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May 14, 2024

Ms. Luly Massaro, Clerk Rhode Island Public Utilities Commission 89 Jefferson Boulevard Warwick, RI 02888

Re: Docket No. 22-47-WW- The Narragansett Bay Commission

General Rate Filing

Dear Ms. Massaro:

cc:

Enclosed please find an original and nine copies of the following:

1. The Narragansett Bay Commission's Response to the Rhode Island Public Utilities Commission's First Set of Data Requests regarding the Narragansett Bay Commission's Motion For Relief.

Please note that an electronic copy of this document has been provided to the service list. Thank you for your attention to this matter.

Sincerely,

Joseph A. Keough, Jr.

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Docket 22-47-WW Service List (via electronic mail)

Comm. 1-1: Please provide a brief explanation of the biogas cogeneration facility and associated digestors. Please be sure to include nameplate capacity and expected annual output when complete and running solely on biogas. Please explain how the system is currently operating, how it should ideally operate, and how NBC plans to operate it in the future.

Response:

A. Brief Explanation Of The Biogas Cogeneration Facility And Associated Digestors

The digesters and biogas cogeneration facility are located at NBC's Bucklin Point Wastewater Treatment Facility (BPWWTF) in East Providence. They are described below.

Digesters:

The digester system consists of three primary digesters and one secondary digester, fitted with a floating cover, which serves as a storage tank for digested sludge and digester gas (biogas). The digestion system is designed to provide a minimum detention time of 15 days to achieve Class B stabilization of the digested sludge solids, as defined by Environmental Protection Agency ("EPA") Rule 503. Digestion of the liquid sludge prior to dewatering reduces the disposal volume of BPWWTF dewatered sludge cake by about 50%. Biogas is produced as part of the sludge digestion process.



Photo: Primary Digester Tank #1 and #2 and the Combined Heat and Power System.

Biogas Cogeneration Facility:

NBC's engineers refer to the Biogas Cogeneration Facility as a Combined Heat and Power System or CHP System. The CHP system includes the engine-generator and digester gas treatment system (DGTS). CHP components include the engine-generator, heat recovery equipment, a thermal balance system, a gas blending system, gas conditioning system and engine operating ancillaries with associated electrical and control systems. The CHP System is capable of operating on 100% biogas, a blend of biogas and natural gas, and 100% natural gas. It produces electricity and heat. Surplus biogas generated from the biosolids digestion process is fed through a gas conditioning system for cleaning and conditioning before it is combusted in the CHP System. Any excess biogas not combusted in the CHP System is burned off using two waste gas flares.

B. Nameplate Capacity Of The CHP System

- Nameplate Thermal Capacity is 2.74 MMBtu/hour
- Nameplate Electric Capacity is 644 kWac (gross power output at power factor of 1.0)



Photo: Packaged chiller Heat Exchanger and Primary Digester Blowers.



Photo: Biogas Conditioning Filter System. The biogas needs to be treated before it is fed to the engine. Excess moisture is removed from the biogas. Two filters remove siloxanes, and two filters remove hydrogen sulfide.



Photo: Combustion Engine

C. Expected Annual Output Of The CHP System When Complete And Running Solely On Biogas

According to the 2017 Technical Assessment completed for National Grid, the expected electric production from operating the system as designed is 4,810,116 kWh per year with 2,850,000 coming from biogas. A study performed in 2022 by NBC staff based on the flowmeter for the cleaned biogas indicates that up to 3,874,240 kWh may be generated from biogas.

DOCKET 22-47-WW

The Narragansett Bay Commission's Response To The Rhode Island Public Utilities Commission First Set of Data Requests

Re: NBC's Motion For Relief

D. Explanation Of How The CHP System Is Currently Operating.

The CHP System is currently activated twice a month using available biogas blended with a smaller amount of natural gas as needed to operate and preserve the integrity and prevent premature deterioration of mechanical components of the CHP System until it can be operated continuously on natural gas while the digesters are off-line for rehabilitation. NBC's objective is to operate the CHP continuously. Due to the digester rehabilitation projects, NBC is unable to operate the CHP on the biogas/natural gas blend. NBC plans to modify the CHP programing to run 100% on natural gas. Emission testing, daily monitoring, and sampling will be required.

