



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

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) ORDER
OF INCENTIVE FUNDING TO THE CITY OF HOBOKEN)
FOR PHASE I FEASIBILITY STUDY) DOCKET NO. QO17060634

Party of Record:

Caleb Stratton, Principal Planner, City of Hoboken

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 City of Hoboken submitted an application to the Board.

The City of Hoboken's TC DER Feasibility Study will examine the potential of connecting the following critical facilities to a TCDER Microgrid: Hoboken Fire Company 3, Police HQ, Pump Stations, City Hall, Hoboken Homeless Shelter, St. Matthews Church, as well as St. Peter and Paul Church, Kings Grocery, municipal garages B, D & G, multiple Senior Housing facilities, the YMCA, two local pharmacies, and three Hoboken Housing Authority Properties (Andrew Jackson Gardens, Harrison Gardens, Adams and Monroe Gardens). The applicant will evaluate most commercially-viable technologies, including but not limited to DER, energy storage systems, solar, combined heat and power ("CHP"), thermal loops and biodiesel fueled generators. The current timeframe for completion of the study is approximately 12 months.

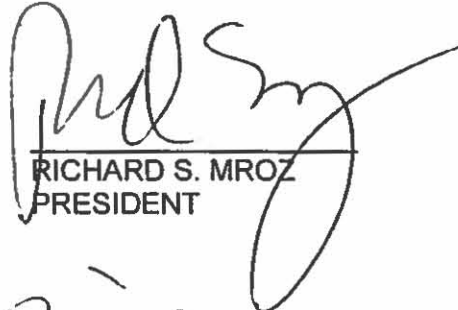
After review of the application Board Staff recommends that the Board approve the above-referenced application.

The Board **HEREBY ORDERS** the approval of the aforementioned application for the total incentive amount of \$157,000 for the City of Hoboken 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

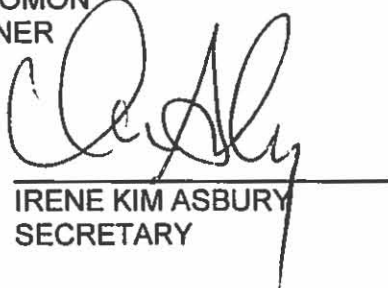


DIANNE SOLOMON
COMMISSIONER



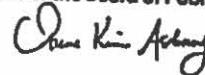
UPENDRA J. CHIVUKULA
COMMISSIONER

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 CITY OF HOBOKEN FOR PHASE I
FEASIBILITY STUDY

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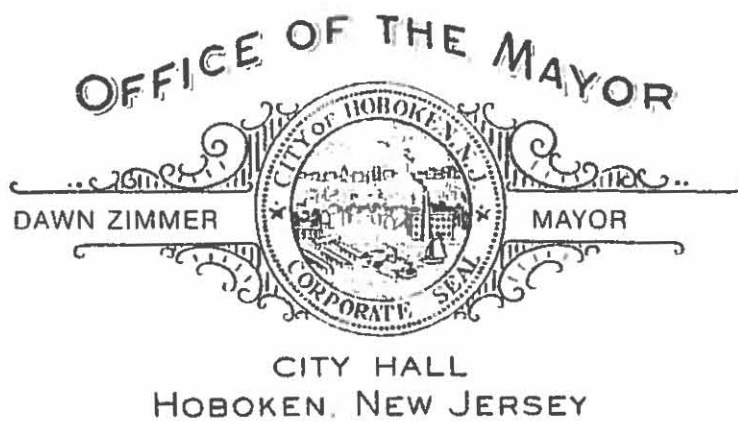
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March 23, 2017

Richard Mroz
President
New Jersey Board of Public Utilities
44 S. Clinton Avenue
Trenton, NJ 08625

Dear President Mroz:

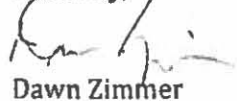
I am writing to ask for your strong consideration for the City of Hoboken's application for the TCDER Feasibility Study Incentive Program.

Hoboken experienced widespread power disruptions as a result of flooding from Hurricane Sandy, and we have been working diligently ever since to learn from that experience and develop solutions to make us more energy resilient. The microgrid is a critical part of our resilience strategy, and is especially important for our most vulnerable residents that do not necessarily have the means to evacuate or shelter in place without power.

Hoboken's investment in generators and underground conduit as part of our Washington Street project demonstrates our strong commitment to this effort. This project, coupled with the expected flood protection from the \$230M Rebuild by Design project, could represent the future of infrastructure solutions not only for New Jersey, but for urban coastal municipalities along the east coast. It will also offer business and service models that expand energy services throughout the state. The Hoboken Microgrid has been identified as a priority within the New Jersey State Energy Master Plan, and I am committed to making it the most likely to succeed in implementation.

The microgrid will deliver more than just a secondary source of power – it will provide peace of mind, safety, and security for our city and will serve as a model for other communities. I very much look forward to once again working with the Board, PSE&G and other local stakeholders to study the feasibility of our microgrid project. Thank you in advance for your careful consideration.

Sincerely,



Dawn Zimmer

The Hoboken Microgrid

The City of Hoboken respectfully requests that a feasibility study be funded by the Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program in the amount of \$200,000. The feasibility study will be conducted in direct coordination with PSE&G and the New Jersey Board of Public Utilities.

In general, the feasibility study will focus on two main project areas. The first area of focus is the Washington Street study area, which includes in excess of 6,000 linear feet of dual 6-inch conduits that are under construction exclusively for the purpose of connecting critical facilities through a parallel medium voltage distribution network. This area is within 500 feet of at least 18 critical facilities that were studied as part of Sandia National Laboratories Preliminary Design Summary (Design Summary), and are located in an area of the city that is elevated above the 100 year floodplain. The second area of focus is the Hoboken Housing Authority main campus and includes, at a minimum, approximately 23 facilities spanning 800,000 square feet and serving 931 public housing units.

The attached map depicts the boundaries of the project and the approximate distances between critical facilities.ⁱ The attached excel spreadsheetⁱⁱ outlines the approximate size of the project in energy load, lists project partners and estimates the square footage of buildings to be included in the study. A Letter of Support from PSE&G is also attached.

Project Background

Hoboken is bordered by the Hudson River and Upper New York Bay to the east, the Lincoln Tunnel Helix to the North, the Palisades to the West, and Lackawanna Terminal/Holland Tunnel area to the south. It is a critical regional gateway accessed by nearly every mode of transit in the New York Metropolitan Area and has over 52,000 residents living within approximately 1 square mile.

In 2012, Hurricane Sandy made landfall on the Atlantic coast as a Category 2 storm. In the Upper New York Bay, storm surges were recorded up to 13 feet above mean sea level, resulting in severe flooding across more than 70% of Hoboken. In the days following the storm power to major substations in the area was available, yet the city's electrical distribution system was de-energized, and critical facilities and services lost the ability to function.

To address growing concerns related to prolonged electrical outages, and specifically the effect these outages had on the health and safety of urban residents, a memorandum of understanding was drafted between and among the United States Department of Energy Office of Electricity Delivery and Energy Reliability, the New Jersey Board of Public Utilities, Public Service Electric and Gas Company, and the City of Hoboken, New Jersey. The subject of the memorandum was to enhance electric power resiliency using advanced system design.ⁱⁱⁱ

Sandia National Laboratories was engaged to prepare a design summary that would power critical facilities under a design basis threat. In the case of Hoboken, this threat was established as a prolonged power outage of at least seven days, including a flood event exceeding the 100 year flood elevation. In September 2014, Sandia National Laboratories published the City of Hoboken Energy Surety Analysis: Preliminary Design Summary (Design Summary), the contents of which are attached to this proposal^{iv}.

