

September 19, 2018

VIA HAND DELIVERY & ELECTRONIC MAIL

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

**RE: Docket 4846 - 2018 Distribution Adjustment Charge
Responses to Division Data Requests – Set 1**

Dear Ms. Massaro:

Enclosed please find 10 copies of National Grid's¹ responses to the First Set of Data Requests issued by the Division of Public Utilities and Carriers (Division) in the above-referenced docket.

This filing contains a Motion for Protective Treatment of Confidential Information in accordance with Rule 1.2(g) of the Public Utilities Commission's (PUC) Rules of Practice and Procedure and R.I. Gen. Laws § 38-2-2(4)(B). National Grid seeks protection from public disclosure of certain customer-related information, which is provided in response to Division 1-2 and Attachments DIV 1-2-1 and DIV 1-2-2. Accordingly, National Grid has provided the PUC with one complete unredacted copy of the confidential materials in a sealed envelope marked **"Contains Privileged and Confidential Materials – Do Not Release,"** and has included redacted copies of the materials for the public filing.

Thank you for your attention to this matter. If you have any questions, please contact me at 401-784-7415.

Very truly yours,



Robert J. Humm

Enclosures

cc: Docket 4846 Service List
Leo Wold, Esq.
Al Mancini, Division
John Bell, Division
Bruce Oliver, Division

¹ The Narragansett Electric Company d/b/a National Grid (National Grid or the Company).

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

RHODE ISLAND PUBLIC UTILITIES COMMISSION

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	)	
Annual Distribution Adjustment Charge	)	Docket No. 4846
2018	)	
	)	
_____	)	

**MOTION OF THE NARRAGANSETT ELECTRIC
COMPANY D/B/A NATIONAL GRID FOR PROTECTIVE
TREATMENT OF CONFIDENTIAL INFORMATION**

National Grid¹ hereby requests that the Rhode Island Public Utilities Commission (PUC) grant protection from public disclosure of certain confidential, competitively sensitive, and proprietary information submitted in this proceeding, as permitted by PUC Rule 1.2(g) and R.I. Gen. Laws § 38-2-2(4)(B). National Grid also hereby requests that, pending entry of that finding, the PUC preliminarily grant the Company's request for confidential treatment pursuant to Rule 1.2 (g)(2).

I. BACKGROUND

On September 19, 2018, National Grid filed responses to the First Set of Data Requests from the Division of Public Utilities and Carriers in this docket (Division Set 1). Division Set 1 includes Data Request Division 1-2, seeking information regarding projects presently being considered by the Company for inclusion in the Advanced Gas Technology (AGT) program. The Company's response to Division 1-2 includes the identity and usage-related information of a customer considering participation in the AGT program. The Company's response to

¹ The Narragansett Electric Company d/b/a National Grid (National Grid or the Company).

Division 1-2 also includes Attachment DIV 1-2-1, which similarly contains the customer's identity and usage-related information, and Attachment DIV 1-2-2, which is a technical assistance study analyzing the customer's potential involvement in the AGT program. As the customer has not yet committed to the AGT program, the customer-related information in the Company's response to Division 1-2 and the attachments thereto is information the Company ordinarily would not share with the public. Additionally, the customer has requested that the Company keep its identity confidential until it has committed to the project. In accordance with Rule 1.2(g)(3), National Grid has provided a redacted public version of the responses and attachments to Division 1-2, as well as an unredacted, confidential version.

Therefore, the Company requests that, pursuant to Rule 1.2(g), the PUC afford confidential treatment to the customer-related information contained in: (1) the Company's response to Division 1-2; (2) Attachment DIV 1-2-1; and (3) Attachment DIV 1-2-2.

II. LEGAL STANDARD

Rule 1.2(g) of the PUC's Rules of Practice and Procedure provides that access to public records shall be granted in accordance with the Access to Public Records Act (APRA), R.I. Gen. Laws § 38-2-1, *et seq.* Under APRA, all documents and materials submitted in connection with the transaction of official business by an agency is deemed to be a "public record," unless the information contained in such documents and materials falls within one of the exceptions specifically identified in R.I. Gen. Laws § 38-2-2(4). To the extent that information provided to the PUC falls within one of the designated exceptions to the public records law, the PUC has the authority under the terms of APRA to deem such information as confidential and to protect that information from public disclosure.

In that regard, R.I. Gen. Laws § 38-2-2(4)(B) provides that the following types of records shall not be deemed public:

Trade secrets and commercial or financial information obtained from a person, firm, or corporation which is of a privileged or confidential nature.

The Rhode Island Supreme Court has held that this confidential information exemption applies where the disclosure of information would be likely either (1) to impair the government's ability to obtain necessary information in the future; or (2) to cause substantial harm to the competitive position of the person from whom the information was obtained. *Providence Journal Company v. Convention Center Authority*, 774 A.2d 40, 47 (R.I. 2001).

The first prong of the test is satisfied when information is provided to the governmental agency and that information is of a kind that would customarily not be released to the public by the person from whom it was obtained. *Providence Journal*, 774 A.2d at 47.

III. BASIS FOR CONFIDENTIALITY

The customer-related information contained in the Company's response to Division 1-2 and Attachments DIV 1-2-1 and DIV 1-2-2 should be protected from public disclosure. As discussed herein, the response and attachments contain confidential customer-related information, including the identity and usage information of a customer considering whether to participate in the AGT program. The information is of the type that the Company ordinarily would not disclose to the public. In addition, the customer has requested that the Company keep its identity confidential until it has committed to the project. Accordingly, the Company is providing its response to Division 1-2 and Attachments DIV 1-2-1 and 1-2-2 to the PUC on a voluntary basis to assist the PUC with its decision-making in this proceeding, but respectfully requests that the PUC provide confidential treatment to the information.

IV. CONCLUSION

For the foregoing reasons, National Grid respectfully requests that the PUC grant its Motion for Protective Treatment of Confidential Information.

Respectfully submitted,

**THE NARRAGANSETT ELECTRIC
COMPANY d/b/a NATIONAL GRID**

By its attorney,

A handwritten signature in blue ink, appearing to be 'RH' followed by a long horizontal stroke.

Robert J. Humm, Esq. (#7920)

National Grid

280 Melrose Street

Providence, RI 02907

(401) 784-7415

Dated: September 19, 2018

Division 1-1

Request:

Re: The Direct Testimony of Witness Ann E. Leary at page 7, line 12, though page 8, line 10, for existing AGT project, please identify each potential project considered by the Company for inclusion in the AGT program over the last year and provide:

- a. The name of the customer (may be provided subject to confidentiality restrictions);
- b. The projected annual gas use volumes by year for the proposed facility;
- c. Description of the advanced technology to be utilized;
- d. Any workpapers, studies and analyses relied upon to support the Company's assessment of the proposed project;
- e. The estimated amount of rebate the Company would offer for each project and the calculations and assumptions used to compute the estimated rebate;
- f. The estimated in-service date for the proposed facility;
- g. The anticipated schedule for payment of rebates.

Response:

- a. The following customers had projects included in the Advanced Gas Technology (AGT) program over the last year: Toray Plastics Inc. (Toray), Aspen Aerogels (Aspen), and Crowne Plaza.
- b. Toray's projected annual gas increase volume is 6,349,418 therms. Aspen's projected annual gas increase volume is 471,407 therms. Crowne Plaza's projected annual gas increase volume is 30,311 therms.
- c. The advanced technology being used is combined heat and power (CHP) for all three customers.

Division 1-1, page 2

- d. The Company used Technical Assistance (TA) studies to determine eligibility for the AGT rebate. Please refer to Attachments DIV 1-1-1, 1-1-2, and 1-1-3 for copies of the TA study for each customer. In addition, the Company performed AGT program financial analyses to determine eligibility. Please refer to Attachments DIV 1-1-4, 1-1-5, and 1-1-6 for copies of the financial analysis for each customer. For additional materials regarding the Company's assessment of the Toray project, please refer to Docket No. 4397.
- e. Toray received a \$1,800,000 rebate (see Attachment DIV 1-1-4). Aspen received a \$300,000 rebate (see Attachment DIV 1-1-5). Crowne Plaza received a \$50,000 rebate (see Attachment DIV 1-1-6). The Company determined the rebate amounts based on the available AGT budget under the Distribution Adjustment Charge, the customer's need for the project, and the financial analyses set forth in Attachments DIV 1-1-4 through 1-1-6.
- f. Toray's AGT project went in service in December 2015. Aspen's AGT project went in service in June 2017. Crowne Plaza's AGT project went in service in June 2018
- g. The schedule for payment of rebates for each project is as follows:

The Company paid Toray four annual rebates – in August 2015 (\$500,000), August 2016 (\$500,000), August 2017 (\$500,000), and September 2018 (\$300,000) – for a total of \$1,800,000 in rebates. The Company paid Aspen its rebate of \$300,000 in September 2017. The Company paid Crowne Plaza its rebate of \$50,000 in September 2018.

Attachment DIV 1-1-1

Due to the large electronic file size associated with Attachment DIV 1-1-1, the Company is providing this attachment to the PUC on USB Flash Drive.

ASPEN AEROGELS
East Providence, RI

Cogeneration Feasibility Assessment

TA Study Report – Final

17 July 2015

PREPARED FOR:

National Grid

PREPARED BY:

Andelman and Lelek Engineering, Inc.
1408 Providence Highway
Norwood, MA 02062
(781) 769-8773

PROJECT CONTACT INFORMATION

Customer's Facility/Project Location

Aspen Aerogels
East Providence, RI

Customer's Consultants:

Robert Rose	Consulting Engineer A/Z Corporation	860-445-3469 rrose@a-zcorp.com
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National Grid

Dinesh Patel	Principal Engineer, Technical Strategy and Policy	781-907-2250 Dinesh.Patel@nationalgrid.com
Jeffrey Dunham	Lead Strategic Sales	401-527-4055 Jeffrey.Dunham@nationalgrid.com
Gerald Ferris	Lead Technical Service Consultant	401-784-7364 Gerald.Ferris@nationalgrid.com

TA Study Consultants: Andelman and Lelek Engineering, Inc.

Michael Andelman	Principal	781-769-8773 mike@andelmanlelek.com
Neil Sen	Project Engineer	781-769-8773 neil@andelmanlelek.com

Executive Summary	4
Facility Description.....	5
General Cogeneration Considerations	6
Load Characterization and System Sizing	7
Proposed Cogeneration System	11
System Pricing	12
Energy and Cost Savings Analysis	13
Appendix.....	15

Executive Summary

A/Z Corporation and National Grid retained Andelman and Lelek Engineering, Inc. (ALE) to perform a Technical Assistance (TA) study to assess cogeneration opportunities for Aspen Aerogels in East Providence, RI.

This report presents an analysis of the savings and costs associated with adding a natural gas engine generator cogeneration system for Aspen Aerogels. The new cogeneration system would produce hot water via the engine's cooling circuits and via an engine exhaust heat exchanger. The option explored for this study was cogeneration system of approximately 1,275 kWe electric capacity. An energy analysis was performed using a custom spreadsheet calculation based on available usage records, manufacturers' performance data, and calculated values. A summary of the analysis results is shown in Table 1.

This report begins with a description of the existing facility equipment and operating sequences, followed by a general discussion of cogeneration requirements for the site. We then characterize the current electrical and thermal loads, and we present the evaluated cogeneration option along with its expected installed cost. The energy analysis calculation and important assumptions are then described.

Table 1: Savings and Costs Summary

Plant economics 1,275 kWe		
Useful electricity produced by new cogen	kWh/yr	9,946,930
Natural gas consumed by new cogen	therms/yr	972,905
Boiler fuel offset	therms/yr	501,499
Total increase in natural gas purchased	therms/yr	471,407
Total energy cost savings	\$/yr	859,464
Approx. cost for complete system	\$	3,600,000
Maintenance cost	\$/yr	248,673
Total annual cost savings	\$/yr	610,791
Simple payback (before incentives)	yrs	5.9
Annual Electrical Efficiency	%	34.9
Annual Thermal efficiency	%	41.2
Annual system efficiency	%	76.1

Facility Description

Aspen Aerogels in East Providence, RI produces industrial insulation. The manufacturing process is constant throughout the year.

Information used in this study was obtained from Aspen personnel, from documentation provided by Aspen, and from power usage information obtained from NGrid.

Existing Cogeneration Equipment

Aspen Aerogels does not have any existing cogeneration equipment.

Facility Schedule

Aspen Aerogels operates 24 hours a day, 7 days a week. The facility shuts down for one shift every month for maintenance.

General Cogeneration Considerations

Gas-fired cogeneration systems typically contain either a turbine generator or an engine generator. In gas turbine systems, heat is recovered from the turbine exhaust gases; the exhaust gas temperature is sufficient to generate steam. Exhaust heat is captured in gas engine systems and can be used to produce steam, but a significant fraction of the recoverable energy is in the form of lower-grade heat from the engine jacket and other cooling systems. Jacket heat is not suitable for steam generation; to make full use of an engine cogeneration system, the facility must have suitable hot water loads (or other end-uses of low-grade heat).

The most suitable system depends on the balance between heating and electrical loads, but generally speaking, gas engine installations are less costly than gas turbines of similar size. Further economic benefits are often conferred by engines' higher electrical efficiency.

Installed cost per kW decreases as the size of the installation rises. It is therefore advantageous to select the largest unit that can currently be accommodated at the facility; however, oversizing the unit results in significant efficiency penalties because part load performance often drops rapidly below 50% loading. If electricity demands are not large enough to operate the unit close to capacity, or if a lack of heating demand forces the unit to operate at low part load (or to dump heat), energy savings will suffer.

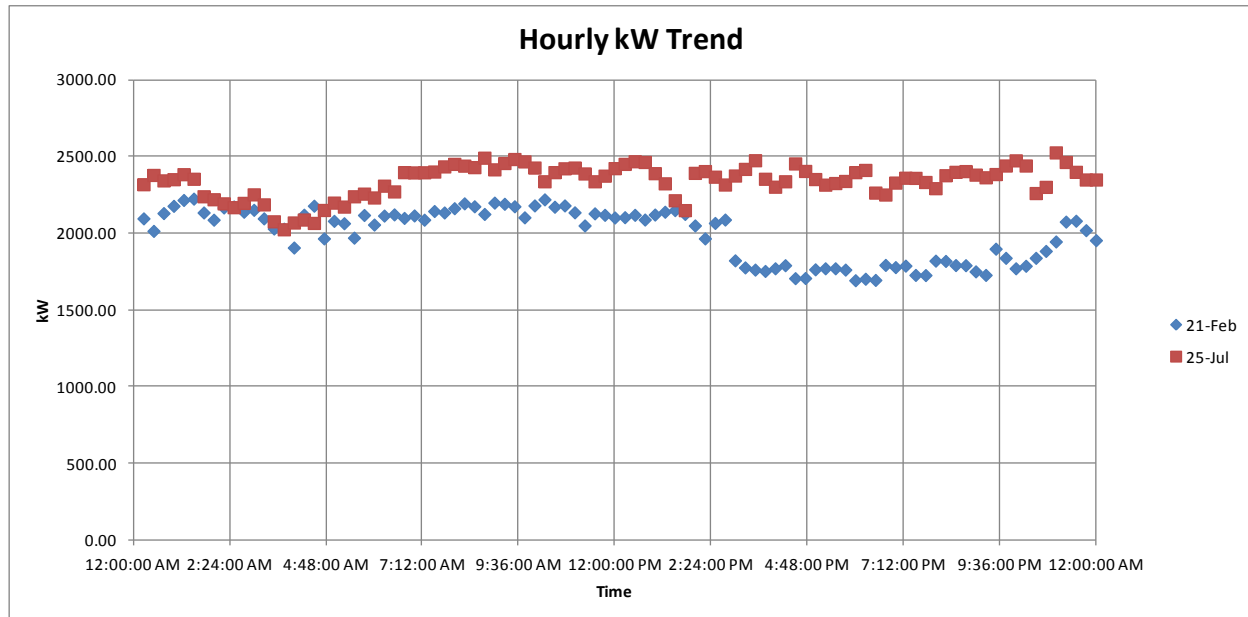
Load Characterization and System Sizing

The facility's electrical and thermal loads were characterized to determine the optimal sizing of the cogeneration system.

