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

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 MICROGRID INCENTIVE PROGRAM AUTHORIZATION OF INCENTIVE FUNDING TO THE TOWNSHIP OF MONTCLAIR FOR PHASE I FEASIBILITY STUDY	))))	ORDER DOCKET NO. QO17060637

Party of Record:

Gary Russell, Sustainability Officer, Township of Montclair

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, the Township of Montclair submitted an application to the Board.

The Montclair Town Center Microgrid (Project) was submitted by the Township of Montclair. The Project's core partners include the Township of Montclair, the Montclair School District, United Methodist Communities, New Jersey Transit and Hackensack UMC – Mountainside Hospital. The Project critical facilities include the Fire Department headquarters ("HQ"), Glenfield Middle School, Pine Ridge Senior Living housing, Mountainside Hospital and New Jersey Transit Bay Street Station and Garage. Several other public building and private sector businesses were identified as potential sites in The Project. Based on the list of partners and proposed critical facilities there are two FEMA category IV designated facilities and two FEMA category III facilities can provide shelter in an emergency. The estimated total annual electricity usage of the selected buildings in the proposed Project is 24,261,143 kWh with an estimated electric peak load of 4.844 MW. The estimated annual natural gas usage is 954,443. The FEMA category facilities that have a combined energy usage per square foot of approximately 152,339 Btu's per square foot.

There are no existing DER facilities in the proposed Project buildings. The Project will evaluate approximately 2.3 MW of new power capacity which may include solar and dispatchable generation such as combined heat and power ("CHP"), battery storage and other new electric infrastructure to allow the proposed Project to operate during normal and emergency conditions.

The Project proposes to evaluate both Siemens SICAM and Johnson Controls Grid Connect microgrid control/communications systems. The Project proposes to use the US Department of Energy ("USDOE") Lawrence Livermore Berkeley Laboratories Distribution Energy Resource Customer Adoption Model (DER-CAM). The estimated timeframe to complete the feasibility study is 11 months. PSE&G is the electric utility and natural gas utility for the Township of Montclair and PSE&G and provided a letter of support (LOS) to participate in the feasibility study.

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 $142,480 for The Township of Montclair 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 TOWNSHIP OF MONTCLAIR FOR
PHASE I FEASIBILITY STUDY

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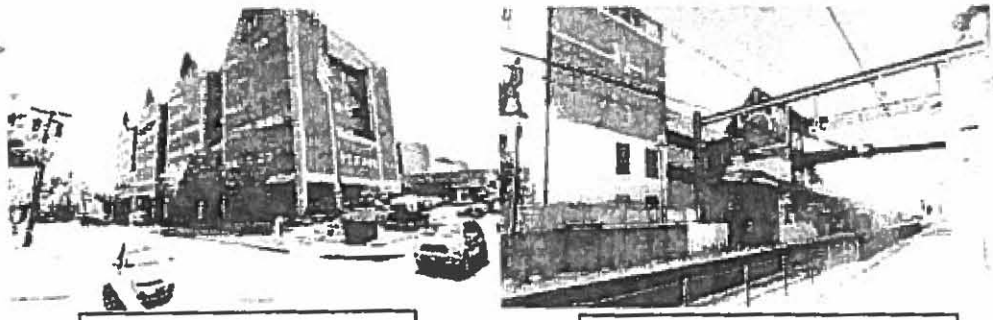
Application from the Township of Montclair For the New Jersey Office of Clean Energy's Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program

Fire Headquarters | Glenfield School | Pine Ridge



Mountainside Hospital | NJ Transit Bay Street Station

Township of Montclair
Application for Town Center Microgrid Pilot Grant
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Township of Montclair Proposed Microgrid
Executive Summary

The Township of Montclair is proposing a microgrid project in response to the request for applications issued by the Board of Public Utilities Office of Clean Energy. Our proposal was selected after a review of no fewer than nine potential locations within our town and we believe that the selected site will provide an excellent pilot location for development of context and knowledge, necessary for moving to the next stage of increasing energy resiliency consistent with the objectives outlined in New Jersey's most recent Energy Master Plan.

Montclair is proposing a project which will includes five facilities. Two of these facilities are classified as Level IV by FEMA, our Fire Headquarters / Emergency Operations Center and Mountainside Hospital. Two other facilities are classified as Level III (NJ Transit's Bay Street Station and Glenfield School). The last facility on our proposed microgrid is a Senior Citizen multi-family housing building.

While the Township of Montclair is the applicant for this microgrid, it contains not only Township facilities (Fire Headquarters and Glenfield School) but three other facilities which are not under the ownership or control of Montclair. All three have consented to be part of this study and several have provided letters of support which are included with this application in the Appendices.

Pine Ridge is the most central of the facilities located on our microgrid. All other facilities lie within 2,200 feet of Pine Ridge with most being less than 1,200 feet from it.

The proposed microgrid will incorporate a number of distributed energy resources (DER) at various locations and will be anchored by a CHP plant serving the hospital's electric and thermal needs. The hospital electric and thermal loads can support a 2 MW CHP reciprocating engine-based CHP plant and the Glenfield School can support a 100 kW CHP plant. The hospital CHP plant will run 24/7 while the school CHP plant will support a 100 kW CHP plant during school operating hours which is estimated to be approximately 3,000 hours per year. In addition, 50 kW of roof-top Solar PV will be installed on the Pine Ridge building, 75 kW Solar PV will be installed on the roof of the Glenfield School and 20 of Solar kW PV will be installed on the roof of the Fire HQ building.

Given the resilience requirements at the Fire HQ which also acts as the communications center for the Montclair emergency services, a 100-kWh battery array will be installed at the facility that will both enable short-term electric power resilience as well as act as an ancillary services device for PJM.

Thermal energy produced by the proposed CHP plants will be utilized by the host sites. During winter the CHP plant at the hospital will provide steam and hot water to the facility and in summer, the hospital CHP plant will incorporate an absorption chiller that can provide 250 tons of cooling during normal as well as grid island mode.

The 100 kW CHP plant at Glenfield School will provide space heating and domestic hot water and for summer operation the plant will also incorporate a 30-ton absorption chiller for summer operation.

In addition to the absorption chiller, microgrid thermal load demand response will be provided through an upgrade of the existing hospital building automation system that will allow for reduced HVAC loads during emergency operation.

The existing diesel emergency generators and their associated oil storage tanks will also be leveraged during grid outages to provide additional electric power to the microgrid. This will enable the hospital to operate at near normal operation during a long-term grid outage while also supplying emergency power to the microgrid. Conversion of the existing emergency diesel generators to either EPA Tier-4 compliance or addition of natural gas fired engines for demand response will be considered in the proposed study but are not incorporated in the proposal preliminary evaluation.

There are other renewable / efficiency options that may be available such as incorporating the power and thermal needs of a new Medical Office Building to be built on the current site of the Mountainside School of Nursing. When built this facility if designed to do so, can offer attractive thermal profiles to enhance the scope of our project. At this stage we have not included any loads or generation assets at the anticipated Medical Office Building. Also, the hospital has several location where high pressure steam is being reduced in pressure by pressure relief valves. We will evaluate the potential for using small back pressure turbines to generate more power from these locations but at this point this alternative has not been included in our current proposal.

The total cost for the proposed project is estimated at $12,655,000. Both CHP plants proposed as part of the microgrid will be able to avail themselves of the Board of Public Utilities, Office of Clean Energy's CHP grant program. Those programs as currently configured would result in a grant payment of $2,050,000 and $180,000 for the hospital and school CHP components respectively. This would result in a net microgrid cost of $10,425,000.

With annual energy savings projected at approximately $1.2 million the simple payback on the project is estimated at 8.8 years.

The primary consultant working on this study will be Gearoid Foley of Integrated CHP Systems, Inc. and Mr. Foley will we working in collaboration with Fred Fastiggi of Shoreline Energy Advisors, LLC. Technical subcontractors on the project are Triad Consulting Engineers and Kar Engineering Associates.

The budgeted cost for the study is $204,600 but with anticipated cost sharing from various sources the requested grant is for $174,600.

It is anticipated that the study can be completed within eleven months from the time of funding approval by the Office of Clean Energy.