The Design Summary establishes both the purpose of the microgrid project and the demonstrated need for microgrid services. In addition, the New Jersey Town Centers Distributed Energy Resource Microgrids Potential: Statewide Geographic Information Systems Analysis Technical Report identifies Hoboken as a Town Center Microgrid and the New Jersey Energy Masterplan also identifies the Hoboken Microgrid as a critical project.

Project Description

The purpose of the proposed feasibility study is to analyze the specific conditions within the project area that present potential technical, financial and regulatory challenges, and to propose strategies or solutions to overcome existing barriers to project implementation. This grant project will build upon the work performed by Sandia National Labs, but not duplicate previous efforts in any way. Although comprehensive in its investigation, the Sandia study did not provide an implementation strategy for the city, nor did it address operation under blue sky conditions. It became apparent that reaching the project goals and objectives would be difficult, if not impossible, based on the scope and complexity of the proposed action. From 2014 through the present, the City has worked diligently to take incremental actions that build towards the intent of the Design Summary, while modifying certain recommendations. Much of the background information from the Design Summary has influenced the City's microgrid progress over the last few years which includes, but is not limited to:

- Installation of Distributed Energy Resources (DER) at multiple municipal, sewerage authority and housing authority sites, compatible with the proposed microgrid.^v
- The installation of a fiber optic conduit and 13.8 kV distribution network as part of a 16 block Washington Street redesign that will act as a medium voltage "spine" for the proposed project area.^{vi}
- Reducing the scope of the Design Summary investigation from 55 critical facilities to approximately 18 facilities located within 500 feet from the Washington Street "spine" and approximately 23 Housing Authority Facilities as part of a Combined Heat Power (CHP) feasibility project (In collaboration with the Department of Energy's Combined Heat and Power Accelerator).
- Redesign and Elevation of the 16th Street PSE&G Substation (Completed).
- Redesign, consolidation and elevation of the Marshall Street and Madison Street substations from 4kV to 69kV (Estimated date of completion is summer 2019).
- Land swap agreement with PSE&G to provide a site for DER or CHP facilities for the Hoboken Housing Authority at the current Marshall Street Substation.^{vii}

- Replacement of low pressure gas mains to high pressure gas mains city-wide as part of the energy strong program.
- Analysis of utility models and refinement of system design with Rocky Mountain Institute.
- Installation of Energy Efficiency projects at City Facilities (mostly related to lighting improvements).
- Execution of multiple memorandums with local/state and federal agencies, as well as inter-local agreements for complex projects.

In the Design Summary, 55 buildings were selected from working group meetings with stakeholders and City officials. The original 55 buildings included emergency response facilities, flood control facilities, shelters, parking garages, pharmacies, grocery stores, gas stations, and senior and affordable housing properties. Each service provided by these facilities is considered critical because it affects the ability for the City to provide essential functions, perform emergency response, and shelter the most vulnerable residents.

In the almost five years following Hurricane Sandy, and after extensive renovations and rehabilitations of facilities in the floodplain, City staff and advisors have come to the conclusion that the focus of the public/private microgrid investments should be made in areas outside of the floodplain, where possible. This single change will significantly reduce retrofitting costs, and furthermore, limit the likelihood of system failure. However, given the criticality of assisting social justice populations in the floodplain, an additional study area has been identified immediately north of the Marshall Street Substation, and encompassing the Hoboken Housing Authority Campus.

Costs to implement the 55 building microgrid presented by the Design Summary on page 204 estimated construction costs at a \$48.4M in 2014. This estimate included building retrofits, controls and communications, microgrid infrastructure, combined heat and power, design and engineering, with a 25% contingency. By reducing building retrofits, limiting the number of new generation sites (aggregating to a larger generation site), limiting the scope of facilities and installing the underground conduit on Washington Street, the cost breakdown for this project will be reduced substantially.

To optimize costs the feasibility study will likely utilize proprietary economic modeling spread sheets for Combined Heat and Power economics. In addition, once a project team is fully established, the intent is to use eGrid data and the USCHPA emissions savings calculators to estimate the net impact of the microgrid on CO₂ and NO_x emissions. The City will work with PSE&G as the Electric Distribution Company to evaluate the interconnection between the microgrid and PSE&G's distribution system. To the extent that PSE&G deems it necessary or appropriate the City will seek their input on these issues which may require use of their in-house analytics, which may be proprietary. The feasibility study will also evaluate the locational value to the electric grid from the proposed microgrid with software currently being developed by Rutgers University, or the Distribution Grid Locational Performance Modeling Tool model

being developed by Berkley Labs based on the DER-CAM model. Both models are currently in development stage and it is anticipated that both groups will provide insight into how a microgrid provides value to the electrical grid and how to quantify that value.

The PSE&G distribution system is a network system which has great reliability and redundancy. As is required for CHP or other DG it is expected that dedicated communications will be required between the microgrid generation and building interfaces with the existing PSE&G substations. PSE&G is currently reinforcing their substations and associated distribution systems so we will have the opportunity to integrate operations with new state of the art systems. Due to the distributed nature of the proposed microgrid, spanning multiple locations within the City, there will be local level interconnections, the simplest of which would be traditional transfer trip switches such as those used by emergency generators and more sophisticated synchronized interconnections, as is typical for closed transfer with CHP systems.

A grid interconnection interface will be required to coordinate the connection to the electric grid and islanding operations in the event of an emergency. When operating in island mode a microgrid controller will be necessary to coordinate the generating units being operated and will be necessary to synchronize to the grid when returning to normal power. It will be determined during the study phase which manufacturer's microgrid controller would be most effective in this role. Detailed input will be sought from PSE&G on what Utility Control equipment and communications will be necessary to assure safe operation both when grid connected and when operating in island mode. There is expected to be some automatic control, but it may be necessary to establish some manual or permissive control interlocks to ensure worker safety.

The microgrid does not contemplate any normal power export to the grid; however, opportunities such as behind the meter Demand Response or Synchronizes Reserve will be considered and where possible individual facilities will site solar, thermal or other forms of renewable energy that can be incorporated into the microgrid service model. If a larger central generator is incorporated to the microgrid it will need to consider revenue opportunities which could include participating in the PJM Capacity market in order to provide offsetting project revenue. The business model will engage stakeholders and anchor facilities that constitute a majority of the baseline microgrid energy load. The North Hudson Sewerage Authority and Hoboken Housing Authority have provided expressions of support consistent with the previously Design Summary, and constitute major project partners. It is important to note that the North Hudson Sewerage Authority serves the communities of Weehawken, Union City and West New York, elevating this project to being regionally significant.