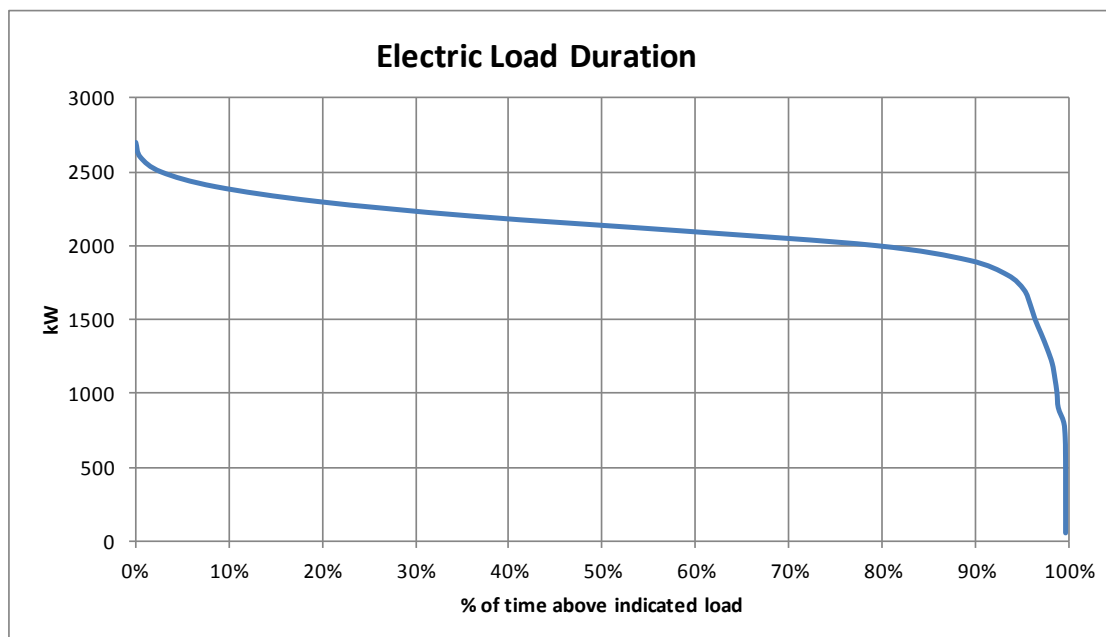
Electrical Loads

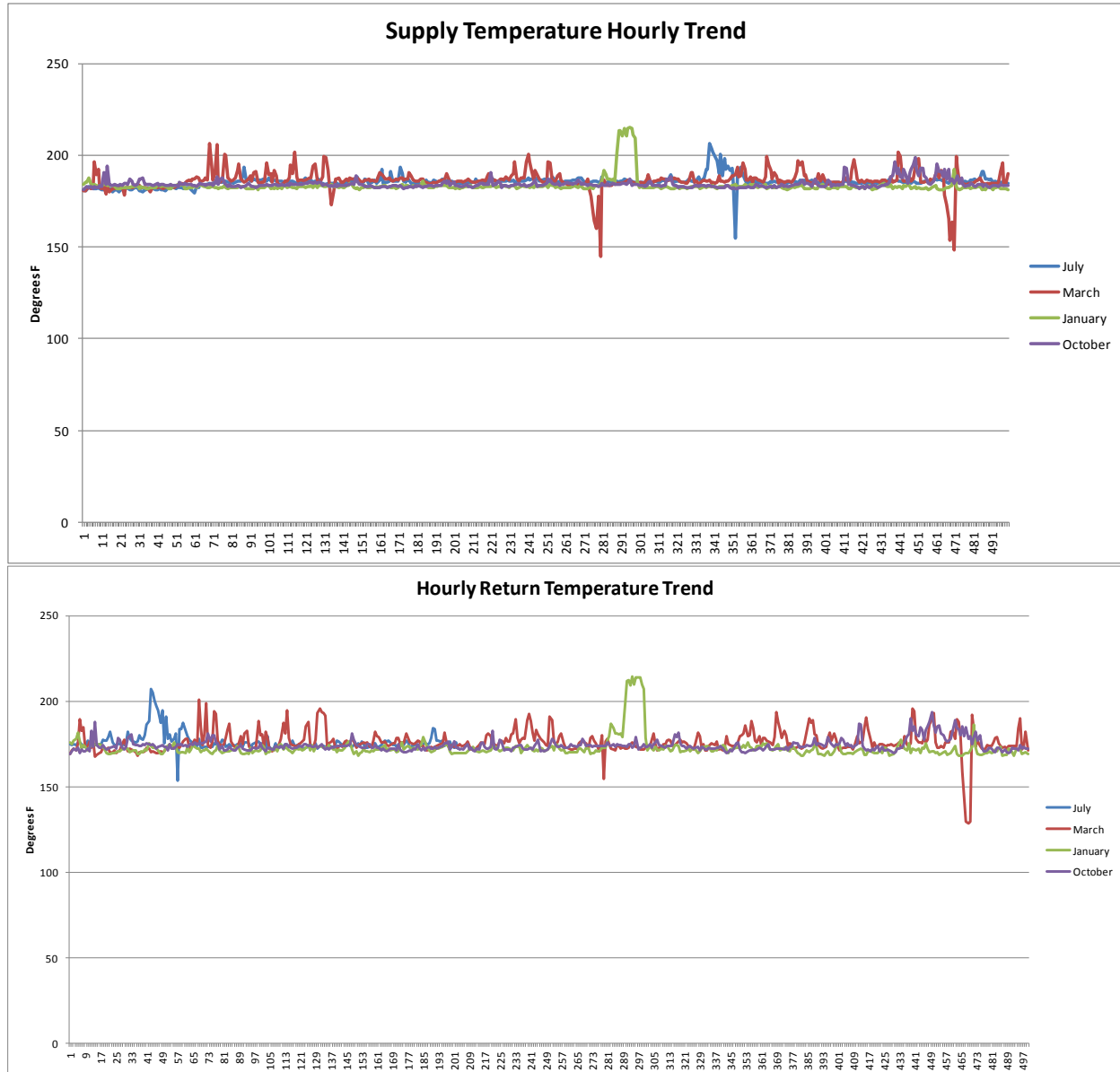
Hourly electrical data for Aspen from 2014 were obtained from National Grid. Below is a graph showing the electrical usage for one day in the winter and one day in the summer.

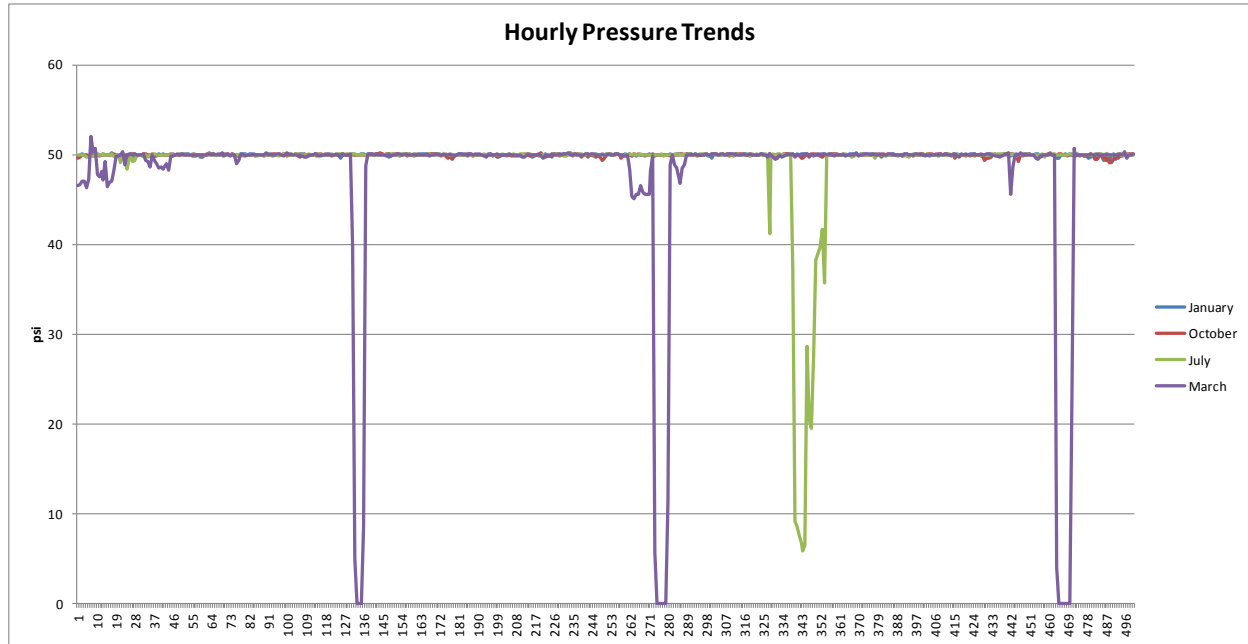
Electrical consumption patterns do not vary significantly with season.



The electrical load duration curve for the facility is shown below.







Proposed Cogeneration System

A final selection for the proposed CHP unit is a 1,275 kWe gas engine generator. The savings calculations presented here use data obtained for a 1,275 kWe gas engine generator with high electrical efficiency.

The proposed cogeneration system package contains the following main components:

- Gas engine generator: packaged system containing the gas engine, electrical generator, and heat recovery system to produce hot water from engine cooling circuits

Table 2: Summary of Cogeneration System Properties

Gas engine generator model	Dresser-Rand HGM 560
Nominal generator capacity (kWe)	1,275
Electrical generation efficiency (HHV)	36.0%
Hot water produced via engine cooling circuits	25 therms/hr

Sequence of Operation

The CHP unit would normally operate continuously in thermal and electrical-following mode, i.e. no excess electricity would be produced and no thermal dumping would occur. Hot water would be produced via the engine's cooling circuits. The CHP unit would be controlled to operate above a minimum of 50% turndown. Based on electric and thermal load data, the unit is expected to operate above 80% capacity all operational hours (analysis assumes 93% availability).

System Pricing

The cost of the new cogeneration system was estimated based on information received from the equipment vendor. Please note that this estimate is based on initial pricing from the owner's contractor; it does not represent a guaranteed maximum price, and is not associated with a specific detailed system design.

According to Aspen Aerogels' consulting engineer, the packaged cogeneration system would have an installed cost of approximately \$3,600,000.

Energy and Cost Savings Analysis

A custom cogeneration spreadsheet analysis was used to perform the energy analysis for this study. A summary of the analysis results is provided in Table 1 in the Executive Summary of this report. Details of the modeling methodology are presented below, along with information on the utility rates used in the analysis.

Calculation Methodology

The full calculation spreadsheet will be provided to National Grid for review. Notes on assumptions are provided below.

- The calculation used 15-minute interval electrical usage data for the entire year of 2014 and 1-minute interval thermal data for early 2015.
- Cogen thermal loads were determined from thermal data as described in the Load Characterization section of this report.
- For the four-week period from October 18 to November 19, adjacent days were used to approximate the hourly electrical interval data in that time as the original data were missing.
- Gas engine generator performance data (generation capacity, heat rate, thermal output, and part-load performance) were obtained from the technical properties document supplied by the vendor.
- System parasitic power (circulation pumps and radiator fan) was assumed to be 3% of full-load capacity.
- The cogeneration system was assumed have 93% availability throughout the year.
- Average electric and gas rates for 2014, which were \$0.117/kWh and \$0.656/therm, were used to calculate energy cost savings estimates. No additional demand charges were applied during outage periods.
- Existing boiler thermal efficiency was modeled as 80% at all times; no part load variations were modeled.
- The system was assumed to be in electrical and thermal load following mode, i.e. no excess electrical or thermal production was permitted.
- The minimum turndown for the cogen system was set to be 50%.
- Thermal process loads were assumed to be constant (24/7 schedule).

Tabulated below is the monthly increase in fuel consumption.

Table 3: Monthly Increase in Gas Usage

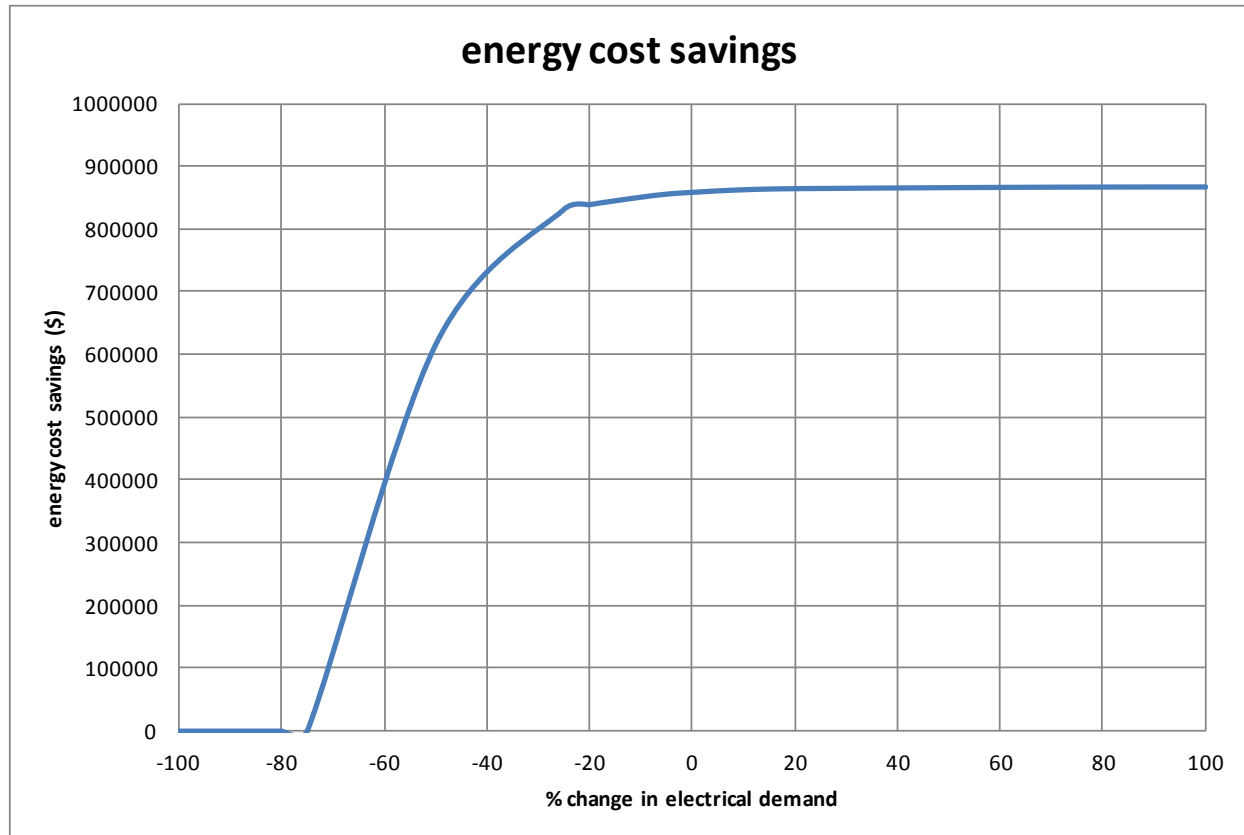
Month	Existing Load (Therms)	Generator Load (Therms)	Thermal Offset Recovery (Therms)	Increase in gas use (Therms)	Proposed Therms
January	59,834.8	89,370.4	46,045.9	40,291.8	100,126.5
February	54,235.3	80,833.5	41,647.0	36,443.4	90,678.8
March	59,893.9	89,449.5	46,080.7	40,333.0	100,226.9
April	58,385.6	85,784.6	44,228.8	38,646.9	97,032.5
May	59,922.3	88,437.2	45,616.2	39,823.5	99,745.9
June	58,033.5	86,702.2	44,663.8	39,095.8	97,129.3
July	60,245.9	89,581.5	46,147.8	40,393.4	100,639.3
August	59,922.3	89,536.9	46,128.4	40,369.9	100,292.2
September	58,033.5	84,558.7	43,673.0	38,023.7	96,057.3
October	60,245.9	88,340.4	45,511.0	39,831.4	100,077.3
November	57,833.0	85,428.6	44,012.6	38,516.8	96,349.8
December	60,174.4	88,111.5	45,490.7	39,637.3	99,811.7

The monthly increase in gas use is 93% of the difference between the monthly generator load and thermal offset recovery. The total proposed gas usage is the sum of the existing load and the increase in gas use. The months from May to September represent 42% of the increase in gas consumption after the installation of the CHP system.

Sensitivity Analysis

In this section, we explore the sensitivity of the results to changes in the facility's electrical demand.

Facility Thermal Demand



When the electrical demand decreases, it adopts three linear regimes from 0% to 25%, 25% to 45%, and 45% to 75%. The cost savings decrease more dramatically with each regime.

When the increase in energy demand exceeds 50%, the amount of money saved per year plateaus at about \$868,000. On the other hand, if the percent decrease exceeds 75%, the savings sharply decrease until the savings approach \$0.

Appendix

- HGM 560 Technical Description document
- Custom Cogen Calculation Spreadsheet
- Custom Screening Spreadsheet
- Aspen Aerogels MRD

nationalgrid



CROWNE PLAZA®

801 GREENWICH AVE
WARWICK, RI



Prepared for
NATIONAL GRID



Prepared by
B2Q Associates, Inc.
North Andover, MA

Revision Date

4/2/2013

Technical Assistance Study



146 Main Street Suite 2
North Andover, MA 01845



TECHNICAL ASSISTANCE STUDY

CROWNE PLAZA HOTEL

Contacts	3
Executive Summary.....	4
Incentive Programs Overview.....	5
Introduction	7
Facility Description.....	8
Model Calibration	9
EEM 1: Guest Room Occupancy Sensors Reactivation	11
EEM 2: Upgrade Watersource Heat Pumps (WSHPs)	14
EEM 3: Upgrade Roof Top Units (RTUs)	16
EEM 4: Install a Building Automation System (BAS)	19
EEM 5: Kitchen Hood Controls	22
EEM 6: Install Laundry Wastewater Heat Recovery Device.....	24
EEM 7: Upgrade Hot Water (HW) Boilers	26
EEM 8: Install Variable Speed Drives (VSDs) on the CW Pumps	28
EEM 9: Install Variable Speed Drives (VSDs) on Cooling Tower Fans	30
EEM 10: Low Flow Kitchen Spray Nozzle	32
EEM 11: Install Aerators and Low Flow Shower Heads to Reduce Domestic Hot Water (DHW) Use	34
EEM 12: Combined Heat and Power (CHP).....	36
EEM 13: Groundsource Heat Pump	38
EEM 14: Freezer	40
EEM 15: Pool Cover	41
EEM 16: Application of Vista Window Film	43
Appendix A: Calculations	45
Appendix B: Ben-Cost Screening.....	52
Appendix C: Cost Estimates	61
Appendix D: Simulation Output	76

CONTACTS

CUSTOMER'S CONTACT

Deidra Tart	Director of Quality Assurance	401-732-6000	deidra.tart@providenceri.crowneplaza.com
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NATIONAL GRID

Gerald Mirabile	Account Executive	401-784-7417	gerald.mirabile@us.ngrid.com
Jed Ferris	Technical Energy Consultant	401-784-7364	gerald.ferris@nationalgrid.com

NATIONAL GRIDS TA CONSULTANTS - B2Q ASSOCIATES, INC.

Richard Andelman	Vice President	978-208-0609x203	randelman@b2qassociates.com
Janne Kairento	Designer	978-208-0609x209	jkairento@b2qassociates.com

EXECUTIVE SUMMARY

This technical assistance (TA) study investigates potential energy efficiency measures (EEMs) for the facility's heating, cooling, ventilation, and controls systems. The EEMs focus on upgrading existing equipment to new, higher-performance equipment, improving control to reduce energy use when it is not required, and investigating significant changes to the facility's HVAC system types.

