building management system, system pressure sensors, and a bypass valve at the end of the building system loop.

A/E Scope:

- Survey site and existing conditions
- Prepare pre-balance scope& Specifications
- Prepare contract documents
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide system balancing
- Provide support for commissioning

Energy Saving Calculation:

The savings estimated for this ECM was derived through the development of a detailed energy model to reflect the baseline energy usage, physical building characteristics, and operational parameters of the existing building. The ECM was then modeled to assess its impact, along with other ECMs, on building energy use. The effective impact on the building and the savings generated were considered cumulatively, with the compounded impact of the various ECMs considered.

An energy model was assembled utilizing the Trane Trace software platform version 6.3.0. Due to the size of the facility, the energy analysis has been conducted by populating an individual energy model for each building section on campus (e.g.: 100, 200, 300, admin, greenhouse, and gas station). Each space throughout the campus has been extensively surveyed to provide an accurate representation of the space. Factors such as: occupancy, plug loads, equipment, roof insulation, wall insulation, vertical fenestration, HVAC equipment and usage schedules are all incorporated. The energy use associated with each of the building model files has been calculated based on published ASHRAE weather data and the simulation has been run based on a full year of 8760 hours to produce an estimated value for electric, natural gas, and fuel oil use. The energy savings associated with this ECM are listed in Table 10. Supplemental modeling results and information can be found in Appendix "C".

Table 10: ECM #2 Modeled Energy Savings

Energy Efficiency Measure #2 (Variable Speed Pumping)						
Building	Variable Speed Pumping					
	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3562.8	*$141,969.00*	4693.4	*$57,259.00*	0.0	*$0.00*
200 wing	1758.4	*$70,067.00*	2290.8	*$27,948.00*	0.0	*$0.00*
300 wing	2791.5	*$111,233.00*	1992.6	*$24,309.00*	0.0	*$0.00*
Admin Bldg	475.4	*$18,944.00*	84.6	*$1,111.00*	0.0	*$0.00*
Greenhouse	215.9	*$8,600.00*	0.0	*$0.00*	575.3	*$14,602.00*
Gas Station	173.2	*$6,904.00*	0.0	*$0.00*	170.6	*$4,329.00*
Sub Total	8,977.2	*$357,717.00*	9,061.4	*$110,627.00*	745.9	*$18,931.00*
Total	**18,784.5**	***$487,275.00***		**Savings**	***264.2***	***$10,532.00***

ECM #3 100 wing DHW Upgrade:

Existing Equipment Description:

Domestic hot water heating for the 100 wing is currently provided via an original 1969 hot water heating boiler with the following specifications

- Manufacturer: AO Smith
- Model #: BC670-780
- Input: 670 MBH
- Recovery: 563 gal/hr
- Storage tank size: 1468 gals
- (3) Hot water recirculation pumps serving the following zones
    - "D" Wing
    - Kitchen
    - 100 Wing
- (1) Hot water recirculation pump between storage tank & water heater

Given the age of the unit, its current operating efficiency is estimated to be around 80% and it has exceeded its recommended operating life.

Scope:

Decommission and remove the current domestic hot water heater and storage tank. Replaced with instantaneous, high efficiency condensing domestic water heaters with an approximate efficiency of 96.4% and associated controls. The existing hot water recirculating pumps appear to be recently replaced and are in good working order therefore replacement will not be required. Although replacement of the hot water tempering valve is recommended and will be included as part of this ECM.

A/E Scope:

- Survey site and existing conditions
- Prepare contract documents to retro fit existing 100 wing DHW system with new high efficiency water heater
- Reuse existing zones and recirculation system
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide system pre balance and post balancing specification
- Provide support for commissioning

Energy Saving Calculation:

The savings estimated for this ECM was derived through the development of a detailed energy model to reflect the baseline energy usage, physical building characteristics, and operational parameters of the existing building. The ECM was then modeled to assess its impact, along with other ECMs, on building energy use. The effective impact on the building and the savings generated were considered cumulatively, with the compounded impact of the various ECMs considered.

An energy model was assembled utilizing the Trane Trace software platform version 6.3.0. Due to the size of the facility, the energy analysis has been conducted by populating an individual energy model for each building section on campus (e.g.: 100, 200, 300, admin, greenhouse, and gas station). Each space throughout the campus has been extensively surveyed to provide an accurate representation of the space. Factors such as: occupancy, plug loads, equipment, roof insulation, wall insulation, vertical fenestration, HVAC equipment and usage schedules are all incorporated. The energy use associated with each of the building model files has been calculated based on published ASHRAE weather data and the simulation has been run based on a full year of 8760 hours to produce an estimated value for electric, natural gas, and fuel oil use. When evaluating this ECM, the existing domestic hot water system was modeled with an 80% efficient domestic hot water heater, with a 1468 gallon storage tank and four recirculation pumps with a combined horsepower rating of 0.5 HP. The proposed model called for the replacement of the existing water heater and storage tank with a new 94.6% efficient, condensing water heater. Additionally, the pump horsepower was dropped to 0.33 HP as one of the recirculation pumps is no longer required with the new system. Domestic hot water demand was calculated using historical school occupancy data and remained consistent between the baseline and proposed models. The energy savings associated with this ECM are listed in Table 11 and are attributed to the increased water heater efficiency, the elimination of the storage tank losses and the reduction in pump horsepower. Supplemental modeling results and information can be found in Appendix "D".

Table 11: ECM #3 Modeled Energy Savings

Energy Efficiency Measure #3 (100 Wing Domestic Hot Water Upgrade)						
Building	100 Wing DHW					
	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3557.7	*$141,768.00*	4401.4	*$53,697.00*	0.0	*$0.00*
200 wing	1758.4	*$70,067.00*	2290.8	*$27,948.00*	0.0	*$0.00*
300 wing	2791.5	*$111,233.00*	1992.6	*$24,309.00*	0.0	*$0.00*
Admin Bldg	475.4	*$18,944.00*	84.6	*$1,111.00*	0.0	*$0.00*
Greenhouse	215.9	*$8,600.00*	0.0	*$0.00*	575.3	*$14,602.00*
Gas Station	173.2	*$6,904.00*	0.0	*$0.00*	170.6	*$4,329.00*
Sub Total	8,972.1	*$357,516.00*	8,769.4	*$107,065.00*	745.9	*$18,931.00*
Total	18,487.4	*$483,512.00*		Savings	*297.1*	*$3,763.00*

ECM #4 300 Wing Boiler Upgrade:

Existing Equipment Description:

The two currently installed and operating boilers in the 300 wing are sectional cast iron boilers, originally installed in 1979, and are considered to be past their useful operating life of 30 years. The two AH-994 WF boilers manufactured by Weil McLain have a input of 4,691 MBH each and are specified to provide 3,770 MBH of heating capacity each.

Scope:

Decommission and remove the two current boilers. Replaced with two high efficiency condensing boilers and controls with a minimum efficiency of 85%. This ECM will include a boiler temperature reset based on outdoor air temperature. By varying the output temperature of the heating water to more appropriately meet demand, greater savings can be realized.

Additionally, the domestic hot water heating shall be removed from the boiler operations, with domestic service provided by a new hot water heating system to be designed and installed through other financing options.

A/E Scope:

- Survey site and existing conditions
- Coordinate retrofit with Rod Grant DHW work
- Retro fit existing 300 wing cast iron boilers with new high efficiency hot water boilers.
- Prepare new boiler control sequence
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide system pre balance and post balancing specification
- Provide support for commissioning

Energy Saving Calculation:

The savings estimated for this ECM was derived through the development of a detailed energy model to reflect the baseline energy usage, physical building characteristics, and operational parameters of the existing building. The ECM was then modeled to assess its impact, along with other ECMs, on building energy use. The effective impact on the building and the savings generated were considered cumulatively, with the compounded impact of the various ECMs considered.

An energy model was assembled utilizing the Trane Trace software platform version 6.3.0. Due to the size of the facility, the energy analysis has been conducted by populating an individual energy model for each building section on campus (e.g.: 100, 200, 300, admin, greenhouse, and gas station). Each space throughout the campus has been extensively surveyed to provide an accurate representation of the space. Factors such as: occupancy, plug loads, equipment, roof insulation, wall insulation, vertical fenestration, HVAC equipment and usage schedules are all incorporated. The energy use associated with each of the building model files has been calculated based on published ASHRAE weather data and the simulation has been run based on a full year of 8760 hours to produce an estimated value for electric, natural gas, and fuel oil use. The energy savings associated with this ECM are listed in Table 12. Supplemental modeling results and information can be found in Appendix "E".

Table 12: ECM #4 Modeled Energy Savings

Energy Efficiency Measure #4 (300 Wing Boiler Upgrade)						
Building	300 Wing Boiler Upgrade					
	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3557.7	*$141,768.00*	4401.4	*$53,697.00*	0.0	*$0.00*
200 wing	1758.4	*$70,067.00*	2290.8	*$27,948.00*	0.0	*$0.00*
300 wing	2790.9	*$111,212.00*	1894.9	*$23,118.00*	0.0	*$0.00*
Admin Bldg	475.4	*$18,944.00*	84.6	*$1,111.00*	0.0	*$0.00*
Greenhouse	215.9	*$8,600.00*	0.0	*$0.00*	575.3	*$14,602.00*
Gas Station	173.2	*$6,904.00*	0.0	*$0.00*	170.6	*$4,329.00*
Sub Total	8,971.5	*$357,495.00*	8,671.7	*$105,874.00*	745.9	*$18,931.00*
Total	**18,389.1**	***$482,300.00***		**Savings**	***98.3***	**$1,212.00**

ECM #5 Fuel Oil to Natural Gas conversion:

Existing Equipment Description:

Two buildings operated by the campus currently utilize heating oil. By removing the outdated equipment and decommissioning the oil tanks, the school can realize significant savings, as well as potential issues related to severe fluctuations in oil prices, delivery delays, and the environmental impact of oil storage and upkeep.

Outbuilding with Attached Greenhouses:
The existing boiler for the Greenhouse is a cast iron boiler feed from (2) 250 Gallon above ground oil storage tanks located adjacent to the structure. The boiler was found to be installed in 1973, which puts it 11 years beyond its design useful life. The de-rated efficiency of this boiler is estimated to be 60%, making it inefficient for its current service. In addition to the boiler replacement, a gas fired unit heater in one of the greenhouses will be replaced with a more efficient unit. The efficiency of the existing gas fired unit heater was estimated to be approximately 65%. There are four existing circulator pumps associated with the boiler with a combined rating of 0.67 HP. These pumps appear to be in acceptable condition and are to be reused.

Gas Station:
The existing furnace installed at the Gas Station consists of a oil fired unit feed from an 250 gallon above ground oil storage tank. The unit's efficiency is listed as 80%, which has since been de-rated to 60% over many years of use.

Outbuilding with Attached Greenhouses:

- Boiler and fintube radiation
- Manufacturer: Weil McLain
- Model: PI-584-W-F
- Fuel: #2 Fuel Oil @ 6.5 gal/hr
- Input/Output: 728/633 MBH
- Pumping configuration: Zone pumps
- Bare element fintube

Gas Station:

- Forced air furnace
- Manufacture: York Shipley
- Model: SDF-20-OSHR
- Fuel: #2 Fuel oil @ 1gph
- Input/Output: 250/200 MBH
- CFM: 2170-3080 cfm

Scope:

Outbuilding with Attached Greenhouses:
Decommission and replace the existing oil fired boiler and fuel delivery system with a single condensing natural gas boiler and associated gas service. This boiler shall have an efficiency of 96% and reuse four existing circulator pumps. The new gas fired unit heater in the greenhouse shall have an efficiency of 93%.

Gas Station:
Decommission and replace the existing oil furnace and fuel delivery system with a 94% efficient natural gas furnace and associated gas service.

A/E Scope:

- Survey site and existing conditions
- Prepare specifications and scope in accordance with State & DEP requirements for underground and above ground fuel oil storage tanks
- Contact local utility agency to coordinate the installation of a new gas service if required
- Prepare contract documents for boiler and air handler replacement
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide system pre balance and post balancing specification
- Provide support for commissioning

Energy Saving Calculation:

The savings estimated for this ECM was derived through the development of a detailed energy model to reflect the baseline energy usage, physical building characteristics, and operational parameters of the existing building. The ECM was then modeled to assess its impact, along with other ECMs, on building energy use. The effective impact on the building and the savings generated were considered cumulatively, with the compounded impact of the various ECMs considered.