If the project is advanced, the City envisions creating a Microgrid Request for Proposals or Qualifications depending on the input from the Board and PSE&G. The RF(P)(Q) would seek to develop a well-rounded team capable of undertaking the feasibility report. The City will work with its authorized project agent, Concord Engineering, to establish a mechanism to consolidate procurement under local public contracts law. The City will also offer an in-kind contribution of

10% of the project costs in staff time and resources to help manage the completion of the feasibility study within a one year period from award. In general, the City will take the lead on any procurement related issues, and where appropriate, act as an agent for interested parties to the microgrid MOU. The RF(P)(Q) could envision one or several companies bidding as a team in order to accomplish the goal of completing the feasibility study as defined after coordination with project partners. The investigation should include:

- Identification of stakeholders.
- A baseline characterization of electric and thermal facility demands and construction information.
- Engineering due diligence to reduce the complexity and cost of reaching buildings from the Washington Street conduit and refinement of the project area consistent with the attached map and list of facilities.
- Performing field based due diligence on siting new manholes and transformers.
- Defining network voltage.
- Identifying PSE&G interconnections.
- Defining a supervisory control and data acquisition architecture (SCADA). In the past, the City has entertained conversations with IPERC's control technology, but is open to the consideration of other technologies.
- Performing investigations on existing generation sites and identifying necessary permits for additional periods of operation. Identifying necessary generation improvements
- Identification of sites for new DER.
- Identification of sites best suited for EE measures in advance of microgrid development.
- Operating parameters of: independent facilities utilizing DER; Microgrid paralleling capabilities and the ability to operate in island mode in the event of a central grid outage; and Microgrid operation while grid connected for energy services.
- Microgrid operations under a design basis threat.
- The approximate size of the microgrid; consistent with the Sandia study with a lower bound solution of approximate 18 facilities and ~3.5MW, or an upper bound solution of approximately 41 facilities and ~5 MW.
- The microgrid will consider: optimization of CHP units for the Housing Authority and Senior Facilities as a priority; or a centralized CHP facility; or a CHP facility and generator collocated at a facility yet to be constructed – potentially as the point of interconnection.
- The inclusion of a thermal loop, where appropriate.
- The location of a sufficiently large and efficient generator to support islanding for the Washington St. Area.
- Evaluation of energy storage to enable integration of solar renewable energy.
- Evaluation of biodiesel as a renewable fuel for the larger generators or dual fuel units.
- Consideration of a microgrid "service charge" to recipient facilities, or to recipient service area.

- Investigation of a special purpose vehicle to share risk and financial obligations between different entities.
- Investigation of the Commercial Energy Aggregation opt-out program to consolidate procurement issues.
- Investigation of the Energy Savings Improvement Program.
- Investigation of a Municipal Energy Authority.
- Investigation of clean energy rebates.
- Insurance and Liability identification.
- A methodology to test project assumptions.
- A general outline of the anticipated and potential revenue streams for the microgrid such as; Demand Response, Peak Shaving, Frequency Regulation, Synchronized Reserve or other potential PJM/ PSE&G value streams.

Elements of the feasibility study should include, but are not limited to:

1. The proposed technology and generation mix.
2. The location of new distribution infrastructure.
3. A business model that incorporates strategies to finance capital costs, operation and maintenance for the microgrid solution set.
4. A regulatory framework to continue partnership with PSE&G.
5. Defining ownership operation and maintenance models for the project stakeholders.
6. Defining responsibilities of interested and vested agencies.
7. Drafting interlocal agreements as necessary.
8. The inclusion of energy efficiency measures and developing renewable energy options, as well as including, CHP to address the requirement that the project comply with the funding justifications for use of Societal Benefits funds.
9. A design document capable of soliciting bids for further design advancement.

The point of contact for the grant application is Caleb Stratton, the Principal Planner for the Hoboken. He will be supervised by Stephen Marks, Business Administrator. The project team will be advised by Joe Sullivan, Vice President of Engineering for Concord Engineering. The project team will also be advised by Leia Guccione, Principal of Rocky Mountain Institute Electricity and Industry Practice. The point of contact from PSE&G is Caren Freyer DeSouza, with additional support from Michael Henry.

¹ Project Area

² Facility Summary and Characteristics

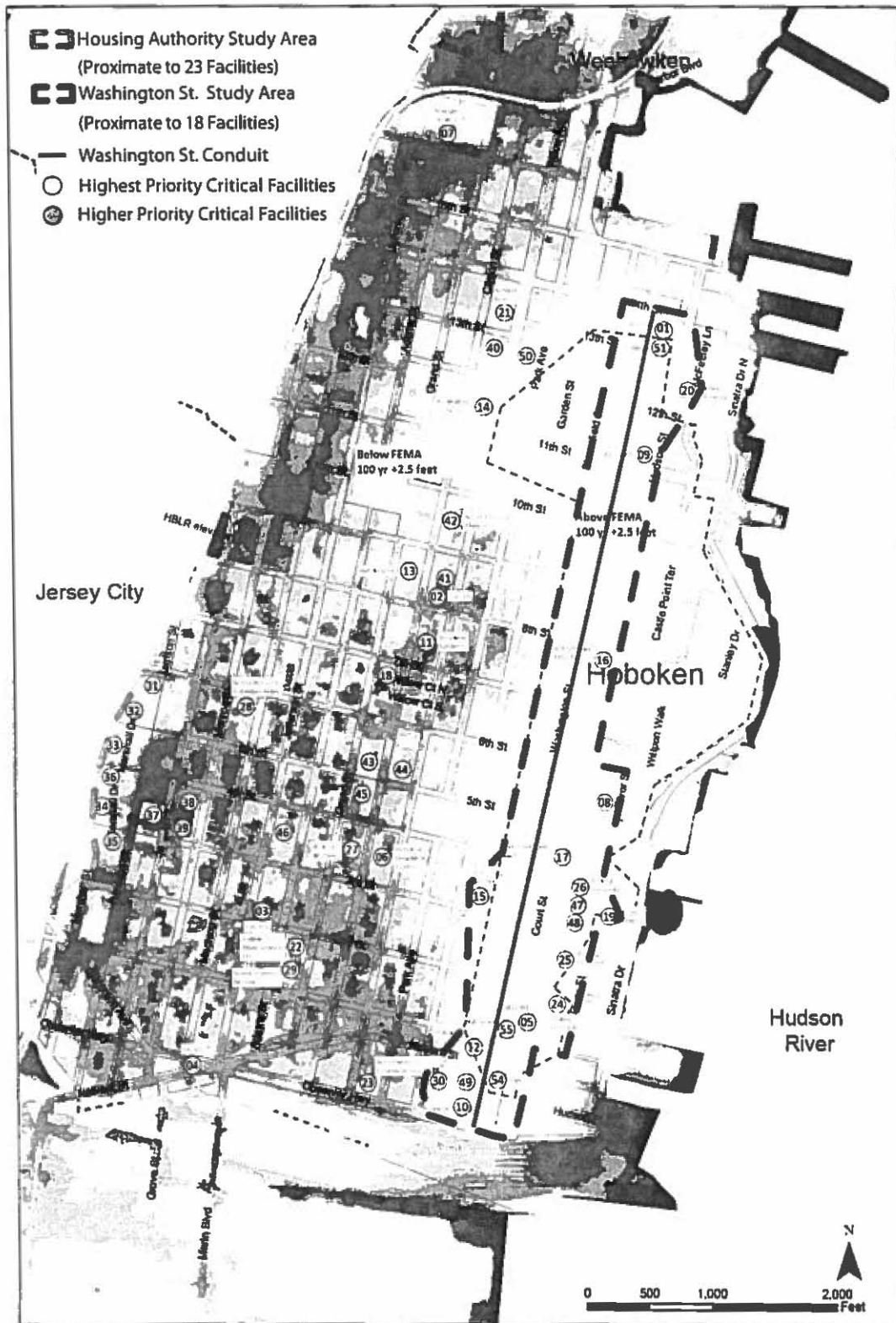
³ Previously authorized MOU; Council Authorization for Grant Application

⁴ Sandia National Laboratories Preliminary Design Summary

⁵ Generator Construction Documents available upon request (large files)

⁶ Washington Street Construction Documents available upon request (large files)

⁷ Land Swap agreement available upon request



City of Hoboken Proposed Study Area Locations for TCDER Feasibility Study

Map of Superstorm Sandy inundation (in gray) and Preliminary Design Summary facility locations.