ECM #	ECM	Electric Energy Savings	Natural Gas Savings	Total Cost Savings	Retrofit Cost	Simple Payback Before Incentive	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback After Incentive
-	-	kWh	therms	\$	\$	yrs	\$	\$	\$	yrs
1	Occupancy Sensors	82,083	3,441	\$11,793	\$36,719	3.1	\$12,035	\$917	\$23,767	2.0
2	Upgrade Water Source Heat Pumps	71,200	-346	\$6,951	\$280,302	40.3	\$0	\$0	\$280,302	40.3
3	Upgrade Rooftop Units	72,327	0	\$8,054	\$72,539	9.0	\$15,369	\$0	\$57,170	7.1
4	Upgrade Building Automation Systems	385,536	27,954	\$62,284	\$90,878	1.5	\$21,171	\$4,828	\$64,879	1.0
5	Kitchen Hood Controls	5,294	1,678	\$2,076	\$38,603	18.6	\$0	\$0	\$38,603	18.6
6	Install Laundry Drain Water Heat Recovery	0	1,209	\$1,088	\$16,176	14.9	\$0	\$0	\$16,176	14.9
7	Upgrade Hot Water Boiler	-4,795	3,349	\$2,571	\$179,010	69.6	\$0	\$0	\$179,010	69.6
8	Install VFDs on CW Pumps	127,676	-2,804	\$9,711	\$51,246	5.3	\$20,620	\$0	\$30,626	3.2
9	Install VFDs on Cooling Tower Fans	35,788	0	\$3,903	\$17,898	4.6	\$8,700	\$0	\$9,198	2.4
10	Low Flow Kitchen Spray Nozzle	0	1,254	\$1,128	\$281	0.2	\$0	\$0	\$281	0.2
11	Install Aerators and Low Flow Shower Heads	0	7,289	\$6,560	\$30,168	4.6	\$0	\$15,084	\$15,084	2.3
12	Combined Heat and Power	1,379,678	-107,222	\$38,757	\$643,469	16.6	-	-	-	-
13	Ground Source Heat Pump	82,657	8,767	\$15,381	\$967,229	62.9	\$0	\$0	\$967,229	62.9
14	Freezer	41,273	0	\$4,953	\$21,858	4.4	\$6,666	\$0	\$15,192	3.1
15	Pool Cover	33,681	-732	\$2,395	\$14,999	6.3	\$5,439	\$0	\$9,560	4.0
16	Install Window Tint	149,230	-1,112	\$14,167	\$66,390	4.7	\$24,101	\$0	\$42,289	3.0

Note: Costs and savings values assume a total electricity rate of \$0.12 / kWh and \$0.90 / therm for natural gas.

INCENTIVE PROGRAMS OVERVIEW

Incentive Programs Overview

National Grid's electric and natural gas incentive programs for medium and large business customers are fully integrated and consolidated into two (2) programs for 2012. They are the:

- Commercial New Construction Program; and the
- Large Commercial Retrofit Program.

Both programs consist of Prescriptive and Custom incentive classifications for projects saving either electricity or natural gas, but not both energy sources. Prescriptive incentives are typically for common, individual pieces of equipment and are assigned pre-determined incentive values based on their type, size and certified efficiency rating. All Prescriptive incentives are located on www.powerofaction.com under the "What can you do?" and "Energy Efficiency" menus. Custom incentives apply to complete energy systems, less common individual pieces of equipment and anything not eligible for a Prescriptive incentive. Projects simultaneously saving electricity and natural gas are classified as Custom and are specially addressed at the end of this section.

The Commercial New Construction Program (CNC) is designed for new buildings and additions to and major renovations in existing buildings. The CNC also applies to spaces changing function within existing buildings, failed equipment or equipment age exceeding 75% of their useful lifetimes. Incremental Energy Savings and Incremental Capital Costs are defined as the difference between the Rhode Island Energy Code's requirements and the proposed energy project's characteristics. All projects falling under the Custom classification must pass a Benefit-to-Cost Ratio (BCR) test to determine its incentive eligibility. In most cases, an individual electric or Natural Gas (NG) project passing its associated BCR will receive an incentive equal to the lesser of the below, respective amounts.

Incentive Determinant	Electric Incentive	Natural Gas Incentive
Incremental Capital Cost	Up to 75%	Up to 75%
Incremental Energy Savings	Up to \$0.25/kWh-Y	Up to \$3.00/Therm-Y
Incremental Payback Buy-Down	Down to 1.0 Year	Down to 1.0 Year

The Large Commercial Retrofit Program (LCR) is designed for existing buildings with an average, monthly demand of 200 kW or greater. The proposed project's Total Energy Savings is based on the difference between the existing, operating equipment/system relative to the proposed equipment/system. Total Capital Cost is defined as all line item costs including, but not necessarily limited to permitting, design, major equipment, installation labor and miscellaneous materials, start-up, testing, commissioning and close-out. Like the CNC, a project falling under the Custom classification must pass its BCR test to determine its incentive eligibility in the LCR. In most cases, an electric or NG project passing its associated BCR will receive an incentive equal to the lesser amount of the below, respective amounts.

Incentive Determinant	Electric Incentive	Natural Gas Incentive
Total Capital Cost	Up to 50%	Up to 50%
Total Energy Savings	Up to \$0.19/kWh-Y	Up to \$3.00/Therm-Y
Total Payback Buy-Down	Down to 1.0 Year	Down to 1.0 Year

For a proposed project falling under either the CNC or LCR and saving both electricity and NG, a unique BCR process determines incentive eligibility. In general, an eligible project receives an incentive equal to the larger of the individually calculated electric and NG program incentives. The electric and NG contributions to the incentive are based on the lifetime, societal benefit each energy source contributes to the proposed project.

INTRODUCTION

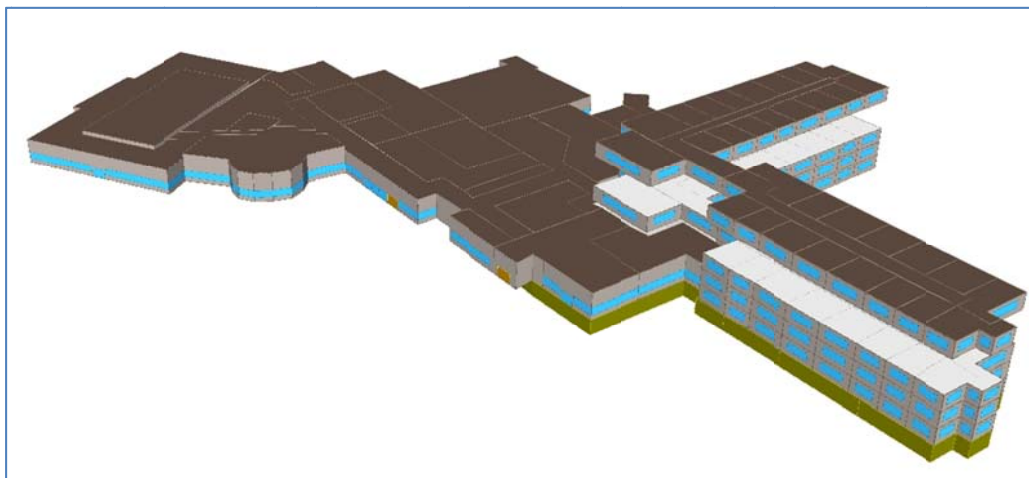
B2Q Associates (B2Q) has been retained by National Grid to prepare a technical assistance study for the Crowne Plaza Hotel facility at 801 Greenwich Ave in Warwick, RI. The energy efficiency measures (EEMs) that are being considered consist of equipment upgrades, domestic hot water savings, variable speed drives, demand control ventilation, occupancy controls, and kitchen hood controls. The measures also call for potential, significant changes in the systems that provide the heating and cooling for the facility, such as cogeneration (CHP) and groundsource heat pumps. These measures could lead to a decrease in energy use, electric demand, and fuel use. This study aims to assess and estimate the potential energy savings, costs, and simple paybacks of implementing these measures.

To analyze these changes in energy consumption, a computer model of the facility was developed and building consumption simulations were performed using the eQUEST building analysis program. eQUEST uses the latest DOE-2.2 building energy analysis software as its calculating engine. This very flexible program permits modeling of a variety of building types and components, including complex building geometry, lighting systems, HVAC systems, central plant equipment, and utility rate structures.

The eQUEST model was compiled using a reproduction of the building footprint, aerial imaging, estimated schedules for the facility based on discussions with facilities staff and general hotel facilities, and HVAC and lighting equipment based on observations from walkthroughs of the facility. Providence weather data was used in the analysis. Electric utility costs and cost savings were calculated using a rate of \$0.12/kWh while thermal energy costs and cost savings employed a rate of \$0.90/therm.

Utility incentives were estimated for the EEMs using National Grid's 2012 gas and electric custom screening tools. **The utility incentives included in this report must be confirmed with National Grid prior to implementation and may be subject to change.**

FACILITY DESCRIPTION



Crowne Plaza eQUEST model

Note that the new and old building wings seem to have missing floors in the eQUEST model. This is how eQUEST shows the floor multiplying function. The middle floors of the building were modeled by copying the inputs of a typical floor in order to simplify this complex model.

ARCHITECTURAL DESCRIPTION

The Crowne Plaza hotel is a six story building located at 801 Greenwich Ave, Warwick, RI. The building is approximately 250,000 square feet and houses a multitude of space types including guest rooms, offices, function/meeting rooms, ballrooms, auditoriums and dining areas.

EQUIPMENT DESCRIPTION

The Crowne Plaza Hotel was built in two phases. As a result, it has different types of HVAC systems. The new and old wing each have separate water loop heat pump systems served by a gas boiler and cooling tower. The common areas are served by rooftop units (RTUs). All of the RTUs are equipped with a gas fired furnace for heating and packaged DX coils for cooling. There are two domestic hot water (DHW) systems – one for the laundry and one for guest rooms. The RTUs and cooling towers are located on the roof, whereas the boilers, pumps, and tanks are located in mechanical rooms on the basement level.

MODEL CALIBRATION

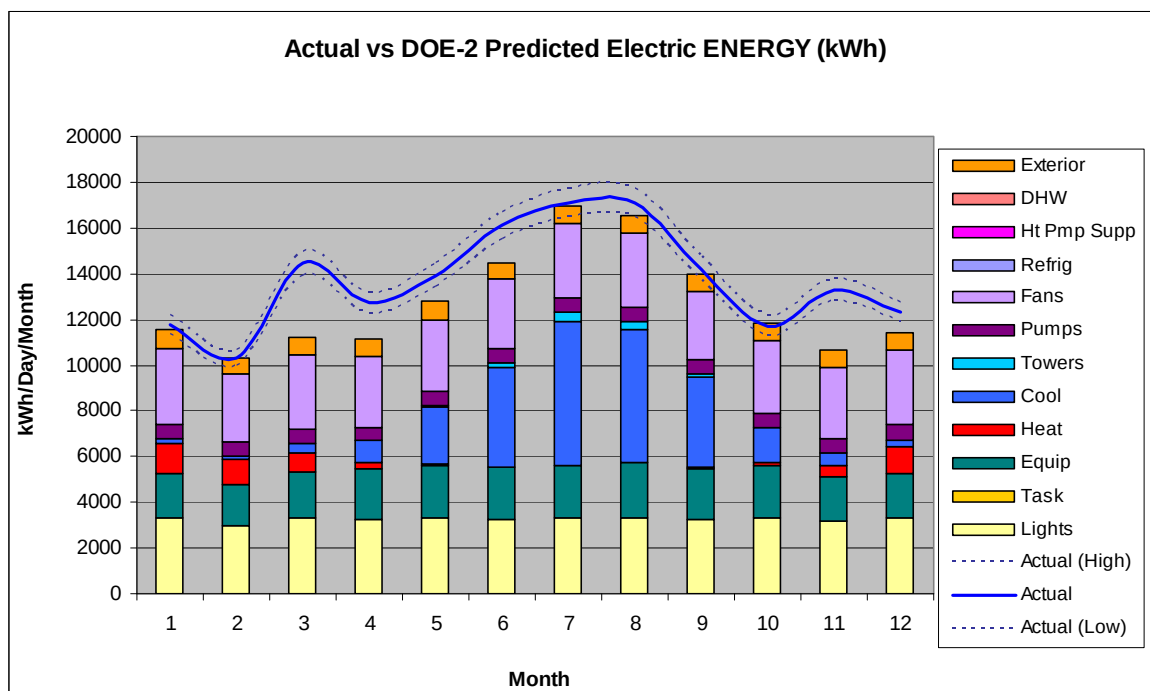
UTILITIES

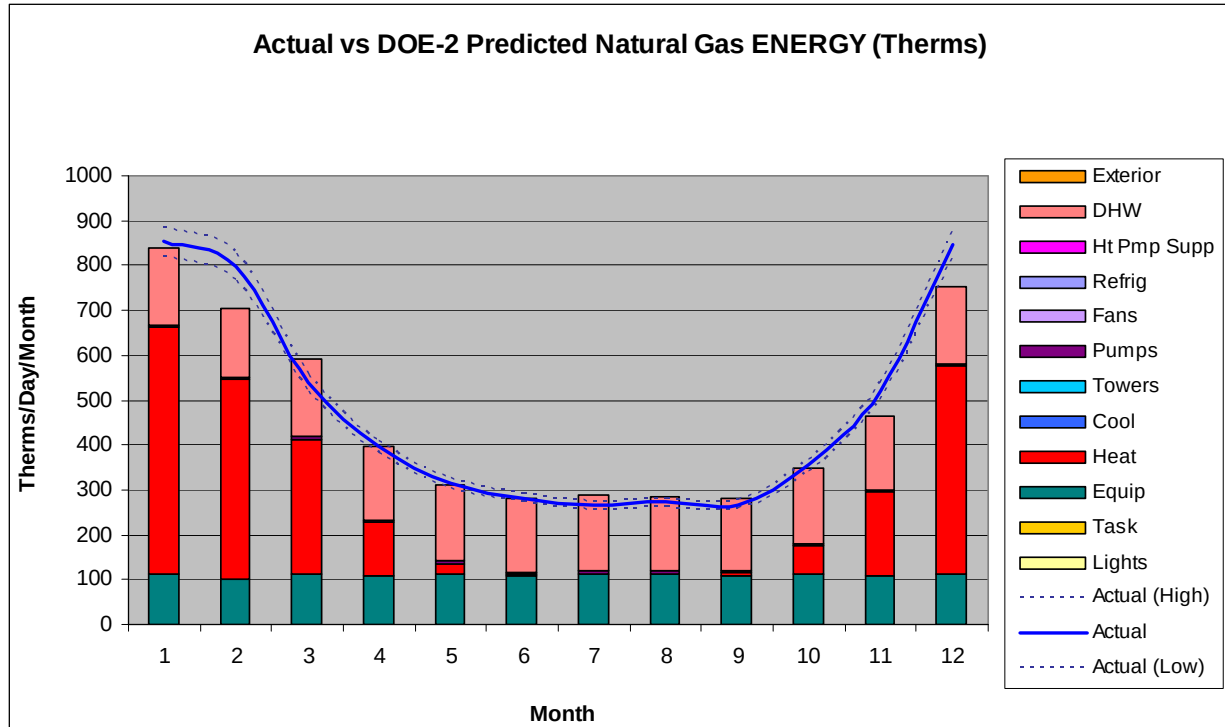
Natural Gas Delivery: National Grid
Natural Gas Supply: National Grid
Electricity Supply: National Grid (G3 rate)

GAS AND ELECTRICITY USAGE INFORMATION

The eQUEST model was built using Google Earth to draw the building footprint. Thermal zones were outlined using observation from site visits. Once done, the model is calibrated by changing the occupancy, lighting, and plug load schedules and setpoints to the data of the existing building. This was done comparing the gas and electrical consumption of 2009 and 2010 received from NGRID to the PS-E report generated by each simulation of the eQUEST model.

The monthly electrical and gas consumption charts used for the calibration are shown below. The blue curve represents the existing building consumption and the bars represent the eQUEST model output. The average of 2009 and 2010 were used for the existing building electrical use. The model output also provides the energy end use breakdown of the building.





eQUEST models DHW usage on an hour to hour basis. Using the installed data loggers' reading of the water consumption, an hourly water consumption schedule was created.

Time	Midnight-1am	1-2am	2-3am	3-4am	4-5am	5-6am	6-7am	7-8am	8-9am	9-10am	10-11am	11-Noon
Morning Ratio	1.0%	1.1%	1.6%	1.1%	1.1%	2.0%	15.1%	42.4%	100.0%	19.8%	20.6%	23.8%
Time	Noon-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	10-11pm	11-midnight
Afternoon Ratio	25.4%	24.1%	30.5%	35.5%	42.0%	38.3%	29.4%	20.3%	23.0%	19.0%	9.5%	7.7%

The above chart indicates the hourly percentage of the peak flow. The peak flow measured was 61.1 gpm according to the data recorded by the data loggers.

EEM 1: GUEST ROOM OCCUPANCY SENSORS REACTIVATION

InnComm Guest Room Occupancy Control allows for the WSHPs serving a particular room to “setback” based on occupancy, saving energy when no occupants are detected. When the occupancy sensor detects that the guest has re-entered the room, the thermostat resets its setpoints to occupied values. The technology for this measure is already installed in most of the rooms and should be re-engaged and/or repaired.

EXISTING CASE

The existing for this measure consists of each room being equipped with a non-programmable thermostat. The temperature setpoint for the room is manually set by the occupant. HVAC systems modulate as needed to meet that setpoint, regardless of whether the occupant is present in the space.

The assumptions made for the baseline model are the following:

- The guest room thermostat is set at a constant temperature of 72°F for cooling and 70°F for heating all year long.
- The WSHP fans are cycled on for the hour if the guest room temperature falls outside the throttling range
- The hotel has a high season from April to October and a low season from November to March. This affects the equipment load, lighting load, occupancy load, and DHW use of every space of the hotel. However, it does not affect the heating and cooling of the guest room in the baseline model. Below are shown the schedules of the occupancy, equipment load, and occupancy load of the guest rooms. The following percentages are the fraction of the maximum occupancy set for each guest room (200 ft²/person).

