BPDA – *Smart Utilities Policy for Article 80 Development Review*
Feasibility Assessment for District Energy Microgrids – Contents Outline

Introduction:

The Feasibility Assessment should serve as the technical and economic evaluation of the applicability, scope, nature and extent of a District Energy Microgrid for a Article 80 project of 1.5 million square feet or greater, including whether District Energy, a Microgrid, and/or a District Energy Microgrid are appropriate on the project. The Feasibility Assessment must be signed by a Licensed Professional Engineer with substantial experience designing and constructing District Energy Microgrid systems. The Feasibility Assessment is composed of two parts – "Part A" and "Part B". Unless a different process is agreed upon between the project proponent and the BPDA, Part A should be submitted as part of the Project Notification Form ("PNF"). Part B should be submitted as part of the Draft Project Impact Report ("DPIR").

The review of the Feasibility Assessment Parts A and B should be a collaborative, iterative process, with several meetings between the project proponent, the BPDA, and any other pertinent parties. This iterative process is particularly important for Part B.7., where the scenarios to be tested will be defined.

The scoping level feasibility analysis associated with the District Energy Microgrid Program should include – but is not limited to – the following topics:

<u>Part A:</u>
A.1. Data Collection and Site Investigation
A.2. Utility Load Profiles
A.3. Physical System Constraints
A.4. Regulatory Constraints

<u>Part B:</u>
B.1. Definition of Economic Parameters
B.2. Business as Usual Case
B.3. Screening Analysis
B.4. Construction Cost and Schedule
B.5. Operations and Maintenance Cost
B.6. Economic Analysis
B.7. Technical Description

The following sections explain each of these topics further.

<u>Part A:</u>

A.1. Data Collection and Site Investigation

Identify and document all data that is pertinent for the analysis of a District Energy Microgrid System.

The data will include the preliminary site plan, phasing in schedule, building type, use, and occupancy, existing utilities in the area, and other facts that could impact the energy consumption and requirements for the development.

A.2. Utility Load Profiles

Develop annual 8760 models of the utility loads including chilling as they will vary throughout the phasing in of the development.

Utility profiles can be based on similar building type and building uses scaled for the new building square footage.

A.3. Physical System Constraints

Identify technical restrictions in the existing infrastructure that may be cost or feasibility impediments to the project.

Examples are natural gas supply, electric utility fault levels, supporting system capacities and conditions, etc. Some of these restrictions could be overcome through capital spending, but other restrictions may be unsurmountable. The type of review for this sections could be presented as a simple "stop sign" type of analysis, identifying "yellow lights" and "red lights." Yellow lights are defined as hurdles that can be overcome by the application of additional equipment, cost, etc. Red lights are defined as deal breakers that will stop the project. Yellow light costs should be included in the 'Screening Analysis' section. Any red lights will be identified and documented but do not need to be included in the 'Screening Analysis' section.

A.4. Regulatory Constraints

Develop an understanding of the regulatory influences on the District Energy Microgrid Project from the various utilities and other pertinent agencies. This section should include but is not limited to the following:

a) *Determine utility requirements for future electric interconnection. Definition of the scope of the electrical interface is a key consideration for construction cost and space allocation.*

b) *Determine utility capabilities for the future supply of natural gas, in terms of both capability and pressure availability.*
c) *Define the value of Alternative Portfolio Standard ("APS") credits for CHP.*
d) *Define the value of ISO New England ("ISO-NE") capacity.*
e) *Develop permitting pathways for the options considered under 'Screening Analysis' and how that may impact cost, performance, and schedule.*
f) *Explore any possible*

<u>Part B:</u>

B.1. Definition of Economic Parameters

Document the economic, regulatory and market assumptions.

This section will include the assumptions for the commodity cost of electricity and natural gas, standby rates and other costs that will be used in Business as Usual model and to inform the options selected for the future cases. The economic analysis should be produced in accordance with these assumptions.