City of Hoboken - Microgrid Stakeholder Facility List

Design Summary #	Building Name	Owner/Stakeholder	Type	Location	Existing DER	Thermal Load	Est. kW Load	Estimated sf.	FEMA Class
1	Fire Company 3	City of Hoboken	Emergency Facility	1313 Washington St.	Yes	Energy Audit Available	50	3,300	IV
5	Police Headquarters	City of Hoboken	Emergency Facility	106 Hudson St.	Yes	Energy Audit Available	150	23,000	IV
8	Pump Station 5th Street	North Hudson Sewerage Authority	Flood Control	500 River Road	Yes	N/A	750	N/A	IV
9	Pump Station 11th Street (H5)	North Hudson Sewerage Authority	Flood Control	83 11th Street	Yes	N/A	150	N/A	IV
10	Pump Station H1	North Hudson Sewerage Authority	Flood Control	99 Observer Highway	Yes	N/A	225	N/A	IV
12	City Hall (Emergency Operations)	City of Hoboken	Emergency Facility	94 Washington	In Design	Energy Audit Available	225	22,000	IV
15	Hoboken Homeless Shelter	Not for Profit	Shelter	300 Bloomfield	Yes	()	45	3,500	III
16	St. Matthews Church	Not for Profit	Shelter	57 8th Street	No	()	15	4,500	III
17	St. Peter and Paul Church	Not for Profit	Shelter	404 Hudson Street	No	()	30	5,000	III
19	Kings Grocery	For Profit Entity	Groceries	325 River St.	No	()	450	()	N/A
20	Kings Grocery	For Profit Entity	Groceries	1212 Shipyard Lane	No	()	450	()	N/A
24	Garage B	City of Hoboken	Parking Garage	28 2nd Street	In Design	N/A	90	N/A	N/A
25	Garage D	City of Hoboken	Parking Garage	215 Hudson Street	In Design	N/A	225	N/A	N/A
26	Garage G	City of Hoboken	Parking Garage	315 Hudson Street	In Design	N/A	150	N/A	N/A
30	Columbian Towers	For Profit Entity	Senior Housing	76 Bloomfield Street	No	()	150	()	III
51	YMCA	Not for Profit	Shelter	1301 Washington Street	No	()	150	()	III
54	CVS Pharmacy	For Profit Entity	Pharmacy	59 Washington Street	No	()	150	18,000	N/A
55	Walgreens	For Profit Entity	Pharmacy	101 Washington Street	No	()	90	6,000	N/A
31-41	Andrew Jackson Gardens (19 buildings)	Hoboken Housing Authority	Env. Justice Pop	Marshall, Harrison, Jackson St.	Yes	Energy Audit Available	600	500,000	III
31-41	Harrison Gardens (2 buildings)	Hoboken Housing Authority	Env. Justice Pop	Marshall, Harrison, Jackson St.	Yes	Energy Audit Available	600	192,000	III
31-41	Adams and Monroe Gardens (2 buildings)	Hoboken Housing Authority	Env. Justice Pop	Marshall, Harrison, Jackson St.	Yes	Energy Audit Available	600	98,000	III

Washington Street Study Area total estimated kW	3545
Housing Authority Study Area total estimated kW	1800



Public Service Electric and Gas Company

March 9, 2017

Mr. Caleb D. Stratton AICP, CFM
Principal Planner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Dear Mr. Stratton,

This correspondence serves to demonstrate PSE&G's support of Hoboken's application to the Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive program. PSE&G will work with you, other town officials and your consultant to develop and submit your feasibility study, if selected for funding.

PSE&G will support your study in the following ways:

- PSE&G will provide building load data for all buildings included in your microgrid feasibility study, contingent on receiving approval from the owners of each of the buildings to release its electric and gas load data to the town or its consultant.
- PSE&G will provide technical support to you and your technical consultant in the development of your feasibility study. We expect that the existing Non-Disclosure Agreement can continue to be used if needed, but the NDA may need to be amended to add your technical consultant, should any confidential or propriety information need to be disclosed.

Ms. Caren Freyer DeSouza will be the primary point of contact for PSE&G to coordinate our efforts with your team. Please feel free to reach out to me at 856-778-6705 if you have any technical questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Henry".

Michael Henry
Distribution Business Team Leader

MEMORANDUM OF UNDERSTANDING
Between and Among
Department of Energy–Office of Electricity Delivery & Energy Reliability,
New Jersey Board of Public Utilities,
Public Service Electric & Gas Company,
and the City of Hoboken, New Jersey

SUBJECT: Enhancing Electric Power Resiliency Using Advanced System Designs

Parties

The Parties to this Memorandum of Understanding (MOU) are the U.S. Department of Energy (DOE) Office of Electricity Delivery & Energy Reliability (DOE OE), the New Jersey Board of Public Utilities, the Public Service Electric & Gas Company (PSE&G), an investor-owned electric and gas utility, and the City of Hoboken, New Jersey (Hoboken). To the extent this MOU contemplates action by the Sandia Corporation (Sandia), a Delaware Corporation that operates Sandia National Laboratories (SNL) pursuant to Contract No. DE-AC04-94AL85000 with DOE, DOE will direct Sandia action and be responsible to the other parties to this MOU for Sandia action.

Background

Our nation faces significant risk from prolonged electrical outages, which, largely because of extreme weather events, have been steadily increasing in frequency since 1995. What our nation needs is a resilient grid that can adapt to large-scale disruptive events, and remain operational in the face of adversity, thus minimizing the catastrophic consequences that affect quality of life, economic activity, national security and critical-infrastructure operations. To address these challenges, DOE and SNL have developed an Energy Surety Design Methodology (ESDM) to enhance the reliability and resiliency of the electric infrastructure to meet local critical needs.

The ESDM is a quantitative risk-based assessment approach developed to help communities evaluate regional critical and priority energy needs and identify advanced solutions to attain energy system performance goals. At the core of this methodology is the use of advanced, smart-grid technologies and distributed and renewable-energy power generation and storage resources as a way to improve the reliability, security, and resiliency of the electric grid during a disruptive event. Advanced or smart design approaches use modern communication and energy-management and -control technologies to enable distribution system feeders to operate both 'grid-tied' and 'islanded,' using renewable and distributed energy generation and storage components to support demand/response opportunities for utilities when grid-tied, and to enhance local-area energy reliability and resiliency when islanded.