Morning Schedule	Midnight-1am	1-2am	2-3am	3-4am	4-5am	5-6am	6-7am	7-8am	8-9am	9-10am	10-11am	11-Noon
April- October	90%	90%	90%	90%	90%	90%	65%	50%	35%	20%	20%	20%
November-March	45%	45%	45%	45%	45%	45%	35%	25%	15%	15%	15%	15%

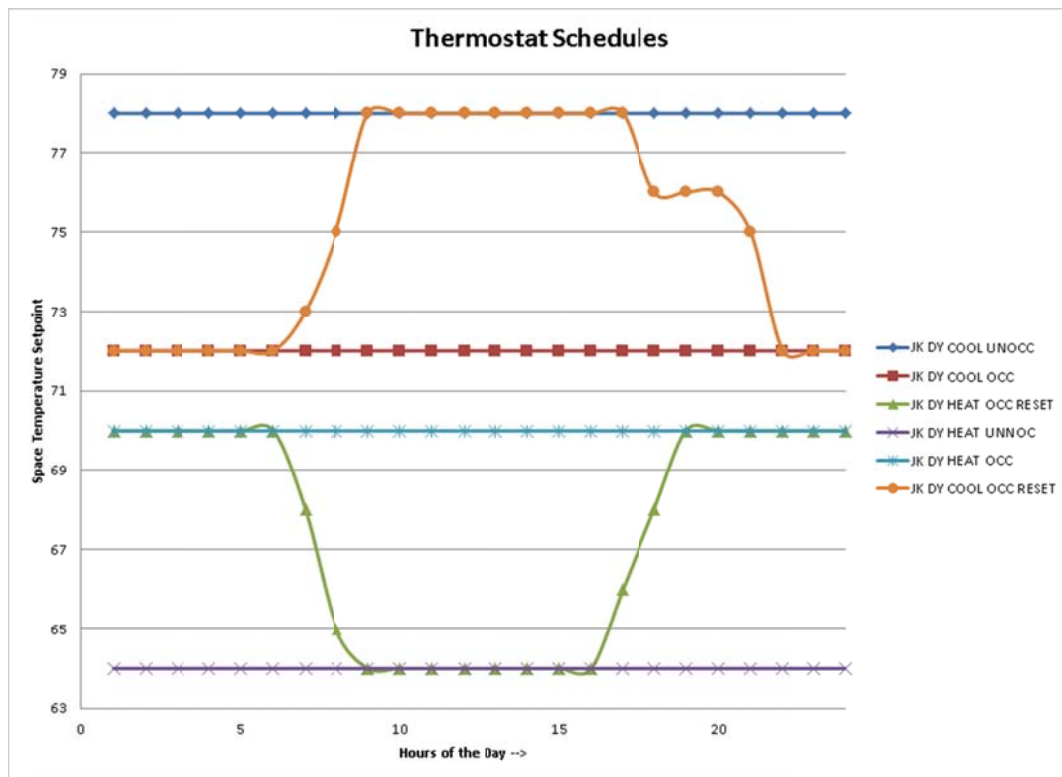
Afternoon Schedule	Noon-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	10-11pm	11-midnight
April- October	24%	20%	20%	20%	20%	40%	45%	50%	65%	85%	85%	85%
November-March	18%	10%	10%	10%	24%	32%	32%	40%	40%	45%	45%	45%

PROPOSED CASE

The proposed change in space temperature control is to re-activate the functioning guest room occupancy sensors and install new ones for rooms with broken or non-existent occupancy sensors. For customers to stop mistaking the InnCom guest room occupancy sensors for cameras, the proposed change is to label the sensors and thermostats with instructions, preventing the customers from deactivating the device by removing its batteries.

When the occupant leaves the space, the occupancy sensor changes the space temperature setpoint by raising the cooling setpoint temperature and lowering the heating setpoint temperature. This saves energy by reducing the heating/cooling load when the space is unoccupied. When the occupant re-

enters the space, the occupancy sensor signals the equipment to begin a specialized start-up mode, which returns the space temperature setpoint to the previously occupied value.



The graph displays the different thermostat schedules used to simulate the occupancy based temperature reset.

ENERGY SAVINGS METHODOLOGY

This measure was simulated by using a parametric run of the base case model, changing the guest room thermostat set point temperature from a constant temperature of 72°F for cooling and 70°F for heating all year long to multiple thermostat schedules to model the temperature reset with respect to the time of day changes in occupancy density.

COST ESTIMATES

It was estimated that guest room occupancy sensor systems reactivation and labeling of the 266 rooms in the facility would cost \$36,719 for the project. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	1	Occupancy Sensors				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
82,083	1.8%	\$8,696	3441	2.5%	\$3,097	\$11,793
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$36,719	\$12,035	\$917	\$23,767	3.1	2.0	49.6%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
11.4	19.3	20.3	19.4	8.5	111%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
64	955	287	71		105,217	

Please note that the percentage of savings which occur on-peak is greater than 100% because there is a slight energy use increase during off-peak periods.

EEM 2: UPGRADE WATERSOURCE HEAT PUMPS (WSHPs)

The current water source heat pumps that are installed throughout the facility have reached the end of the typical service life and the units can be replaced with newer equipment which has increased efficiency and effectiveness, saving energy for the facility.

EXISTING CASE

The base case for the upgraded WSHPs energy efficiency measure is RI code minimum efficiency heat pumps, with a coefficient of performance (COP) of 4.2 for heating and EER of 12 for cooling for each of the estimated 266 heat pumps in the facility. The efficiency curves used are the default eQUEST curves for WSHP.

PROPOSED CASE

The proposed change is to increase the WSHP heating COP from 4.2 to 4.9 and increase the unit cooling EER from 12 to 13.5. These correspond to the efficiencies of the Trane GECE012 WSHP.

The electric savings generated by this measure can be attributed to the higher efficiency compressor. It requires less energy to extract or add heat to the condenser loop. The natural gas penalty is due to the fact that the boilers have to add the heat that the high efficiency compressors do not release into the loop.

ENERGY SAVINGS METHODOLOGY

This measure was simulated using a parametric run of the base case model, changing the WSHP's COP and EER as described above, but keeping the same efficiency curves.

COST ESTIMATES

The incremental cost for this measure is \$280,302. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	2	Upgrade Water Source Heat Pumps				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
71,200	1.5%	\$7,262	-346	-0.2%	-\$311	\$6,951
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$280,302	\$0	\$0	\$280,302	40.3	40.3	2.5%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
5.9	22.5	28.6	23.2	5.8	73%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
38	778	249	42		85,761	

EEM 3: UPGRADE ROOF TOP UNITS (RTUs)

Several of the existing roof top units are also nearing the end of their service life. Newer models have improved efficiencies, providing energy savings for this capital replacement.

EXISTING CASE

The base case for this measure consists of code compliant RTUs. The existing RTUs are approaching the end of their life, so the incentives for this measure were generated using the Design 2000 approach. The Design 200 (D2) is an incentive program that will pay back up to half of the incremental cost (the cost difference between a code minimum efficiency unit and the proposed unit) depending on how much less energy it will consume as compared to the code minimum efficiency unit.

Code efficiency for each size category included in the EEM are as follows:

Capacity	Efficiency
tons	EER
3	13
5	13
15	10.8
17	10.8
25	9.5

It was assumed that each zone is attached to only one RTU, whose heating and cooling capacity corresponds to the sum of the RTUs normally attached to the zone. The temperature set points of the zones controlled by the RTUs are 68 °F for heating and 72 °F for cooling.

PROPOSED CASE

The proposed change is to replace the code compliant RTUs, with units that have an EER of 13. This corresponds to a typical high-efficiency Carrier unit. Below is a list of the 25 year old RTUs that need to be replaced.

Served space	Location	Type	Make	Model	Capacity	Age	Quantity
Alfred's	3rd FL Roof	RTU	Trane	SFHDC254HD10C45DIA00	25 T	25	1
Lobby	3rd FL Roof	RTU	Trane	SFHDC254HD10C27D1A00	25 T	25	1
Plaza Ballroom	3rd FL Roof	RTU	Trane	BYCO60F4HOBB	5T	25	2
PlazaBallroom	3rd FL Roof	RTU	Trane	BYC036H4LOAA	3T	25	3
Restaurant - Preballroom	3rd FL Roof	RTU	Trane	BYC17OG4LOCA	15T	25	2
Hallways+restroom	3rd FL Roof	RTU	Trane	BYC200G4LOCA	17T	25	1
Restaurant - Preballroom	3rd FL Roof	RTU	Trane	BYC17OG4LOCA	15T	25	2
Hallways+restroom	3rd FL Roof	RTU	Trane	BYC200G4LOCA	17T	25	1

ENERGY SAVINGS METHODOLOGY

This measure was simulated by using a parametric run of the base case model, changing RTUs efficiency from a code minimum to 13.

COST ESTIMATES

The incremental cost for this measure is \$72,539. The total cost for code compliant RTUs is \$446,095 and the total cost for high efficiency units is \$518,634.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	3	Upgrade Rooftop Units				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
72,327	1.6%	\$8,054	0	0.0%	\$0	\$8,054
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$72,539	\$15,369	\$0	\$57,170	9.0	7.1	14.1%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	27.6	33.3	27.5	2.0	86%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
40	796	253	44		87,699	

EEM 4: INSTALL A BUILDING AUTOMATION SYSTEM (BAS)

Installing a building automation system would allow the facility to implement advanced control strategies, such as optimal start/stop, demand control ventilation, discharge temperature reset, dual enthalpy economizer, and condenser water reset. A BAS would also give facilities staff greater control over, RTUs boilers and cooling towers, as well as giving staff more real-time information on the behavior of equipment, allowing possible issues to be identified and corrected more quickly.

EXISTING CASE

The base case for this measure is to continue to operate the building in the same manner that it is now. These include basic equipment timers and thermostatic setpoint control of some of the major RTUs. It was assumed that:

- Min OA control setpoint is a fixed fraction of 15% of supply air.
- The discharge air temperature is currently set at 55 °F
- The RTUs serving the Grand Ballroom, the Grand Foyer, the Kitchen, Rotunda, Bristol and Tiverton are set on a schedule running from 6am to 12am
- The other RTUs are set on a 24/7 schedule

PROPOSED CASE

The proposed changes in BAS capabilities were to implement demand control ventilation (DCV), discharge temperature setback, enthalpy economizer, optimal start/stop, and condenser water reset.

DCV is a BAS control strategy that modulates the amount of fresh air being introduced to a space based on the amount of people in the space. This measure involves installing CO₂ sensors in order to incorporate DCV for the rooftop units (RTUs) that serve large spaces, such as the plaza ballroom, the plaza foyer, the grand ballroom, the grand foyer, the lobby, the restaurant, the Atrium, Alfred's, and the Rotunda, in order to modulate the amount of outside air supplied to the spaces based on occupancy. When the space is unoccupied or has a low occupancy, less outdoor air is needed. Reducing outdoor air saves energy by reducing the amount of energy that is needed to condition the air, either for heating, cooling, or dehumidification. The way that occupancy is sensed by the DCV system is by comparing the carbon dioxide reading in the return air duct against the outside air carbon dioxide level.

Discharge air temperature reset is a control strategy that allows the discharge air to be reset based on outside air temperature. This creates energy savings by reducing the cooling load on the RTUs and the reheat load on the zone level. This control would enable the discharge air setpoint to be constantly reset by the BAS to generate energy savings. The proposed sequence calls for resetting the discharge air temperature between 55 °F to 60 °F when the worst case zone is within its deadband.

Dual-enthalpy economizer is a BAS control strategy that optimizes airside economizer operation. This strategy controls the economizer by considering the humidity in the air, as well as the sensible heat, and enables economizer mode when the outside air enthalpy is lower than the return air enthalpy. Enthalpy economizing optimizes operation and creates more effective economizer hours, creating savings by using "free cooling" and reducing the load on the condenser.

ENERGY SAVINGS METHODOLOGY

An eQUEST parametric run was created to simulate the effect of DCV for the RTUs that serve large spaces.

Assumptions:

- The minimum outdoor air control method is set by the CO₂ differential between the SYSTEM return air stream and outside air intake air stream to determine the hourly outside air fraction. In eQUEST, the minimum damper position is set hourly based on the outside air CFM required per person and the hourly occupancy schedule of each zone.

An eQUEST parametric run was created to simulate the effect of resetting the discharge air temperature setpoint and was applied to all RTUs.

Assumptions:

- The supply air will reset when the worst case zone is satisfied. The discharge air will reset from 55 °F to 60 °F.

An eQUEST parametric run was created to simulate the effect of a dual-enthalpy economizer for all RTUs.

COST ESTIMATES

The cost for this measure is \$90,878.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	4	Upgrade Building Automation Systems				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
385,536	8.3%	\$37,125	27954	20.1%	\$25,159	\$62,284
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$90,878	\$21,171	\$4,828	\$64,879	1.5	1.0	96.0%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
9.3	35.2	55.4	39.8	12.2	55%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
363	4,660	1,351	400		513,699	

EEM 5: KITCHEN HOOD CONTROLS

Installing a kitchen hood control system allows the exhaust fan and makeup air unit serving the kitchen cooking area to modulate their speeds to meet the ventilation requirement throughout the occupied period. A typical constant volume kitchen hood exhausts air and supplies make up air at a constant rate. When cooking is not taking place, conditioned air from the space is exhausted and new makeup air is supplied, potentially wasting energy.

EXISTING CASE

The kitchen hood system continues to use a constant volume exhaust fan and makeup air unit (MAU) to service the kitchen hoods. When the hood is turned on, typically scheduled for when the kitchen is occupied, the hood's exhaust fan runs at a constant speed, extracting the air from above the cook tops. The corresponding supply makeup air is provided through the MAU to maintain pressurization and condition the space.

PROPOSED CASE

The proposed change in the kitchen hood system is to install variable speed drives on the exhaust fan and makeup air unit, as well as a smoke sensor, which senses the presence of smoke in the hood. During periods of reduced cooking activity, the hood exhaust fan will modulate down to its minimum speed (20% was assumed to be the minimum hood fan speed).

It was estimated that the kitchen's exhaust fans are extracting 37 CFM/ft² of hood area giving a total of 7,104 CFM. Cooking occurs each day from 6am to 8pm. It was estimated that the hood fan was equipped with a 1.5 hp motor.

ENERGY SAVINGS METHODOLOGY

This measure was simulated in eQUEST by replacing the constant air extraction of 7,104 cfm from 6am to 8pm with a ratio schedule for the exhaust fan and makeup air unit. The schedule was created to run near capacity around peak cooking hours near breakfast, lunch, and dinner, while gradually decreasing to a minimum speed when there is likely to be little cooking taking place.

Time	midnight	1-2am	2-3am	3-4am	4-5am	5-6am	6-7am	7-8am	8-9am	9-10am	10-11am	11-Noon
Morning Ratio	0%	0%	0%	0%	0%	0%	85%	95%	85%	65%	20%	20%
Time	Noon-1pm	1-2pm	2-3pm	3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	10-11pm	11-midnight
Afternoon Ratio	85%	95%	65%	20%	75%	85%	75%	20%	0%	0%	0%	0%

COST ESTIMATES

It was estimated that the prescribed control upgrade to the kitchen hood would have a total project cost of approximately \$55,268. See Appendix C: Cost Estimates for more information. This measure is for two hoods.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	5	Kitchen Hood Controls				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
5,294	0.1%	\$566	1678	1.2%	\$1,510	\$2,076
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$55,268	\$0	\$0	\$55,268	26.6	26.6	3.8%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.5	5.2	0.5	4.8	0.6	98%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
12	83	19	13		9,193	

EEM 6: INSTALL LAUNDRY WASTEWATER HEAT RECOVERY DEVICE

Installing a heat exchanger on the laundry's wastewater pipe would allow incoming water to recover some of the heat from the hot water being discharged from the laundry equipment. This heat recovery reduces the amount of heat that must be added to the incoming water to raise it to the desired temperature.

EXISTING CASE

Currently, there is no heat recovery of the laundry waste water. When the water is discharged from the washer, it flows directly into the sewer.

PROPOSED CASE

The proposed change to be applied for this measure consists of installing a water to water heat exchanger, harvesting heat from the laundry discharge to preheat incoming water. The heat exchanger works by using the wastewater from the laundry to heat the incoming supply water, transferring its heat and increasing the supply water temperature. Having an increased supply water temperature decreases the amount of heating energy that must be added to the supply water to meet its temperature setpoint. There will be a pumping penalty associated with this measure due to the head from the heat exchanger.

ENERGY SAVINGS METHODOLOGY

The addition of laundry wastewater heat recovery was not simulated in eQUEST, as eQUEST does not have the capacity to do so. The calculations for this measure were received from Fredrick McKiernan at National Grid.

Savings were calculated using 11 days of minute interval measurements on the laundry DHW heaters and guest room DHW heaters. Below is a list of the measured data made to estimate the savings:

- Outlet temperature and flow of the laundry DHW heaters and the ones serving the guest rooms.
- It was estimated that domestic hot water daily load for the laundry room is 4,241 gal/day and 10,400 gal/day for other DHW use. The laundry DHW flow vs. total entering DHW flow ratio is constant at 29%. Please refer to the appendix for additional information on the building domestic hot water consumption.
- Temperature of the returning DHW from the guest rooms going back to the heaters.

The methodology used is described in See Appendix C: Cost Estimates.

COST ESTIMATES

The cost of the this measure is \$16,917. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	6	Install Laundry Drain Water Heat Recovery				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
-410	0.0%	-\$49	1209	0.8%	\$1,088	\$1,039
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yr	yr	%
\$16,176	\$0	\$0	\$16,176	15.6	15.6	6.4%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	0.0	0.0	0.0	0.0	0%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
6	14	-1	7		1,502	

EEM 7: Upgrade Hot Water (HW) Boilers

The current hot water boilers are near the end of their service life. New, condensing boilers can have efficiencies of 92% or higher, which is a significant improvement over the current models installed in the facility. Replacing the boilers could result in energy savings from the increased efficiency and reduced maintenance cost.

EXISTING CASE

The base case for the upgraded boiler energy efficiency measure is to continue to use the existing hot water boilers:

- (1) Teledyne Laars Boiler (Model HL42200) with 2,200 MBH input and 1,650 MBH output serving the new wing WSHP loop (75% efficiency).
- (1) Teledyne Laars Boiler (Model HQ1466KK06B) with 1,466 MBH input and 1,143 MBH output serving the old wing WSHP loop (78% efficiency).

PROPOSED CASE

The proposed change to be applied for this measure is to install high-efficiency condensing boilers that are 92% efficient at full load. These boilers require less natural gas in order to raise the temperature of the watersource heat pump loops to their setpoints, saving energy. The higher efficiency of condensing boilers is due to the secondary heat exchanger which extracts additional latent heat from the exhaust air vapor.

This measure was modeled with a single WSHP loop with two boilers attached. The boilers are staged so that they both operate at the same part load and ramp up and down in unison. This approach simplifies the modeling while still closely projecting the savings of replacing the boilers attached to both the new and old WSHP loops.

ENERGY SAVINGS METHODOLOGY

This measure was modeled in eQUEST by adjusting the boiler efficiencies from heat input ratios (HIRs) of 1.33 and 1.28 in the base case to 1.18 for both in the proposed case. The boiler type was changed from a forced draft boiler to a condensing boiler. Hot water reset was not required in order for boiler to be fully condensing because of the relatively low temperature of the condenser loop.

COST ESTIMATES

It was estimated that the total project cost for installing two new condensing boilers would be \$226,386. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	7	Upgrade Hot Water Boiler				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
-4,795	-0.1%	-\$444	3349	2.4%	\$3,015	\$2,571
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$179,010	\$0	\$0	\$179,010	69.6	69.6	1.4%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
-2.7	0.0	0.0	0.0	-1.0	55%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
15	-3	-17	17		-276	

EEM 8: INSTALL VARIABLE SPEED DRIVES (VSDs) ON THE CW PUMPS

The pumps that serve the facility's watersource heat pump loop operate at a constant speed, regardless of the demand from the facility. New inverter rated pump motors and variable speed drives will modulate the speed that the pump runs so that water is circulated at a rate that meets, but does not exceed, the requirement to adequately heat or cool the facility.