Application from the Township of Montclair
For the Town Center Distributed Energy Resource
Microgrid Feasibility Study Incentive Program

1. **Project Name** – Montclair Town Center Microgrid

2. **Project Description** – The Montclair Town Center Microgrid is situated primarily in the Township of Montclair, a suburban town in Essex County with a population of approximately 39,000. Montclair was first settled long ago in 1679 at the foot of the Watchung Mountains and eventually developed from a mountainous rocky community of grazing land for cows and sheep, into a "bedroom community" for many of the financial and banking leaders of the industrial revolution. Montclair, originally part of neighboring Bloomfield, became its own township in 1868. It has been characterized as a gracious residential community with several distinct 'town-centers" within its borders. These town centers are primarily centered around an extensive network of Erie-Lackawanna commuter train stations which provide service into New York City and Newark. Each of these distinctive neighborhoods have single and multi-family homes, schools, retail shopping, churches, parks and other public buildings and spaces interspersed within walkable distances.

Today Montclair has many municipal amenities including its own salaried police force, a full time, salaried fire department which serves both Montclair and the neighboring town of Glen Ridge, and a school district consisting of seven elementary schools, three middle schools and a high school. It is recognized as one of the most racially and economically diverse towns in the United States with an educated and activist population who are well aware of, and concerned with, issues such as the environment, sustainability and the health, safety and welfare of all of its residents. Hackensack UMD Mountainside Hospital (Mountainside) lies on the eastern border of Montclair sharing a substantial contiguous site with the neighboring Borough of Glen Ridge.

Montclair is governed by a Manager-Council form of government. Montclair is also one of the few school districts in New Jersey with a Board of Education that is appointed by its Mayor as opposed to being elected by voters.

During the development of the Montclair Town Center Microgrid application, nine potential locations within Montclair were evaluated, each which contained buildings that substantially satisfied the screening criteria for town center microgrids as set forth in the NJIT report. Another site in neighboring Glen Ridge was also evaluated for potential incorporation into a more extensive, two-municipality microgrid however Glen Ridge elected not to participate at this time.

All of the potential sites were judged for proximity to Mountainside Hospital and their ability to be integrated into a more substantial microgrid over time by interconnecting with one another. Montclair is long and narrow in its shape and the nine sites considered for the microgrid included in this

application spanned the entire seven-mile length of Montclair from Upper Montclair near the Clifton/Little Falls border in the north, to the South End shopping district near the East Orange/Glen Ridge border.

Table 1 which follows, provides a brief description of the ten sites that were evaluated in the initial stages of feasibility analysis:

Table 1

Microgrid Option	Facilities Included
1-Glenfield / Fire HQ	Fire HQ including Emergency Dispatch and Town Data Center, Glenfield School, Pine Ridge Senior Living, NJT Bay Street Station and Mountainside Hospital
2-Grove & Walnut	Walnut Street First Aid, Deron School, County Senior Services Building and Mountainside Hospital
3-High School / DPW	Montclair High School, George Inness School, Rand School, DPW
4-Lackawanna Plaza	Potential Future Municipal Building, YWCA, Pathmark, Union Gardens Apartments
5-Bloomfield Avenue	Hillside School, Police HQ, YMCA
6-Watchung Plaza	Watchung School, Watchung Plaza Shopping District
7-Upper Montclair	Acme, Fire House, Buzz Aldrin School, Library Annex
8-South End	Nishuane School, Fire House, South End Shopping District
9-Municipal Building	Current Municipal Building (could be incorporated into Grove & Walnut or Bloomfield Avenue microgrids)
10-Glen Ridge	Town Hall, First Aid, Police Headquarters, Library, Middle School, High School

Appendix 1 to this application is a satellite image showing the proximate location of each considered site in relation to each other, also showing Mountainside Hospital and the Glen Ridge buildings.

Appendices 2a – 2k are satellite views of each of the nine microgrid locations considered with their member buildings highlighted in yellow. Also included are the Glen Ridge buildings which were eliminated from the analysis, and Mountainside Hospital which is included in our selected microgrid configuration.

Appendix 3 is a table which summarizes how each of the nine Montclair-evaluated sites matched the desired criteria for a microgrid (i.e.: FEMA / NJIT and other desirable characteristics).

During the evaluation of sites that would be suitable for the Town Center Microgrid Pilot Project, the proposing team were concerned with meeting NJIT criteria, but also in selecting a site that was capable of being developed, not just on paper, but in reality. We limited our selection of buildings to quantities and locations that would lend themselves to development of a microgrid in a reasonable amount of time in the event our study proves feasible. Almost all evaluated sites contained dozens of potential buildings which could be incorporated into a microgrid but in order to propose an economically viable project, Montclair has kept the proposed microgrid simple, we are proposing a manageable number of buildings that can be interconnected without onerous site control issues or distribution complexities

which will exponentially increase study costs, and site control challenges characteristic of a more dense urban settings.

The site ultimately selected for incorporation into this application is the Glenfield / Fire Headquarters site. It consists of five (5) critical facilities initially, with the ability to incorporate many more facilities (gas stations, multi-family housing, food retail, etc.) and the added functionality of being able to link up easily with future potential microgrids (Grove/Walnut, Lackawanna Plaza, Glen Ridge, Bloomfield Avenue, etc.) if the program were to be expanded in the future.

Selected Site – The Glenfield / Fire Headquarters site initially includes: 1) Montclair's Fire Headquarters and Emergency Dispatch Center which handles all 911 calls and also serves as a data center for all servers used in township business; 2) Glenfield School, a 5-8 grade middle school directly across Bloomfield Avenue from Fire Headquarters which can serve as an emergency shelter or public meeting space in the event of a prolonged power outage; 3) Pine Ridge of Montclair, a senior living residential building serving low income residents of Montclair, owned and operated by non-profit United Methodist Homes; 4) Mountainside Hospital, a 365-bed community hospital, also designated as a Primary Stroke Center by the NJ Department of Health & Senior Services and licensed by NJ to perform emergency angioplasty, and; 5) NJ Transit's Bay Street Station and Parking Garage, the link in the "Montclair Connection" which interconnected NJT's Montclair and Boonton lines for service into New York City.

Exhibit 1 below depicts the potential area that could be served by the microgrid including many buildings which are not included in this initial proposal.

Pine Ridge is the most centrally located building to the other four facilities that comprise the proposed microgrid. All of the remaining facilities are within 1,200 feet of Pine Ridge, providing a compact, but comprehensive collection of critical facilities that can be serviced by the microgrid.

Table 2 provides a summary of each facility on the proposed microgrid:

Table 2

	Fire Headquarters	Glenfield School	Pine Ridge	Mountainside Hospital	NJT's Bay Street Station & Parking Garage	Total
Peak Electric Load (KW)	354	875	84	3,500	20	4,833
Total KWH Annual Consumption	900,000	1,585,268	291,628	21,320,711	163,536	24,261,143
Total Annual Therm Consumption	18,000	48,140	21,434	866,869		954,443
Estimated Square Footage of Facility	36,500	220,000	48,416	765,000	100,000	1,169,916
BTU's per Sq. Ft.	133,447	46,468	64,822	208,409	5,580	152,339
Closest Other Microgrid Facility	Glenfield	Fire HQ	Fire HQ	Pine Ridge	Fire HQ	
Distance in Feet to Closest Other Microgrid Facility	220	220	740	1,400	100	
FEMA Classification	IV	III	II	IV	III	

Mountainside Hospital and Pine Ridge have undergone Level II Energy Audits. Glenfield School, Fire Headquarters and Bay Street Station have not yet completed energy audits although all routinely replace energy infrastructure as needed with the most current technology.

3. **Satisfactory Compliance with NJIT Screen Criteria –** Montclair is not one of the Town Centers identified in the NJIT Report however it overwhelmingly meets criteria from the NJIT report and cited by the Office of Clean Energy as mandatory for consideration as a pilot site. Those being:
    a. Having at least two (2) Category III or IV facilities within ½ mile of each other (the proposed Montclair site has four)
    b. Having a facility with an energy usage of approximately 90,000 BTU's per square foot (the proposed Montclair microgrid has two).