An energy model was assembled utilizing the Trane Trace software platform version 6.3.0. Due to the size of the facility, the energy analysis has been conducted by populating an individual energy model for each building section on campus (e.g.: 100, 200, 300, admin, greenhouse, and gas station). Each space throughout the campus has been extensively surveyed to provide an accurate representation of the space. Factors such as: occupancy, plug loads, equipment, roof insulation, wall insulation, vertical fenestration, HVAC equipment and usage schedules are all incorporated. The energy use associated with each of the building model files has been calculated based on published ASHRAE weather data and the simulation has been run based on a full year of 8760 hours to produce an estimated value for electric, natural gas, and fuel oil use. The energy savings associated with this ECM are listed in Table 13. Supplemental modeling results and information can be found in Appendix "F".

Table 13: ECM #5 Modeled Energy Savings

Energy Efficiency Measure #5 (Fuel Oil to Natural Gas Conversion)						
Building	Fuel Oil to Gas Conversion					
	Electric Consumption (MMBTU per Yr)	Electric Cost ($)	Natural Gas Consumption (MMBTU per Yr)	Natural Gas Cost ($)	Fuel Oil Consumption (MMBTU per Yr)	Oil Cost ($)
100 wing	3557.7	*$141,768.00*	4401.4	*$53,697.00*	0.0	*$0.00*
200 wing	1758.4	*$70,067.00*	2290.8	*$27,948.00*	0.0	*$0.00*
300 wing	2790.9	*$111,212.00*	1894.9	*$23,118.00*	0.0	*$0.00*
Admin Bldg	475.4	*$18,944.00*	84.6	*$1,111.00*	0.0	*$0.00*
Greenhouse	196.7	*$7,838.00*	361.3	*$5,165.00*	0.0	*$0.00*
Gas Station	173.2	*$6,904.00*	108.9	*$1,443.00*	0.0	*$0.00*
Sub Total	8,952.3	*$356,733.00*	9,141.9	*$112,482.00*	0.0	*$0.00*
Total Cost	18,094.2	*$469,215.00*		Savings	*294.9*	$13,085.00

ECM #6 HVAC Air and Hydronic System Re-Balance:

Scope:

This ECM would provide a means to verify proper operating, efficiency, and space comfort by the means of proper balancing of the air distribution and water system. Over time, system flows change due to numerous variables such as changes in space usage, increased infiltration, drop in equipment operating efficiency, cleanliness, or changes to the system. By verifying the correct design flows to all hot water devices and terminal air units, the system will run at optimum levels and provide system efficiency and effectiveness. A full balancing of the air and water systems shall be performed on the entire campus.

A/E Scope:

- Review existing drawings, survey site and existing conditions
- Prepare specifications and scope in accordance with industry standards for testing and balancing existing and new mechanical systems
- Publicly bid the work

Construction Scope:

- Submit testing and balancing accreditations for approval
- Coordinate balancing procedure with new and existing equipment
- Provide system pre balance and post balancing report for review
- Provide support for commissioning.

Energy Saving Calculation:

The estimated savings through implementation of this ECM was assessed based on past experience with the implementation of such measures and the resulting savings and efficiencies. The estimated savings impact from this ECM is $13,740.00 per year or approximately 3% of yearly energy expenses. An estimate of the labor that would be involved in the implementation was used to determine the costs. This information is presented in Table 14.

Table 14: ECM #6 Energy Saving Calculation

ECM # 6 - HVAC System Air/Water Rebalance						
Description	**Units**	**Unit**	**Unit Cost**	**Est. Cost**	**Est. Annual Savings**	**Simple Payback**
Estimated manhours - air	256	hrs	$110.00	$28,160		
Estimated manhours - water	192	hrs	$110.00	$21,120		
Contingency			5.0%	$2,464		
Estimated Total ECM Cost				$51,744		
Estimated Incentive Value						
Adjusted Estimated ECM Cost				$51,744	$13,740	3.77 yrs
Estimated Soft Costs		15%		$7,762		
Estimated ECM Project Cost				$59,506		4.33 yrs

ECM #7 Retro-Commissioning of Building Energy System:

Scope:

This ECM would provide a means to verify proper operating, efficiency, and space comfort by the means of verifying proper operation of the existing and newly installed mechanical electrical and plumbing equipment. The RCx process further seeks to identify equipment deficiencies and operational issues that lead to decreased efficiency, unnecessary energy usage, poor operational methods, and maintenance procedures.

To maintain building health and operational integrity it is necessary to continue to run efficiently and keep systems in prime working order. On average, owners can expect to save $0.05 to $0.50 per square foot, or 16% of their energy costs as a result of a RCx program, as well as implementing a continuing commissioning program within their building.

A/E Scope:

- Review existing drawings, survey site and existing conditions
- Prepare Specifications and scope in accordance with industry standards for commissioning/Retro-commissioning, testing and balancing existing and new mechanical, electrical and plumbing systems
- Publicly bid the work

Construction Scope:

- Submit commission accreditations for approval
- Coordinate commissioning procedure with new and existing equipment
- Provide system commissioning reports for review

Energy Saving Calculation:

The estimated savings through implementation of this ECM is assessed based on past experience with the implementation of such measures and the resulting savings and efficiencies. Savings from this ECM are estimated at $12,000.00 per year. The costs associated with implementing this ECM are detailed in Table 15.

Table 15: ECM #7 Energy Saving Calculation

ECM # 7 - Retro-Commissioning						
Description	**Units**	**Unit**	**Unit Cost**	**Est. Cost**	**Est. Annual Savings**	**Simple Payback**
Estimated Construction Cost	241000	SF	$0.20	$53,200		
Contingency			5.0%	$2,410		
Estimated Total ECM Cost				$55,610		
Estimated Incentive Value						
Adjusted Estimated ECM Cost				$55,610	$12,000	4.63 yrs
Estimated Soft Costs		15%		$7,592		
Estimated ECM Project Cost				$63,202		5.26 yrs

ECM #8 Plug Load Management:

Scope:

This ECM recommends the installation of plug load controls on multiple pieces of equipment throughout the building. Table 16 identifies many options are available with regards to implementation of this ECM. After reviewing the plug load data throughout the buildings, multiple locations for wireless plugs were recommended.

8.1: Vending Machine Misers

Vending machines remain operational even when not in use during unoccupied hours in the building. The refrigerated vending machine miser utilizes a timed shut off which turns the compressor portion of the machine off during unoccupied hours, limiting the run times of the unit. Installation of misers in 4 machines throughout the building is estimated to have a total cost of $3,295 in parts and labor, and save $843.00 per year.

8.2: Computer Monitor and TV Wifi Enabled Plug Loads

1. Computer Monitors: Of the computer monitors in the building, 481 are good candidates for wireless plugs. Estimating a single plug for each monitor, investing in wirelessly controlled plugs will result in a total cost of $31,199.00. Savings to be realized from shutting down all units every night and on weekends would result in a yearly savings of $1,369.00. The computer's themselves will not be shut down to avoid impacting IT upgrade and update schedules.

2. TV's: The building utilizes 132 TV's in many locations as teaching aids or for presentation purposes. While not in use, these items still draw a significant amount of power when combined over the year. Estimating a single plug for each television, investing in wirelessly controlled plugs will result in a total cost of $10,268.00. Savings to be realized from shutting down all units every night and on weekends would result in a yearly savings of $1,223.00.

A/E Scope:

- Survey site and existing conditions
- Prepare contract documents
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide support for commissioning

Energy Saving Calculation:

The savings associated with this ECM were assessed on a per component basis. The standby loads of the targeted vending machines, computers and televisions were measured and considered to be consumed continuously. These loads were used to estimate the expected energy savings and the monetary savings were calculated based on a BERTs plug system which has an average cost of $60.00 per wireless plug. These results are summarized in Table 17.

Table 16: Identified Plug Loads by building section

Identified Plug Loads by Building Section						Plug Load
Identified Plug Loads	100 Wing	200 Wing	300 Wing	Other	Totals	Management?
CPU's	242	13	120	18	393	No
Neoware CPU	105	0	70	0	175	No
Monitors	243	0	118	19	380	Yes
CPU + Monitor	30	13	58	0	101	Yes (Monitors Only)
Copiers	6	2	4	9	21	No
TVs	53	7	70	2	132	Yes
Fax Machine	5	1	2	0	8	No
Printer	40	5	51	5	101	No
Microwave	15	2	9	4	30	No
Mini-Fridge	16	6	6	1	29	No
Projector	11	3	10	0	24	No
Smart Board	9	0	6	0	15	No
Coffee Makers	5	0	6	4	15	No
Refrigerator	4	2	5	2	13	No
Vending Machine - Ref	3	0	1	0	4	Yes
Vending Machine - Non Ref	1	0	0	0	1	No
Water Fountain	6	0	4	0	10	No
Water Cooler	1	0	2	1	4	No
Freezers	7	0	0	0	7	No
Ice Machine	1	0	1	1	3	No
Total	803	54	543	66	1466	
Estimated Plug Load Management Items					617	

Table 17: ECM #8 Energy Saving Calculation

ECM # 8 - Plug Load Management						
Description	Units	Location	Unit Cost	Est. Cost	Est. Annual Savings	Simple Payback
8.1 - Vending Misers: Est. Construction Cost	4	unit	$250.00	$3,295	$843	
8.2.1 - Computers/Monitors: Est. Construction Cost	481	unit	$60.00	$31,199	$1,223	
8.2.2 - TV's: Est. Construction Cost	132	unit	$60.00	$10,268	$1,369	
Contingency			4.0%	$1,790		
Estimated Total ECM Cost				$46,552		
Estimated Incentive Value						
Adjusted Estimated ECM Cost				$46,552	$3,435	13.6 yrs
Estimated Soft Costs		15%		$6,983		
Estimated ECM Project Cost				$53,535		15.6 yrs

ECM #9 Transformer Upgrades:

Scope:

While transformers handle the distribution and alteration of electrical voltage throughout the building, lower efficiency models can result in significant amount of wasted energy each year while in operation. Low efficiency during non-peak usage periods and harmonic distortions can lead to energy loss through transformers.
To assess potential transformer upgrades, an analysis was done in consultation with Powersmiths™, a supplier of high efficiency building load transformers. Of the 42 transformers reviewed, three are eligible for upgrade to Powersmiths™ e-saver model transformers, which significantly reduce energy loss during operations.

A/E Scope:

- Survey site and existing conditions
- Prepare contract documents
- Prepare written specifications
- Publicly bid the work

Construction Scope:

- Obtain approved shop drawings
- Coordinate installation with new and existing equipment
- Provide system, start-up, testing and training
- Provide support for commissioning

Energy Saving Calculation:

The estimated savings through implementation of this ECM was assessed based on replacement of eligible transformers as noted above. Estimated savings are shown in Table 18 below. For the full Powersmiths™ energy savings report please refer to Appendix "K".

Table 18: ECM #9 Energy Saving Calculation

ECM # 9 - Replace Transformers						
Description	**Units**	**Unit**	**Unit Cost**	**Est. Cost**	**Est. Annual Savings**	**Simple Payback**
Estimated Construction Cost	3	Unit	$7,000.00	$27,350		
Contingency			4.0%	$1,050		
Estimated Total ECM Cost				$28,400		
Estimated Incentive Value						
Adjusted Estimated ECM Cost				$28,400	$3,729	7.61 yrs
Estimated Soft Costs		15%		$3,308		
Estimated ECM Project Cost				$31,708		8.5 yrs

ECM #10 LED Lighting Upgrades:

<u>Scope:</u>

Replacement of the existing fixtures with new LED fixtures for the areas illustrated in Table 19 below. The new energy efficient, LED fixtures will provide adequate lighting and will save the Owner on electrical costs due to the better performance of the fixture. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the reduction in ballast/lamp replacements. The expected lamp life of an LED fixture (*approximately 50,000 burn-hours*) in comparison to the existing T8 and other lamps (*approximately 20,000 and 30,000 burn-hours*) will require the Owner to make fewer replacements per year. This savings was assessed based on the assumption that existing light bulbs would require one bulb change at some point during the next 15 years where would not be required for LEDs.

LED lighting technology also extends to exterior lighting applications. In this case, the typical 250 watt high pressure sodium parking lot area fixture, with poor light quality and color rendering index, would be replaced with an LED fixture running at 109 watts, with much greater light quality.