EXISTING CASE

The base case for the variable speed drives energy efficiency measure is to continue to use constant volume condenser water pumps.

eQUEST model assumptions:

- The 4 CW circulator pumps have single speed motors.
- The pump's motors efficiency each are 88%.
- The two motors are 10 HP and two are 15 HP.
- Each pump is designed for 225 gpm and 90 ft of head.

PROPOSED CASE

The proposed change to be applied for this measure is to replace the pumps' motors with premium-efficiency inverter duty-rated motors and install variable speed drives. The premium-efficiency inverter duty-rated motor ensures highest efficiency and compatibility with the VSD. The pumps will modulate to maintain an adjustable loop differential pressure setpoint. Overall the facility can save electric energy by decreasing the speed of the pumps, decreasing the amount of power that each draws.

ENERGY SAVINGS METHODOLOGY

The variable speed drive measure was simulated in eQUEST using a parametric run that changes each unit from a single speed pump to a variable speed pump. The motors' efficiency has also been increased from 88% to 92%. In addition, the WSHPs condenser isolation valve status has been changed from no to yes. This is needed since the variable speed pump is controlled by the loop differential pressure which depends on the WSHPs isolation valves position. **Therefore, this EEM assumes that the WSHPs have been replaced as suggested in the earlier EEM.**

COST ESTIMATES

It was estimated that the total project cost for installing the variable speed drives would be \$51,246. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	8	Install VFDs on CW Pumps				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
127,676	2.8%	\$12,234	-2804	-2.0%	-\$2,523	\$9,711
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$51,246	\$20,620	\$0	\$30,626	5.3	3.2	31.7%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
15.6	5.8	5.9	5.8	13.1	64%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
56	1,362	447	62		150,176	

EEM 9: INSTALL VARIABLE SPEED DRIVES (VSDs) ON COOLING TOWER FANS

The cooling tower fans which control the amount of heat that is rejected from the condenser loop run at a fixed speed. Variable speed drives (VSDs) would allow the fans to modulate their speeds to save energy when the building load is below the design cooling capacity.

EXISTING CASE

The base case for this measure is to continue to use constant speed cooling tower fans. It was assumed the cooling tower fans run at full speed whenever there is a cooling load on the condenser loop.

It was estimated that each fan is equipped with a 93% efficiency, 15 HP one speed motor.

PROPOSED CASE

The proposed change to be applied for this measure is to install variable speed drives on the cooling tower fans. The motors of the two tower fans are already inverter duty-rated and do not need to be replaced. Variable speed drives allow the fans to modulate their speed to maintain a leaving condenser water temperature setpoint. This EEM will need to be coordinated with the BAS EEM, which includes resetting the condenser water loop temperature. Overall the facility can save electric energy by decreasing the speed of the fans, which decreases the amount of power that each draws.

ENERGY SAVINGS METHODOLOGY

The variable speed drive measure was simulated in eQUEST using a parametric run that changes the capacity control of the two units from a single speed fan to a variable speed fan.

COST ESTIMATES

It was estimated that the total project cost for installing the variable speed drives would be \$17,898. See Appendix C: Cost Estimates for more information. The incentive for the EEM was calculated using the rates from the Rhode Island VFD and Motor Retrofit Program prescriptive incentive application.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	9	Install VFDs on Cooling Tower Fans				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
35,788	0.8%	\$3,903	0	0.0%	\$0	\$3,903
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$17,898	\$8,700	\$0	\$9,198	4.6	2.4	42.4%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	17.7	38.5	19.8	1.4	79%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
20	394	125	22		43,394	

EEM 10: LOW FLOW KITCHEN SPRAY NOZZLE

Installing a low flow kitchen spray nozzle reduces the amount of water that is used to clean kitchen pots, dishes, etc. The specialized nozzle still provides the same effectiveness, despite the reduced flow, while the reduced flow decreases the amount of heating energy that is needed.

EXISTING CASE

The base case for the low flow kitchen spray nozzle energy efficiency measure is to continue to use standard flow rate hot water for dish cleaning.

The kitchen is equipped with four faucets with a nozzle on each. Each of the nozzles is rated at 3 gallons per minute (GPM). Assuming each faucet will be fully running for a total of 1 hour per day, the total hot water consumption of the kitchen sinks would be 720 gallons per day.

PROPOSED CASE

The proposed change to be applied for this measure is to install low flow rate spray nozzles for dish cleaning. The new nozzles will consume 40% less water than the existing nozzles. Each nozzle will use 1.8 GPM. The total daily water consumption of the kitchen spray nozzles will be 432 gallons. Decreasing the flow rate of the water decreases the amount of heating energy that must be added to the water in order to raise it to the required temperature. New low flow spray nozzle designs allow for maintained effectiveness in cleaning, despite the reduced flow rate meaning increased savings without a loss of performance.

ENERGY SAVINGS METHODOLOGY

This measure was simulated in eQUEST by changing the main DHW heater inlet flow to reflect the reduced flow of the kitchen sinks.

COST ESTIMATES

It was estimated that the total project cost for installing the 4 low flow spray nozzles would be \$281. This value is based on \$55 per nozzle material cost and there is no labor cost, as installation can be completed by internal staff. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	10	Low Flow Kitchen Spray Nozzle				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
0	0.0%	\$0	1254	0.9%	\$1,128	\$1,128
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$281	\$0	\$0	\$281	0.2	0.2	401.4%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	0.0	0.0	0.0	0.0	0%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
7	19	0	7		2,073	

EEM 11: INSTALL AERATORS AND LOW FLOW SHOWER HEADS TO REDUCE DOMESTIC HOT WATER (DHW) USE

Aerators in sinks and low flow shower heads reduce the amount of water that is used overall by those units, without decreased effectiveness. The decreased amount of domestic hot water use as a result of these measures decreases the amount of natural gas used by the facility.

EXISTING CASE

The base case for this measure is to continue to use standard flow sinks and shower heads in restrooms throughout the facility. There are approximately 300 standard flow rate sinks in the facility and 266 shower heads.

It was assumed that each guest room uses an average of 40 gallons per day and it was determined using the guest room occupancy list that there is in average of 130 rooms occupied throughout the entire year.

PROPOSED CASE

The proposed change to be applied for this measure is to install aerators in standard flow rate sinks and low flow shower heads in showers with standard DHW use. Aerators are added to the existing sinks and decrease the water flow rate through the faucet. Despite the decreased flow, aerators are still equally effective for users and with decreased DHW flow, less heating energy must be added to the water to raise it to the desired temperature. Low flow shower heads accomplish a similar function, though they replace the existing shower head rather than being retrofitted onto an existing fixture. This measure proposes retrofitting 300 of the sinks in guest rooms and public restrooms with aerators and replacing 266 shower heads with new, low flow shower heads. These aerators reduce the water flow by 40%.

ENERGY SAVINGS METHODOLOGY

This measure was simulated in eQUEST by changing the main DHW heater inlet flow from 5.71gpm to 3.72gpm. This is the equivalent of reducing the daily water load by 40% per room assuming each room uses 40 gallons per day. For more details, see Appendix C: Cost Estimates.

COST ESTIMATES

It was estimated that the total project cost for replacing and retrofitting these fixtures would be \$30,168. This value is based on \$50 per shower head for 266 shower heads, \$15 per aerator for 300 aerators and \$4,700 for the labor. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	11	Install Aerators and Low Flow Shower Heads				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
0	0.0%	\$0	7289	5.2%	\$6,560	\$6,560
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$30,168	\$0	\$15,084	\$15,084	4.6	2.3	43.5%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	0.0	0.0	0.0	0.0	0%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
39	109	0	43		12,052	

EEM 12: COMBINED HEAT AND POWER (CHP)

A combined heat and power system is a large engine or turbine that creates electricity to meet the facility's electric demand, while also recovering heat generated by the unit to heat the facility. CHP units can have overall efficiencies up to 80% and significantly reduce the amount of electricity that the facility must purchase from the grid. Facilities, such as the Crowne Plaza Hotel that have high hot water loads year round can be good candidates for a CHP system.

EXISTING CASE

The base case for the combined heat and power energy efficiency measure is to continue to use the current HVAC systems for producing heating energy and to continue to purchase all electricity from the utility.

It was assumed that the electrical base load is 250 kW and the gas base load is 6 MBH, equivalent to the total DHW gas load. Note that this does not equal the total load of the facility; rather it is an average "minimum threshold" that the facility experiences each month.

PROPOSED CASE

The proposed change to be applied for this measure is to install a KRAFT KMGR-150-4SH Cogeneration (CHP) system that produces 150 kW of electric power from a 14.3 Therms/hr natural gas input. CHP systems are electric generators, typically either engines or gas turbines, that make use of the heat created in the exhaust and engine jacket in order to create steam or hot water for use within the facility. The CHP system proposed in this measure is a gas engine type with jacket water and exhaust heat exchangers. The total heat recovered from both heat exchangers combined is 784,012 BTU/hr. The facility can see a significant decrease in monthly electric utility bills and a decrease in heating energy that must be created by the existing facility heating system, offset by an increase in monthly natural gas bills to fuel the CHP system. The overall efficiency of this unit is 81.38%.

ENERGY SAVINGS METHODOLOGY

The CHP measure was modeled in eQUEST by creating a parametric run which includes a 150kW electric generator with two heat recovery stages, one for the engine-jacket and the other one from the exhaust gas. The jacket recovers 32.9% of the generator's input energy and is used to heat the main DHW loop. The heat recovery exhaust gas recovers 21.7% of the generator's input energy and is used to heat the laundry DHW. **The higher heating value was used when calculating the efficiency of this unit.**

COST ESTIMATES

It was estimated that the total project cost for installing a CHP system would be \$643,469. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	12	Combined Heat and Power				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
1,379,678	29.8%	\$135,256	-107222	-77.2%	-\$96,499	\$38,757
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$643,469	-	-	-	16.6	-	-
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
157.5	157.7	157.5	178.6	160.1	45%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
198	13,568	4,822	218		1,495,630	

EEM 13: GROUND SOURCE HEAT PUMP

A groundsource heat pump is a system that takes advantage of the nearly constant ground water temperature throughout the year, meaning that it can serve as a heat sink in the warmer months and heat source in the colder months. Water from the facility's main loop is pumped through a heat exchanger, which exchanges heat with the ground source loop.

EXISTING CASE

The base case for the ground source heat pump energy efficiency measure is to continue to make use of the existing condenser water loop configuration.

PROPOSED CASE

This measure involves drilling standing column wells with a heat rejection/extraction capacity of 395 tons while providing 55 °F +/- 5 °F water year-round. The system will have pumps to draw water out of the standing column well and run it through a water-to-water heat exchanger where heat is rejected or extracted by the condenser water loop. The advantage of using geothermal is that it eliminates the need for cooling towers and supplementary boilers.

ENERGY SAVINGS METHODOLOGY

The GSHP was modeled in eQUEST by creating another eQUEST model, which is identical to the base model except for the boiler and cooling tower of the WLHP which are replaced by a ground loop heat exchanger and standing column wells. The well field will be comprised of (11) 1000 ft deep wells. Each well has a heat rejection capacity of approximately 35 tons.

COST ESTIMATES

It was estimated that the total project cost for installing a ground source heat pump would be \$1,223,211. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	13	Ground Source Heat Pump				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
82,657	1.8%	\$7,490	8767	6.3%	\$7,891	\$15,381
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$967,229	\$0	\$0	\$967,229	62.9	62.9	1.6%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
8.8	41.9	55.3	19.8	-66.6	82%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
93	1,041	290	102		114,721	

EEM 14: FREEZER

The savings and cost estimates for this EEM were provided by National Resource Management. Refer to Appendix A for their report.

EXISTING CASE

Crowne Plaza has seven walk-in freezers and coolers. The total wattage load for all of the freezers is 2.0873 kW. The freezers are not equipped with destratification fans, ECM motors, or economizers.

PROPOSED CASE

NRM proposes installing ECM motors for the evaporator fans, installing destratification fans inside the freezers, installing a wall-mount economizer (NRM-500), installing a roof-mount economizer (NRM-1000), and installing additional controls.

ENERGY SAVINGS METHODOLOGY

The savings were calculated by NRM.

COST ESTIMATES

The cost for this measure is \$21,858 and was provided by NRM.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	14	Freezer				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
41,273	0.9%	\$4,953	0	0.0%	\$0	\$4,953
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$21,858	\$6,666	\$0	\$15,192	4.4	3.1	32.6%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
1.4	1.4	1.4	1.4	1.4	0%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
23	454	144	25		50,045	

EEM 15: POOL COVER

The current indoor pool is heated everyday throughout the year. The heated water evaporates into the space, cooling the pool down. An automatic pool cover can cover the pool while it is not being used to limit pool evaporation. In addition, pool covers also reduce the need to ventilate the room with outdoor air, meaning more energy can be saved by reducing the outdoor air flow when the pool is covered.

EXISTING CASE

The base case for the pool cover energy efficiency measure is to continue to use the standard pool heater. The existing pool is heated by a 15 kW three-phase electric heater to keep the pool at an average water temperature of 85°F all year long, while the room temperature is between 62 °F and 64 °F. The pool is 225 ft² and open to customers from 8 am to 7 pm every day of the year.

To simulate the baseline model, it was assumed that the swimming pool electric water heater is running at the same rate 24/7 throughout the year, using 79,300 kWh per year. This electric use was calculated using the following assumptions:

- pool water temperature is 85 °F,
- room temperature is 63 °F,
- pool area is 225 ft²,
- pool perimeter of 60 ft,
- room relative humidity of 60%.

See Appendix C: Cost Estimates for more information. This electric use was then simulated in eQUEST by adding a 9.3 kW electric load for the pool heater running 100% on a 24/7 schedule.

PROPOSED CASE

The proposed change is to install an automatic pool cover to limit pool evaporation when the pool is not used. Evaporating water absorbs tremendous amounts of energy and is by far the largest source of the pool energy loss. In addition, pool covers also reduce the need to ventilate the room with outdoor air meaning more energy can be saved by reducing the outdoor air flow when the pool is covered.

ENERGY SAVINGS METHODOLOGY

The pool cover measure was simulated in eQUEST using a parametric run that changes the pool heater schedule from a 100% 24/7 to 100% from 8 am to 7 pm and 30% from 7 pm to 8 am. This schedule matches the opening schedule of the pool facility. It was assumed that the heater runs at 30% because the cooling load is reduced when the pool cover decreases the amount of heat released from the pool via latent heat of vaporization.

COST ESTIMATES

It was estimated that the total cost for installing an automatic pool cover is \$14,999. This value is based on the price per square foot of \$40 given by the vendor for an L shaped pool. The estimates were obtained from COVERTECH LLC. See Appendix C: Cost Estimates for more information.

ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	15	Pool Cover				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
33,681	0.7%	\$3,054	-732	-0.5%	-\$659	\$2,395
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	hrs	hrs	%
\$14,999	\$5,439	\$0	\$9,560	6.3	4.0	25.1%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
0.0	0.2	0.2	0.2	0.2	40%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
15	360	118	16		39,629	

EEM 16: APPLICATION OF VISTA WINDOW FILM

BASE CASE

Crowne Plaza has 11,219 square feet of glazing and 212 sliding glass doors that do not have a window film applied. The solar heat gain coefficient (SHGC) of the clear double hung windows and the double hung sliding doors was assumed to be 0.48.

PROPOSED CASE

A window tint will be applied to the 11,219 square feet of double hung glazing and the 212 sliding glass doors. The window tint will reduce the SHGC to 0.30. The reduction in the SHGC will reduce the load on the heat pumps during cooling operation. There will be a slight heating penalty as the film reduces the amount of passive solar heating during heating operation. The savings are attributed to reduced compressor run hours in the heat pumps, reduced CW loop pump run hours, and reduced cooling tower fan run hours.

ENERGY SAVINGS METHODOLOGY

An eQUEST model was created. The model was created using information gathered during previous site visits, as well as an aerial image that was traced in AutoCAD to create a realistic envelope geometry. The model was calibrated to historical electrical and natural gas consumption that was obtained from NGRID. The base case building was modeled to existing conditions. The proposed case was run by modifying the window SHGC 'parametrically'.

COST ESTIMATES

The cost for this measure was obtained by Crowne Plaza from Solar Tint. The cost for this measure is \$66,390.

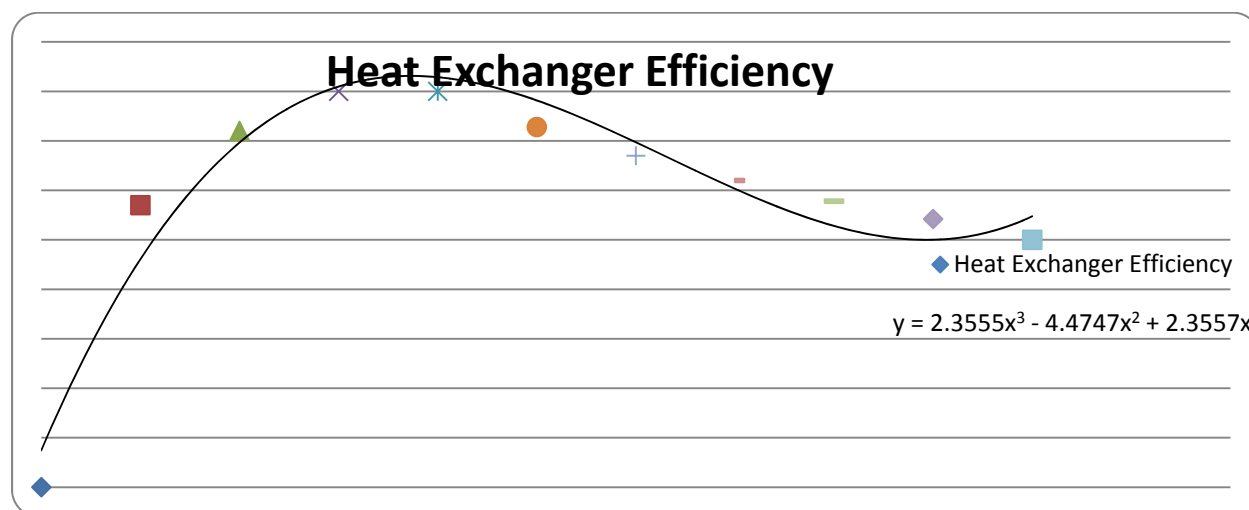
ENERGY SAVINGS & ECONOMICS SUMMARY

ECM #	16	Install Window Tint				
Electric Energy Savings	Electric Energy Savings	Electric Cost Savings	Natural Gas Energy Savings	Natural Gas Energy Savings	Natural Gas Cost Savings	Total Cost Savings
kWh	%	\$	therms	%	\$	\$
149,230	3.2%	\$15,168	-1112	-0.8%	-\$1,001	\$14,167
Retrofit Cost	Electric Incentive	Natural Gas Incentive	Net Cost	Simple Payback Before Incentive	Simple Payback After Incentive	Return on Investment After Incentive
\$	\$	\$	\$	yrs	yrs	%
\$66,390	\$24,101	\$0	\$42,289	4.7	3.0	33.5%
January Peak Demand Savings	June Peak Demand Savings	July Peak Demand Savings	August Peak Demand Savings	December Peak Demand Savings	Percentage of Savings On-Peak	Other Savings
kW	kW	kW	kW	kW	%	\$
8.6	38.5	50.1	38.7	12.7	76%	\$0
CO ₂ Savings	NO _x Savings	SO _x Savings	Equivalent Trees Savings		Equivalent Gasoline Savings	
metric tons	lbs	lbs	trees		gallons	
77	1,625	522	85		179,108	

APPENDIX A: CALCULATIONS

EEM #6: Laundry Drain Water Heat Recovery

Below, the efficiency of the Exergy 23 series, model 00540-2 heat exchanger with a fixed temperature difference between hot and cold water depending on the Hot water to Cold water flow ratio. For example, for a 20% ratio, 20% of the total flow is hot water and 80 % is cold water.