FEMA defines criticality in facilities and buildings based on their centrality for life safety. Category I buildings include buildings and structures whose failure would represent a low hazard to human life.

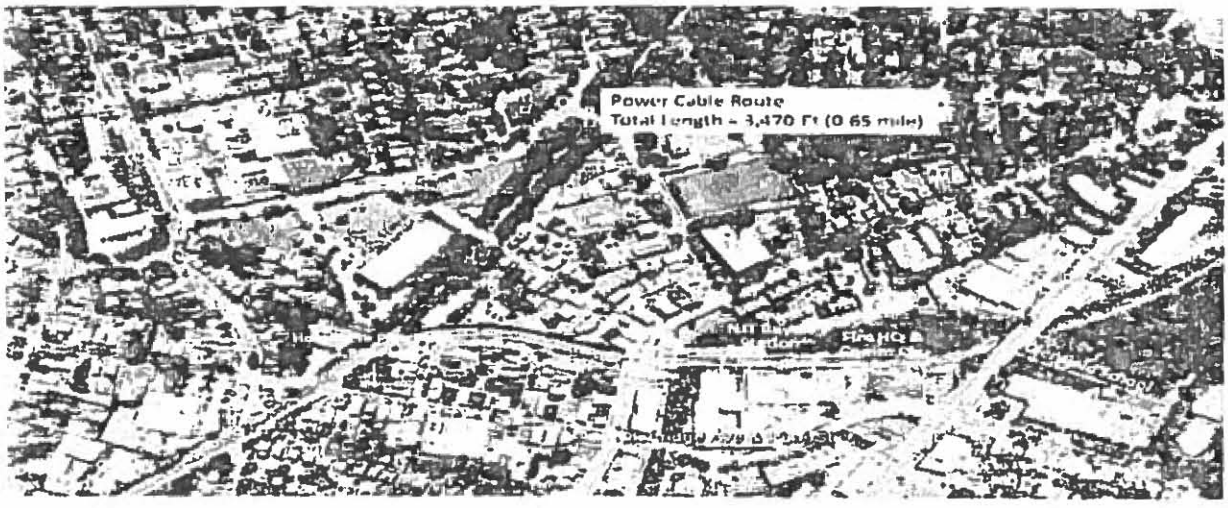
Category III includes buildings with a higher concentration of occupants such as schools, college, adult education and daycare facilities. Category IV buildings and structures are the most critical for life safety. These include facilities such as hospitals, fire and police stations, rescue and other emergency service facilities, water supply facilities and others. Category II buildings include those that are not included in categories I, III or IV. The below cited Table 3 shows FEMA Categorical Classification of Facilities and Buildings based on Energy Consumption and Criticality:

Table 3

Principal Building Activity	Energy Consumption (000's of BTU's per sq ft)	Energy Consumption Classification	Criticality Classification
Service	77	1	1
Education	83.1	2	3
Office	92.9	3	2
Public Assembly	93.9	4	3
Public Safety & Order	115.8	5	4
Inpatient Health Facility	249.2	6	4

The Montclair Microgrid is anchored by Mountainside Hospital. It initially includes five facilities including the hospital, Fire Headquarters Building (which serves both Montclair and Glen Ridge as well as housing Montclair's emergency dispatch and its central data center which serves all components of Township service*s*), Glenfield Middle School, Pine Ridge multi-family senior residence and the Bay Street Train Station. Both Mountainside Hospital and Fire Headquarters are Level IV facilities in terms of criticality, with Glenfield Middle School and Bay Street Station Level III, and Pine Ridge Level II.

The below cited satellite image is an aerial view of the entire microgrid site which shows the two Level IV facilities (Mountainside Hospital and Fire Headquarters) and illustrates that the distances between each would be less than ½ mile for an electrical distribution network.



There are a multitude of other facilities which could be incorporated into the microgrid including a large gas station directly across the street from Fire Headquarters, food stores and other low-income.

multi-family housing. The Bay Street Station sits on a site directly adjacent to Fire Headquarters as does a major NJ Transit-owned electric substation.

While we have included projected routing of the microgrid along public thoroughfares, if NJ Transit Right of Ways were used for distribution line routing, the potential reach and expandability of the microgrid would be significantly increased. Appendix 4 shows the proximity of considered Montclair microgrids in relation to existing NJ Transit lines along the former Montclair and Boonton lines.

The Glenfield / Fire Headquarters site meets all criteria for criticality and maximum distances between buildings as prescribed by NJIT, FEMA and the Office of Clean Energy.
There are also many food stores, outpatient health care facilities and low-income multi-family housing facilities which lie within the anticipated route of the electric distribution line for the proposed Glenfield / Fire Headquarters microgrid.

In terms of meeting the requirements for energy intensity, Mountainside Hospital has an energy usage of 208,409 BTU's per square foot, and Fire Headquarters has an energy usage of 133,447 BTU's per square foot, both well in excess of the 90,000 BTU's per square foot threshold required by the NJIT criteria. The projected energy intensity for all five buildings on the Glenfield / Fire Headquarters project is 152,339 BTU's per square foot.

Again, Montclair sought to submit a grant application that is practical and buildable in the immediate term, offering the Office of Clean Energy a workable site that would provide rational context on the regulatory, technical, economic and operational issues that would need to be considered in their eventual development of a more complete microgrid program. The Montclair proposal will provide a basis for a program that will improve energy infrastructure resiliency, emergency preparedness and response, and is consistent with the overarching goals cited in the Energy Master Plan. At this point, inclusion of additional buildings would in our opinion, needlessly complicate the goal of uncovering the obstacles and issues that would impact the development of a workable microgrid.

The Montclair microgrid is fully capable and well positioned to offer the Office of Clean Energy and the BPU, strategic context to implement and achieve the action steps cited in the Energy Master Plan, those being:

- Protect the State's Critical Energy Infrastructure
- Improve Electric Distribution Company's (EDC) Emergency Preparedness and Response
- Improve and Enhance EDC Start Grid and Distribution Automation Plans
- Increase the use of Microgrid Technologies and Application for Distributed Energy Resources
- Create Long Term Financing for Local Energy Resilience Measures through an Energy Resiliency Bank and other Financing Mechanisms

4. **Potential Partners to be Included in the Montclair Town Center DER Microgrid –** One of the complicating factors in developing a microgrid will be securing the cooperation of owners who control the facilities proposed for inclusion in the microgrid. This is one of the complexities which will certainly impinge on the viability of potential urban microgrids with their high site density and multiple facility ownership. Table 4 which follows indicates the ownership and control for the five initial facilities included in this application. Each of these parties (the Township of Montclair is the applicant and the buildings it controls are not listed here) has consented to be part of the pilot study as evidenced by Letters of Support which are included with this application as Appendices 6a, 6b and 6c.

Table 4

Facility	Ownership / Control	Contact	Title	Phone
Fire Headquarters	Township of Montclair	Gray Russell	Sustainability Officer	(973) 509-5721
Pine Ridge Senior Residence	United Methodist Homes	Cynthia Jacques	Vice President-Housing	(732) 922-9800
Mountainside Hospital	Montclair Health Systems LLC-Joint Venture between Hackensack UMC and Ardent Health Services	Daniel Deighan	Director of Engineering	(201) 618-7050
Bay Street Train Station	NJ Transit	Dr. Steve Jenks	Manager of Energy and Sustainability Programs	(973) 491-8589