<u>A/E Scope:</u>

- Survey site and existing conditions
- Prepare contract documents demonstrating area that lighting fixture will be replaced
- Prepare written specifications
- Publicly bid the work

<u>Construction Scope:</u>

- Obtain approved shop drawings
- Removal of existing light fixtures
- Installation of new LED light fixtures
- Provide system, start-up, testing and training.

Energy Saving Calculation:

The estimated savings through implementation of this ECM was assessed directly by comparison of proposed LED wattage and energy use as compared to current fixture energy use. Additionally, costs were reduced by the allocation of (1) anticipated incentives available through the NJ Smart Start program and (2) reduced maintenance costs associated with the elimination of a lamping change for each fixture during the modeled 15 year period. The energy savings and costs associated with this ECM are summarized in Table 20 below.

Table 19: Lighting Fixture Upgrades

Other Main Bldg Lighting												
Description	Fixtures	Lamps /Fixt	Lamps	Exg SF	Exg W/SF	Prop W/SF	Hrs of Oper	Exg kWh	Prop kWh	Annual Savings	Est. Costs w/ Contingency	Simple Payback
117 - Classroom 117	13	2	26	716	2.193	0.835	2600	4082	1554	$442	$4,095	9.26 yrs
119 - Classroom 119	17	3	51	2123	0.769	0.368	2600	4245	2031	$387	$5,355	13.85 yrs
119A - Band Room	12	3	36	700	1.646	0.789	2600	2996	1436	$273	$3,780	13.85 yrs
131 - Classroom 131	50	3	150	1614	2.974	1.425	2600	12480	5980	$1,137	$15,750	13.85 yrs
137 - Classroom 137	37	3	111	1334	2.663	1.276	2600	9236	4426	$841	$11,655	13.85 yrs
138 - Classroom 138	48	3	144	1475	3.124	1.497	2600	11981	5741	$1,091	$15,120	13.85 yrs
139 - Classroom 139	64	3	192	2080	2.954	1.415	2600	15975	7652	$1,455	$20,160	13.85 yrs
150 - Classroom 150	9	3	27	744	1.161	0.556	2600	2246	1076	$205	$2,835	13.85 yrs
151 - Classroom 151	9	3	27	748	1.155	0.553	2600	2246	1075	$205	$2,835	13.85 yrs
152 - Classroom 152	9	3	27	728	1.187	0.569	2600	2247	1077	$205	$2,835	13.85 yrs
153 - Classroom 153	9	3	27	752	1.149	0.551	2600	2247	1077	$205	$2,835	13.85 yrs
154 - Classroom 154	4	3	12	387	0.992	0.475	2600	998	478	$91	$1,260	13.85 yrs
155 - Classroom 155	12	3	36	1174	0.981	0.470	2600	2994	1435	$273	$3,780	13.85 yrs
156 - Classroom 156	12	3	36	1204	0.957	0.458	2600	2996	1434	$273	$3,780	13.85 yrs
157 - Classroom 157	12	3	36	1189	0.969	0.464	2600	2996	1434	$273	$3,780	13.85 yrs
158 - Classroom 158	12	3	36	1212	0.950	0.455	2600	2994	1434	$273	$3,780	13.85 yrs
167 - Classroom 167	12	3	36	1254	0.919	0.440	2600	2996	1435	$273	$3,780	13.85 yrs
176 - Classroom 176	9	3	27	795	1.087	0.521	2600	2247	1077	$205	$2,835	13.85 yrs
178 - Classroom 178	9	3	27	795	1.087	0.521	2600	2247	1077	$205	$2,835	13.85 yrs
186 - Classroom 186	6	3	18	671	0.858	0.411	2600	1497	717	$136	$1,890	13.85 yrs
203 - Classroom 203	12	3	36	720	1.514	0.703	2600	2834	1316	$266	$3,780	13.85 yrs
204 - Classroom 204	12	3	36	715	1.611	0.772	2600	2995	1435	$273	$3,780	13.85 yrs
216 - Garage Bay	15	4	60	1708	0.937	0.269	2600	4161	1195	$518	$4,725	9.11 yrs
230 - Aux. Gym	12	1	12	3565	1.346	0.663	3600	17275	8509	$1,534	$3,780	2.46 yrs
230A - Aux. Gym Stage	14	1	14	937	2.408	0.491	3600	8123	1656	$1,131	$4,410	3.9 yrs
318 - Classroom 318	8	3	24	867	0.886	0.424	2600	1997	956	$182	$2,520	13.85 yrs
319 - Classroom 319	8	3	24	878	0.875	0.419	2600	1997	956	$182	$2,520	13.85 yrs
320 - Classroom 320	8	3	24	916	0.838	0.402	2600	1996	957	$182	$2,520	13.85 yrs
321 - Classroom 321	8	3	24	891	0.862	0.413	2600	1997	957	$182	$2,520	13.85 yrs
323 - Classroom 323	16	3	48	800	1.920	0.920	2600	3994	1914	$364	$5,040	13.85 yrs
325 - Classroom 325	47	2	94	2476	1.164	0.706	2600	7493	4545	$516	$14,805	28.71 yrs
329E - Classroom 329 Studio	24	1	24	329	4.377	2.796	2600	3744	2392	$236	$7,560	31.97 yrs
331 - Classroom 331	42	2	84	2446	1.099	0.677	2600	6989	4305	$469	$13,230	28.19 yrs
Total	591	91	1,586	38,943						$14,480	$186,165	12.86 yrs

Site and Exterior Lighting											
Description	Lamps	Exg W/Fixt	Exg Total W/Fixt	Prop W/Lamp	Prop Total W/Fixt	Hrs of Oper	Exg kWh	Prop kWh	Annual Savings	Est. Costs w/ Contingency	Simple Payback
1 - Pole MTD Spot	4	250	1000	109	436	3500	3500	1526	$314	$4,095	13.05 yrs
2 - Shoebox	21	250	5250	109	2289	3500	18375	8012	$1,648	$21,499	13.05 yrs
3A - Wall Mounted. Ext. Light	35	150	5250	36	1260	3500	18375	4410	$2,220	$35,831	16.14 yrs
4A - Canopy Lights Surface	5	150	750	36	180	3500	2625	630	$317	$5,119	16.14 yrs
Total	65								$4,499	$66,544	14.79 yrs

Estimated Savings from Lamp Changes (material and labor) if ECM is implemented

Type	Est. Hours/bulb
LED	50,000
T8	30,000

Estimated Average Bulb Years-to-Change	
Operating Hours/Day	10
Operating Days/Week	5
Operating Hours/Year	2600
Estimated Life Spans (hrs)	30,000
Estimated Years to Bulb Change	11.5
Bulb Changes/15 Years	1

Estimated Cost/Bulb Change	
Labor Hours/Bulb Change	0.2
Avg. Hourly Rate	$60.00
Estimated Cost/Bulb Change	$12.00
Estimated Material Cost/Change	$7.00
Total Estimated Cost/Change	$19.00
ECM #10 Number of Fixtures	1,712
Estimated Savings	$32,528

Table 20: ECM #10 Energy Saving Calculation

ECM # 10 - LED Lighting Upgrades						
Description	Units	Unit	Unit Cost	Est. Cost	Est. Annual Savings	Simple Payback
Exterior Fixture Replacement	65	fixture	$975.00	$63,375	$7,456	
Interior Fixture Replacement	612	fixture	$300.00	$183,600	$23,552	
Contingency			5.0%	$12,349		
Estimated Total ECM Cost				$259,324		
Estimated Maintenance Savings				$32,528		
Estimated Incentive Value				$12,620		
Adjusted Estimated ECM Cost				$214,176	$31,008	6.91 yrs
Estimated Soft Costs		15%		$32,126		
Estimated ECM Project Cost				$246,302		7.94 yrs

VII. Design, Commissioning, Maintenance & Risk

Design & Commissioning:

The various ECMs and their associated preliminary scope that are outlined in this document have design aspects that will require the services of a licensed professional engineer to both save energy and comply with State and local building codes. Spiezle Architectural Group and Partner Engineering and Science Inc. are prepared to provide professional architectural and engineering services to assemble a publicly bid set of construction documents as well as provide bidding and construction administration support during the implementation of the selected ECMs.

Additionally the services of a commissioning agent should also be enlisted to provide commissioning services. The use of a licensed professional engineer with commissioning experience is recommended as it will aid in providing an efficient transition from design, construction and to final turnover to the district. The commissioning scope for the project is presented in Table 21.

Table 21: Commissioning Scope

Energy Conservation Measures		
ECM #	***ECM Description***	***Commissioning Y/N***
ECM#1	DDC Controls Upgrade	Yes
ECM#2	Variable Speed Pumping	Yes
ECM#3	100 Wing Domestic Hot Water Upgrade	Yes
ECM#4	300 Wing Boiler Upgrade	Yes
ECM#5	Fuel oil to Natural Gas Conversion	Yes
ECM#6	HVAC Air/Water Rebalance	No
ECM#7	.Retro Commissioning	Yes
ECM#8	Plug Load Management	No
ECM#9	Transformer Replacement	No
ECM#10	LED Light Upgrades	Yes

Maintenance:

To ensure the estimated energy saving associated with each ECM is continued through the 15 year duration of the ESIP project the District maintenance staff will have to continue to perform regular maintenance and review the following:

- Operational Commissioning Report: The district should note the various temperature set points damper positions and occupied/un-occupied schedules outlined in the report. These control points should be added to the schools regular maintenance program to ensure the estimated energy savings associated with each ECM are realized.

- Operation and Maintenance Manual: On project closeout the District should review the supplied O&M manuals provided with the new equipment and maintenance procedures reviewed during training and add these service procedures to their current maintenance program.

Additionally as the work is performed under the ESIP regarding to the replacement of several pieces of equipment that are near or have exceed their useful service life, associated maintenance cost are foreseen to be less costly than the current cost, saving the District additional monies.

Risks:

The Districts pursuit of a "Do-It-Yourself" ESIP process introduces a few risks. One of these is a situation where the projected energy savings of an ECM is not realized and causes the district to utilize budget dollars in lieu of the funds saved by the energy savings measure. The "Do-It-Yourself approach allows the required measurement and verification (M&V) process that is normally carried out in an ESCO style contract to be eliminated from the scope. The M&V process is used to help verify the energy savings of the implemented ECMs over the life of the project. The implementation of an M&V plan can be costly. By omitting this portion of work under the "Do-It-Yourself" approach the capital saved can act as an insurance policy to offset any anomalies in energy savings encountered throughout the life of the project. Having worked closely with the Districts Facility manager during the audit process it is our opinion the District has a comprehensive maintenance plan. Implementation of the commissioning process coupled with the current maintenance plan we do not recommend the District to undertake the cost associated with an M&V plan. An additional risk is the cost associated with natural gas. The two year average cost of natural gas has been \$1.26/Therm. The fluctuation in natural gas prices over the 15 year life of the EISP can have an impact on the amount of savings seen with gas fired equipment however when compared to the historical cost of fuel oil, these fluctuations should have little impact on the amount of savings realized by the oil to gas conversion portions of the ESIP. The installation of the various energy efficiency measures will provide the District with newer more efficient equipment to replace the facilities existing equipment that is at the end of its useful service life therefore reducing the risk of capital replacement project cost.

VIII. PJM Demand Response and Curtailable Service

PJM, the regional transmission organization oversees the electricity grid in many of the Mid-Atlantic States including New Jersey. PJM offers a variety of demand response and curtailable service programs to end users on the grid that provide the opportunity to generate revenue by participating in the program(s) offered. Some of the most common programs offered are the Emergency Load Response Program, Economic Load Response Program and Synchronized Reserves Market. The emergency load response program is structured to allow the end user the ability to receive financial incentives at time when there are emergencies on the power grid.

The Districts current electricity transmission provider Atlantic City Electric is listed as a participating member in the demand response program but the districts third party electricity provider Energy Sol is not affiliated with the program. It is not recommended the District switch third party providers for participation in the program at this time. As the facilities hours of operation are varying and scheduled reductions in consumption could impact class and lab schedules.

IX. ESIP Cash Flow Summary

The financing for an ESIP project is based on the principal the cost of the energy various improvements and will be paid in relation to the energy saved. Additionally NJ ESIP Laws require the project to have a maximum payback period of fifteen years and have a positive cash flow during the program life.

For this project a 4.00% interest rate was utilized with a 2.00% electric and 2.00% natural gas utility escalation rate. Table 3, which is located in the Executive Summary section of this report and Appendix "I" shows a simple pay back of 11.3 years based on estimated project cost.