Below, the assumptions made to calculate savings:

Assumptions		
Delay between Laundry income water vs drain	10	min
City water temp before heat recovery	52	F
Laundry Drain water temp	105	F
Heat exchanger efficiency (x=ratio between HW vs CW)	$2.3555x^3 - 4.4747x^2 + 2.3557x$	
Water Heater efficiency	80%	

Below, a section of the 11 day onsite measured data:

Laundry		Guest room		Total	City water	Heat gain	Gas
Time	City water Demand Flow	Time	City water Demand Flow	Flow	temp after heat recovery (F)	in city water	Savings
(hh.mm)	(gpm)	(hh.mm)	(gpm)	gpm		Btu/min	Btu/min
17.21	0.0	17.21	3.1	3.1	61.7	248.1	310.2
17.22	0.0	17.22	3.8	3.8	52.0	0.0	0.0
17.23	0.0	17.23	2.9	2.9	56.7	113.1	141.4
17.24	7.9	17.24	3.0	10.9	52.0	4.1	5.1
17.25	7.9	17.25	4.4	12.3	61.2	949.0	1186.3
17.26	0.2	17.26	2.9	3.2	52.0	0.0	0.0
17.27	11.9	17.27	4.5	16.4	52.0	0.0	0.0
17.28	9.8	17.28	5.2	15.1	52.0	0.0	0.0
17.29	14.9	17.29	5.2	20.0	58.2	1041.1	1301.3

Savings per year (therms)	1208.5
---------------------------	--------

Measured data:

- Laundry City water demand flow
- Guest room City water demand flow was calculated by deducting all other know flows, leaving only the guest room water consumption.

Calculated data formulas:

- **Total flow** = Laundry City water demand flow + Guest room City water demand flow
- **City water temp after heat recovery**= $\text{City_water_temp} + ((\text{City_water_temp} * \text{City_water_flow} + \text{Laundry_Drain_water_temp} * \text{Drain_water_flow}) / (\text{City_water_flow} + \text{Drain_water_flow}) - \text{City_water_temp}) * \text{Heat_Exchanger_efficiency}$
- **Heat gain in city water** = $8.35 * \text{Total flow} * (\text{City water temp after heat recovery} - \text{City water temp before heat recovery})$
- **Gas Savings** = Heat gain in city water - Water Heater efficiency

Low Flow Kitchen Spray Nozzle:

Time	Midnight - 1am	1- 2am	2- 3am	3- 4am	4- 5am	5- 6am	6- 7am	7- 8am	8- 9am	9- 10am	10- 11am	11-Noon
Morning Ratio	60.5%	60.4 %	52.7 %	49.1 %	48.7 %	53.1 %	58.5 %	62.8 %	87.9 %	100.0 %	83.4%	85.6%
Time	Noon- 1pm	1- 2pm	2- 3pm	3- 4pm	4- 5pm	5- 6pm	6- 7pm	7- 8pm	8- 9pm	9- 10pm	10- 11pm	11- midnight
Afternoon Ratio	81.3%	69.8 %	61.9 %	69.6 %	64.9 %	64.9 %	58.8 %	63.5 %	59.5 %	54.9%	62.0%	66.0%

Average hourly ratio	65.8%	
eQUEST Input flow	5.7	gpm
Total water use	5,420	Gal/day
Daily water load per nozzle	180	gal/day
Number of nozzle	4	rooms
Kitchen water load	720	gal/day
Aerator savings	50%	
Proposed daily usage	5060.1	gal
Proposed case eQUEST input flow	5.34	gpm

Shower Aerator calculations:

Time	Midnight - 1am	1- 2am	2- 3am	3- 4am	4- 5am	5- 6am	6- 7am	7- 8am	8- 9am	9- 10am	10- 11am	11-Noon
Morning Ratio	60.5%	60.4 %	52.7 %	49.1 %	48.7 %	53.1 %	58.5 %	62.8 %	87.9 %	100.0 %	83.4%	85.6%
Time	Noon- 1pm	1- 2pm	2- 3pm	3- 4pm	4- 5pm	5- 6pm	6- 7pm	7- 8pm	8- 9pm	9- 10pm	10- 11pm	11- midnight
Afternoon Ratio	81.3%	69.8 %	61.9 %	69.6 %	64.9 %	64.9 %	58.8 %	63.5 %	59.5 %	54.9%	62.0%	66.0%

Average hourly ratio	65.8%	
eQUEST Input flow	5.7	gpm
Total water use	5,420	gal/day
daily water load per room	40	gal/day
Average occupied room per day	130	rooms
Total guest room load	5200	gal/day
Aerator savings	40%	
Proposed daily usage	3340.1	gal
Proposed case eQUEST input flow	3.52	gpm

EEM #14: Freezer

Printed 2/28/2012 2:55 PM

Page 5 of 5
EXHIBIT A

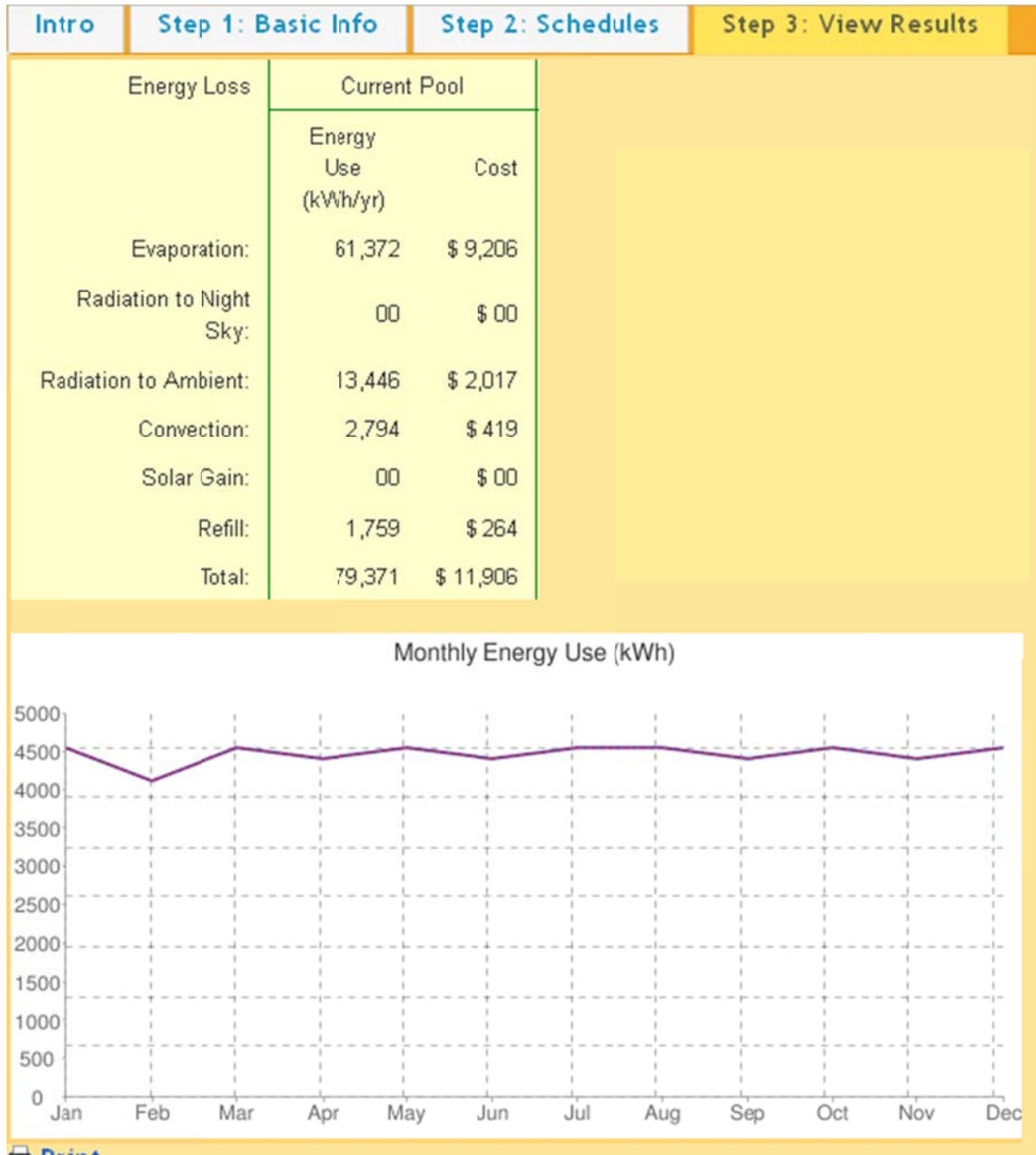
Customer: Crowne Plaza		#2446-BD	
Address: 801 Greenwich Ave., Warwick, RI 02886			
Telephone: 401-732-0000 x7878			
Contact: Deidra Tart			
Utility Company: National Grid			
Account Number: 0000-000-0000		Install: TTCSDH1FH18ECM15DK	
PAYBACK ANALYSIS			
Economizer & Walk-In Cooler/Freezer Evaporator Fan and Door Heater Controls			
Material Code	Quantity	Description	Total Cost
E NRM-500	0	NRM-500 Economizers Wall Mount	\$1,500.00
E NRM-1000	0	NRM-1000 Economizers Roof/Wall Mount	\$8,500.00
CCS 1EV	1	Controls for Temp, Evap Fan, Defrost	\$1,450.00
CCS-2+EV	6	Controls per Additional Cooler/Freezer	\$840.00
A DESTTR-1000	0	Destrallifier fan units	\$210.00
CCS-7 DH	1	Cooler Door Heater Control Option	\$700.00
CCS-7 FH	1	Freezer Door Heater Control Option	\$700.00
CCS-2+DH	4	Additional Cooler Door Heater Circuits	\$525.00
CCS-2+FH	0	Additional Freezer Door Heater Circuits	\$525.00
SD Control	1	Smart Defrost Kit on Walk-in Freezers	\$700.00
1/2 HP ECM	16	ECM Evaporator Fan Motor Replacement for 1/2HP	\$165.00
1/4 HP ECM	5	ECM Evaporator Fan Motor Replacement for 1/4HP	\$290.00
C VCOOL SCT3	0	NRM-Switched Receptacle Control System	\$150.00
MATERIAL SUB TOTAL			\$13,330.00
Sales Tax @ 7%			\$933.10
TOTAL MATERIAL COSTS			\$14,263.10
Cooler Retrofit Labor Cost			\$3,215.00
Economizer Installation Labor Cost			\$0.00
Destrallifier Fan Installation Labor Cost			\$0.00
Cooler Door Heater Retrofit Labor Cost			\$1,025.00
Freezer Door Heater Retrofit Labor Cost			\$445.00
SDK Smart Electric Defrost Control Labor Cost			\$350.00
ECM Evaporator Fan Motor Replacement Labor Cost			\$1,760.00
Novelty Cooler Control Labor Cost			\$0.00
LABOR SUBTOTAL			\$7,595.00
2 YR Warranty on CoolTrol Products			
1 YR Warranty on Electric Defrost Controls and ECM's			
Total PROJECT COST			\$21,858.10
PROJECT ECONOMIC SUMMARY			
Estimated KWH Savings/yr			41,273
Energy savings/yr @ \$0.15/KWH		\$0.150	\$6,603.61
Simple Payback Period Before Incentive			3.31 YRS
PAYBACK ANALYSIS			
ESTIMATED National Grid Incentive		50% of Control and ECMs	\$10,929.05
Net cost to customer			\$10,929.05
Simple Payback Period With Incentive			1.66 YRS

Prepared by National Resource Management, Inc. (NRM) 3/28/2011 Control and ECM's Large CI - MA, N.E. RI (ccoltr).xls CCS7-ROI

EEM #15: Pool Cover

Pool energy consumption calculation using the following online software:

<http://www.energyexperts.org/CalculatorsTools/PoolEnergyUseCalculator.aspx>



EEM #16: Vista Window Film

SOLAR TINT

225B George Waterman Road - Johnston, Rhode Island 02919
(401) 233-0075 800-649-0767 Fax (401) 233-0086
Email: solartintri@verizon.net • www.solartintri.com

PROPOSAL SUBMITTED TO <u>CROWNE PLAZA</u>		PHONE <u>732-6000</u>	DATE <u>6-1-12</u>
STREET <u>801 GREENWICH AVE.</u>		JOB NAME <u>GUEST ROOMS / COMMON AREAS</u>	
CITY, STATE AND ZIP CODE <u>WARWICK, RI 02886</u>		JOB LOCATION	
ARCHITECT	DATE OF PLANS	EMAIL	FAX

We hereby submit specifications and estimate for:

THE FOLLOWING ROOMS AND AREAS
LIMITED WITH VISTA V33B WINDOW FILM

① FRONT - EAST : 60 SLIDING DOORS / 216
3700 SF LITES OF GLASS

② FRONT - EAST PORCHES - 48 LITES OF GLASS
500 SF

③ REAR - WEST - 52 SLIDING DOORS / 135
2465 SF LITES OF GLASS

④ ADDITION - NORTH - 26 SLIDING DOORS / 146
2350 SF LITES OF GLASS

⑤ ADDITION - SOUTH - 26 SLIDING DOORS / 140
2200 SF LITES OF GLASS

We therefore hereby to furnish material and labor to complete in accordance with above specifications, for the sum of:

SIXTY-THREE THOUSAND, FIVE HUNDRED Dollars \$ 63,500.00

Payment to be made as follows:

Tax 2,890.00

TOTAL: 66,390.00

TERMS TO BE DISCUSSED

All material is guaranteed to be as specified. All work to be completed in a substantial workmanlike manner according to specifications submitted, per standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders, and will become an extra charge over and above the estimate. Our workers are fully covered by Workers' Compensation Insurance.

Authorized
Signature

Note: This proposal may be withdrawn by user not accepted within 30 days.

Acceptance of Proposal The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

Signature

Date of Acceptance

Signature

CHART 19: Dual-Pane, 1/8 Inch (3mm) Panes, Exterior Pane High Performance Low-E on #2 Surface, Clear Interior Pane																
	(1) % Total Solar Transmittance	(2) % Total Solar Reflectance	(3) % Total Solar Absorptance	(4) % Visible Transmittance	(5) % Visible Reflectance (exterior)	(6) % Visible Reflectance (interior)	(7) % UV Rejected	(8) Winter U-value	(9) Shading Coefficient	(10) % Total Solar Energy Rejected	(11) Solar Heat Gain Coefficient (SHGC)	(12) Emittance	(13) Light to Solar Heat Gain Ratio (LSG)	(14) % Summer Solar Heat Gain Reduction	(15) % Winter Heat Loss Reduction	(16) % Glare Reduction
Window without film applied:	38	35	27	72	11	12	84	0.30	0.48	58	0.42	0.04	1.71	-	-	-
Window with film applied:																
NEUTRALS																
V33 SR CDF	14	39	47	27	20	20	99.9	0.29	0.38	67	0.33	0.04	0.82	21%	3%	63%
V45 SR CDF	18	37	45	35	16	14	99.9	0.30	0.41	64	0.36	0.04	0.97	15%	0%	51%
V58 SR CDF	24	36	40	46	13	11	99.9	0.30	0.44	62	0.38	0.04	1.21	8%	0%	36%
DUAL REFLECTIVES																
V14 SR CDF	5	47	48	9	39	24	99.9	0.30	0.27	77	0.23	0.04	0.39	44%	0%	88%
V18 SR CDF	8	43	49	16	31	21	99.9	0.30	0.32	73	0.27	0.04	0.59	33%	0%	78%
V28 SR CDF (PS8)	10	42	48	21	29	22	99.9	0.29	0.33	72	0.28	0.04	0.75	31%	3%	71%
V38 SR CDF (PS8)	16	39	45	32	20	17	99.9	0.30	0.38	67	0.33	0.04	0.97	21%	0%	56%
V48 SR CDF	19	36	45	37	15	11	99.9	0.30	0.42	64	0.36	0.04	1.03	13%	0%	49%
V33 BR SR CDF	14	42	44	29	22	19	99.9	0.29	0.34	70	0.30	0.04	0.97	29%	3%	60%
HARMONY SERIES																
V31 SR CDF	12	35	53	28	10	9	99.9	0.29	0.42	64	0.36	0.04	0.78	13%	3%	61%
V40 SR CDF	18	35	47	35	11	9	99.9	0.29	0.43	63	0.37	0.04	0.95	10%	3%	51%
V41 SR CDF	18	35	47	38	10	8	99.9	0.29	0.43	63	0.37	0.04	1.03	10%	3%	47%
V50 SR CDF	21	36	43	43	12	10	99.9	0.28	0.42	63	0.37	0.04	1.16	13%	7%	40%
V51 SR CDF	20	35	45	43	10	9	99.9	0.29	0.43	63	0.37	0.04	1.16	10%	3%	40%
LOW-E SERIES																
VE35 SR CDF	11	46	43	22	36	36	99.9	0.26	0.27	77	0.23	0.04	0.96	44%	13%	69%
VE50 SR CDF	20	40	40	40	22	27	99.9	0.26	0.36	68	0.32	0.04	1.25	25%	13%	44%
EXTERIOR																
VRE20 ER HPR	9	65	26	13	65	60	99.9	0.30	0.13	88	0.12	0.04	1.08	73%	0%	82%
VNE35 ER HPR	29	19	52	34	20	21	99.9	0.30	0.41	65	0.35	0.04	0.97	15%	0%	53%
ENERLOGIC																
VEP35 SR CDF	12	46	42	26	36	29	99	0.22	0.26	77	0.23	0.04	1.13	46%	27%	64%
VEP70 SR CDF	27	35	38	56	11	6	99	0.23	0.42	63	0.37	0.04	1.51	13%	23%	22%
SPECTRALLY SELECTIVE																
V860 SR CDF	22	36	42	49	11	11	99.9	0.29	0.43	63	0.37	0.04	1.32	10%	3%	32%
V861 SR CDF	25	38	37	50	18	20	99.9	0.29	0.41	65	0.35	0.04	1.43	15%	3%	31%
V870 SR CDF	25	35	40	56	11	10	99.9	0.28	0.44	62	0.38	0.04	1.47	8%	7%	22%
V80BL SR CDF	26	35	39	61	11	11	99.9	0.30	0.45	61	0.39	0.04	1.56	6%	0%	15%