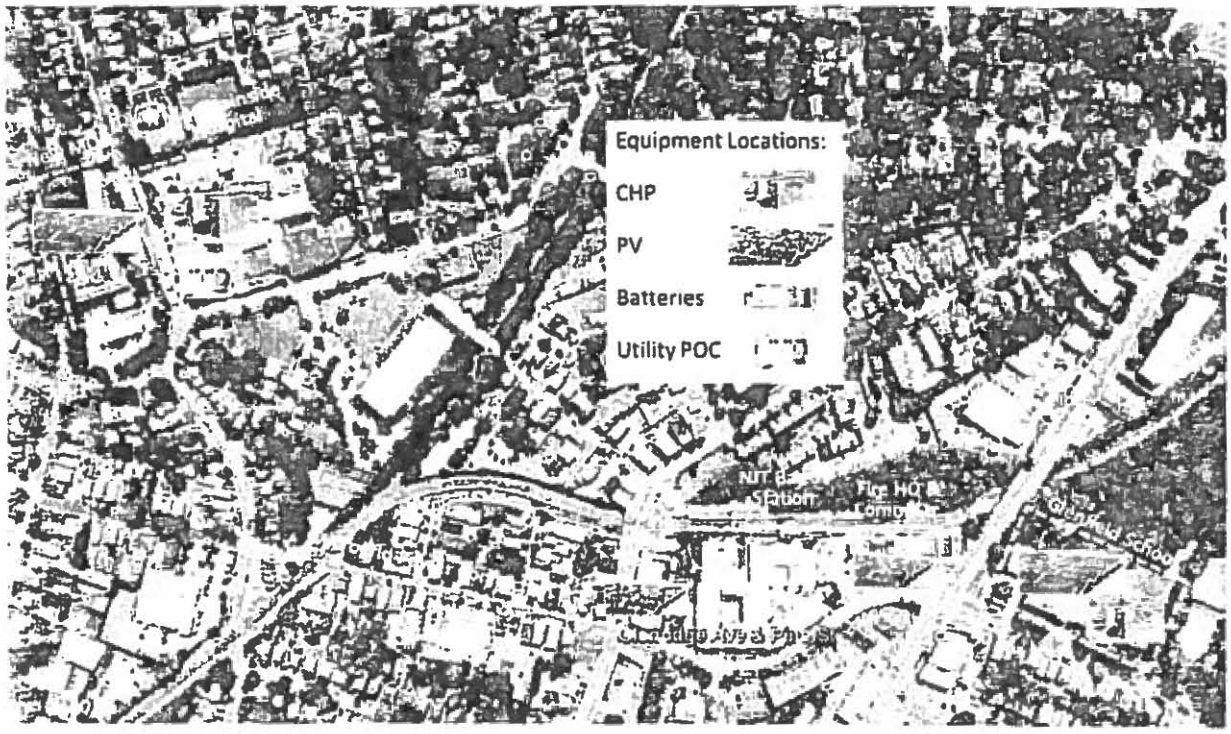
It is anticipated that all of the original five participants included in this study will be taking whatever electric and thermal energy that can be generated from the microgrid at prices that are equivalent to what they are paying for similar energy services from current suppliers/methodologies while having the added benefit of resiliency. Given the obvious attraction of this value proposition, there are no expected procurement issues.

5. **General Description of the technology developed and location within Microgrid -**

The proposed microgrid will incorporate a number of distributed energy resources (DER) at various locations and will be anchored by a CHP plant serving the hospital's electric and thermal needs. The hospital electric and thermal loads can support a 2 MW CHP reciprocating engine based CHP plant and the Glenfield School can support a 100 kW CHP plant. The hospital CHP plant will run 24/7 while the school CHP plant will support a 100 kW CHP plant during school operating hours which is estimated to be approx. 3,000 hours per year. In addition, 50 kW of roof-top Solar PV will be installed on the Pine Ridge building, 75 kW Solar PV will be installed on the roof of the Glenfield School and 20 of Solar kW PV will be installed on the roof of the Fire HQ building. Given the resilience requirements at the Fire HQ which also acts as the communications center for the Montclair

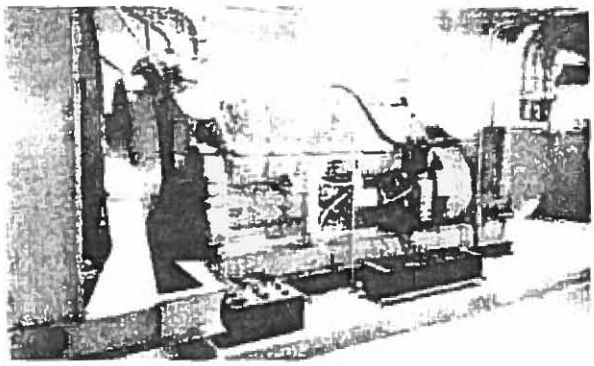
emergency services, a 100-kWh battery array will be installed at the facility that will both enable short-term electric power resilience as well as act as an ancillary services device for PJM. It is further envisioned that the new Medical Office Building (MOB) to be constructed on the site of the existing nurses' residence will incorporate Solar PV, although at this time there is no estimate for the amount of PV that can be installed.

Thermal energy produced by the proposed CHP plants will be utilized by the host sites. During winter the CHP plant at the hospital will provide steam and hot water to the facility and in summer, the hospital CHP plant will incorporate an absorption chiller that can provide 250 tons of cooling during normal as well as grid island mode. The 100 kW CHP plant at Glenfield School will provide space heating and domestic hot water and for summer operation the plant will also incorporate a 30-ton absorption chiller for summer operation. In addition to the absorption chiller, microgrid thermal load demand response will be provided through an upgrade of the existing hospital building automation system that will allow for reduced HVAC loads during emergency operation. The existing diesel emergency generators and their associated oil storage tanks will also be leveraged during grid outages to provide additional electric power to the microgrid. This will enable the hospital to operate at near normal operation during a long-term grid outage while also supplying emergency power to the microgrid. Conversion of the existing emergency diesel generators to either EPA Tier-4 compliance or addition of natural gas fired engines for demand response will be considered in the proposed study but are not incorporated in the proposal preliminary evaluation.



The microgrid will be interconnected to the various DER technologies and the identified loads with a dedicated power connection that will run from the hospital to the school. This power line will be interconnected with the utility grid through a single point of connection at the hospital to the existing dual 13.2 kV utility service which is a radial feed from the local PSE&G substation. A single utility meter will be located at the hospital and all of the identified loads will take normal and emergency power from the microgrid connection.

During 'blue sky' operation, the microgrid will work in parallel with the PSE&G utility and import the power required above the output capacity of the proposed DER systems. Solar PV generated power can be net metered (amounting to 145 kW) if regulations allow for net metering when CHP exists on the microgrid bus. No CHP energy production will be required to be net metered since the combined capacity of the CHP plant is less than the proposed microgrid's base load. During grid outages, the microgrid is capable of generating 2,100 kW of dispatchable power with an additional 145 kW of Solar PV power to provide a maximum of 2,245 kW during peak solar power production. The average load on the aggregated microgrid loads is approx. 2,000 kW so that the microgrid DER's are capable of maintaining all emergency loads as well as average loads through long-term grid outages. Aggregated loads on the microgrid peak at 4,525 kW in July due to high HVAC demands at the hospital. During such peaks the existing emergency diesel generators at the hospital (total capacity is 3,000 kW) will be leveraged to provide power in conjunction with the microgrid DERs.



6. General Description of the overall cost and potential financing that may be available –

The focus for the proposed project it that it is not only technically feasible, but that it is also economically feasible and ultimately buildable, in a timely manner.

The proposed microgrid technologies as outlined above have been reviewed and costed at a preliminary level (see Appendix 10d) to determine a high level economic evaluation of the proposed project (see Appendix 10b). As stated above, the focus for the proposed project it that it is not only technically feasible, but that it is also economically feasible and ultimately buildable, in a timely manner. The proposed configuration was specifically selected from the range of microgrid options that were developed early in the process, and it is considered to be a practical and implementable design. The proposed microgrid power connection routes require that 3,470 linear feet of power cable be installed underground. Based on past experience as well as norms for work in dense urban environments, a cost of $750 per foot including contingency has been carried allowing for cable, conduit, utility crossings, manholes, excavation and repair. The various DER technologies included in the proposed microgrid are costed in accordance with industry norms for NJ including reference to the BPU's installation data for similar projects. The total cost for the

proposed project is estimated at $12,655,000. A breakout of the major cost items is provided in the following Table 6. Individual costs per unit include contingency.