X. Greenhouse Gas Emissions Summary

Greenhouse gas reductions associated with the ESIP program were calculated based on several standards obtained from external sources. According to the Environmental Protection Agency's (EPAs) eGrid, 9th Edition, Version 1.0, Year 2010 GHG Annual Output Emission Rates, approximately 1562.72 pounds of CO_2 are produced for every MWh of electricity in the RFC East subregion (which includes New Jersey). Similarly, the EPA's website states that 11.689 pounds of CO_2 are created for every Therm of natural gas consumed. Lastly, the U.S. Energy Information Administration lists the rate of CO_2 generation associated with the burning fuel oil at 16.13 pounds per Therm.

The conversion factors listed above were used in conjunction with the estimated electricity, natural gas and fuel oil savings associated with the ESIP program in order to determine potential greenhouse gas emission reductions. As evidenced by Table 22 below, a total of 1,351,731 pounds of CO_2 can be prevented from entering the atmosphere each year by adopting the ESIP program. For additional information regarding this calculation, refer to Appendix "J".

Table 22: Greenhouse Gas Emissions Reduction

Greenhouse Gas Emissions Reduction			
Energy Conservation Measure (ECM)	Electric Consumption (kWh per Yr)	Natural Gas Consumption (Therms per Yr)	Fuel Oil Consumption (Therms per Yr)
Baseline - Historic Energy Consumption	2,742,798	117,074	8,273
Proposed - Energy Consumption After Applying ECMs	2,155,207	91,419	0
Net Energy Savings	587,592	25,655	8,273
Greenhouse Gas Emissions Reduction (lbs of CO_2)	918,406	299,881	133,443
Total Greenhouse Gas Emissions Reduction (lbs of CO_2)	1,351,731		

Attachment 4. Letter of Support CMCM Special Services School

CAPE MAY COUNTY
SPECIAL SERVICES SCHOOL DISTRICT
4 Moore Road, DN 704
Cape May Court House, New Jersey 08210
(609) 465-2720 • Fax (609) 465-8220

BARBARA J. MAKOSKI
Superintendent of Schools
Ext. 2200

KATHLEEN M. ALLEN
School Business Administrator
Board Secretary
Ext. 2211

JONATHAN PRICE
Director of Related Services
Ext. 4400

ANNAMARIE HAAS
Principal, CMC High School
Principal, Ocean Academy
Principal, COMPACT
Ext. 8800

LORI VILARY
Assistant Principal
Ext. 5500

RECEIVED
MAR 20 2017
CMCMUA

March 15, 2017

To Whom It May Concern:

The Cape May County Special Services School District supports the CMCMUA application for a Town Center Distributed Energy Resource Microgrid Feasibility Study and will work cooperatively with the CMCMUA in the execution of this Study. The Point of Contact at the Cape May County Special Services School District for this effort will be Charles Yahara, Facilities Director, who can be reached at cyahara@cmcspecialservices.org or by telephone at 609-465-2720 extension 7760.

Sincerely,

Barbara J. Makoski

Barbara J. Makoski
Superintendent

C: Charles Yahara, Facilities Director
Kathleen M. Allen, School Business Administrator

CC: JVR
ETF.

CAPE MAY COUNTY SCHOOLS FOR SPECIAL SERVICES
Ocean Academy • Cape May County High School • Cape Educational COMPACT

INTEROFFICE MEMORANDUM

TO: Bradley Rosenthal

FROM: Barbara Makoski

SUBJECT: CMCMUA Support Letter

DATE: March 15, 2017

The information you requested is as follows:

- Annual Natural Gas usage - 94,899 Therms.
- Annual Electrical usage = 1,701,300 kWh.
- Peak Electrical Demand - 624 kW.
- Square Footage - 176,000.
- No large significant conservation purchases

The TC DER Microgrid Feasibility Study Letter of Support is enclosed.

Attachment 5. Letter of Support NJ Army National Guard

State of New Jersey
DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
POST OFFICE BOX 340
TRENTON, NEW JERSEY 08625-0340

CHRIS CHRISTIE *Governor* *Commander-in-Chief*	☆ MICHAEL L. CUNNIFF *Brigadier General* *The Adjutant General*

NJARNG-CFM

9 March 2017

MEMORANDUM FOR BRAD ROSENTHAL, Executive Assistant, Cape May Municipal Authority.

SUBJECT: Microgrid for the Crest Haven Complex

1. The purpose of this memorandum is to show support by the NJ Department of Military and Veterans Affairs to the Cape May Municipal Authorities application for a feasibility study grant for a possible future construction of a micro-grid to support multiple structures including the NJ National Guard Armory and Field Maintenance Shop located at 1601 E. Atlantic Ave, Cape May Court House, NJ 08210.

2. The New Jersey Army National Guard (NJARNG) currently has the 253th Transportation Company stationed at the Cape May Courthouse Armory and that unit is an important part of the NJARNG domestic response mission. During every domestic emergency that the NJARNG has responded to, the transportation assets that reside in that unit have been critical in the state response. Having the unit HQ'd in a facility that has energy security could greatly improve the ability to respond to future events.

3. The NJARNG is interested in supporting and assisting the Cape May Municipal Authority in any way we can towards this effort. The Point of Contact at DMAVA for this effort will be Christopher Moore, the NJDMAVA Energy manager who can be reached at Christopher.Moore@DMAVA.NJ.gov or by telephone at 609-530-7124 or you can contact COL Michael A. Lyons @ Michael.A.Lyons5.mil@mail.mil or 609-847-5441.

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Date: 2017.03.09 11:41:01 -05'00'

Michael A. Lyons
COL, LG. NJARNG
Director, CFMO

BOARD *of* CHOSEN FREEHOLDERS

Attachment 6. Letter of Support CMC

COUNTY *of* CAPE MAY
4 Moore Road
Cape May Court House, N.J. 08210-1654
(609)465-1065 Fax: 465-6189
Website: www.capemaycountygov.net

GERALD M. THORNTON, Director
Administration,
Revenue & Finance,
Emergency Management

LEONARD C. DESIDERIO
VICE-DIRECTOR
Public Offices,
Public Safety

E. MARIE HAYES
Consumer Affairs,
Tourism and Public Information,
Transportation

WILL MOREY
Planning, Economic Development,
Education, and Engineering

JEFFREY L. PIERSON
Health and
Human Services

Elizabeth Bozzelli
Clerk of the Board

22 March 2017

RE: TC DER Microgrid Feasibility Study Letter of Support

Dear New Jersey Board of Public Utilities (NJBPU),

The Cape May County Municipal Utilities Authority (CMCMUA) owns and operates the Seven Mile Middle Wastewater Treatment Facility (WTF) located at the north end of the Crest Haven Complex in Cape May Court House. The New Jersey Institute of Technology's October 2014 New Jersey Town Centers Distributed Energy Resource Microgrids Potential: Statewide Geographic Information Systems Analysis Technical Report, designates this WTF as the anchor in Town Center CM1. The NJBPU has made funding available to encourage applications to the NJBPU for the performance of Microgrid Feasibility Studies for designated Town Centers.

The CMCMUA will act as lead agency in submitting and managing an application for a Town Center Distributed Energy Resource Microgrid Feasibility Study to determine:

1. the validity of establishing a Syngas / natural gas fueled Combined Heat and Power power plant at or near the WTF that would supply electrical and thermal energy to the WTF and several other government buildings in the Crest Haven Complex considered to be critical infrastructure; and,
2. the available technologies and define the optimal technological solution from a financial and operational aspect; and,
3. necessary alterations to existing utility infrastructure and building systems and the costs thereof; and,
4. administrative models for the sale and distribution of electrical and thermal energy and the benefits and challenges thereof.

The County of Cape May supports the CMCMUA application for a Town Center Distributed Energy Resource Microgrid Feasibility Study and will work cooperatively with the CMCMUA in the execution of this project. The Point of Contact at Cape May County for this effort will be Ann Marie Mc Mahon, Director of Facilities and Services who can be reached at annmarie.mcmahon@co.cape-may.nj.us or by telephone at 609-465-1291.

Very Truly Yours,

Gerald M. Thornton

Gerald M. Thornton, Freeholder Director

Cc. Elizabeth Bozelli, Clerk of the Board
Michael Laffey, Director of Operations
Ann Marie Mc Mahon, Director of Facilities and Services

Attachment 7. Preliminary Gas and Energy Production Estimate

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total	Notes
Sludge Feed (dry tons/month)	127	133	131	169	227	369	796	747	449	204	123	149	3624	
Days per month	31	28	31	30	31	30	31	31	30	31	30	31	365	
Sludge Feed (dry lbs/day)	8194	9500	8452	11267	14645	24600	51355	48194	29933	13161	8200	9613		
Assumed VS:TS Fraction	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%		
Assumed VSR in Digestion	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%		
Calculated VSR (lbs VSR/day)	3073	3563	3169	4225	5492	9225	19258	18073	11225	4935	3075	3605		
Unit Digester Gas Production (scf/lb VSR)	15	15	15	15	15	15	15	15	15	15	15	15		
Digester Gas Production (scf/day)	46,089	53,438	47,540	63,375	82,379	138,375	288,871	271,089	168,375	74,032	46,125	54,073		Assumes 15 days SRT
Digester Gas Production (scf/min)	32	37	33	44	57	96	201	188	117	51	32	38		
Digester Gas Production (scf/mo)	1,428,750	1,656,563	1,473,750	1,964,625	2,553,750	4,289,625	8,955,000	8,403,750	5,219,625	2,295,000	1,429,875	1,676,250	41,346,563	
Unit Energy in Digester Gas (BTU/scf)	600	600	600	600	600	600	600	600	600	600	600	600		
Energy in Digester Gas (MMBTU/day)	27.7	32.1	28.5	38.0	49.4	83.0	173.3	162.7	101.0	44.4	27.7	32.4		
Electrical Efficiency	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%		
Heat Efficiency	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%		
Electrical Production (kw)	118	137	122	163	211	355	741	695	432	190	118	139		Generator output rating
CHP system uptime	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%		
Electrical Production (kwh/mo)	79,142	82,881	81,635	105,315	141,459	229,949	496,042	465,507	279,803	127,126	76,650	92,852	2,258,362	kWh/year
Heat Output (MMBTU/day)	10.0	11.5	10.3	13.7	17.8	29.9	62.4	58.6	36.4	16.0	10.0	11.7		Hot water available
Heat Output (MMBTU/mo)	308.81	323.29	318.33	410.67	551.61	896.67	1934.28	1815.21	1091.07	495.72	298.88	362.07	8,806	MMBTU/year

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Heat Output (BTU/hr)	414,798.39	480,937.50	427,862.90	570,375.00	741,411.29	1,245,375.00	2,599,838.71	2,439,798.39	1,515,375.00	666,290.32	415,125.00	486,653.23

From: "Chianelli, Julian" <jchianelli@hazenandsawyer.com>
To: Joshua Palombo <palomboj@cmcmua.com>
Cc: "Bottin, Mark" <MBottin@hazenandsawyer.com>
Bcc:
Date: Fri, 17 Mar 2017 14:25:21 +0000
Subject: Biosolids Management Plan: Draft Biogas Production

Josh,

Per our discussion yesterday, please see attached draft biogas production estimates for your review and comment. These calculations use our combined sludge numbers from the Existing Conditions Report and apply some conservative assumptions to arrive at the gas production numbers shown. We took it a step further to estimate potential electrical production and thermal recovery from a combined heat and power system for your info. As I indicated, there are ways to boost gas production in the digestion process, but this provides a good base for now. Let me know if you have any questions or would like to discuss.

Regards,

Julian R. Chianelli. PE

Associate | Hazen and Sawyer
333 Thornall Street, 3rd Floor, Suite 3B, Edison, NJ 08837
732 491-2813 (direct) | 908 285-7929 (cell)
jchianelli@hazenandsawyer.com | hazenandsawyer.com

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6529

July 31, 2010

Cape May County Facilities and Services
Administration Building
4 Moore Road
Cape May Court House, NJ 08210-1601

Attention: ***Mr. Robert Springer***
Director

Reference: ***Revised Combined Heat and Power Opinion***
Concord Project Number 2C09019

Gentlemen,

Further to our meeting on Friday July 16, 2010 Concord Engineering Group, Inc. (CEG) is pleased to provide Cape May County Facilities and Services (CMC) with a Revised Combined Heat and Power (CHP) Opinion. The purpose of this report is to review the original Energy Study performed by CEG in 2003 and evaluate if, based on the current energy cost and consumption, the opportunity for CHP at the CMC campus is economically viable, and whether or not CMC should proceed with preliminary engineering.