Chart 19-V IGU-3mm-LowE 2

Prepared by Solutia Performance Films 1/17/2012

Page 1 of 1

APPENDIX B: BEN-COST SCREENING

EEM1 - Occupancy Sensors 11/15/2012

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Occupancy Sensors
Existing or Base Case	Existing Occupancy Sensors are deactivated
Proposed Case:	Existing Occupancy Sensors are activated

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	357.00	42	8.50
January 5pm-7pm M-F	478.80	42	11.40
February	-	-	0.00
Summer			
June 1pm-5pm M-F	1,621.20	84	19.30
July 1pm-5pm M-F	1,705.20	84	20.30
August 1pm-5pm M-F	1,784.80	92	19.40
September	-	-	0.00

Measure Code:	EMS10
Measure Description:	EMS & HVAC controls - 10yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 28,358.08
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	233,330
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 19,809.72
Percent OnPeak Energy Savings	62%

Calculated Incentive	\$ 8,548
Authorized Incentive	\$ 8,548
Customer Cost	\$ 19,810

Results

Oil	-	(mmBtu)
Propane	-	(mmBtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	-	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	9.95	kW
Pk Sum kW Rd	19.67	kW

Payback Without Incentive	1.43	years
Payback With Incentive	1.00	years

EEM1 - Occupancy Sensors 11/15/2012

National Grid Gas 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Occupancy Sensors
Existing or Base Case	Existing Occupancy Sensors are deactivated
Proposed Case:	Existing Occupancy Sensors are activated

Utility Contact	0	Phone Number	0
Program	Retrofit	App Number	0
State	RI	Funding Type	0

Measure Category:	EMS10
Measure Description:	EMS & HVAC controls - 10yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 4,340.92
Est Incremental Labor Costs	\$ -

Total Est Annual Therm Savings	3,441
Average Cost per therm	\$ 1.15
Est annual Gas Cost Savings	\$ 3,957.15

Calculated Incentive	\$ 384
Authorized Incentive	\$ 379

Customer Cost	\$ 3,962
---------------	----------

Payback Without Incentive	1.10 years
Payback With Incentive	1.00 years

Gas Savings	
Gas Heating	3,441.00 therms
Gas Non Heating	- therms
Gas All	- therms

Energy Savings	
Total Est Annual kWh Savings	- kWh

Demand Savings	
Pk Wm kW Rd	- kW
Pk Sum kW Rd	- kW

Results	
Oil	- (mmBtu)
Propane	- (mmBtu)
Water	- (gallons)
Waste Water	- (gallons)
Other Annual Benefits	- (\$)
Other One Time Benefits	- (\$)
Lifetime Value of Benefits	- (\$)

EEM4 - BAS 5/13/2013

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Building Automation System
Existing or Base Case	No BAS exists
Proposed Case:	A BAS will be installed and all equipment will be controlled centrally

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	512.40	42	12.20
January 5pm-7pm M-F	390.60	42	9.30
February	-	-	0.00
Summer			
June 1pm-5pm M-F	2,958.80	84	35.20
July 1pm-5pm M-F	4,653.60	84	55.40
August 1pm-5pm M-F	3,624.80	92	39.40
September	-	-	0.00

Measure Code:	EMSB10
Measure Description:	EMS & HVAC controls - 10yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 53,902.66
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	385,536
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 32,732.01
Percent OnPeak Energy Savings	55%

Calculated Incentive	\$ 21,171
Authorized Incentive	\$ 21,171
Customer Cost	\$ 32,732

Results

Oil	-	(mmbtu)
Propane	-	(mmbtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	-	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	10.75	kW
Pk Sum kW Rd	43.33	kW

Payback Without Incentive	1.65	years
Payback With Incentive	1.00	years

EEM4 - BAS 5/13/2013

National Grid Gas 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Building Automation System
Existing or Base Case	No BAS exists
Proposed Case:	A BAS will be installed and all equipment will be controlled centrally

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Measure Category:	EMSB10
Measure Description:	EMS & HVAC controls - 10yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 36,975.34
Est Incremental Labor Costs	\$ -

Total Est Annual Therm Savings	27,954
Average Cost per therm	\$ 1.15
Est annual Gas Cost Savings	\$ 32,147.10

Calculated Incentive	\$ 4,828
Authorized Incentive	\$ 4,828

Customer Cost	\$ 32,147
---------------	-----------

Payback Without Incentive	1.15 years
Payback With Incentive	1.00 years

Gas Savings

Gas Heating	-	therms
Gas Non Heating	-	therms
Gas All	27,954.00	therms

Energy Savings

Total Est Annual kWh Savings	-	kWh
------------------------------	---	-----

Demand Savings

Pk Win kW Rd	-	kW
Pk Sum kW Rd	-	kW

Results

Oil	-	(mmBtu)
Propane	-	(mmBtu)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

EEM9 - VFD CT 11/16/2012

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Heat Rejection
Existing or Base Case	The CTs are not equipped with VFDs
Proposed Case:	The CTs are equipped with VFDs

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	58.80	42	1.40
January 5pm-7pm M-F	-	42	0.00
February	-	-	0.00
Summer			
June 1pm-5pm M-F	1,344.00	84	16.00
July 1pm-5pm M-F	3,225.60	84	38.40
August 1pm-5pm M-F	1,784.80	92	19.40
September	-	-	0.00

Measure Code:	VSDH10
Measure Description:	Drives on HVAC systems - 10Yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 17,898.00
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	35,788
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 3,038.40
Percent OnPeak Energy Savings	7900%

Calculated Incentive	\$ 5,780
Authorized Incentive	\$ 24,101
Customer Cost	\$ (6,203)

Results

Oil	-	(mmbtu)
Propane	-	(mmbtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	-	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	0.70	kW
Pk Sum kW Rd	24.60	kW

Payback Without Incentive	5.89	years
Payback With Incentive	(2.04)	years

EEM11 - Install Aerators 11/16/2012

National Grid Gas 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Reduce HW consumption
Existing or Base Case	Fixtures and shower heads are standard flow
Proposed Case:	Fixtures and showers heads will be retrofitted with low flow heads and aerators.

Utility Contact	0	Phone Number	0
Program	Retrofit	App Number	0
State	RI	Funding Type	0

Measure Category:	DHW10
Measure Description:	Domestic/Service Water Systems
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 30,168.00
Est Incremental Labor Costs	\$ -

Total Est Annual Therm Savings	7,289
Average Cost per therm	\$ 1.15
Est annual Gas Cost Savings	\$ 8,382.35

Calculated Incentive	\$ 15,084
Authorized Incentive	\$ 15,084

Customer Cost	\$ 15,084
---------------	-----------

Payback Without Incentive	3.60 years
Payback With Incentive	1.80 years

Gas Savings	
Gas Heating	- therms
Gas Non Heating	- therms
Gas All	7,289.00 therms

Energy Savings	
Total Est Annual kWh Savings	- kWh

Demand Savings	
Pk Wm kW Rd	- kW
Pk Sum kW Rd	- kW

Results	
Oil	- (mmBtu)
Propane	- (mmBtu)
Water	- (gallons)
Waste Water	- (gallons)
Other Annual Benefits	- (\$)
Other One Time Benefits	- (\$)
Lifetime Value of Benefits	- (\$)

EEM15 - Pool Cover 11/16/2012

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Freezer
Existing or Base Case	Evaporator fans do not cycle
Proposed Case:	Evaporators fans will cycle

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	-	42	0.00
January 5pm-7pm M-F	-	42	0.00
February	-	-	0.00
Summer			
June 1pm-5pm M-F	-	84	0.00
July 1pm-5pm M-F	-	84	0.00
August 1pm-5pm M-F	-	92	0.00
September	-	-	0.00

Measure Code:	REFG10
Measure Description:	ercial Refrigeration Equip - 10Yrs
Measure Life:	10
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 21,858.00
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	41,273
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 3,504.08
Percent OnPeak Energy Savings	1%

Calculated Incentive	\$ 6,666
Authorized Incentive	\$ 6,666
Customer Cost	\$ 15,192

Results

Oil	-	(mmbtu)
Propane	-	(mmbtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	7,289.00	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	-	kW
Pk Sum kW Rd	-	kW

Payback Without Incentive	1.84	years
Payback With Incentive	1.28	years

EEM15 - Pool Cover 11/16/2012

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Pool Cover
Existing or Base Case	The pool is not covered
Proposed Case:	The pool will have a cover

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	8.40	42	0.20
January 5pm-7pm M-F	-	42	0.00
February	-	-	0.00
Summer			
June 1pm-5pm M-F	16.80	84	0.20
July 1pm-5pm M-F	16.80	84	0.20
August 1pm-5pm M-F	18.40	92	0.20
September	-	-	0.00

Measure Code:	HTGO
Measure Description:	Heating Other
Measure Life:	15
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 14,999.00
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	33,681
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 2,859.52
Percent OnPeak Energy Savings	1%

Calculated Incentive	\$ 5,439
Authorized Incentive	\$ 5,439
Customer Cost	\$ 9,580

Results

Oil	-	(mmbtu)
Propane	-	(mmbtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	(732.00)	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	0.10	kW
Pk Sum kW Rd	0.20	kW

Payback Without Incentive	7.43	years
Payback With Incentive	4.74	years

EEM16 - Install Window Tint 11/16/2012

National Grid Electric 2012 Custom Screening Tool	
Customer Name	Crowne Plaza
Project Description	Windows
Existing or Base Case	The windows do not have a tint film
Proposed Case:	The windows will be equipped with a window film to reduces SHGC

Utility Contact	0
Program	Retrofit
State	RI

Phone Number	0
App Number	0
Funding Type	0

Time Period	Energy (kWh) Reduction per Period	Hours Per Period	Average Demand Reduction
Winter			
December 5pm-7pm M-F	533.40	42	12.70
January 5pm-7pm M-F	361.20	42	8.60
February	-	-	0.00
Summer			
June 1pm-5pm M-F	3,234.00	84	38.50
July 1pm-5pm M-F	4,208.40	84	50.10
August 1pm-5pm M-F	3,560.40	92	38.70
September	-	-	0.00

Measure Code:	BSHL
Measure Description:	Building Shell (Insul & Windows)
Measure Life:	25
Base Costs	
Proposed Costs	
Est Incremental Costs	
Est Incremental Equip Costs	\$ 66,390.00
Est Incremental Labor Costs	\$ -

Total Est Annual kWh Savings	149,230
Average Cost per kWh	\$ 0.0849
Est annual Energy Cost Savings	\$ 12,669.63
Percent OnPeak Energy Savings	76%

Calculated Incentive	\$ 24,101
Authorized Incentive	\$ 24,101
Customer Cost	\$ 42,289

Results

Oil	-	(mmbtu)
Propane	-	(mmbtu)
Gas Heating	-	(therms)
Gas Non Heating	-	(therms)
Gas All	(1,112.00)	(therms)
Water	-	(gallons)
Waste Water	-	(gallons)
Other Annual Benefits	-	(\$)
Other One Time Benefits	-	(\$)
Lifetime Value of Benefits	-	(\$)

value not currently i

Pk Win kW Rd	10.65	kW
Pk Sum kW Rd	42.43	kW

Payback Without Incentive	5.83	years
Payback With Incentive	3.71	years

APPENDIX C: COST ESTIMATES

			OPINION OF PROBABLE COST								
			Guest room occupancy sensor								
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com			
			Description: Install guest room occupancy sensor						978-208-0609 phone 978-719-6339 fax		
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost
1	3	Label									\$200
2	3	Smart Digital Thermostat - E527	ea	\$180	133	\$23,940	\$50.00	60	\$3,000		\$26,940
2	3	Batteries									\$266
Sources:		NOTE: State Sales Tax not included.						Sub-Total		\$27,406	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$2,741
2)	Vendor Quote							Overhead & Profit		10.0%	\$3,015
								Engineering		8.0%	\$2,653
								Eng Commissioning		2.0%	\$603
3)	Engineering Est.							Construction Management		1.0%	\$301
Total Cost with Mark-up								\$36,719			

						OPINION OF PROBABLE COST								
						WSHP								
						CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax			
						Description: Upgrade WSHPs								
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost			
1	quote	WSHP equipment + instalation	ea	\$1,475	266	\$392,350	\$115.00	2128	\$244,720		\$637,070			
Sources:		NOTE: State Sales Tax not included.						Sub-Total \$637,070						
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$63,707			
2)	Vendor Quote							Overhead & Profit		10.0%	\$70,078			
								Engineering		15.0%	\$115,628			
								Eng Commissioning		10.0%	\$70,078			
3)	Engineering Est.							Construction Management		15.0%	\$105,117			
Total Cost with Mark-up								\$1,061,677						

			OPINION OF PROBABLE COST							
			Upgrade BAS							
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT:	B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com	
			Description: Upgrade BAS						978-208-0609 phone 978-719-6339 fax	
Item #	Source	Description	Cost per point	# of Units	# of Points/Unit	total # of points	Labor Cost	Item Cost		
1	3	Install BAS Program	-	-	-	-	\$20,000	\$20,000		
2	3	Cooling towers	\$650	2	6	12	Included	\$7,800		
3	3	WSHP loop	\$650	1	4	4	Included	\$2,600		
4	3	RTU	\$650	48	9	432	Included	\$280,300		
5	3	Boiler	\$650	6	6	36	Included	\$23,400		
6	3	Pump	\$650	8	2	16	Included	\$10,400		
7	3	Miscellaneous points	\$650	1	4	4	Included	\$2,600		
8	3	Commissioning					\$31,200	\$31,200		
Sources:		NOTE: State Sales Tax not included.			Sub-Total		\$378,800			
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials			Contingency		5.0%	\$18,940		
2)	Vendor Quote				Overhead & Profit		10.0%	\$39,774		
					Engineering		10.0%	\$43,751		
					Eng Commissioning		10.0%	\$39,774		
3)	Engineering Est.				Construction Management		5.0%	\$19,887		
Total Cost with Mark-up						\$540,926				

			OPINION OF PROBABLE COST								
			Kitchen Hood Controls								
			CLIENT: Crown Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax			
			Description: Install kitchen smoke detector								
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost
1	2	Install Kitchen smoke dertector, VSDs and inverter rated motor on Make up and exhaust air	ea	\$10,000	2	\$20,000					\$20,000
2	3	Programming	ea	\$0	2	\$0	\$100.00	24	\$2,400		\$2,400
4		Control Wiring	lf	\$4	200	\$764	inc. in material cost				\$764
Sources:		NOTE: State Sales Tax not included. Vendor quote from previous project.						Sub-Total		\$23,164	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$2,316
2)	Vendor Quote							Overhead & Profit		10.0%	\$2,548
3)								Engineering		15.0%	\$4,204
								Eng Commissioning		10.0%	\$2,548
		Construction Management		15.0%	\$3,822	Total Cost with Mark-up		\$38,603			

			OPINION OF PROBABLE COST									
			Laundry waste water									
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax				
			Description: Install Laundry waste water									
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost	
1	1	Exergy 23 series, model 00540-2 heat exchanger	lf	\$9	100	\$1,160	\$46.85	20	\$937		\$2,097	
2	1	Allocation 90 deg elbow	ea	\$11	6	\$64	\$46.85	4.8	\$225		\$289	
3	3	Allocation for GFX	ea	\$500	1	\$500	\$100.00	4	\$400		\$900	
4	1	Allocation for Circulation Pump	ea	\$1,025	1	\$1,025	\$46.85	3.2	\$150		\$1,175	
5	3	Allocation for Additional Piping Components				\$0	\$0.00		\$0		\$2,500	
6	3	Allocation for Controls				\$0	\$0.00		\$0		\$2,000	
7	1	Allocation for Valving		\$335	2	\$670	\$51.90	1.454	\$75		\$745	
Sources:		NOTE: State Sales Tax not included.							Sub-Total			\$9,706
1)	Means								Contingency		10.0%	\$971
2)	Vendor Quote								Overhead & Profit		10.0%	\$1,068
									Engineering		15.0%	\$1,762
									Eng Commissioning		10.0%	\$1,068
3)	Engineering Est.	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials							Construction Management		15.0%	\$1,602
Total Cost with Mark-up											\$16,176	

			OPINION OF PROBABLE COST									
			Boiler									
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI				REVISION DATE: 11/27/2012 ESTIMATED BY: RE CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax			
			Description: Upgrade Boiler									
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost	
1	3	Allowance for removal of old Gas Boilers	ea	\$1,500	2	\$3,000	\$100.00	24	\$2,400		\$5,400	
2	3	Gas condensing Boiler, 1.466 MBH, Circulator,		\$15,442	1	\$15,442	\$100.00	170	\$17,000		\$32,442	
3	3	Gas Condensing Boiler, 2.2 MBH, Circulator,	ea	\$24,675	1	\$24,675	\$100.00	180	\$18,000		\$42,675	
4	3	Expansion Tank, 60 gal capacity	ea	\$645	2	\$1,290	\$61.00	8	\$488		\$1,778	
5	3	Allowance for boiler Demolition					\$100.00	96	\$9,600		\$9,600	
6	3	Breeching/Penetration/Flues	lf	\$20	100	\$2,000	\$255.00	10	\$2,550		\$4,550	
7	3	Allowance for piping, Sch 40	lf	\$27	100	\$2,700	\$300.00	10	\$3,000		\$5,700	
8	3	Allowance for Pipe Covering	lf	\$7	100	\$700	\$100.00	5	\$500		\$1,200	
9	3	Allowance for Fittings, Valves	ea	\$500	16	\$8,000	\$130.00	40	\$5,200		\$13,200	
10	3	Allowance for Air Separator	ea	\$2,500	1	\$2,500	\$350.00	8	\$2,800		\$5,300	
11	3	Allowance for Electrical									\$5,000	
12	3	Allowance for masonry									\$6,000	
13	3	Allowance for rigging									\$3,000	
Sources:												
1)	Means	NOTE: State Sales Tax not included.										
2)	Vendor Quote	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials										
3)	Engineering Est.											
Total Cost with Mark-up												\$179,010