Table 6

	Size	Unit	Cost/unit	Total
Hospital CHP	2,000	kW	$3,500	$7,000,000
Hospital BAS Upgrade	1	EA	$250,000	$250,000
School CHP	100	kW	$4,500	$450,000
Pine Ridge PV	50	kW	$4,000	$200,000
Fire HQ PV	20	kW	$5,000	$100,000
School PV	75	kW	$3,500	$262,500
Fire HQ Battery incl Inverter	100	kW-hr	$900	$90,000
MG Power Line	3,470	Ft	$750	$2,602,500
MG 13.2-480V Trf/Accy	3	EA	$200,000	$600,000
MG 13.2-208V Trf/Accy	2	EA	$125,000	$250,000
Power Monitor	1	EA	$300,000	$300,000
Control Communications	1	EA	$150,000	$150,000
Control Center	1	EA	$400,000	$400,000
			Total Estimated Cost:	$12,655,000

Both CHP plants proposed as part of the microgrid will be able to avail themselves of the Board of Public Utilities, Office of Clean Energy's CHP grant program (http://www.njcleanenergy.com/chp). The program as currently configured would result in a grant payment of $2,050,000 and $180,000 for the hospital and school CHP components respectively. This would result in a net microgrid cost of $10,425,000.

The proposed microgrid incorporates multiple DERs that will operate on a continuous basis and in parallel with the utility grid. CHP technologies are highly leveraged by the proposed microgrid and will offset utility electric power and natural gas to provide a cost savings revenue stream. Proposed Solar PV systems will be net metered on the microgrid and provide a cost offset revenue as well as renewable energy credit revenue. The proposed 100 kW-hr battery will be connected to the microgrid and will be available to provide ancillary services to the grid as well as acting as a regulation device for the microgrid when in grid isolation mode. In addition, the microgrid will connect the school, fire HQ, train station and potentially the new medical office building to be built on the site of the old Nursing School at the hospital, to the grid at 13.2 kV. (Note: MOB loads not considered in this proposal and capacities may need to be adjusted if it is ultimately added). This will provide additional savings to these facilities that are currently connected to the grid at lower voltages and therefore at higher tariff rates.

Based on utility cost and equipment performance versus load availability derived from historic billing data, the DER technologies offset 17,730,240 kWh annually or 73% of the combined microgrid load.

The load is mainly at the hospital which is under the "large service" tariff and based on utility rates as indicated in the following table, the electric offset value is deemed to be $2,160,216. The model assumes that 85% of the thermal energy produced by both the proposed CHP systems will be used by the host sites to offset natural gas to their respective boilers resulting in a boiler fuel offset of 67,355 million Btu per year with a value of $378,470. The Solar PV systems will produce 254,040 kWh per year resulting in a renewable energy credit (REC) of $76,212 annually based on an assumed REC value of $300 per MWh. Additional incomes and cost offsets from ancillary services as well as tariff rate reductions for individual facilities are not captured in this preliminary evaluation, but will be fully evaluated in the proposed study.

Costs for microgrid operation are based on CHP fuel costs plus operation and maintenance costs for the CHP, PV and battery systems. Fuel to the CHP plants is based on large boiler tariff rates less 7% SUT and the maintenance cost for CHP is estimated at $0.0225 per kWh which is in line with industry norms for large reciprocating engine based systems with SCR emissions treatment. An allowance of $22,450 is carried for maintenance of the PV and battery systems and an allowance of $100,000 per year is made for system operation and control cost. The following table provides the assumptions and calculations that result in a statement of $1,196,729 annual net savings which when compared to the net capital investment required, calculates to an 8.9 year simple payback. This is an acceptable investment horizon for a municipality in a project that brings 20 years of critical infrastructure resilience.

Assumptions and Calculations

CHP kW Installed	2,100	kW
PV kW Installed	145	kW
CHP Heat Rate (HHV)	9,389	Btu/kWh
CHP Thermal Output	3,627	Btu/kWh
Cost of Electricity (Large Svs)	$0.12	/kWh
Cost of Electricity (Small Svs)	$0.15	/kWh
Cost of CHP Fuel	$5.14	/Mmbtu
Cost of Boiler Fuel (Large Svs)	$5.50	/Mmbtu
Cost of Boiler Fuel (Small Svs)	$8.00	/Mmbtu
CHP O&M per kwh	$0.0225	/kWh
Assumed Class 1 REC Value	$300	/MW
Annual MG CHP Production	17,476,200	kWh
Annual MG PV Production	254,040	kWh
Annual MG Thermal Production	63,393	MMBtu
Thermal Utilization	85%	

Annual Project Revenues/Costs

MG Power Offset	$2,160,216
CHP Thermal Fuel Offset	$378,470
PV RECs	$76,212
CHP Fuel Costs	$902,414
CHP Maintenance Cost	$393,215
PV & Battery Maint Costs	$22,540
System Operations	$100,000

Simple Payback

Project Cost	$12,655,000
ONJ BPU OCE CHP Grant	$2,050,000
Nwt Project Cost	$10,605,000
Net MG Energy Savings	1,196,729
Simple Payback	**8.86**

Potential Financing – According to our preliminary analysis, the proposed microgrid offers a simple payback of just under nine (9) years. While this is generally acceptable for direct investment in the proposed project, Montclair will consider all alternatives for both the financing of the initial investment in the microgrid, and, revenue enhancements from its production, in the event our pilot proves to have economic, operational, technical and regulatory feasibility. The entire range of both private and public alternatives will be considered.

The purpose and presumed outgrowth of this pilot program may be the development and implementation of regulatory treatments that facilitate the development of microgrids for early adopters. It is recognized that these initiatives could involve the provision of funding from the BPU, EDA or other state agencies as well as local electric distribution utilities such as PSE&G (our host utility for both gas and electric service) but any speculation as to the nature and magnitude of this assistance other than the currently available CHP grant program, these initiatives provide on the financial structuring of a microgrid is currently premature. All forms of government (state or federal) assistance in the form of grants, low/no interest loans or prescribed regulatory treatment such as virtual net metering, a "resiliency portfolio standard" in combination with valued marketable certificates, "preferred" gas tariffs specifically for microgrids or any number of other vehicles, individually, or in combination, which would defray the initial cost of implementation for early adopters will be evaluated.

In the event the local electric distribution company elects to participate in the development of microgrids with financial incentives such as those similar to what they offer on efficiency and demand side management, we intend to incorporate them into our financial structure if it is economical. Similarly, if PJM, the Independent System Operator offers programs or solicits services that would increase the revenue potential for these systems with their continued solicitations for grid support, demand reduction, frequency regulation or other ancillary services, Montclair will seek to incorporate these programs and opportunities into the overall financial plan for the microgrid.

The use of Public-Private-Partnerships is an increasingly popular and long-tested method of financing public infrastructure. A microgrid currently under construction in Bridgeport, Connecticut which was developed by Shoreline Energy Advisors, one of the consultants to Montclair in the development of specifically in the development of a microgrid. The Bridgeport project required an overall investment of $8,821,000 and was financed with a combination of private investment, low-interest state sponsored loans, a grant from the Connecticut Department of Energy and Environmental Protection and a market-based loan from a commercial bank.

The following illustrates the financial structure of that project:

Private Investor Equity	$1,200,000
Connecticut Clean Energy Fund Loan	500,000
Loan to Investors from Commercial Bank	4,146,000
Grant from Connecticut DEEP to Bridgeport	2,975,000
	$8,821,000

7. Benefits of, and Need for, the proposed Microgrid- Montclair is a town of almost 39,000 and is the 60th largest town in New Jersey when ranked by population (see Appendix 11). When looking at the towns which are larger than Montclair (those ranked 1 – 59) many, if not all, can be characterized as either cities with dense urban structures, or sprawling suburbs which retain many of the "suburban" amenities and characteristics of Montclair, but are far are more dispersed in their layout.

We suspect that many of the towns which can be classified as "urban" will be submitting applications for this pilot program. Indeed some like Hoboken, have already done extensive studies on microgrid feasibility and provide valuable context on the challenges of developing a microgrid in an urban setting. There are approximately twenty-two (22) cities or towns with significant "urban" characteristics. Coincidently these towns also represent 22% of New Jersey's population (again see Appendix 11)..

Rural towns make up a very small part of the state's population, perhaps as small as 5%.