E. Ideal Operation Of The CHP System

Ideally, the CHP System should operate in accordance with its design parameters which are:

- Operate on 100% biogas to the maximum extent feasible.
- Offset the current BPWWTF electric load through maximizing onsite generation of power.
- Offset current anaerobic digester heat demand through use of surplus heat produced from CHP system.

F. NBC's Plan To Operate The CHP System In The Future

Once the digester tanks are cleaned, repaired, rehabilitated, and returned to normal operation, NBC intends to maximize the use of biogas produced from the digestion process and increase the percent operational uptime of the CHP System to as close to 100% as possible. The CHP System is designed to use natural gas to supplement the operation during periods of low biogas production when tanks are offline for maintenance and rehabilitation.

Prepared by: Barry Wenskowicz/Robert Baglini

DOCKET 22-47-WW

The Narragansett Bay Commission's Response To The Rhode Island Public Utilities Commission

First Set of Data Requests

Re: NBC's Motion For Relief

Comm 1-2: To date, has the biogas cogeneration facility produced any usable electric energy while running on biogas? If yes, how much?

Response: Yes, a total of 296,435 kWh of net usable electric energy has been produced between 1/1/2021 through 11/30/2023 with 205,953 kWh of the total derived from biogas and 90,482 kWh derived from natural gas.

Prepared by: Barry Wenskowicz

DOCKET 22-47-WW

The Narragansett Bay Commission's Response To The Rhode Island Public Utilities Commission

First Set of Data Requests

Re: NBC's Motion For Relief

Comm. 1-3: Please provide the original cost estimate for the biogas cogeneration facility. Please also include any original estimates for the operation and maintenance of the facility.

Response: The CHP system involves intricate components, including studies and economic analyses conducted by multiple parties. Additionally, NBC staff has changed during the project, so the following costs are derived from file research.

The design engineer of record, Brown and Caldwell (B&C) estimated the capital construction cost at \$4,900,000, with estimated annual operation and maintenance costs of \$239,463, in October of 2013.

Comm. 1-4: Please provide an itemized list of costs incurred to date relating to the biogas cogeneration facility. If applicable, please include any digester costs that relate to the biogas facility. Please include all related costs (i.e., costs related to purchase and installation, maintenance, modification, operation, consultant costs, etc.) and include subtotals where appropriate.

Response: Costs for planning, design and construction of the CHP system are as follows:

12000C BPWWTF Biogas Cogeneration System

12000 Planning - Preliminary Feasibility Assessment			
Expenditure Type		Cost	
NBCFRINGE	\$	7,959	
NBCLABOR		14,471	
SCS ENGINEERS		24,700	
Total	\$	47,130	

12000 Design - Conceptual and Final Desig	gn	
Expenditure Type		Cost
BROWN &CALDWELL	\$	322,793
NBCFRINGE		43,216
NBCLABOR		79,336
OTHER		2,633
SPECIAL SERVICES		24,856
Total	\$	472,834

12000 Construction - Construction				
Expenditure Type		Cost		
ADVERTISING	\$	1,524		
BROWN & CALDWELL		413,991		
CONSULTING		19,998		
DANIELO'CONNELL'S SONS		6,829,297		
DAYMARK ENERGY ADVISORS		6,525		
NBCFRINGE		238,196		
NBCLABOR		435,660		
OTHER*		(92,442)		
Total	\$	7,852,749		

^{*}Other includes National Grid CHP Rebate of \$119,870.

Cost for the digester complex are independent of the CHP system, however as outlined in response to COM 1-5, there are some expenditures pertinent to the CHP system. Below are the costs spent to date.

81800 BPWWTF Sludge Digestion Facility Improvements

81800 Desig	n	
Expenditure Type		Cost
BLACK & VEATCH CORPORATION	\$	89,352

Operating costs to date related to biogas are as follows:

Account 54097 Biogas

Vendor	FY 2021	FY 2022	FY 2023	FY 2024	Total
Aeromet Engineering	\$ 530				\$ 530
AirGas USA			406	916	1,322
BioSpark Clean Energy			19,621		19,621
CPI Cole Parmer Instrumt	654				654
Grainger	593			31	624
Ocean State Oil				4,382	4,382
Technology Sales Associates	51,100				51,100
QED Environemntal System	24,136				24,136
BioSpark Clean Energy		1,700			1,700
Total	\$77,013	\$ 1,700	\$20,027	\$ 5,329	\$ 104,069

The Narragansett Bay Commission's Response
To The Rhode Island Public Utilities Commission
First Set of Data Requests

Re: NBC's Motion For Relief

Comm. 1-5: Please provide an itemized list of the additional costs NBC expects to incur related to the biogas cogeneration facility. If applicable, please include any digestor costs that relate to the biogas facility. Please include totals where appropriate.