Background

In 2003 CEG was engaged by CMC to evaluate the existing Crest Haven Complex and Court House Complex mechanical and electrical systems and the feasibility of installing a new CHP system. The study was intended to develop a long term plan to address on-site generation, power reliability, control of costs for transmission and distribution (T&D) of power, identification of long term commodity purchasing arrangements for electricity and natural gas, operation and maintenance of the equipment and all energy facilities. As part of the investigation CEG identified available means of alternative financing for the project, and we have researched the availability of grants/rebates from Federal and State sources.

During the CEG analysis of the CMC campus energy usage and generation systems, it was determined that two separate alternative options could be considered.

The first alternative was the construction of a central utility plant (CUP) concept to serve the entire Crest Haven Complex. This alternative required the installation of a four-pipe network system for the distribution of hot water and chilled water, and the buyout of the existing Conectiv electrical distribution system or installation of a new system. At the time of the original CEG Energy Study it was not possible to obtain a cost from Conectiv for the buyout of their distribution system; therefore an estimate was prepared by CEG to install a new distribution system. The simple payback analysis showed a simple payback of about 9 years with an annual energy savings of about $900,000 per year.

The second alternative was the construction of a distributed generation plant to serve only the larger buildings at the Crest Haven Complex. This concept reduced the distribution cost and improved the balance between the electrical and the thermal energy profile. These buildings were the Nursing Home, the Correctional Center, the Health Department, the Special Education School, the Technical School, the Administration building and the Court House Center. These buildings together accounted for 80 % of the energy consumed for the entire complex. The simple payback analysis showed a simple payback of about 5.5 years with an annual energy savings of about $800,000 per year. At the time it was noted that the Technical School and the Special Education School would require HVAC system modifications which were not included in the study.

In addition, the 2003 CEG Energy Study recommended the installation of diesel emergency generators in critical buildings where power is required at all times to fully address power reliability for the Crest Haven Complex. These generators were intended to provide the additional electrical power for peak demand, provide backup power in case of Utility power failure, and be utilized during periods of high demand under the PJM Emergency Load Response and the Economic Load Response Programs. Participation in these programs will require that the air quality permits for the emergency generators be modified to allow operation in this mode. The simple payback analysis showed a simple payback of between 5 and 7 years.

Current Energy Consumption and Cost

As expected the cost of energy has risen since the 2003 Energy Study. CMC has provided the energy invoice data for a period from 2005 to 2008 (partial year) which is summarized as follows:

		Gas Cost (per therm)	Electric Cost (per KWhr)
2005	Unit Price	$1.14382	$0.14905
	Total Cost	$650,354	$1,260,936
2006	Unit Price	$1.52168	$0.16293
	Total Cost	$335,444	$1,449,783
2007	Unit Price	$1.68452	$0.15773
	Total Cost	$519,080	$1,652,527
2008	Unit Price	$1.58056	$0.16875

Total Cost	$246,895	$1,003,725 (part year cost)

It must be noted that the average electrical unit cost data above is skewed by a large number of meters with low electrical consumption. In the case of these meters the lump sum meter charge is a large portion of the cost, resulting in the average electrical unit cost being much higher than the actual electrical energy charge. In 2007 the central facility buildings (large loads) had the following electrical consumption and average cost:

Maximum Demand	3,071 KW
Average Load	1,571 KW
Average Unit Cost	$0.1371 per KWhr

In addition the average natural gas consumption was 4.027 MMBtu/hr.

As expected the electrical and natural gas consumption coincides with ambient temperature and activity in the facility buildings which are not continuously occupied. As a result the peak electrical and natural gas (heating) consumptions are not coincident. It is expected that the near term future building additions and modifications will provide an additional summer time chilling load. The new building additions and modifications will also increase the thermal heating load which will improve the shoulder month (spring and fall) thermal energy load profile. In order to further improve the coincidental thermal and electrical loads for a CHP installation, the engine exhaust heat can be used to generate chilled water in an absorption chiller configuration,

As stated above the cost of electricity for the major loads was about $0.1371/KWhr in 2007. For the purpose of this CHP Opinion it has been assumed that electricity has continued to escalate in accordance with the national averages and a rate of $0.15/KWhr has been used. It may be possible to take credit for demand charge savings and obtain additional project income from the PJM Demand Response Program with the addition of a demand response generator, or over sizing the proposed CHP engine. This CHP Option could be explored during the more detailed Conceptual Design Phase. For this CHP Opinion it has been assumed that CMC would receive a onetime Demand Response Program payment for the new CHP plant.

This CHP Opinion is based on reasonable natural gas fuel prices and hot water efficiencies which would be applicable for CHP systems of this nature. This natural gas rate has been set to $9.00 per MMBtu based on the average NYMEX Henry Hub rate over the past ten years. This rate is significantly lower than the rate that CMC is paying for their building services. In addition this CHP Opinion has also utilized the CHP natural gas rate. State of New Jersey has passed bill A3339 which eliminates the sales and use tax (about 7%) on natural gas being used for CHP.

Combined Heat and Power

Combined heat and power, or cogeneration is the simultaneous production of two useful forms of energy (electricity and thermal) from a single fuel source. The standard CHP system is comprised of a prime mover (reciprocating engine or turbine generator) and a heat recovery unit. The heat recovery unit utilizes the waste and exhaust heat from the prime mover to produce hot water or steam. The hot water or steam can in turn be utilized to produce chilled water. In some cases the prime mover exhaust can be directly vented into an absorption chiller, which will produce chilled water without the need for a heat recovery unit.

Depending on the design and application, CHP systems can have total efficiencies of 70% to 90%. This is much higher than the traditional utility grid generation with simple cycle generators (25% to 45%) and combined cycle power plants (50% to 60%) due to the more complete utilization of the exhaust and/or waste heat from the prime mover. The higher efficiency of CHP can result in significant energy cost savings. In addition, the higher fuel efficiency results in lower emissions per unit of power produced compared to traditional electrical and steam generating units.

The efficiency and cost savings of CHP systems depend on the complete use of the exhaust thermal energy from the prime mover. The economics of CHP are very sensitive to the thermal energy production and consumption. If the prime mover exhaust thermal energy cannot be completely used, the system efficiency is reduced, which will negatively impact the project lifecycle cost and payback. Therefore when examining a potential CHP system it is important to consider the thermal load profiles first and then review the electrical profiles.

CHP Opportunity Analysis

The normal CHP heat/electrical "rule of thumb" relationship between non-supplementary fired heat recovery and electrical generation is 4 to 6 MMbtu/hr for gas turbine prime movers and 2 to 4 MMbtu/hr for gas reciprocating engine prime movers per 1 MW of electric generation. Based on this CHP heat/electrical relationship, the average thermal load is low compared to the electrical average load for the CMC campus. Due to the mismatch of thermal and electrical loads, a CHP configuration designed to generate the full electrical load will not be economically feasible since it will generate more heat than can be used on a regular basis.

Based on the CMC electrical and thermal loads this CHP Opinion has evaluated a 1.4 MW reciprocating engine generator with exhaust heat recovery for the generation of hot and chilled water. The engine generator electrical capacity is slightly less than the average electrical load and therefore will operate continuously throughout the year in a base or high part load mode. The engine generator will operate in parallel with the local utility, with the utility supplying the peak electrical requirements.

For the current evaluation it has been assumed that engine waste heat recovery (about 2 MMBtu/hr net) is from the engine exhaust only, however additional lube oil and jacket water heat recovery may be possible which may improve the overall project economics. The advantage of this system is that it will produce the base load thermal and electrical requirements for the facility; however the peak electrical and thermal loads will have to be generated on site or purchased from the grid. The disadvantage is that the reciprocating engine is only available with natural gas combustion and cannot run on liquid fuel.

The reciprocating engine will require post combustion emission controls to comply with the current NJ DEP air permit requirements. This system will reduce green house gas emissions over the current steam boilers, or in comparison with a new central utility plant without CHP and grid supplied electrical power.

The installed capital cost budget for this CHP Opinion is based upon standard commercial construction (equipment and material specifications, and labor costs) in a new facility in a suburban environment. Operation and maintenance costs are based upon industry standard rates and equipment vendor technical specifications and recommendations. Due to the nature of the equipment and power generation market, there is limited opportunity to specify multiple vendors for specific engine sizes and characteristics, and, in some cases only a single manufacture exists for a particular engine size and type.

The capital cost estimates include the engine generator sets, heat recovery and chilled water equipment, new building, and associated balance of plant equipment to form a complete combined heat and power system. The capital cost does not include an offsetting credit for existing boiler replacements, new hot water generators or standby power generators that may be avoided as a result of the installation of the CHP system.

Based upon our meeting on July 16, 2010 the financial evaluation does include a capital cost offset for the avoided cost of new and lifecycle replacement equipment. The new CHP can be designed in conjunction with the new Correction Center, in order to either eliminate or offset the cost of the new facility boilers and chillers. The offset cost is the total installed cost of equipment and plant facilities. The financial evaluation includes an estimate which can be more accurately determined and evaluated during the first stage of the engineering.

In addition, by integrating the design of the two facilities, the additional cost of plant operations can be minimized. This would be achieved by centralizing all of the fired equipment, which requires regular operator attendance, in one location and potentially locating the balance of plant, unfired, and backup equipment in the other location.

The financial evaluation has also included a onetime demand response payment (discussed above) and the current Board of Public Utilities (BPU) CHP grant. The potential of additional demand response income and the utilization of a net metering program will be evaluated in further detail in the first stage of engineering. It may be possible to increase the power island equipment size, with minimal project capital cost increase to take advantage of these two programs. However this electrical generation increase must also be evaluated against the thermal exhaust heat utilization, and any local utility costs imposed for equipment upgrades to participate in these programs.

The BPU CHP grant program had been stalled by the un-allocation of grant funds by the new NJ Governor. This program has subsequently been funded under The American Recovery and Reinvestment Act of 2009 (ARRA). This program will provide $450/KW (installed) for new high efficiency combined heat and power. The eligibility of these funds depends on the new CHP installation achieving a minimum efficiency threshold. This threshold is an important consideration for the utilization of thermal exhaust heat, and will have an impact on the consideration of a power island equipment size increase for participation in net metering and/or demand response (discussed above). The ARRA requirements include a quick project implementation (discussed below).

The new CHP system and interconnection to the CMC facilities could be expected to have the following capital cost:

Equipment	$1,833,000
Power Island	
Mechanical	
Electrical & Controls	
Construction	$2,209,000
Building	
Labor and Materials	
Construction Management	
Mechanical & Electrical Interconnection	$1,343,000
Engineering and Project Management	$747,000
Contingency	$919,000
Total	$7,051,000

The CHP proforma is based on the following basic assumptions:

Boiler Fuel (natural gas)	$9.00 per MMBtu
CHP Fuel (natural gas less sales & use tax)	$8.63 per MMBtu
Offset Boiler Efficiency	75%
Electricity (energy and supply)	$0.15 per KWhr
CHP System Availability	92%
Thermal Heat Recovery (annual average)	75%
System Heat Recovery Thermal Loss	7%
Power Island Parasitic Electrical Load	2%

Based on the examined configuration, and the assumptions above, the CHP proforma should be expected to be as follows:

Average Electrical Gen	1,428	KW
Average Heat Recovery	2.163	MBtu/hr
Average Heat Rate (HHV)	9,456	Btu/KWhr
Annual Electrical Generated	11,278,367	KWhr
Annual Thermal Generated	17,428,286	MBtu
Offset Electrical Cost	$1,583,483	
Offset Thermal Cost	$209,139	
Total Annual Offset	$1,792,622	
CHP Fuel Consumption	$910,858	

CHP Maintenance	$169,176
Total CHP Annual Cost	$1,080,034
Annual Savings	$712,588
Simple Payback	9.89

The simple payback can be further reduced by the current grant and capital offsets as follows:

Initial Capital Cost	$7,051,000
NJ BPU Grant ($450/KW installed)	($642,000)
One Time Demand Response Payment	($120,000)
New Equipment Offset (boilers & chillers)	($678,000)
Net Capital Cost	$5,611,000
Simple Payback	7.78 years

~~Accost~~ An additional cost avoided, does not reduce cost of new plant

Project Schedule

Depending on the selected contract execution method, the project schedule can range from 20 to 30 months in duration. The major critical path activities and long lead items include air permitting and the procurement of the power island equipment.