This leaves the balance of New Jersey's population, or an estimated 73%, residing in communities like Montclair with either town, or suburban, characteristics. It would seem that any effort at developing a portfolio of workable microgrid pilot projects would include several projects with characteristics representative of 73% of New Jersey's population.

Where we believe Montclair is unique is its layout as a representative town with distinctive town centers which provide an integrated, but compact relationship between facilities that represent a typical New Jersey town or suburb. There are many towns resembling Montclair (Ridgewood, Westfield, Summit, Maplewood, South Orange, Rutherford, Collingswood, Bernards Township, Cape May, Princeton, etc.) and given their central business districts and mixed use characteristics within workable distances, Montclair, and towns like it, represent excellent pilot locations for discovering and resolving the challenges of implementing microgird technology.

Our project specifically addresses an area of our town that was impacted with prolonged power outages during Sandy and also during Irene and several early Fall snowstorms.

It is worth noting that our Fire Headquarters which includes a large fire station, serves both the residents of a large portion of Montclair as well as the entire borough of neighboring Glen Ridge.

Mountainside Hospital has long been a part of the Montclair community but also has as part of its primary service territory, the towns of Glen Ridge, Bloomfield, Verona, Fairfield, the Caldwells, Essex Fells, Cedar Grove, Little Falls and Clifton which in total constitute a population approaching a quarter of a million people.

The Bay Street station of New Jersey Transit is one of the largest stations in the NJ Transit system and is the vital link in connecting the Montclair and Boonton lines. It is a major facility for commuters to both New York City and Newark and has a substantial parking garage adjacent to it which provides the capability to significantly reduce traffic on local streets and highways.

Pine Ridge is a senior housing facility whose residents are not easily relocated in the event of power failures or loss of heating. Providing this facility with a higher level of resiliency will be a significant benefit to the population Pine Ridge serves.

Finally, Glenfield School is one of three middle schools located in Montclair and provides an excellent emergency shelter location for the population living in and around the school. This area of Montclair has a larger proportion of low-income families than other sections of the town and the benefit of resiliency will be especially valued by the residents in the area of Glenfield School.

Incorporation of cogeneration and renewable energy into our proposed microgrid will significantly increase the overall efficiency of the electric and thermal supply needed by those on the microgrid. A cleaner environment and lower air emissions are correlated with higher energy efficiency.

The expected dollar savings to facilities on our microgrid using today's prices for electric and natural gas fuel (which determine the price of power and thermal energy) is $1.2 million.

We have been careful to develop out proposal with a preliminary design that is technically, operationally and economically viable as well as buildable in the short term. It should not require additional study upon study to refine or revise its initial scope as outlined in this proposal.

We have not made untested assumptions or speculated on the availability of extreme and costly regulatory programs in order to justify our project. While we have allowed for grants that are consistent with current CHP incentive programs, we have built in nothing for other incentives or revenue enhancements which could be available such as those from the ISO, PSE&G, virtual net metering, resiliency portfolio standards or the like.

Once our pilot study is complete, it will represent a project than is applicable to a large portion of New Jersey's population and similar towns, and one that is buildable in a timely manner and economically viable.

8. General Description of Communication System between PSE&G and Microgrid –The proposed microgrid incorporates multiple DERs interconnected to the defined loads through a new microgrid power connection which will have a single point of connection (POC) to the utility grid at the hospital's incoming 13.2 kV service. The two CHP plants will be controlled using a backflow prevention relays on the POC which will determine the level of output from the engines with priority given to the larger 2 MW unit. The proposed PV arrays totaling 145 kW will be allowed to net meter within the microgrid and depending on regulatory treatment for PV connected on a common bus with CHP (the microgrid power connection), the PV may be allowed to net meter with the grid. However, due to the relative size of the CHP systems, the combined loads and the PV system, it is not necessary for the PV system to net meter in order to allow for development of the microgrid as currently configured. In the event that the proposed new medical office building (MOB) can support a significant sized Solar PV array, then net metering with the grid will become a design issue in sizing this portion of the proposed microgrid.

A capital cost allowance is made to incorporate a microgrid power monitoring system, interconnect all DER devices with hard wired IP cable and provide a central controller that will communicate the integrated microgrid operation with the utility should such communication with the utility grid become viable. There are multiple microgrid controllers on the market which will allow for control of all the microgrid DERs and the utility grid including SICAM from Siemens and GridConnect from Johnson Controls as well as DER-CAM Operations from Lawrence Berkeley National Labs. This would allow for control of all microgrid DERs in relation to the grid and wholesale market price signals as well as provide power export should this become economically acceptable or desired by the utility. Under current conditions with little monetary value for power export on an annual basis, it is not envisioned that the microgrid will export power. In the event that the utility identified the desire and economic justification for export of power from the microgrid, then additional resources such as diesel emergency generators or new natural gas fired generation and/or an expansion of PV could be incorporated into the microgrid to provide power export.

9. Timeline for completion of Feasibility – It is anticipated that the study will take eleven (11) months to complete from the time funding is committed from the Office of Clean Energy. A rough breakdown of anticipated timing for major components of the study as detailed in Section 11 of this application (Requested Funding Amount) is as follows:

Introduction and Context	2 months
System Overview and Asset Facility Characterization	2 months
Design	3 months
Modeling	2 months
Conclusions and Report Preparation	2 months

10. Specific Microgrid Modeling to be used in Feasibility Study – The consultants working on this study for Montclair will be using a variety of tools to evaluate the optimal design and operating protocols for the microgrid.

At a bare minimum, they will be including the results from the DER-CAM model which was developed by Lawrence Livermore Berkeley Laboratories (LLBL) which can be reviewed at https://building-microgrid.lbl.gov/projects/der-cam.

The Distributed Energy Resources Customer Adoption Model (DER-CAM) is an economic and environmental model of customer DER adoption. This model has been in development at the Berkeley Lab since 2000. The objective of the model is to minimize the cost of operating on-site generation and combined heat and power (CHP) systems, either for individual customer sites or a microgrid. The focus of this work is primarily economic.

In addition to DER-CAM, both Integrated CHP Systems, Inc. and Shoreline Energy Advisors, LLC have a variety of proprietary models they have developed and will adopt, to the Montclair Town Center Microgrid project. These models will reflect the anticipated technical, operational and economic performance of the designed microgrid when fed by the anticipated microgrid loads over an entire 8,760-hour year. These models consider a variety of load influencers including local weather and historical cooling and heating degree days.

Mountainside Hospital is the anchor for our microgrid and we are already in possession of 15 minute interval data for its electric loads, and hourly data for its gas loads from PSE&G. These loads have been incorporated into the preliminary design described in Section 5 of this application. While we currently only have monthly data from the other sites since most are on tariffs which do not require interval periodicity other than that of a given billing period, we will utilize generally accepted engineering data from widely accepted and recognized sources, based on history from similar buildings to develop accurate load curves for the non-hospital buildings on the microgrid.

We will also examine and utilize whatever modeling exists, or becomes available, from other locally recognized sources such as Rutgers, NJIT or other reputable sources in order to accurately model the anticipated loads, operating protocols and economics of our selected design.

11. The Requested Funding Amount – The total estimated cost of this study is $204,600 although the amount being requested after cost sharing by stakeholder partners is $174,600. The study costs are summarized in the below cited Table 7 and were developed using the outline from the Sandia study completed for the City of Hoboken.

Table 7

1	**Introduction & Context**		
		Microgrid & Program Goals	
		Basis of Design	
		Site Specific Characteristics	
		Program Considerations	
			$26,600
2	**System Overview / Asset and Facility Characterization**		
		Concept of Operations	
		Integrator Responsibilities	
		Building Loads	
		Data Requirements	
		Electric Network Characterization	
		Load Characteristics	
		Generation Characteristics	
		Service Entrances and Interconnections	
			$45,500
3	**Optimal Design Selection**		
		Designs Considered	
		Optimal Design Selection and Why	
		Requirements and Recommendations	
			$58,750
4	**Modeling**		
		Operational & Performance	
		Financial & Economic	
			$53,400
5	**Conclusions and Report Preparation**		$20,350
	Study Budget		$204,600

12. Cost Share by Montclair or stakeholder partners- At this time we are expecting an estimated $30,000 in cost sharing for the completion of this study from several stakeholders. The Township of Montclair will have occasional involvement in the development of the study and we are allocating approximately $10,000 to reflect the anticipated time from various personnel including our Sustainability Officer, Planner, Accountants and various other employees amounting to an estimated 360 hours at an average cost of $27.78 per hour.