Response: It is important to recognize that the improvements to the digester complex are separate from the CHP system project. NBC must complete a Digester Complex Rehabilitation Project to ensure the integrity of BPWWTF's sludge digestion process, which reduces the volume of dewatered sludge cake requiring disposal.

The design work for the Digester Complex Rehabilitation Project involves process optimization and consultation with NBC on how to effectively manage the CHP system during the project. The cost for professional and technical consulting services associated with the CHP system is \$115,825. The cost to temporarily operate the engine on natural gas during construction is estimated to be \$70,000. This includes a specialty mechanical consultant to tune the CHP equipment to operate temporarily on 100% natural gas, conduct emissions testing, professional engineering services to oversee the work, temporary system controls modifications, and a contingency.



Photo on left: Access door of the Secondary Digester, showing obvious signs of needed repair.

Photo on right: Partially obstructed primary sludge pipe that feeds the digester complex





Photo: Structural engineer performing assessment of Primary Digester No. 2

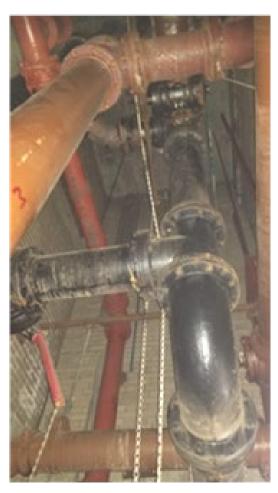


Photo: Piping gallery for Primary
Digester No. 2. Valves and piping have
exceeded their useful life and are being
replaced as part of project 81800C.

The Narragansett Bay Commission's Response To The Rhode Island Public Utilities Commission First Set of Data Requests

Re: NBC's Motion For Relief

Comm. 1-6: Ms. Giebink states at page 3 of her testimony that running the cogeneration facility on natural gas would protect the engine until improvements are made that would allow the facility to run on digester gas.

- a. Please provide an explanation (in laymen terms) of how this will protect the engine and the nature of any potential damage that will be avoided.
- b. Please provide a description of the improvements to the facility that NBC intends to make to enable the operation of the cogeneration facility on digester gas. Please include in your description a timeline for those improvements.
- c. How long does NBC expect to run the equipment solely on natural gas?

Response:

a. Running the engine regularly is required to keep the internal components of the CHP System working properly. The main issue associated with not running the engine is the degradation of the internal components due to the formation of rust. Regular movement and lubrication will prevent the formation of rust on various components such as pistons, motor, engine, and piping. Rust can develop quickly and can accumulate to the point of requiring a costly engine overhaul. Another negative impact on the unit if it sits idle for long periods is the potential for additional toxins to be discharged during the operation from the accumulated rust throughout the unit. In addition, moisture can accumulate in many of the electronic components rendering the electronic system inoperable. Running the engine dissipates this moisture buildup in the electrical components and prevents the formation of rust.

The CHP System has not been continuously operational since it was fully constructed in 2020. The downtime of the CHP system has been a significant concern, and efforts to make the unit continuously operational have been explored over the past few years, however, progress has been limited as outlined in response to COM 1-6b. The CHP system includes the engine-generator and digester gas treatment system (DGTS). While the CHP was designed to utilize biogas or natural gas as a fuel source, with the normal primary fuel being biogas gas, the unit has only operated for very brief periods on biogas gas only. The Digester Complex Rehabilitation Project is underway and programmed to be completed in late 2025 requires that the digesters are taken off-line to be cleaned. As a result, biogas will not be available for the CHP until that work is finished and the digesters are operational. To minimize downtime of the CHP, which makes it vulnerable to premature aging, the CHP unit will need to operate on natural gas until biogas gas is available.