Based on a traditional design/bid/bid project approach, and a four month preliminary air permit review, we anticipate that the project will require about 24 months from start of engineering to commercial operation. This project schedule is expedited since the current BPU grant funding program is based upon ARRA funding which requires that the major power island equipment must be delivered by April 2012.

We have attached a preliminary draft schedule which has the following major milestones:

Project Start	August 30, 2010
Engineering Start	August 30, 2010
Air Permit Submission	November 19, 2010
Order Power Island Equipment	February 4, 2011
Start Construction	June 20, 2011
Deliver Equipment	January 6, 2012
Project Complete	August 24, 2012

This schedule is based upon the immediate start of engineering with a final project Go/No Go decision by December 31, 2010.

Conclusions and Recommendations

The CHP system appears to have a reasonable simple payback, based upon the configuration assumptions noted above. Any additional waste heat thermal energy being used by CMC will be offsetting much higher energy costs than shown in the pro forma, which should result in higher cost savings.

In order to reduce operations cost and maximize the thermal consumption this system should be located adjacent to the major facility buildings with a thermal and electrical connection to the CMC facility. Further, the new CHP plant could be designed and operated in conjunction with the other boiler facilities in order to reduce or eliminate and additional operator manpower costs. Based on the basic proforma in this letter it is our opinion that CHP does make sense and that it should be pursued in more detail with a full feasibility study.

If the option to use a third party is considered the inclusion of additional overhead and profit will reduce the payback slightly from what is shown above. However, the third party owner-operator, would allow the 10% Federal Investment Tax Credit and five (5) year Accelerated Depreciation for CHP projects to be monetized back to CMC, offsetting some of these fees.

This project is consistent with the State of New Jersey Energy Master Plan Study and is eligible for a number of potential Federal and State grants, rebates and other incentives.

As stated above, the eligibility for the current BPU grant program is dependent on the ability to get equipment delivery by April 2012. As a result, we recommend that you immediately initiate procurement of conceptual and detailed engineering services on a Request for Qualifications (RFQ) basis, with a target award in late August 2010 to support the initial project milestone dates.

If you have any questions or comments, please do not hesitate to call us at 802-999-6062.

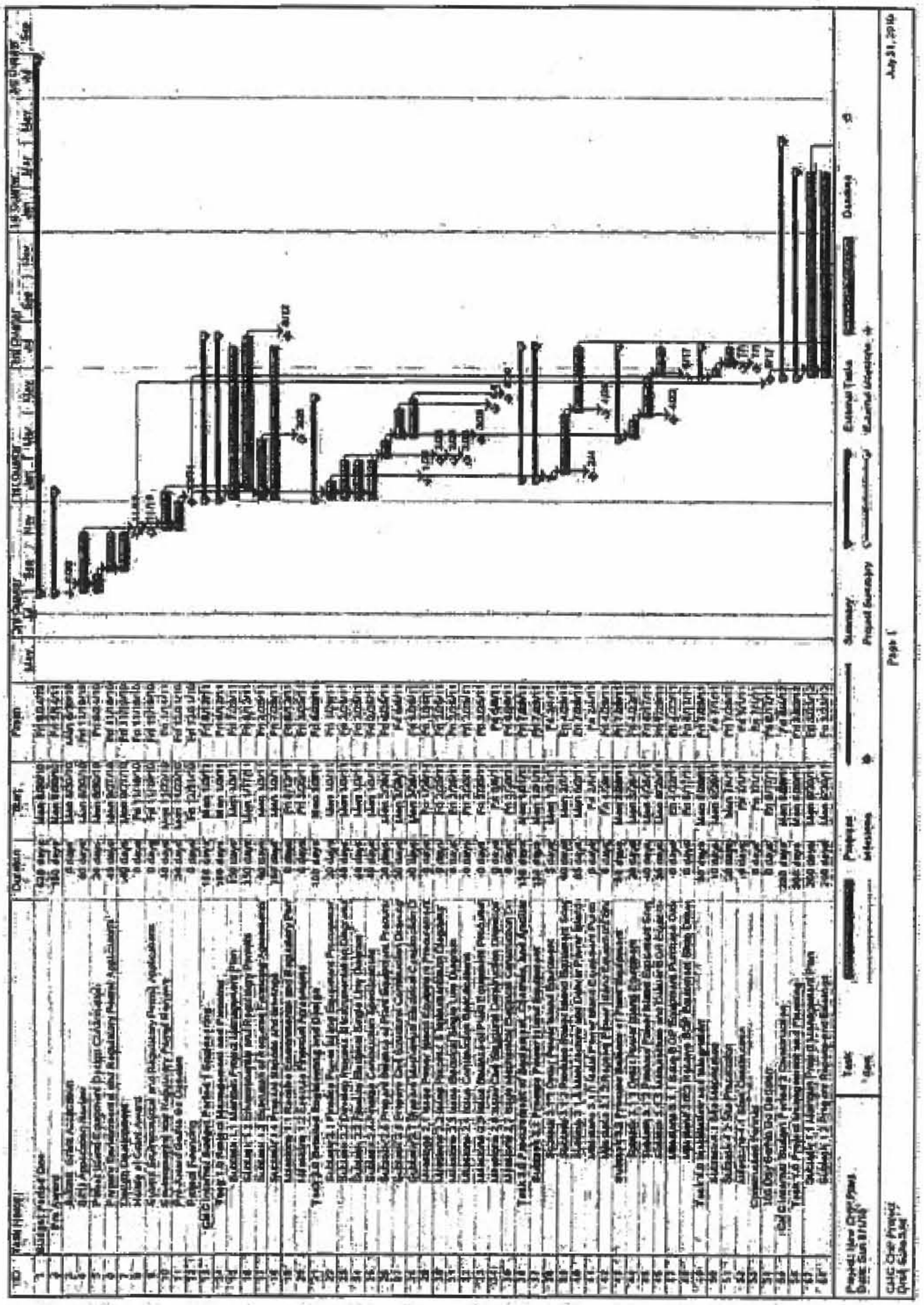
Sincerely,

CONCORD ENGINEERING GROUP, INC.

Johnathan Coleman, P.Eng.
Vice President Sales & Marketing

cc M.Fischette, CEG
T.Iannuzzi, CEG
File

encl Draft Schedule (2 pages)



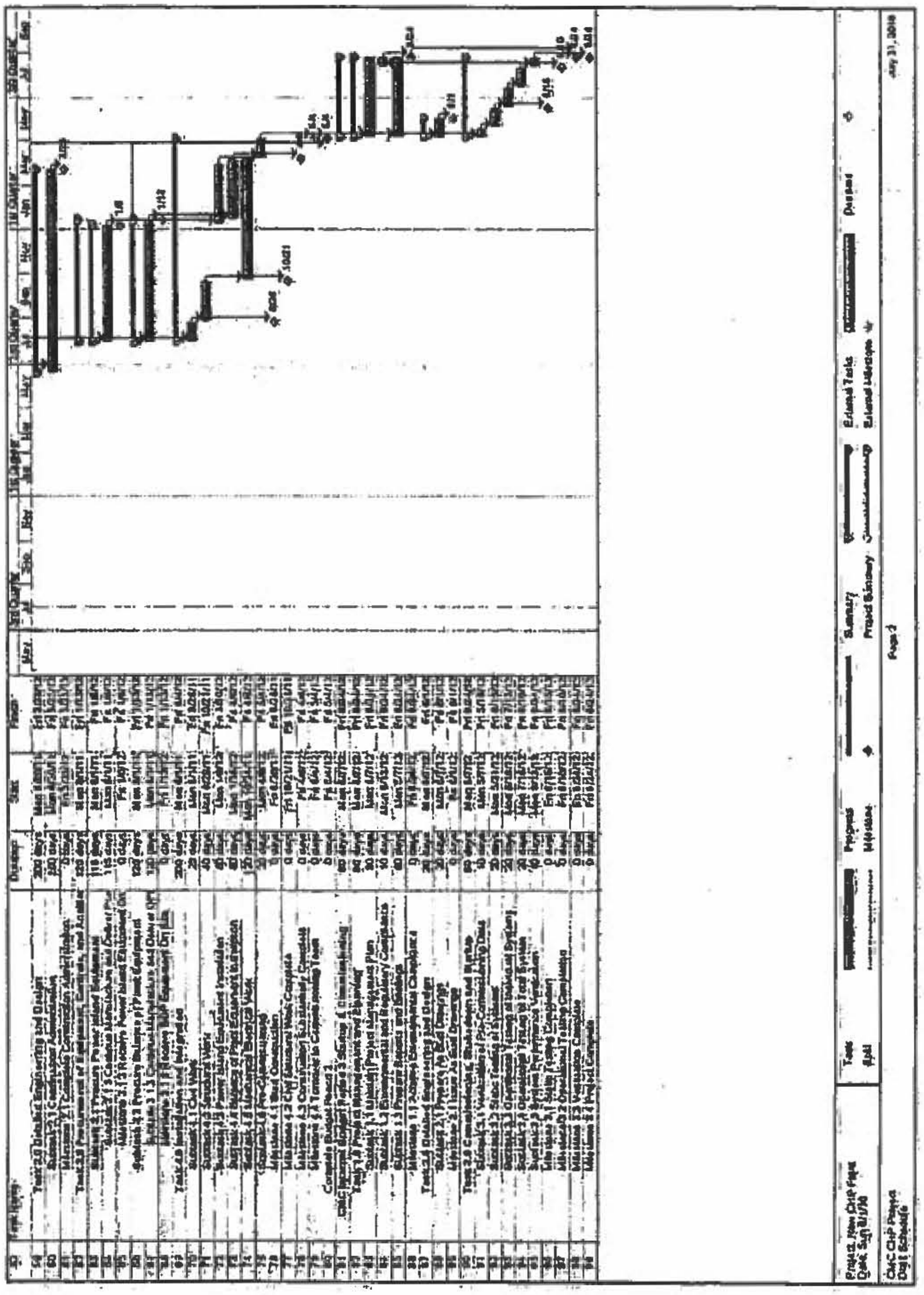


Table 1: List of Major Buildings to be Connected to the Crest Haven Microgrid and their Related Energy Use.

	Annual KW 2016	KW 2016	Annual 2016 - Thermal Load				Google Earth, Straight Line		
Facility	Electric Load	Peak Demand	Nat. Gas Therms	Propane Gals.	Oil Gals.	Square Footage	Distance from WTF (miles)	FEMA Category	Previously Installed Energy Efficiency Measures?
CMCMUA Seven Mile / Middle Wastewater Treatment Facility (WTF) and Wastewater Re-Use Water Supply System (Fire Hydrants and other Non-Potable Water Uses)	3,194,125	806	3,040	0	0	135,000	0	III	High Efficiency Variable Speed Pump Motors, Lighting
CMCMUA Crest Haven Wastewater Pump Station	42,329	35	0	0	0	250	0.8	III	High Efficiency Variable Speed Pump Motors
Cape May County Prosecutor's Office / Crime Lab	225,075	266	12,182	0	0	41,168	0.15	IV	LED lighting, upgraded boilers, we are in the process of replacing windows at the nursing home, and we utilize Johnson Controls Metasys Building Management System
Cape May County Sheriff's K9	60,745	126	2,099	0	0	3,487	0.98	IV	
Cape May County Correctional Center	18,969	47	26,145	0	0	46,872	0.83	III	
Cape May County Police and Fire Academies	49,829	232	8,116	0	0	4,482	0.44	IV	
Cape May County Administration Building	3,836	9	18,639	0	0	65,634	0.75	III	
Cape May County Health Department	5,652	17	17,415	0	0	31,229	0.69	III	
Cape May County Crest Haven Nursing and Rehabilitation Center	73,092	15	3,273	0	0	95,669	0.58	III	
Cape May County Facilities & Services Warehouse	45,148	173	18,494	0	0	10,000	0.15	IV	
Cape May County Facilities & Services Maintenance Shop	41,804	160	5,578	0	0	1,500	0.87	IV	
Cape May County Bridge Commission	19,295	12	2,819	0	0	3,427	0.55	III	
Cape May County Special Services School	1,701,300	624	94,899	0	0	176,000	0.59	III	
Cape May County Technical High School	2,794,225	832	1,714,285	0	5,577	249,800	0.41	III	Energy Savings Plan included in Application
New Jersey National Guard Armory	90,822	36	4,369	65	8,448	32,052	0.95	IV	T5 Lighting. LED Exterior Lighting. New Roof, Windows and Doors. Smart electric meters.
Total	8,366,246	3,390	1,929,353	65	14,025	896,568			