B.2. Business as Usual Case

Define the Business as Usual ("BAU") by modeling the operations of the development taking service from the existing utility system.

A carefully defined BAU is needed to accurately estimate the value created by and risks associated with the District Energy Microgrid investment proposal. The BAU should model the operations of the development receiving service from the existing utility system. The BAU case must be defined through a quantitative model, in a manner that allows calculations and measurements necessary to gain the appropriate range of insights. Insights should be provided not only with respect to capital stewardship, operating costs, and financial risks, but also with respect to implications for energy efficiency and greenhouse gas emissions.

Utility Load Profiles should be inputted into a rate model to determine the cost of serving the loads for each year of the development phase in. The model should include utility rate structures for electric and natural gas, as well as cost data that includes a demand component, energy component, and commodity costs. The model should act as a tool to as accurately as possible calculate the annual operating cost of the base case and each system studied in the 'Screening Analysis,' along with the revenue associated with Alternative Energy Credits or other programs such as demand response.

The output of the BAU is an annual base case utility cost model that will define the cost to operate the development over each of a 20-year time horizon. The model will also quantify on an annual basis the greenhouse gas emissions associated with the incremental load on the electric grid and fuel consumed on site.

B.3. Screening Analysis

Develop a series of District Energy, Microgrid, and District Energy Microgrid options, as well as other options based on existing infrastructure or energy systems on or close to the site, that should be compared to the BAU case.

This section should take a "clean canvas" approach, allowing the developer to determine the best fit for utility generation that will optimize efficiency, economics, sustainability, and resiliency.

Typical options to be reviewed include but are not limited to:

a) Gas Turbines including Micro Turbines
b) Fuel Cells
c) Reciprocating Engines
d) Various chiller configurations that work with the generating equipment to optimize efficiency and economics
e) Photovoltaics ("PV")
f) Energy Storage
g) Combined Heat and Power systems ("CHP")

The options defined above should be run through the model used to define the Business as Usual Case to calculate the new utility operating cost, energy efficiency change, and greenhouse gas emissions change. For each option studied, the report should include information that defines the level of resiliency that each system could provide (i.e., the thermal and/or electric loads that could be served in island mode during a potential failure of the macro electric grid.)

B.4. Construction Cost and Schedule

Estimate the construction costs for the complete construction of the BAU and other options identified in the 'Screening Analysis' section.

The construction cost estimates include all of the scope required for the complete construction of the BAU and each option identified in the 'Screening Analysis' section. The high-level cost can be developed using a factored cost estimate based on the experience from building similar plants. A high-level construction schedule should be developed as the basis for the cost estimate and the phasing in of the capital investment. The cost estimate and schedule should include allowances for infrastructure work, phasing in, and preparatory work required to make the site ready for the main construction.

B.5. Operations and Maintenance Cost

Estimate Operations and Maintenance Costs for the BAU and other options identified in the 'Screening Analysis' section.

Development of Maintenance and Operations Cost for the options should utilize a Long Term Service Agreement cost structure and philosophy for the prime mover package. Additional or reductions in FTE staff will be identified as compared to the BAU case. Budgets for incremental consumables compared to the BAU case should be included.

B.6. Economic Analysis

Perform an Economic Analysis of the options identified in the 'Screening Analysis' section.

The economic impact of the options should be displayed on a simple ROI investment basis. Credit against the capital cost should be given to the options. The ROI should be based on 100% equity. The ROI should be compared to investment hurdles typically required by infrastructure investment funds.

B.7. Technical Description

Provide a Technical Description of the preferred energy system

This Technical Description should be 2-3 pages in length and include a description of the following items as a minimum:

1. *Utility Load Profiles for electric, hot water, steam and/or chilled water*
2. *Microgrid Electrical System*
3. *Thermal Distribution System*
4. *Generation, Storage System Capabilities*
5. *Electric Interconnection Operations*
6. *Fuel Supply and Storage*
7. *Operations and Maintenance Plan*