The ESDM process typically consists of 3 phases:

Phase 1: Team with local public officials and their infrastructure, public safety, social services, and others appropriate coordinators to develop a detailed understanding of (a) the municipality's critical and priority energy needs; (b) the local energy system design and functions relative to local and regional energy and other critical infrastructure interdependencies; and (c) potential

issues, challenges, and/or constraints (regulatory, financial, structural, or environmental). This can include but would not be limited to:

- evaluating likely outage durations and providing information on historical critical and priority energy demand loads as available;
- providing design drawings of electrical and natural gas distribution system layouts, one-line diagrams, switchgear and transformers, fault studies, etc., to help assess single points of failure and appropriate grouping and sorting of critical energy needs;
- providing information and input on communication infrastructure capabilities to support advanced or smart grid operations such as AMI; and
- supporting evaluation of the use of distributed energy generation and storage resources and technologies and local opportunities such as wind, solar, natural gas, waste to energy, or combined cooling, heating, and power.

Phase 2: Working jointly with public officials, identify and evaluate potential system improvements, including infrastructure changes, equipment improvements, and distributed energy generation and storage resource considerations. Using consequence and risk-management modeling tools and techniques, such as generic fault trees or system-dynamics-based modeling depending on system complexity, assess the benefits of various improvements to overall energy system performance and resiliency. This can include but would not be limited to:

- supporting evaluation of approaches for load shedding, optimization of distributed energy and storage resources, efficient use of existing energy infrastructure, and other infrastructure improvement considerations;
- supporting training on consequence modeling use by team members; and
- supporting power-flow analysis of potential upgrades to determine power reliability, system stability, and power quality.

Phase 3: Based on the consequence and power-flow modeling results, jointly assess the cost and performance identified for energy system improvement options and develop conceptual designs that will cost-effectively meet the energy system supply, efficiency, reliability, resiliency, and restoration goals. Cost/performance estimates for various design options may be developed to aid in developing final design requirements and to help support approval and funding of the energy infrastructure improvements. Efforts can include but would not be limited to:

- providing information on cost-estimating tools used and updates needed to account for local construction practices, costs, and scheduling requirements;
- jointly presenting preliminary findings and conceptual designs to public officials and regulatory agencies as required; and
- supporting development of a conceptual design report appropriate for use by architecture and engineering firms who, in cooperation with a utility such as PSE&G and with technical support from Sandia as needed, can develop final designs that incorporate the identified smart-grid and distributed generation improvements such that the energy system resiliency and reliability performance goals are met.

The ESDM framework has been applied at more than 25 sites, primarily military, across the country in cooperation with over 20 local and regional utilities. Current designs are up to 4 MW in size with up to 50% renewable-energy power generation penetration. Construction and demonstration of several designs have been coordinated with the United States Army Corps of Engineers Construction Engineering Research Laboratory, while other designs have been

implemented with other groups and utilities. The demonstrations have shown that energy management and resource control within a smart-grid framework can enhance reliability, provide enhanced resiliency to the energy system, improve renewable and distributed-energy use, while also being cost-effective in both grid-tied and islanded operations

Purpose

While the ESDM approach has been used extensively with military installations, it has not been applied to large electric and gas utilities. This MOU establishes a relationship with the Parties to facilitate the exploration of ESDM application in Hoboken to: (i) collaborate in applying ESDM and the associated analysis modeling and (ii) design tools to assess the potential benefits and costs associated with implementing smart-grid technologies to improve energy reliability and resiliency in the PSE&G service area in Hoboken. Under this MOU, DOE OE, through Sandia, may work cooperatively with designated city officials and utility coordinators from Hoboken, and PSE&G representatives and utility engineers, to jointly identify, model, and evaluate potential advanced and cost-effective solutions

Authority

DOE enters into this MOU under the provisions of section 646 of the Department of Energy Organization Act (Pub. L. 95-91, as amended; 42 U.S.C. § 7256).

Implementing Agreements

The details of the levels of support to be furnished to one organization by the other with respect to funding will be developed in specific implementing agreements subject to availability of funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Antideficiency Act, 31 U.S.C. §1341 and/or any State of New Jersey equivalent. Agreements or project plans that set forth specific arrangements for program implementation shall be separately developed and implementing agreements, if any, facilitated by this MOU shall be subject to the mutual agreement of the Parties, each in its sole discretion. Specific funding and tasking will be established under such implementing agreements. Appropriate patent and other intellectual property provisions shall be separate and distinct from this MOU, and shall be consented to by implementing agreements entered into by the Parties, each in its sole discretion.

The DOE patent and intellectual property policies shall apply to any such work performed by a contractor such as Sandia (including any subcontractors) that is funded in whole or in part by DOE under the implementing agreements. No claims for consequential damages, incidental damages, claims for lost profits, or other indirect damages arising out of or resulting from the work conducted under implementing agreements facilitated by this MOU shall be allowed under this MOU, except as expressly provided for in the applicable implementing agreement.

Financial Obligations

This MOU does not itself authorize the expenditure or reimbursement of any funds. Nothing in this MOU obligates the Parties to expend appropriations or enter into any contract, implementing

agreement, or other obligations. This MOU is not a DOE Reimbursable Agreement, Cooperative Research and Development Agreement, or procurement. Signature of this MOU does not constitute a financial obligation on the signature parties. Each signatory party is to use and manage its own funds in carrying out the purpose of this MOU. Transfers of funds or items of value are not authorized under this MOU. This MOU shall not be used to obligate or commit funds or as the basis for the transfer of funds. This MOU does not commit any Party to take any actions; the actions of each Party are independent of, and not obligated by, the actions of the other Parties.

This MOU shall not effect nor in any way limit the exercise of the authority of the New Jersey Board of Public Utilities or of the State of New Jersey, in any future petition or in any future proceeding, with respect to rates, franchise, services, financing, accounting, capitalization, depreciation or in any other matters affecting PSE&G. In an appropriate subsequent proceeding, PSE&G shall have the burden of demonstrating whether, and to what extent, any costs associated with this MOU or any subsequent implementation shall be allocated to ratepayers.

Reservation of Rights

Nothing in this Agreement shall be interpreted as limiting, superseding, or otherwise affecting a Party's normal operations or decisions in carrying out its statutory or regulatory duties. This MOU does not limit or restrict the Parties from participating in similar activities or arrangement with other entities.

Legal Effect

This MOU is strictly for internal management purposes for each of the Parties. It is not legally enforceable and shall not be construed to create any legal obligation on the part of any Party. This MOU shall not be construed to provide a private right or cause of action for or by any person or entity. No damages of any kind can result as a consequence of this MOU.

Term

This MOU shall take effect upon the signature of all the Parties, and shall remain in full force and effect for a period of 1 year from the date of the MOU. This MOU may be amended by written agreement of the Parties. Any Party may withdraw from this MOU in its sole discretion upon thirty (30) days written notice to the other Parties.