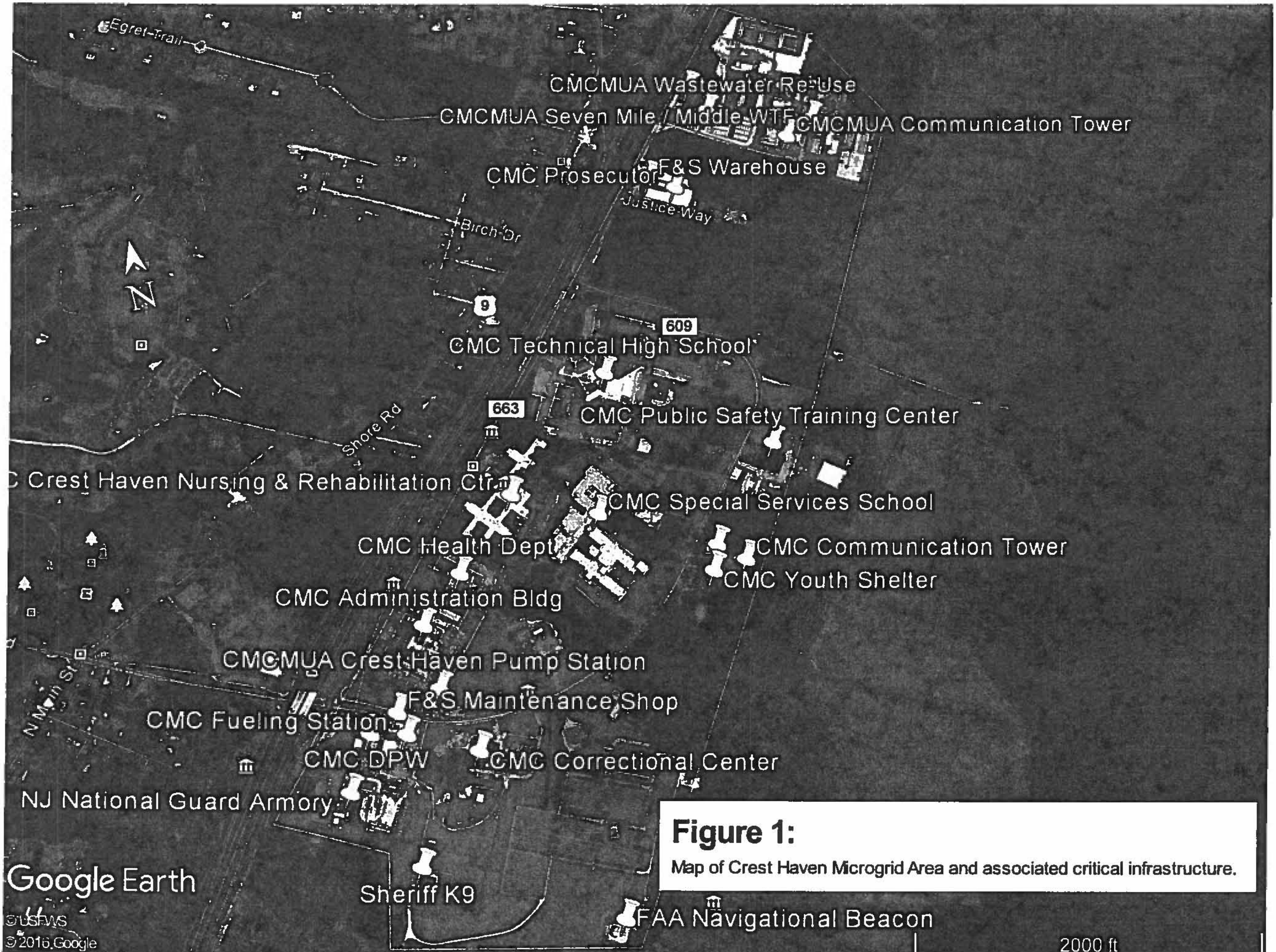


Figure 1:
Map of Crest Haven Microgrid Area and associated critical infrastructure.

State of New Jersey
BOARD OF PUBLIC UTILITIES
44 SO. CLINTON AVENUE
THIRD FLOOR, SUITE 314 – P.O. BOX 350
TRENTON, NEW JERSEY 08625-0350

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

RICHARD S. MROZ
PRESIDENT
TEL: (609) 777-3310
FAX: (609) 292-2264

April 17, 2017

Brad Rosenthal, Executive Assistant
Cape May County Municipal Utilities Authority
Post Office Box 610
Cape May Court House, NJ 08210

Dear Mr. Rosenthal:

The NJBPU Town Center DER Microgrid Evaluation Team (Evaluation Team) has received your application for a TC DER microgrid feasibility study incentive.

BPU has received 13 proposals for feasibility study incentives. The Board's approved DER microgrid line item budget is $1 million. The 13 proposals significantly exceed that budget. The TC DER evaluation team is requiring that you submit a best and final offer (BAFO) for your proposal. This BAFO should include your estimated breakdown of the budget for the prime investigator and all subcontracts including any estimated fees to be paid to the EDC/GDC. The above noted items, the BAFO and the budget breakdown of the prime investigator and subcontractors should be submitted to TCDERmicrogrid@bpu.nj.gov by close of business (COB) 5:00 p.m. on May 1, 2017. Non-submittal of the additional items, the BAFO and budget breakdown will result in a non-completeness determination of the proposal.

As noted in the TC DER microgrid feasibility study application, the Board has the sole discretion over the approval of projects and awards of incentives, and may change criteria or available funding at any point during the duration of the program.

Sincerely,

Michael Winka
Senior Policy Advisor

Joseph V. Rizzuto, Executive Director

George W. Betts, Chairman
Richard Rixey, Vice Chairman
William G. Burns, Jr.
Patricia A. Callinan
Carl H. Groon
Carol A. Heenan
Carol L. Saduk

Cape May County Municipal Utilities Authority

Post Office Box 410 Cape May Court House NJ 08210
Telephone (609) 465 9026 Telefax (609) 465 9025
www.cmcmua.com email info@cmcmua.com

April 26, 1017

Michael Winka, Senior Policy Advisor
New Jersey Board of Public Utilities
TCDERmicrogrid@bpu.nj.gov

SENT VIA EMAIL

RE: Advanced Microgrid Program Advanced Feasibility Study Grant

Dear Mr. Winka,

In response to your letter dated April 17, 2017 and associated request for a more thorough budget and best and final offer for the Advanced Microgrid Program Feasibility Study Grant, the Cape May County Municipal Utilities Authority (CMCMUA) provides our estimated budget below.

In its original application, the CMCMUA asked for $200,000. In performing the additional analysis as requested, the project is estimated to require $243,000 in funding for consultant work and $54,334 in CMCMUA project management costs for a total project cost of $297,334. The CMCMUA reiterates its request for $200,000 in project funding and anticipates the additional funding will be provided by the CMCMUA should it not be available from the NJBPU or other sources. It is the intention of the CMCMUA to use a consulting firm capable of acting as a single prime investigator for all aspects of the project.

Chief Engineer's Estimate of Consultant Work Costs	
1) Calculation of Power Demand	$18,000
2) Energy Distribution Infrastructure Assessment and Recommendations	$27,000
3) Energy Sale Feasibility Study	$12,000
4) Generation Site Assessment	$18,000
5) Energy Source and Generation Methods Alternatives Study (including a review of effects on the Distribution Companies and operational impacts to project partners)	$90,000
6) Economic Analysis of Alternatives	$36,000
7) Coordination With Project Partners	$30,000
8) Project Partner Meetings	$12,000
TOTAL:	**$243,000**

CMCMUA Project Management Estimated Costs	
Procurement	$13,921
1) Calculation of Power Demand	$2,210
2) Energy Distribution Infrastructure Assessment and Recommendations	$7,637
3) Energy Sale Feasibility Study	$1,477
4) Generation Site Assessment	$2,009
5) Energy Source and Generation Methods Alternatives Study (including a review of effects on the Distribution Companies and operational impacts to project partners)	$12,327
6) Economic Analysis of Alternatives	$2,954
7) Coordination With Project Partners	$5,371
8) Project Partner Meetings	$6,428
TOTAL:	**$54,334**

The CMCMUA looks forward to a continuing dialogue with the NJBPU regarding this project and thanks you for your further consideration of this project.

Very Truly Yours,

Brad Rosenthal
Executive Assistant

Cc via email: Joseph Rizzuto, Executive Director
Thomas LaRocco, Chief Engineer, Deputy Director

Town Center Distributed Energy Resources Microgrid Feasibility Study Report Requirements

As set forth in the MOU the Town Center (TC) Distributed Energy Resource (DER) Microgrid Feasibility Study Report should be of sufficient detail to demonstrate how the TC DER Microgrid's functional and technical requirements will be executed, the proposed approach to solve technical problems, and how project goals will be accomplished.

The TC DER Microgrid Feasibility Study Report should include an Executive Summary including all project definitions and special terms used in the Report.

The full report must include, but is not necessarily limited to, the following

1. Table of Contents

2. Project Name

3. Project Applicant – This should be the local government or state agency that is the MOU signatory.

4. Project Partners – This should include any agreements entered into by the partners.

5. Project location – This should include a detailed mapping of the boundaries on the TC DER microgrid within the municipality.

6. Project Description including a detailed description of all included critical facilities with a description of why they are critical facilities within the proposed TC DER Microgrid. The Project Description should include the following: [1]

   i. The electrical and thermal loads for each critical facility over the month and year. This should include a description and illustration of any variability in loads including daily, weekend or seasonal loads that impact on the peak, minimum and average loads.

   ii. The electric and thermal load of the total microgrid project over the month and year. This should include a description and illustration of any variability in loads including daily, weekend and seasonal loads that impact on the peak, minimum and average loads as well as the coincident loads of the overall system.

[1] The energy data in this section and the full report should be provided through metered data were available but may also be provided through simulated data from models such as EnergyPlus. If the data is simulated the specific software and model should be identified and available.

iii. The monthly and annual energy costs for each critical facility and the overall project including both energy and demand costs. This should include the monthly cost and any variations over the year that could impact demand costs.

iv. The square footage of each building and the total project.

v. The overall boundaries of the proposed project and distance between critical facilities should be provided. A map should be provided showing the locations of any Right of Way (ROW) crossings.

vi. The size of the available emergency shelter facilities and for what periods they can serve during and after an emergency.

vii. The specific FEMA Category Classification of each building and whether they are a state or federal designated critical or emergency facility.

viii. A listing of all potential permits, permit issuing agency, and general timeframe for issuance.

ix. Any previously installed EE or energy conservation measure (ECM) or currently implemented demand response (DR) measure.

6. A detailed description of the ownership/business model for the overall project including all procurement issues between the various local government and state government partners. This should include a detailed description of the statutory and regulatory provisions of proposed ownership models, EDC/GDC utility roles, as well as any billing systems for electricity and thermal energy.

7. A detailed description of the technology, business and operational protocol to be developed and/or utilized and the location within the TC DER Microgrid. This should include the following:

i. A detailed description of the proposed connections (electric, gas and/or thermal) of the critical facilities and the DER technologies.

ii. A one line diagram of the microgrid and location of the electrical connections to the EDC's facilities/equipment.

iii. A detailed description of the type of distribution system the TC DER would be interconnecting into (radial or network) and the interconnection procedures and requirements.

iv. A detailed description of how the TC DER will black start and operate and over what time period in island mode and in sync with the distribution system.

v. A detailed description of the NJBPU and EDC tariff requirements/issues including any smart grid or distribution automation upgrades proposed or under development by the EDC.

vi. A detailed description of the FERC and PJM tariff requirements/issues.

8. A detailed description of the overall cost including site prep, equipment and equipment installation, construction, operations and maintenance including a detailed construction schedule. This should include a detailed description of the overall energy costs for each critical facility and the overall project as well as any proposed ECM or DR measure to be constructed or operated within each critical facility and the overall project and its impact of the overall operation costs.

(Both 7 and 8 should be detailed through an available microgrid modeling efforts. Applicants must also demonstrate that their proposed project is consistent with the use of the Societal Benefit Charge as set forth in N.J.S.A. 48:3-60(a)(3)).

9. A detailed cash flow evaluation. This should also include a description of the potential revenue markets for any ancillary services, demand response including EE, capacity or energy markets and any available emission or energy certificate trading markets.