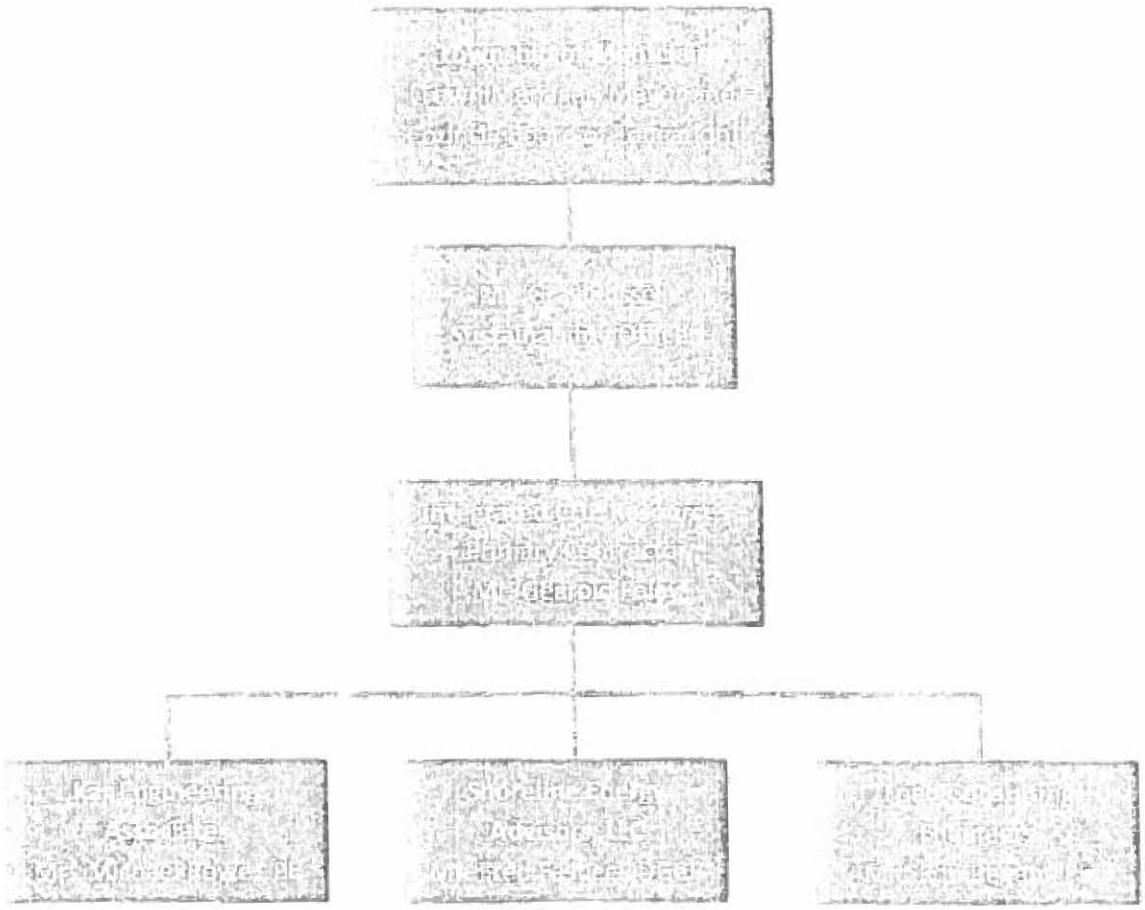
NJ Resources, the holding company for unregulated operations and the regulated New Jersey Natural Gas has expressed an interest in working on the development of the study in order to understand the

possible ramifications to their business and will be assisting in developing market-based assumptions on both fuel costs, anticipated regulatory matters and funding requirements for investors and lenders on this type of project. We are building in an anticipated contribution of $20,000 from NJ Resources.

With this anticipated cost sharing of $30,000, deducted from the projected study budget of $204,600, the net amount being requested from the Office of Clean Energy as a pilot grant from the program is $176,400. Any shortfall from anticipated cost sharing will be absorbed by the consultants and subcontractors working on the project so the amount requested will not change.

13. Listing of Consultants to perform work on study and level of expertise

Township of Montclair - As the applicant for this grant, the Township of Montclair will be the party primarily responsible for the management of our study team which consists of several recognized industry experts in the fields of distributed generation, power engineering, regulatory policy and microgrid development. The township's primary contact on this project will be Mr. Gray Russell, Montclair's Sustainability Officer. The following chart illustrates the organization of Montclair's study team.



Integrated CHP Systems, Inc. – Integrated CHP Systems, Inc. (ICHPS) headed by its president Mr. Gearoid Foley will serve as the prime contractor on this project. Besides being responsible for overall study itself, Mr. Foley will oversee and develop technical evaluations and design work included in the proposed study.

Established in 2003, ICHPS has become a national leader in the development and demonstration of cogeneration systems working with the US Department of Energy, California Energy Commission, Gas Technology Institute as well as various gas utilities and equipment suppliers. In 2009 ICHPS was integrated into the US DOE's Mid-Atlantic CHP Technical Assistance Partnership (CHP TAP) to promote and assist in transforming the market for CHP, waste heat to power, and CHP enabled district energy systems / microgrids. Mr. Foley functions as the New Jersey Director as well as Senior Technical Advisor to this DOE initiative where he works with state policy makers, regulators, government agencies, industry and end users.

Mr. Foley works with DOE's Advanced Manufacturing Office as special advisor to their microgrid initiative, is a contractor to EPRI in their efforts to assist in the development of microgrids and is involved in various microgrid initiatives including the Philadelphia Navy Yard pilot program, Reading Airport/BCIDA microgrid, Washington University microgrid feasibility analysis, Pittsburg district energy/microgrid initiatives and St Elizabeth's microgrid in Washington DC. His experience includes working with multiple private companies and industry associations on assessing microgrid opportunities, working with developers on microgrid design as well as working with various state entities throughout the Mid-Atlantic to provide technical support in their efforts to assess district energy and microgrid opportunities. ICHPS is currently working with multiple hospital owners to assist in the development of resilient CHP systems at these campus microgrid applications. ICHPS was contracted by PACE Energy and Climate Center in 2016 to develop a microgrid evaluation tool for the New York City Housing Authority that provides a methodology for comparison of various sites to allow ranking of those sites according to the cost and benefit of adding a microgrid. Mr. Foley also worked with the NJ Board of Public Utilities in 2015 to assist in the evaluation of a potential microgrid in Atlantic City. His work included an interactive model allowing the addition or deletion of potential client facilities on the microgrid and the provision of resulting financial metrics such as cost per kwh, payback and ROI.

ICHPS has participated in the development of industry standards including the American Society of Heating, Refrigeration and Air Conditioning Engineers' (ASHRAE) Design Guide for CHP Systems, Association of State Energy Research & Technical Transfer Institutions' (ASERTTI) Test Protocol for CHP systems and DOE's CHP Roadmap. ICHPS works with national, regional and state entities to provide outreach and education on CHP and microgrid design through various organizations including: ASHRAE; PowerGen; Association of Energy Engineers; Mid-Atlantic Conference of Regulatory Utilities (MACRUC); Mid-Atlantic Distributed Resources Initiatives (MADRI); at industry sponsored events, and; for the US Department of Energy.

ICHPS previous assignments include design of a modular CHP thermal plant for the California Energy Commission, thermal design oversight for the Sacramento Municipal Utility District microgrid, engineering assistance to Princeton University on the computer research center microgrid, operations review of the GSA owned Heating Operation and Transmission Division (HOTD) in Washington DC and design consultation with DOD's Radford Army Ammunitions Plant which included 92 miles of steam piping, solar PV and CHP.

Mr. Foley is a frequent speaker at industry events and has authored many papers and articles on the field of distributed energy resources. He co-authored ASHRAE's 2008 Handbook Chapter 7 on CHP Systems as well as a book entitled "Sustainable On-Site CHP Systems" recently published by McGraw-Hill. He was a co-author of ASHRAE's Combined Heat and Power Design Guide which was published in 2015.