Re: NBC's Motion For Relief

b. As part of the Digester Complex Rehabilitation Project (Project 81800D), NBC retained an engineering consulting firm to perform an inspection, condition assessment, and evaluation of the digester complex. The consultant recommended cleaning and disposing of inert materials that have slowly collected inside the digester tanks. In addition, the firm recommended the investigation and performance of structural repairs and rehabilitation to eliminate biogas leakage, to enable the digestion process and CHP System to function as designed. This work will be performed as part of project 81800C. Please see picture below of a digester tank that is in the process of being cleaned. The project is currently under construction and expected to be completed in 2025.



Photo: Worker cleaning accumulated grit and debris from Digester No. 3 at Bucklin Point.

c. NBC expects to run the CHP solely on natural gas for two years during the structural rehabilitation project at the digester complex.

564

18,797

662,778

Comm. 1-7: Ms. Giebink states at page 3 of her testimony that operating the cogeneration facility on natural gas could potentially save \$700,000 per year in electric cost and potentially double the natural gas cost of \$409,000. Please provide the calculations to support those assertions.

Estimated Gas Expense

Response: See below.

Therms

122,708

68,632

150,574

12,232

608,612 \$

Facility

IM

Biogas Facility Bucklin Point

Field's Point

COB/WQSB/LAB

Gross Earnings Average Total $Tax^{(1)}$ Delivery/therm Supply/Therm Delivery Supply Subtotal Rate Year 0.5659 69,440 0.56 68,434 137,874 4,264 142,138 0.5104 35,030 0.58 39,477 74,507 2,304 76,811 0.5576 83,960 0.55 82,289 166,249 5,142 171,391

7,027

0.55 \$ 332,667 \$ 662,778

18,233

354,146 199,636 197,227 396,863 12,274 409,137 Rate Year \$ 409,137 **Biogas Facility**

0.57

11,206

(1) Gross Farnings Tax for Biogas Facility included in estimated delivery and supply rates

0.9161

0.5424 \$ 330,111

Estimated Electricity Expense					
Average rate					
	kWh	per kWh	Projected		
Biogas Facility	Produced	Purchased	Savings		
	3,569,904	\$ 0.1932	\$ 689,851		

Prepared by: Karen Giebink

Re: NBC's Motion For Relief

Comm. 1-8: The excerpt below is from the 22-47-WW settlement agreement Paragraph 18, Section c.

- c. At fiscal year-end, NBC will compare the audited figures for the electricity expense line items to the approved cost of service and provide a report to the PUC.
 - If the actual costs are less than the approved cost of service, NBC will transfer this amount from the Operation and Maintenance Fund into the Stabilization Account prior to the end of the year transfer from the Stabilization Account to the Operating Capital Accounts to fund budgeted operating capital and pay-go capital.
 - If the actual costs are more than the approved COS, NBC would transfer this amount, less any transfers during the year, from the OMR Fund to the Operation and Maintenance Fund.
 - The balance in the OMR fund would be replenished annually, if needed, to a \$2.5 million balance as part of the annual transfers from the Stabilization Account, along with the Operating Account transfers for operating capital and pay-go capital.
- a. If, at year end, actual electric costs are less than allowed in the cost of service will the net electric savings be transferred to the Operating Capital Accounts pursuant to the 1st bullet point in Section c. above? If not, please explain.
- b. Assuming that NBC's estimates are accurate regarding potentially saving \$700,000 per year in electric cost and potentially spending double the natural gas cost of \$409,000, it would appear that NBC is receiving \$291,000 more in rates than necessary to fund its expected energy costs. Please explain what NBC intends to do with these funds and whether NBC should refund those funds to ratepayers.

Response:

- a. Yes.
- b. If, at year end, NBC's actual energy costs are less than allowed in the cost of service, NBC would follow the approved OMR Fund process and transfer that amount from the Operation and Maintenance Fund to the Stabilization Account.

Prepared by: Karen Giebink

CERTIFICATION

I hereby certify that on May 14, 2024 I sent a copy of the within to all parties set forth on the attached Service List by electronic mail and copies to Luly Massaro, Commission Clerk, by electronic mail and regular mail.

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