10. A detailed description of the potential financing of each location/critical facility and/or the overall project.

11. A detailed description of the benefits of the proposed Town Center DER Microgrid as well as the need for the proposed project. This should include an estimate of the value for reliability, resiliency, flexibility, sustainability including avoided environmental impacts such as air emissions, water usage, wastewater discharges, land use and waste generation, affordability and security.[2]

12. A general description of the communication system between the TC DER microgrid and the EDC's system. This should include a detailed description of distribution management systems and controls and all building controls.

13. The estimated timeframe for the completion of the construction and commencement of operations of the individual critical facilities and the overall project.

14. A description of the on-going work with the EDC and GDC.

The overall quality of the TC DER microgrid feasibility study report and the data provided will be one factor used by the Board to determine which projects proceed to a Phase 2 – Detailed Engineering Design and TC DER microgrid pilot.

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[2] This valuation should follow the Grid Services and Technologies Valuation Framework developed by the USDOE in their Grid Modernization Initiative.

<u>**MEMORANDUM OF UNDERSTANDING**</u>
BETWEEN AND AMONG
THE NEW JERSEY BOARD OF PUBLIC UTILITIES,
AND
CAPE MAY COUNTY MUCICPAL UTILITIES AUTORITY

THIS MEMORANDUM OF UNDERSTANDING ("MOU"), is made this _____ day of ________, 2017, by and between **The CAPE MAY COUNTY MUNICIPAL UTILITIES AUTORITY** ("Recipient") **and The NEW JERSEY BOARD OF PUBLIC UTILITIES** ("BPU" in general or "Board" when referring to Board of Commissioners) (collectively the "Parties") setting forth the roles and responsibilities of the Parties in connection with the Town Center Distributed Energy Resource (TCDER) Microgrid Feasibility Study Incentive Program ("Program").[1]

WHEREAS, the BPU is charged with the authority to ensure that safe, adequate, and proper utility services are provided at reasonable, non-discriminatory rates to all members of the public who desire such services and to develop and regulate a competitive, economically cost effective energy policy that promotes responsible growth and clean renewable energy sources while maintaining a high quality of life in New Jersey; and

WHEREAS, as set forth in N.J.S.A. 48:2-13, BPU is responsible for regulatory oversight of all necessary services for transmission and distribution of electricity and natural gas including but not limited to safety, reliability, metering, meter reading and billing; and

WHEREAS, the BPU is chair of the Energy Master Plan Committee and is responsible for the preparation, adoption and revisions of the Energy Master Plan (EMP) regarding the production, distribution, and conservation of energy in this State; and

WHEREAS, the BPU 2015 Energy Master Plan Update (EMP Update) established a new overarching goal to "Improve Energy Infrastructure Resiliency & Emergency Preparedness and Response" in response to several extreme weather events that left many people and businesses without power for extended periods of time. One "Plan for Action" policy

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[1] Acronyms related to this program are referred to herein are as follows: Town Center (TC); Disributed Energy Resource (DER);

recommendation included in the EMP Update is to "Increase the use of microgrid technologies and applications for Distributed Energy Resources (DER) to improve the grid's resiliency and reliability in the event of a major storm."; and

WHEREAS, specifically, this new policy recommends that:

"The State [of New Jersey] should continue its work with the [United States Department of Energy], the utilities, local and state governments and other strategic partners to identify, design and implement Town Center DER microgrids to power critical facilities and services across the State."; and

WHEREAS, The Board approved the FY17 Clean Energy Program Budget which established as part of the Office of Clean Energy Distributed Resources Program, the Town Center DER Microgrid Program and budget.; and

WHEREAS, The BPU staff has, under the direction and approval of the Board, issued a full report and recommendations regarding the utilization of TCDER Microgrids and subsequently issued an application for this Program; and

WHEREAS, the Recipients who are Parties to this MOU freely and voluntarily, in full consideration of the costs and benefits incident hereto, submitted an application to participate in the Program; and

WHEREAS, BPU Staff issued a draft application for public comment regarding this Program on August 5, 2016, a public meeting to discuss the draft application on August 23, 2016, and written comments were received and considered and staff responses were published; and

WHEREAS, the Board, by virtue of proper procedure, and execution of this MOU, has determined that the Recipient's application is approved and incentive funds will be awarded to the Recipient, pursuant to the terms included herein;

NOW THEREFORE, in consideration of the promises and mutual representations, warranties, and covenants herein contained, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

I. INCORPORATION

All of the above recitals, the entirety of the TCDER Micrigrid Feasibility Study Incentive Program Application (attached hereto as Appendix A), the entirety of the Recipient's submitted application (Sumbittal letter which references recipient's application is attached hereto as Appendix B), The Best and Final Offer request letter and recipient's response thereto (attached hereto as Appendix C), and final Feasability Study Report Requirements (attache hereto as Appendic D) are hereby incorporated by reference into this MOU as if set forth at length herein.

II. SCOPE OF THE AGREEMENT

This MOU applies only to the Feasibility Study phase of the Program which encompasses the incentive award funding for the satisfactory completion and submission of the Recipient's TCDER Microgrid Feasibility Study only. Conformance to the terms of this MOU and timely completion of the Feasibility Study does not guarantee Recipient's future participation in this Program or any other related programs. Furthermore, the terms and conditions included herein represent the entire scope of this agreement and supersede all former representations whether written or verbally communicated.

III. DUTIES OF THE PARTIES

A. The Recipient will submit a complete and final TCDER Microgrid Feasibility Study (The Study) in accordance with the terms and conditions of this MOU and incoporated documents.

B. The Recipient shall have one (1) year from the date that this MOU is executed to complete The Study, unless a timely request for extension is submitted by the recipient for good cause and is granted by Board Staff.

C. Recipient shall include in the Feasibility Study a Conceptual Design that should be of sufficient detail to demonstrate how the TCDER Microgid functional and technical requirements will be executed, the proposed approach to solve technical problems, and how project goals will be accomplished. The Recipient's Conceptual Design shall include at a minimum: (1) Design Analysis including design narrative and design calculations for all diciplines, an intended specifications list, environmental permitting memorandum that identifies any and all required permits and the detailed outline of process required to obtain the identified permits; (2) Schematic or one-line concept drawings; (3) Conceptual cost estimate; (4) Preliminary construction schedule in bar chart format; and, (5) Project definitions and special conditions.

D. Recipient shall report to Board Staff regarding the status and progress of The Study upon request.

E. The Recipient is solely responsible for fully complying with the terms and conditions of this MOU, the above-referenced incorporated documents, and any and all duly executed subsequent agreements between the Parties.

F. Effective upon execution of this MOU, BPU agrees to firmly commit the sum of $175,000, to cover costs to be incurred by the Recipient to administer, complete, and deliver the Feasibility Study.

G. All requisitions, pay applications, and invoices submitted for costs or expenses associated with the Feasibility Study shall be subject to review and approval by Recipient according to its standard procedures. Upon approval, Recipient shall promptly submit to BPU for payment all such requisitions, pay applications and invoices. In reviewing, approving, submitting and paying such requisitions, pay applications, Recipient and BPU shall be cognizant of and shall comply with the requirements of the New Jersey Prompt Payment Act, N.J.S.A. 2A:30A-1 et seq.

H. Recipient shall submit all final invoices of expenditures and a final draft of the Study within one year of the execution of this MOU or at the end of an approved extension pursuant to Section III B of this MOU.

I. Upon receipt of the Study and final invoices of expenditures, BPU Staff shall determine if the Study meets the requirements of the program and the MOU at Section III C. If BPU Staff determines that the Study does not meet any requirement(s), BPU Staff shall provide to Recipient a list of requested revisions which recipient shall forward to the consultant that completed the Study. The consultant shall then be afforded a reasonable period of time to make the requested revisions and will then resubmit the Study. Final payment shall be made upon BPU Staff approval of the Study.

J. Incentive funds for this program may not be diverted to pay for any work conducted prior to the date of execution of this MOU. Furthermore, Incentive funds must only be used in furtherance of the completion of the Feasibility Study specifically.

K. Recipient shall procure the services necessary to complete the Feasibility Study in compliance with N.J.S.A. 52:32-2, N.J.S.A. 52:34-9.1, et seq., and N.J.S.A. 52:35-1, et seq., and any and all applicable State and local procurement laws, rules, and procedures.

L. The BPU reserves the right to withhold or deny incentive funding for any invoice items submitted by Recipient that BPU determines to be unlawful or otherwise inappropriate for this Program.

IV. DESIGNATED REPRESENTATIVES

Written communication between the Parties for the purpose of this MOU as defined above shall be delivered to the following representatives.

New Jersey Board of Public Utilities
Attn: Michael Winka Sr Policy Advisor
44 S. Clinton Ave, Trenton, NJ 08625
Michael.Winka @bpu.nj.gov

Local Gov
Attn:
Addresss
XXXX.YYY@abc.gov

V. MISCELLANEOUS

A. No Personal Liability. No official or employee of BPU shall be charged personally by Recipient, its employees, agents, contractors, or subcontractors with any liability or held liable to Recipient, its employees, agents, contractors, or subcontractors under any term or provision of this MOU or because of its execution or attempted execution or because of any breach or attempted or alleged breach of this MOU.

No official or employee of Recipient shall be charged personally by BPU, its employees, agents, contractors, or subcontractors with any liability or held liable to BPU, its employees, agents, contractors, or subcontractors under any term or provision of this MOU or because of its execution or attempted execution or because of any breach or attempted or alleged breach of this MOU.

C. Captions. The captions appearing in this MOU are inserted and included solely for convenience and shall not be considered or given effect in construing this MOU, or its provisions, in connection with the duties, obligations, or liabilities of the Parties or in ascertaining intent, if a question of intent arises. The preambles are incorporated into this paragraph as though set forth in verbatim.

D. Entirety of Agreement. This MOU and its attachments represent the entire and integrated agreement between the Parties and supersedes any and all prior agreements or understandings (whether or not in writing). No modification or termination hereof shall be effective, unless in writing and approved as required by law.

E. Amendments. This MOU may be amended by the written request of any Party and with the consent of the other Party. Any proposed amendment of this MOU shall be submitted by one Party to the other Party at least five (5) business days prior to formal discussion or negotiation of the issue. Any agreed amendment of this MOU shall be set forth in writing and signed by an authorized representative of each Party in order to become effective.

F. No Third-Party Beneficiaries. This MOU does not create in any individual or entity the status of third-party beneficiary, and this MOU shall not be construed to create such status. The rights, duties, and obligations contained in this MOU shall operate only between the Parties and shall inure solely to the benefit of the Parties. The provisions of this MOU are intended only to assist the Parties in determining and performing their obligations under this MOU. The Parties intend and expressly agree that only the Parties shall have any legal or equitable right to enforce this MOU, to seek any remedy arising out of a Party's performance or failure to perform any term or condition of this MOU, or to bring any action for breach of this MOU.

G. No Assignment. This MOU shall not be assignable, but shall bind and inure to the benefit of the Parties hereto and their respective successors.

H. Governing Law. This MOU and the rights and obligations of the Parties shall be interpreted, construed, and enforced in accordance with the laws of the State of New Jersey.

I. Authority. By execution of this MOU, the Parties represent that they are duly authorized and empowered to enter into this MOU and to perform all duties and responsibilities established in this MOU.

J. Term. This MOU shall be effective as of the date hereinabove written and, unless terminated sooner as set forth below, shall remain in effect until the completion of the Feasibility Study and payment of funds as set forth in Section III.

K. Termination. Board Staff and the Recipient may terminate this contract in whole, or in part, when both parties agree that the continuation of the project would not produce beneficial results commensurate with the expenditure of funds. The two parties shall agree upon the termination conditions including the date on which the termination shall take effect, and, in case of partial terminations, the portion to be terminated.

K. Counterparts. This MOU may be executed in duplicate parts, each of which shall be an original, but all of which shall together constitute one (1) and the same instrument.

[SIGNATURE PAGE FOLLOWS]

IN WITNESS WHEREOF, the parties have signed this Memorandum of Understanding the date first written above.

Witness: Cape May County Municipal Utilities Authority

_______________ By: _______________

....

Dated: _______________

Witness: New Jersey Board of Public Utilities

_______________ By: _______________

Richard S. Mroz, President

Dated: _______________

APPROVED AS TO FORM:
Andrew Kuntz
Attorney General, State of New Jersey

By: _______________