Gearoid Foley holds a Bachelor of Engineering degree from University College, Galway, Ireland.

Shoreline Energy Advisors, LLC – Shoreline Energy Advisors, LLC (Shoreline) will be working as the key subcontractor to Integrated CHP Systems, Inc. on this study. Fred Fastiggi is the Managing Director of Shoreline Energy Advisors and will be the principal working on the study with Mr. Foley. He will be responsible for evaluating and structuring market-based assumptions on the projected contractual arrangements between the various generators and off-takers on the microgrid, maintenance suppliers, operating management and fuel suppliers. He will also be responsible for evaluation of the various financing alternatives that are, or could be, available for the development of the microgrid. He will collaborate on all financial and economic analysis and modeling that are part of the study.

Mr. Fastiggi has almost three decades of experience working in the power and energy sectors. As Managing Director of Shoreline Energy Advisors, Mr. Fastiggi works with Investor Owned Utilities in the development of their business strategies, and with commercial and industrial energy users, lenders, investors, host sites and engineering firms in the development of complex energy projects dealing with distributed generation, renewable energy, district energy, micro grids and energy storage.

Mr. Fastiggi was the developer and served as owner's representative on the City of Bridgeport's pilot project which was selected for one of only nine grants provided in the initial stages of the Connecticut Department of Energy and Environmental Protection's pilot microgrid initiative. In his role with Bridgeport, Mr. Fastiggi performed the initial feasibility study, worked with engineers to develop a conceptual design, secured funding from the state of Connecticut in the form of grants and low interest loans, secured innovative regulatory treatment to enhance project financial performance, solicited and secured a third party owner for the project and negotiated all critical contracts with the third party owner, operation and maintenance suppliers, equipment suppliers, fuel suppliers, United Illuminating and third party customers for excess thermal energy. The Bridgeport City Hall Microgrid, is currently in the final stages of construction and is expected to be operational in June of 2017.

Mr. Fastiggi spent thirteen years at Public Service Enterprise Group in various roles for their regulated and unregulated operations. He was a founder of PSEG's initial entry into retail energy services post-deregulation where as Vice President of Development and Energy Solutions, he was responsible for their Distributed Generation Business Unit, their Alternative Financing Group and for managing their Technical Services Group which provided engineering services to both internal and external customers.

He was a Senior Vice President and head of the Energy discipline at Partner Engineering Science and their predecessor firm, Birdsall Services Group, where he built their diversified Energy Consulting practice into the largest such firm in New Jersey. Over the course of his career he has advised on, and project managed, dozens of generation transactions encompassing thousands of megawatts of traditional and renewable generation capacity in both wholesale and retail markets.

Fred Fastiggi holds a B.S. in Finance and an M.B.A. in Quantitative Analysis from Seton Hall University and is a Certified Energy Manager and Distributed Generation Certified Professional.

Triad Consulting Engineers – Triad Consulting Engineers, located in Morris Plains and New York City, is headed by Ron Regan, PE. Triad is a full service MEP engineering and design-build firm which specializes in power engineering both in the United States and throughout the world. As and MEP firm that specializes in Power Engineering, Triad has extensive experience working with power plants, CHP facilities, data centers, petrochemical, solar farms, commercial, industrial and resort facilities. Triad designs systems for the transmission and distribution of electrical power in high and low voltages. Triad provides power system studies including short circuit, coordination and arc flash, testing and inspection services. Triad, through a wholly owned subsidiary, also manufactures U.L. Listed IDEW electrical switchgear and other electrical equipment from 208V through 38KV. Their client roster includes public and private utilities, the military, the Department of Homeland Security, FBI, the State Department and the NJ Office of the Attorney General, as well as many Fortune industrial companies, and real estate and power plant developers. They have worked with operators of both renewable and traditional forms of generation including solar photovoltaic, hydro, wind, nuclear and every form of fossil generation.

Ron Regan, President of Triad has over 40 years of experience in the power engineering industry. He has held positions at Foster Wheeler Energy Corp. where he was Worldwide Chief Electrical Engineer with a technical staff of over 3,000 engineers and technical personnel. His utility clients include JCP&L, PSE&G, PG&E and Arizona P&L.

Mr. Regan holds a B.S. in Electrical Engineering from Newark College of Engineering, now known as New Jersey Institute of Technology.

Kar Engineering Associates – Kar Engineering Associates is a consulting engineering firm that works primarily in MEP and Civil disciplines. On this project our team will include Michael Rowe, PE who is KAR's Vice President of Engineering. Mr. Rowe has over thirty years of engineering experience in the fields of electrical distribution, computer hardware and software process controls, combustion engineering, HVAC, thermal sciences and high pressure boiler systems.

Mr. Rowe has an extensive experience base in the boiler industry and over the years has performed hundreds of design and performance studies specifically on high pressure boilers.

Mr. Rowe holds multiple degrees from Rutgers University including a B.S. and M.S. in Electrical Engineering, an M.S. in Mechanical Engineering and a PhD.

14. **EDC Letter of Support** – PSE&G is the Local Distribution Company providing both electricand gas to all of the facilities included in our proposed Microgrid and this application

PSE&G has been briefed on the Montclair Town Center Microgrid project and has prepared letter of support which is attached to this application as Appendix 8.

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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

Timothy F. Stafford, Esq., Acting Township Manager
Township of Montclair
205 Claremont Avenue
Montclair, NJ 07042

Dear Mr. Stafford:

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

Township of Montclair 205 Claremont Avenue Montclair, NJ 07042 tel: 973-509-5721 fax: 973-509-1479

Gray Russell
Sustainability Officer
grussell@montclairnjusa.org

May 2, 2017

Secil Onat – Policy Advisor
Office of Policy and Planning
NJ Board of Public Utilities
44 South Clinton Avenue
Third Floor, Suite 314
Trenton, NJ 08625-0350

Dear Ms. Onat:

With reference to today's email from Mike Winka, the Township of Montclair is re-submitting by email the Letter of Transmission and the Final and Best Offer for the Incentive/Rebate related to the Town Center Microgrid Pilot Program which was originally submitted by Mr. Fastiggi on behalf of our project team yesterday.

Please feel free to call with any questions, the need for clarification or, additional requirements.

The Township of Montclair appreciates the opportunity to offer our site as a pilot location and looks forward to presenting findings which are of value to you and your associates in the future.

Attachments

Cc: Mr. Timothy Stafford, Esq.
Mr. Gearoid Foley
Mr. Frederick Fastiggi

Thank you,

Gray

Gray Russell
Sustainability Officer
Township of Montclair

- CONFIDENTIAL -

Revised Final & Best Offer for Township of Montclair
Town Center Microgrid Pilot Project – Grant Application

Prime or Subcontractor	Original Request	Adjustment	Final and Best Offer	Percent Reduction
Integrated CHP	$80,000	($12,400)	$67,600	-15.50%
Shoreline Energy Advisors	$94,500	($18,700)	$75,800	-19.79%
Triad Consulting Engineers	$11,700	($2,140)	$9,560	-18.29%
KAR Engineering	$8,400	$1,120	$9,520	+13.33%
Township of Montclair	$10,120	-	$10,120	
NJ Transit	$0	-	$0	
PSE&G	$0	-	$0	
Subtotal	$204,720	($32,120)	$172,600	-15.69%
Cost Share-Township	($10,120)	-	($10,120)	
Cost Share- NJR	($20,000)	-	($20,000)	
Total Grant Request	**$174,600**	($32,120)	**$142,480**	-18.40%

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.

MEMORANDUM OF UNDERSTANDING
BETWEEN AND AMONG
THE NEW JERSEY BOARD OF PUBLIC UTILITIES,
AND
TOWNSHIP OF MONTCLAIR

THIS MEMORANDUM OF UNDERSTANDING ("MOU"), is made this _____ day of _____, 2017, by and between **The TOWNSHIP OF MONTCLAIR** ("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

[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 $142,480, 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

Township of Montclair
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: Township of Montclair

_____ 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: _____