**DEPARTMENT OF ENERGY – OFFICE OF ELECTRICITY DELIVERY & ENERGY
RELIABILITY (DOE/OE)**

By: 

Typed Name: Ravi Gorur

Title: Deputy Assistant Secretary, Power System Engineering

Date: 6/13/13

NEW JERSEY BOARD OF PUBLIC UTILITIES

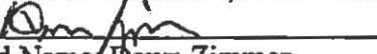
By: 

Typed Name: Robert M. Hanna

Title: President

Date: 6-13-2013

CITY OF HOBOKEN, NEW JERSEY

By: 

Typed Name: Dawn Zimmer

Title: Mayor

Date: 4/13/13

PUBLIC SERVICE ELECTRIC & GAS COMPANY (PSE&G)

By: 

Typed Name: Ralph LaRossa

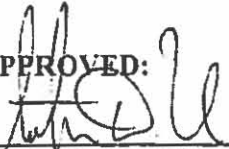
Title: President and Chief Operating Officer

Date: 6/13/13

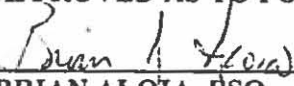
Meeting date: February 15, 2017

Councilperson	Yea	Nay	Abstain/Present	Absent
Ravinder Bhalla	/			
Peter Cunningham				
Michael DeFusco	/			
James Doyle	/			
Tiffanie Fisher	/			
David Mello	/			
Ruben Ramos, Jr.	/			
Michael Russo	/			
President Giattino	/			

APPROVED:


STEPHEN D. MARKS
BUSINESS ADMINISTRATOR

APPROVED AS TO FORM:


BRIAN ALQIA, ESQ.
CORPORATION COUNSEL



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

CHRIS CHRISTIE
GOVERNOR

KIM GUADAGNO
LT. GOVERNOR

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

April 17, 2017

Mayor Dawn Zimmer
Office of the Mayor
City Hall
94 Washington Street
Hoboken, NJ 07030

Dear Mayor Zimmer:

The NJBPU Town Center DER Microgrid Evaluation Team (Evaluation Team) has received your application for a TC DER microgrid feasibility study incentive. While this application was accepted for evaluation, there are a number of items that are required to be submitted in order to complete that evaluation. These items are listed below:

1. A general description of the overall cost
2. The timeframe to complete the feasibility study

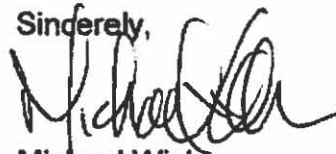
BPU has received 13 proposals for feasibility study incentives. The Board's approved DER microgrid line item budget is \$1 million. The 13 proposals significantly exceed that budget. The TC DER evaluation team is requiring that you submit a best and final offer (BAFO) for your proposal. This BAFO should 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.

April 17, 2017

Page 2

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,

A handwritten signature in black ink, appearing to read "Michael Winka". The signature is fluid and cursive, with a large initial "M" and a long, sweeping tail.

Michael Winka
Senior Policy Advisor



Mr. Richard S. Mroz
 President
 State of New Jersey
 Board of Public Utilities
 44 So. Clinton Avenue
 Third Floor, Suite 314 - P.O. Box 350
 Trenton, New Jersey 08625-0350

May 1, 2017

RE: NJBPU Town Center DER Microgrid Evaluation Team Request for Information

Dear President Mroz:

Thank you for providing Hoboken with the opportunity to respond with a best and final offer. As you may be aware, we have already invested significant time, energy, and money into reaching our current stage of development, including the installation of conduit for a microgrid along the entire length of Washington Street. Therefore, we respectfully request the grant amount of \$157,000.00 to help further advance our project. I am confident that the BPU will leverage tremendous value from this project which will serve as a model for energy resiliency and reliability the State of New Jersey.

The TCDER funds will be used to procure a design team capable of investigating and proposing solutions to advance a microgrid within the PSE&G service territory. Investigation scope and elements of the feasibility study are summarized on pages 5 and 6 of our application (attached). It is expected that the prime investigator as well as subcontractors, will meet with the City of Hoboken on a regular basis throughout the 1-year feasibility study timeframe, with PSE&G providing technical support as needed. We request that the following breakdown of costs and schedule of events associated with the different project phases be considered by the NJBPU evaluation team:

Phase	Feasibility Study Element	Timeframe (Weeks)	Budget	Percentage of Costs
1	Scoping/Stakeholder Outreach	3	\$ 5,000.00	3%
2	Background Data Collection	5	\$ 12,000.00	8%
3	Concept Development	10	\$ 30,000.00	19%
4	Alternatives Analysis	14	\$ 40,000.00	25%
5	Feasibility Report	20	\$ 70,000.00	45%
	Total	52	\$ 157,000.00	100%

*Stakeholder identification will begin in advance of award to prime and sub-contractors. This phase of the feasibility will address additional outreach and coordination, as well as establishing a steering committee comprised of the different project stakeholders.

OFFICE OF THE MAYOR


The timeframe above commences once Hoboken has issued a notice to proceed following our open public procurement process per New Jersey Local Public Contracts Law & Rules (N.J.S.A. 40A:11-1 et seq. and N.J.A.C. 5:34). We will require that the prime contractor provide a proposal consistent with the following terms: There will be no more than three subcontractors; and, each individual subcontractor contract will not exceed \$50,000.00; and, the cumulative value of subcontractor contracts will not exceed \$100,000.00.

I want to restate that Hoboken is very committed to the successful implementation of a microgrid. We are willing to offer a local match in the form of a \$20,000.00 contribution of staff time from Caleb Stratton, Principal Planner (8hrs/week full time equivalent) and an \$8,000.00 contract with Joe Sullivan, Vice President of Concord Engineering acting as a project advisor.

Additional resources have been committed from Rocky Mountain Institute in the form of advisement from Leia Guccione, Principal, of the Electricity Innovation Laboratory (eLab). Should this project advance, advisory and supportive roles will not receive a budgetary allocation from the award from BPU.

This is a critical project for the City of Hoboken, on a critical timeline. The installation of underground conduit is underway, with an expected completion date of summer 2018. Multiple generators have been installed throughout the city, and we are currently pursuing solar installations at some of the facilities studied in the Sandia report. We are in need of funds to advance the connection and automation of these assets and are grateful to the Board of Public Utilities for providing this opportunity.

Sincerely yours,



Dawn Zimmer

The Hoboken Microgrid

The City of Hoboken respectfully requests that a feasibility study be funded by the Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program in the amount of \$200,000. The feasibility study will be conducted in direct coordination with PSE&G and the New Jersey Board of Public Utilities.

In general, the feasibility study will focus on two main project areas. The first area of focus is the Washington Street study area, which includes in excess of 6,000 linear feet of dual 6-inch conduits that are under construction exclusively for the purpose of connecting critical facilities through a parallel medium voltage distribution network. This area is within 500 feet of at least 18 critical facilities that were studied as part of Sandia National Laboratories Preliminary Design Summary (Design Summary), and are located in an area of the city that is elevated above the 100 year floodplain. The second area of focus is the Hoboken Housing Authority main campus and includes, at a minimum, approximately 23 facilities spanning 800,000 square feet and serving 931 public housing units.

The attached map depicts the boundaries of the project and the approximate distances between critical facilities.ⁱ The attached excel spreadsheetⁱⁱ outlines the approximate size of the project in energy load, lists project partners and estimates the square footage of buildings to be included in the study. A Letter of Support from PSE&G is also attached.

Project Background

Hoboken is bordered by the Hudson River and Upper New York Bay to the east, the Lincoln Tunnel Helix to the North, the Palisades to the West, and Lackawanna Terminal/Holland Tunnel area to the south. It is a critical regional gateway accessed by nearly every mode of transit in the New York Metropolitan Area and has over 52,000 residents living within approximately 1 square mile.

In 2012, Hurricane Sandy made landfall on the Atlantic coast as a Category 2 storm. In the Upper New York Bay, storm surges were recorded up to 13 feet above mean sea level, resulting in severe flooding across more than 70% of Hoboken. In the days following the storm power to major substations in the area was available, yet the city's electrical distribution system was de-energized, and critical facilities and services lost the ability to function.

To address growing concerns related to prolonged electrical outages, and specifically the effect these outages had on the health and safety of urban residents, a memorandum of understanding was drafted between and among the United States Department of Energy Office of Electricity Delivery and Energy Reliability, the New Jersey Board of Public Utilities, Public Service Electric and Gas Company, and the City of Hoboken, New Jersey. The subject of the memorandum was to enhance electric power resiliency using advanced system design.ⁱⁱⁱ

Sandia National Laboratories was engaged to prepare a design summary that would power critical facilities under a design basis threat. In the case of Hoboken, this threat was established as a prolonged power outage of at least seven days, including a flood event exceeding the 100 year flood elevation. In September 2014, Sandia National Laboratories published the City of Hoboken Energy Surety Analysis: Preliminary Design Summary (Design Summary), the contents of which are attached to this proposal^{iv}.

The Design Summary establishes both the purpose of the microgrid project and the demonstrated need for microgrid services. In addition, the New Jersey Town Centers Distributed Energy Resource Microgrids Potential: Statewide Geographic Information Systems Analysis Technical Report identifies Hoboken as a Town Center Microgrid and the New Jersey Energy Masterplan also identifies the Hoboken Microgrid as a critical project.

Project Description

The purpose of the proposed feasibility study is to analyze the specific conditions within the project area that present potential technical, financial and regulatory challenges, and to propose strategies or solutions to overcome existing barriers to project implementation. This grant project will build upon the work performed by Sandia National Labs, but not duplicate previous efforts in any way. Although comprehensive in its investigation, the Sandia study did not provide an implementation strategy for the city, nor did it address operation under blue sky conditions. It became apparent that reaching the project goals and objectives would be difficult, if not impossible, based on the scope and complexity of the proposed action. From 2014 through the present, the City has worked diligently to take incremental actions that build towards the intent of the Design Summary, while modifying certain recommendations. Much of the background information from the Design Summary has influenced the City's microgrid progress over the last few years which includes, but is not limited to:

- Installation of Distributed Energy Resources (DER) at multiple municipal, sewerage authority and housing authority sites, compatible with the proposed microgrid.^v
- The installation of a fiber optic conduit and 13.8 kV distribution network as part of a 16 block Washington Street redesign that will act as a medium voltage "spine" for the proposed project area.^{vi}
- Reducing the scope of the Design Summary investigation from 55 critical facilities to approximately 18 facilities located within 500 feet from the Washington Street "spine" and approximately 23 Housing Authority Facilities as part of a Combined Heat Power (CHP) feasibility project (In collaboration with the Department of Energy's Combined Heat and Power Accelerator).
- Redesign and Elevation of the 16th Street PSE&G Substation (Completed).
- Redesign, consolidation and elevation of the Marshall Street and Madison Street substations from 4kV to 69kV (Estimated date of completion is summer 2019).
- Land swap agreement with PSE&G to provide a site for DER or CHP facilities for the Hoboken Housing Authority at the current Marshall Street Substation.^{vii}

- Replacement of low pressure gas mains to high pressure gas mains city-wide as part of the energy strong program.
- Analysis of utility models and refinement of system design with Rocky Mountain Institute.
- Installation of Energy Efficiency projects at City Facilities (mostly related to lighting improvements).
- Execution of multiple memorandums with local/state and federal agencies, as well as inter-local agreements for complex projects.

In the Design Summary, 55 buildings were selected from working group meetings with stakeholders and City officials. The original 55 buildings included emergency response facilities, flood control facilities, shelters, parking garages, pharmacies, grocery stores, gas stations, and senior and affordable housing properties. Each service provided by these facilities is considered critical because it affects the ability for the City to provide essential functions, perform emergency response, and shelter the most vulnerable residents.

In the almost five years following Hurricane Sandy, and after extensive renovations and rehabilitations of facilities in the floodplain, City staff and advisors have come to the conclusion that the focus of the public/private microgrid investments should be made in areas outside of the floodplain, where possible. This single change will significantly reduce retrofitting costs, and furthermore, limit the likelihood of system failure. However, given the criticality of assisting social justice populations in the floodplain, an additional study area has been identified immediately north of the Marshall Street Substation, and encompassing the Hoboken Housing Authority Campus.

Costs to implement the 55 building microgrid presented by the Design Summary on page 204 estimated construction costs at a \$48.4M in 2014. This estimate included building retrofits, controls and communications, microgrid infrastructure, combined heat and power, design and engineering, with a 25% contingency. By reducing building retrofits, limiting the number of new generation sites (aggregating to a larger generation site), limiting the scope of facilities and installing the underground conduit on Washington Street, the cost breakdown for this project will be reduced substantially.

To optimize costs the feasibility study will likely utilize proprietary economic modeling spread sheets for Combined Heat and Power economics. In addition, once a project team is fully established, the intent is to use eGrid data and the USCHPA emissions savings calculators to estimate the net impact of the microgrid on CO₂ and NO_x emissions. The City will work with PSE&G as the Electric Distribution Company to evaluate the interconnection between the microgrid and PSE&G's distribution system. To the extent that PSE&G deems it necessary or appropriate the City will seek their input on these issues which may require use of their in-house analytics, which may be proprietary. The feasibility study will also evaluate the locational value to the electric grid from the proposed microgrid with software currently being developed by Rutgers University, or the Distribution Grid Locational Performance Modeling Tool model

being developed by Berkley Labs based on the DER-CAM model. Both models are currently in development stage and it is anticipated that both groups will provide insight into how a microgrid provides value to the electrical grid and how to quantify that value.

The PSE&G distribution system is a network system which has great reliability and redundancy. As is required for CHP or other DG it is expected that dedicated communications will be required between the microgrid generation and building interfaces with the existing PSE&G substations. PSE&G is currently reinforcing their substations and associated distribution systems so we will have the opportunity to integrate operations with new state of the art systems. Due to the distributed nature of the proposed microgrid, spanning multiple locations within the City, there will be local level interconnections, the simplest of which would be traditional transfer trip switches such as those used by emergency generators and more sophisticated synchronized interconnections, as is typical for closed transfer with CHP systems.

A grid interconnection interface will be required to coordinate the connection to the electric grid and islanding operations in the event of an emergency. When operating in island mode a microgrid controller will be necessary to coordinate the generating units being operated and will be necessary to synchronize to the grid when returning to normal power. It will be determined during the study phase which manufacturer's microgrid controller would be most effective in this role. Detailed input will be sought from PSE&G on what Utility Control equipment and communications will be necessary to assure safe operation both when grid connected and when operating in island mode. There is expected to be some automatic control, but it may be necessary to establish some manual or permissive control interlocks to ensure worker safety.

The microgrid does not contemplate any normal power export to the grid; however, opportunities such as behind the meter Demand Response or Synchronizes Reserve will be considered and where possible individual facilities will site solar, thermal or other forms of renewable energy that can be incorporated into the microgrid service model. If a larger central generator is incorporated to the microgrid it will need to consider revenue opportunities which could include participating in the PJM Capacity market in order to provide offsetting project revenue. The business model will engage stakeholders and anchor facilities that constitute a majority of the baseline microgrid energy load. The North Hudson Sewerage Authority and Hoboken Housing Authority have provided expressions of support consistent with the previously Design Summary, and constitute major project partners. It is important to note that the North Hudson Sewerage Authority serves the communities of Weehawken, Union City and West New York, elevating this project to being regionally significant.

If the project is advanced, the City envisions creating a Microgrid Request for Proposals or Qualifications depending on the input from the Board and PSE&G. The RF(P)(Q) would seek to develop a well-rounded team capable of undertaking the feasibility report. The City will work with its authorized project agent, Concord Engineering, to establish a mechanism to consolidate procurement under local public contracts law. The City will also offer an in-kind contribution of

10% of the project costs in staff time and resources to help manage the completion of the feasibility study within a one year period from award. In general, the City will take the lead on any procurement related issues, and where appropriate, act as an agent for interested parties to the microgrid MOU. The RF(P)(Q) could envision one or several companies bidding as a team in order to accomplish the goal of completing the feasibility study as defined after coordination with project partners. The investigation should include:

- Identification of stakeholders.
- A baseline characterization of electric and thermal facility demands and construction information.
- Engineering due diligence to reduce the complexity and cost of reaching buildings from the Washington Street conduit and refinement of the project area consistent with the attached map and list of facilities.
- Performing field based due diligence on siting new manholes and transformers.
- Defining network voltage.
- Identifying PSE&G interconnections.
- Defining a supervisory control and data acquisition architecture (SCADA). In the past, the City has entertained conversations with IPERC's control technology, but is open to the consideration of other technologies.
- Performing investigations on existing generation sites and identifying necessary permits for additional periods of operation. Identifying necessary generation improvements
- Identification of sites for new DER.
- Identification of sites best suited for EE measures in advance of microgrid development.
- Operating parameters of: independent facilities utilizing DER; Microgrid paralleling capabilities and the ability to operate in island mode in the event of a central grid outage; and Microgrid operation while grid connected for energy services.
- Microgrid operations under a design basis threat.
- The approximate size of the microgrid; consistent with the Sandia study with a lower bound solution of approximate 18 facilities and ~3.5MW, or an upper bound solution of approximately 41 facilities and ~5 MW.
- The microgrid will consider: optimization of CHP units for the Housing Authority and Senior Facilities as a priority; or a centralized CHP facility; or a CHP facility and generator collocated at a facility yet to be constructed – potentially as the point of interconnection.
- The inclusion of a thermal loop, where appropriate.
- The location of a sufficiently large and efficient generator to support islanding for the Washington St. Area.
- Evaluation of energy storage to enable integration of solar renewable energy.
- Evaluation of biodiesel as a renewable fuel for the larger generators or dual fuel units.
- Consideration of a microgrid "service charge" to recipient facilities, or to recipient service area.

- Investigation of a special purpose vehicle to share risk and financial obligations between different entities.
- Investigation of the Commercial Energy Aggregation opt-out program to consolidate procurement issues.
- Investigation of the Energy Savings Improvement Program.
- Investigation of a Municipal Energy Authority.
- Investigation of clean energy rebates.
- Insurance and Liability identification.
- A methodology to test project assumptions.
- A general outline of the anticipated and potential revenue streams for the microgrid such as; Demand Response, Peak Shaving, Frequency Regulation, Synchronized Reserve or other potential PJM/ PSE&G value streams.

Elements of the feasibility study should include, but are not limited to:

1. The proposed technology and generation mix.
2. The location of new distribution infrastructure.
3. A business model that incorporates strategies to finance capital costs, operation and maintenance for the microgrid solution set.
4. A regulatory framework to continue partnership with PSE&G.
5. Defining ownership operation and maintenance models for the project stakeholders.
6. Defining responsibilities of interested and vested agencies.
7. Drafting interlocal agreements as necessary.
8. The inclusion of energy efficiency measures and developing renewable energy options, as well as including, CHP to address the requirement that the project comply with the funding justifications for use of Societal Benefits funds.
9. A design document capable of soliciting bids for further design advancement.

The point of contact for the grant application is Caleb Stratton, the Principal Planner for the Hoboken. He will be supervised by Stephen Marks, Business Administrator. The project team will be advised by Joe Sullivan, Vice President of Engineering for Concord Engineering. The project team will also be advised by Leia Guccione, Principal of Rocky Mountain Institute Electricity and Industry Practice. The point of contact from PSE&G is Caren Freyer DeSouza, with additional support from Michael Henry.

ⁱ Project Area

ⁱⁱ Facility Summary and Characteristics

ⁱⁱⁱ Previously authorized MOU; Council Authorization for Grant Application

^{iv} Sandia National Laboratories Preliminary Design Summary

^v Generator Construction Documents available upon request (large files)

^{vi} Washington Street Construction Documents available upon request (large files)

^{vii} Land Swap agreement available upon request

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.

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

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MEMORANDUM OF UNDERSTANDING
BETWEEN AND AMONG
THE NEW JERSEY BOARD OF PUBLIC UTILITIES,
AND
CITY OF HOBOKEN

THIS MEMORANDUM OF UNDERSTANDING (“MOU”), is made this ____ day of _____, 2017, by and between The CITY OF HOBOKEN (“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); Distributed Energy Resource (DER);

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

33 **WHEREAS**, specifically, this new policy recommends that:
34
35 “The State [of New Jersey] should continue its work with the [United States Department of
36 Energy], the utilities, local and state governments and other strategic partners to identify, design
37 and implement Town Center DER microgrids to power critical facilities and services across the
38 State.”; and

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

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

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

48 **WHEREAS**, BPU Staff issued a draft application for public comment regarding
49 this Program on August 5, 2016, a public meeting to discuss the draft application on August 23,
50 2016, and written comments were received and considered and staff responses were published;
51 and

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

55

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

59 **I. INCORPORATION**

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

66 **II. SCOPE OF THE AGREEMENT**

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

74 **III. DUTIES OF THE PARTIES**

75 **A.** The Recipient will submit a complete and final TCDER Microgrid Feasibility
76 Study (The Study) in accordance with the terms and conditions of this MOU and incorporated
77 documents.
78

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

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

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

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

97 F. Effective upon execution of this MOU, BPU agrees to firmly commit the sum of
98 \$157,000, to cover costs to be incurred by the Recipient to administer, complete, and deliver the
99 Feasibility Study.

100 G. All requisitions, pay applications, and invoices submitted for costs or expenses
101 associated with the Feasibility Study shall be subject to review and approval by Recipient
102 according to its standard procedures. Upon approval, Recipient shall promptly submit to BPU for

103 payment all such requisitions, pay applications and invoices. In reviewing, approving, submitting
104 and paying such requisitions, pay applications, Recipient and BPU shall be cognizant of and
105 shall comply with the requirements of the New Jersey Prompt Payment Act, N.J.S.A. 2A:30A-1
106 et seq.

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

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

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

120 K. Recipient shall procure the services necessary to complete the Feasibility Study in
121 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.,
122 and any and all applicable State and local procurement laws, rules, and procedures.

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

126

127 **IV. DESIGNATED REPRESENTATIVES**

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

130 New Jersey Board of Public Utilities
131 Attn: Michael Winka Sr Policy Advisor
132 44 S. Clinton Ave, Trenton, NJ 08625
133 Michael.Winka @bpu.nj.gov

134
135 City of Hoboken
136 Attn:
137 Addresss
138 XXXX.YYY@abc.gov

139
140 **V. MISCELLANEOUS**

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

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

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

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

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

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

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

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

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

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

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

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

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[SIGNATURE PAGE FOLLOWS]

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

Witness: City of Hoboken

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: _____