			OPINION OF PROBABLE COST										
			Pump Variable Speed Drive										
			CLIENT: Crown Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com					
			Description: Install VSD on Water loop pump						978-208-0609 phone				
									978-719-6339 fax				
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost		
1	3	High efficiency 10 HP motor	ea	\$710	2	\$1,420	\$100.00	10	\$1,000.00		\$2,420		
2	3	High efficiency 15 HP motor	ea	\$935	2	\$1,870	\$100.00	10	\$1,000.00		\$2,870		
3	3	Single VSD for 10 HP motor	ea	\$2,335	2	\$4,670	\$100.00	20	\$2,000.00		\$6,670		
4	3	Single VSD for 15 HP motor	ea	\$2,620	2	\$5,240	\$100.00	20	\$2,000.00		\$7,240		
5	3	Pump Differential Pressure Sensor and VSD controls	ea	\$860	4	\$3,440	\$100.00	16	\$1,600.00		\$5,040		
6	3	Control Wiring	lf	\$3.82	200	\$764	\$115.00	8	\$920.00		\$1,684		
7	3	Ball Valve for Wet Tap	ea	\$121	2	\$241	\$100.00	2	\$200.00		\$441		
8	3	Wet Tap - 4" size, 5/16" Probe dia	ea	\$942	2	\$1,884	\$100.00	24	\$2,400.00		\$4,284		
Sources:		NOTE: State Sales Tax not included.						Sub-Total				\$30,649	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$3,065		
2)	Vendor Quote							Overhead & Profit		10.0%	\$3,371		
3)	Engineering Est.							Engineering		20.0%	\$7,417		
								Eng Commissioning		10.0%	\$3,371		
								Construction Management		10.0%	\$3,371		
Total Cost with Mark-up											\$51,246		

			OPINION OF PROBABLE COST								
			Variable Speed Drive on CT fan								
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax			
			Description: Install VSD on cooling towers								
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost
1	1	VSD for 15hp fan motor	ea	\$2,620	2	\$5,240	\$100.00	20	\$2,000		\$7,240
2	3	Programming and Control Point							\$3,500		\$3,500
Sources:		NOTE: State Sales Tax not included.						Sub-Total		\$10,740	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$1,074
2)	Vendor Quote							Overhead & Profit		10.0%	\$1,181
3)								Engineering	15.0%	\$1,949	
								Eng Commissioning	10.0%	\$1,181	
		Construction Management		15.0%	\$1,772	Total Cost with Mark-up		\$17,898			

						OPINION OF PROBABLE COST							
						Kitchen DHW savings							
						CLIENT: Crowne Plaza Hotel			REVISION DATE: 11/16/2012		CONTACT: B2Q Associates, Inc.		
						CUSTOMER: National GRID			ESTIMATED BY: RB		146 Main Street		
						LOCATION: Warwick, RI			CHECKED BY: RA		North Andover, MA 01845		
						Description: Install low flow nozzles			pbanks@b2qassociates.com				
									978-208-0609 phone				
									978-719-6339 fax				
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost		
1	3	Install low flow nozzle	ea	\$40	4	\$160	\$50.00	1	\$50		\$210		
Sources:		NOTE: State Sales Tax not included.						Sub-Total		\$210			
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$21		
2)	Vendor Quote							Overhead & Profit		10.0%	\$23		
								Engineering		8.0%	\$20		
								Eng Commissioning		2.0%	\$5		
								Construction Management		1.0%	\$2		
3)	Engineering Est.							Total Cost with Mark-up		\$281			

			OPINION OF PROBABLE COST								
			Bathroom DHW savings								
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax			
			Description: Install low flow shower heads and faucets								
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost
1	3	Install low flow shower Heads	ea	\$50	266	\$13,300	\$50.00	44	\$2,217		\$15,517
2	3	Install low flow aerator on faucets	ea	\$15	300	\$4,500	\$50.00	50	\$2,500		\$7,000
Sources:		NOTE: State Sales Tax not included.						Sub-Total		\$22,517	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$2,252
2)	Vendor Quote							Overhead & Profit		10.0%	\$2,477
3) Engineering Est.								Engineering		8.0%	\$2,180
								Eng Commissioning		2.0%	\$495
								Construction Management		1.0%	\$248
Total Cost with Mark-up										\$30,168	

			OPINION OF PROBABLE COST								
			CHP								
			CLIENT: Crowne Plaza Hotel			REVISION DATE: 11/16/2012		CONTACT: B2Q Associates, Inc.			
			CUSTOMER: National GRID			ESTIMATED BY: RB		146 Main Street			
			LOCATION: Warwick, RI			CHECKED BY: RA		North Andover, MA 01845			
			Description: Install CHP					pbanks@b2qassociates.com			
								978-208-0609 phone			
								978-719-6339 fax			
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost
1	3	150 KW CHP package	ea	\$197,419.80	1	\$197,419.80			\$0		\$197,419.80
2	3	Engine/Generator Controls	incl above	\$0.00	0	\$0.00			\$0		\$0.00
3	3	Sound Attenuating Enclosure	incl above	\$0.00	0	\$0.00			\$0		\$0.00
4	3	Exhaust Flue	incl above	\$0.00	0	\$0.00			\$0		\$0.00
5	3	Waste Heat "Dump" Radiator &	incl above	\$0.00	0	\$0.00			\$0		\$0.00
6	3	Piping to/from dump radiator	incl above	\$0.00	0	\$0.00			\$0		\$0.00
7	3	Additional emissions reduction system	incl above	\$0.00	0	\$0.00			\$0		\$0.00
8	3	Demo, site work, concrete	ls	\$17,100.00	1	\$17,100.00			\$0		\$17,100.00
9	3	Rigging	ls	\$3,900.00	1	\$3,900.00			\$0		\$3,900.00
10	3	Process Controls Interface	ls	\$15,000.00	1	\$15,000.00			\$0		\$15,000.00
11	3	Mechanical	ls	\$60,000.00	1	\$60,000.00			\$0		\$60,000.00
12	3	Fuel Piping & Fittings from source to	incl above	\$0.00	0	\$0.00			\$0		\$0.00
13	3	Electrical: See attached	ea	\$52,200.00	1	\$52,200.00			\$0		\$52,200.00
14	3	Add for net metering	allow	\$30,000.00	1	\$30,000.00			\$0		\$30,000.00
15	3	General Construction	incl above	\$0.00	0	\$0.00			\$0		\$0.00
16	3	DEP Permitting	allow	\$3,000.00	1	\$3,000.00			\$0		\$3,000.00
17	3	Construction Permits	allow	\$3,000.00	1	\$3,000.00					\$3,000.00
17	3	Contr Start-up and commissioning	allow	\$4,500.00	1	\$4,500.00					\$4,500.00
Sources:										Sub-Total	
1)	Means	NOTE: State Sales Tax not included.								Contingency	\$38,611.98
2)	Vendor Quote									Overhead & Profit	\$42,473.18
3)	Engineering Est.	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials								Engineering	\$70,080.74
										Eng Commissioning	\$42,473.18
										Construction Management	\$63,709.77
										Total Cost with Mark-up	\$643,469

			OPINION OF PROBABLE COST										
			Ground Water loop										
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax					
			Description: Install ground water loop										
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost		
1	2	Drilling 8" diameter, 1500ft deep wells on arenite	lf	\$56	12000	\$672,000			\$0		\$672,000		
2	incl above	Cement & cementing services	incl above	\$0	0	\$0			\$0		\$0		
3	incl above	Casing tools services	incl above	\$0	0	\$0			\$0		\$0		
4	incl above	Well Piping	incl above	\$0	0	\$0			\$0		\$0		
5	incl above	Labor	incl above	\$0	0	\$0			\$0		\$0		
6	incl above	Insurance	incl above	\$0	0	\$0			\$0		\$0		
7	3	Pump + Motor +VSD + controls	ea	\$22,500	2	\$45,000			\$0		\$45,000		
8	3	Demo, site work	ea	\$2,500	1	\$2,500	\$100.00	25	\$2,500		\$5,000		
9	3	Extra piping to connect to water loop	ea	\$5,000	1	\$5,000	\$100.00	50	\$5,000		\$10,000		
10	3	Permits & Geological Surveys	ls	\$2,000	1	\$2,000			\$0		\$2,000		
Sources:		NOTE: State Sales Tax not included.						Sub-Total				\$734,000	
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency				10.0%	\$73,400
2)	Vendor Quote							Overhead & Profit				10.0%	\$80,740
3)	Engineering Est.							Engineering				15.0%	\$133,221
								Eng Commissioning				10.0%	\$80,740
								Construction Management				15.0%	\$121,110
Total Cost with Mark-up						\$1,223,211							

						OPINION OF PROBABLE COST							
						Freezer							
						CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax		
						Description: Freezer Controls							
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost		
1	2	A quote from National Resource Management (NRM) (dated 2/28/2012)									\$21,858		
Sources:		NOTE: State Sales Tax not included.						Sub-Total \$21,858					
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	Included		
2)	Vendor Quote							Overhead & Profit		10.0%	Included		
								Engineering		15.0%	Included		
								Eng Commissioning		10.0%	Included		
3)	Engineering Est.							Construction Management		15.0%	Included		
Total Cost with Mark-up								\$21,858					

			OPINION OF PROBABLE COST									
			Pool									
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION DATE: 11/16/2012 ESTIMATED BY: RB CHECKED BY: RA		CONTACT: B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax				
			Description: Install Drycooler									
Item #	Source	Description	Unit	Unit Cost	Qty	Material Cost	Labor Rate	Hours	Labor Cost	Equipment Cost	Item Cost	
1	2	Automaticool pool cover	sf	\$40	225	\$9,000			Included		\$9,000	
		Gas Heater?									\$0	
											\$0	
Sources:		NOTE: State Sales Tax not included.						Sub-Total				\$9,000
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	\$900	
2)	Vendor Quote							Overhead & Profit		10.0%	\$990	
								Engineering		15.0%	\$1,634	
								Eng Commissioning		10.0%	\$990	
3)	Engineering Est.							Construction Management		15.0%	\$1,485	
Total Cost with Mark-up								\$14,999				

			Window Tint									
			CLIENT: Crowne Plaza Hotel CUSTOMER: National GRID LOCATION: Warwick, RI			REVISION 11/16/2012 ESTIMATE RB CHECKED RA		CONTACT B2Q Associates, Inc. 146 Main Street North Andover, MA 01845 pbanks@b2qassociates.com 978-208-0609 phone 978-719-6339 fax				
			Description: Apply Window Film									
Item #	Source	Description	Unit	Unit Cost	Qty	aterial Co	Labor Rate	Hours	Labor Cos	quipment C	Item Cost	
1	2	A quote from Solar Tint									\$66,390	
Sources:		NOTE: State Sales Tax not included.						Sub-Total				\$66,390
1)	Means	DISCLAIMER: B2Q does not expressly warrant or represent the accuracy of the above cost estimates due to unforeseeable factors in the construction industry, including price volatility of labor and materials						Contingency		10.0%	Included	
2)	Vendor Quote							Overhead & Profit		10.0%	Included	
								Engineering		15.0%	Included	
								Eng Commissioning		10.0%	Included	
3)	Engineering Est.							Construction Management		15.0%	Included	
Total Cost with Mark-up								\$66,390				

APPENDIX D: SIMULATION OUTPUT

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	32422.	1049850.	44480.	218432.	1325284.	0.	1.	0.	0.	4553928.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	60068.	0.	0.	1889.	0.	0.	0.	42251.	0.	135417.

TOTAL ELECTRICITY	4553928. KWH	17.952 KWH	/SQFT-YR GROSS-AREA	17.952 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	135417. THERM	0.534 THERM	/SQFT-YR GROSS-AREA	0.534 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.99
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 174
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	41740.	1015668.	45958.	217384.	1360601.	0.	1.	0.	0.	4564810.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	63856.	0.	0.	1888.	0.	0.	0.	42251.	0.	139204.

TOTAL ELECTRICITY	4564810. KWH	17.995 KWH	/SQFT-YR GROSS-AREA	17.995 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	139204. THERM	0.549 THERM	/SQFT-YR GROSS-AREA	0.549 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

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REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY KWH	1245437.	0.	638023.	48345.	1004472.	47215.	219590.	1360602.	0.	1.	0.	0.	4563683.
FM1 NATURAL-GAS THERM	0.	0.	31208.	63510.	0.	0.	1888.	0.	0.	0.	42251.	0.	138857.

TOTAL ELECTRICITY	4563683. KWH	17.990 KWH	/SQFT-YR GROSS-AREA	17.990 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	138857. THERM	0.547 THERM	/SQFT-YR GROSS-AREA	0.547 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48598.	851326.	89990.	224680.	1167348.	0.	1.	0.	0.	4265401.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	35653.	0.	0.	1925.	0.	0.	0.	42251.	0.	111038.

TOTAL ELECTRICITY	4265401. KWH	16.814 KWH	/SQFT-YR GROSS-AREA	16.814 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	111038. THERM	0.438 THERM	/SQFT-YR GROSS-AREA	0.438 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE	=	4.06
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED	=	0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE	=	123
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE	=	233

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48345.	1074365.	47215.	219590.	1357739.	0.	1.	0.	0.	4630715.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	61831.	0.	0.	1889.	0.	0.	0.	42251.	0.	137180.

TOTAL ELECTRICITY	4630715. KWH	18.255 KWH /SQFT-YR GROSS-AREA
TOTAL NATURAL-GAS	137180. THERM	0.541 THERM /SQFT-YR GROSS-AREA
		18.255 KWH /SQFT-YR NET-AREA
		0.541 THERM /SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.54
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 93
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 480

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	49549.	1076798.	47218.	223180.	1360600.	0.	1.	0.	0.	4640807.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	60161.	0.	0.	1888.	0.	0.	0.	42251.	0.	135508.

TOTAL ELECTRICITY	4640807. KWH	18.294 KWH	/SQFT-YR GROSS-AREA	18.294 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	135508. THERM	0.534 THERM	/SQFT-YR GROSS-AREA	0.534 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48752.	1076584.	47805.	91128.	1360605.	0.	1.	0.	0.	4508335.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	66314.	0.	0.	1888.	0.	0.	0.	42251.	0.	141661.

TOTAL ELECTRICITY	4508335. KWH	17.772 KWH	/SQFT-YR GROSS-AREA	17.772 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	141661. THERM	0.558 THERM	/SQFT-YR GROSS-AREA	0.558 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48345.	1076798.	9389.	221629.	1360602.	0.	1.	0.	0.	4600223.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	63510.	0.	0.	1888.	0.	0.	0.	42251.	0.	138857.

TOTAL ELECTRICITY	4600223. KWH	18.134 KWH	/SQFT-YR GROSS-AREA	18.134 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	138857. THERM	0.547 THERM	/SQFT-YR GROSS-AREA	0.547 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48345.	1076798.	47215.	219590.	1360602.	0.	1.	0.	0.	4636010.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	63510.	0.	0.	1888.	0.	0.	0.	40997.	0.	137604.

TOTAL ELECTRICITY	4636010. KWH	18.275 KWH	/SQFT-YR GROSS-AREA	18.275 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	137604. THERM	0.542 THERM	/SQFT-YR GROSS-AREA	0.542 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	48345.	1076798.	47215.	219590.	1360602.	0.	1.	0.	0.	4636010.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	63510.	0.	0.	1888.	0.	0.	0.	34962.	0.	131568.

TOTAL ELECTRICITY	4636010. KWH	18.275 KWH	/SQFT-YR GROSS-AREA	18.275 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	131568. THERM	0.519 THERM	/SQFT-YR GROSS-AREA	0.519 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 869878.		0.	441442.	29858.	798242.	35901.	149675.	931336.	0.	1.	0.	0.	3256332.
FM1 NATURAL-GAS													
THERM 36436.		0.	50279.	65303.	27025.	1098.	8671.	41647.	0.	0.	15620.	0.	246079.

TOTAL ELECTRICITY	3256332. KWH	12.837 KWH	/SQFT-YR GROSS-AREA	12.837 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	246079. THERM	0.970 THERM	/SQFT-YR GROSS-AREA	0.970 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	33922.	1045065.	0.	200214.	1390009.	0.	684.	0.	0.	4553355.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	54658.	0.	0.	1889.	0.	0.	0.	42335.	0.	130090.

TOTAL ELECTRICITY	4553355. KWH	17.950 KWH	/SQFT-YR GROSS-AREA	17.950 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	130090. THERM	0.513 THERM	/SQFT-YR GROSS-AREA	0.513 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 31.14
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 227
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 2638

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

Crown Plaza RB

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REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY KWH	1245437.	0.	608828.	48345.	1072510.	47215.	219607.	1360384.	0.	1.	0.	0.	4602328.
FM1 NATURAL-GAS THERM	0.	0.	31208.	64244.	0.	0.	1887.	0.	0.	0.	42251.	0.	139590.

TOTAL ELECTRICITY	4602328. KWH	18.143 KWH	/SQFT-YR GROSS-AREA	18.143 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	139590. THERM	0.550 THERM	/SQFT-YR GROSS-AREA	0.550 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 6.06
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 441

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

REPORT- BEPU Building Utility Performance

WEATHER FILE- Providence RI TMY2

	LIGHTS	TASK LIGHTS	MISC EQUIP	SPACE HEATING	SPACE COOLING	HEAT REJECT	PUMPS & AUX	VENT FANS	REFRIG DISPLAY	HT PUMP SUPPLEM	DOMEST HOT WTR	EXT USAGE	TOTAL
EM1 ELECTRICITY													
KWH 1245437.		0.	638023.	47967.	1018586.	41874.	207685.	1287204.	0.	1.	0.	0.	4486782.
FM1 NATURAL-GAS													
THERM 0.	0.	0.	31208.	64626.	0.	0.	1885.	0.	0.	0.	42251.	0.	139970.

TOTAL ELECTRICITY	4486782. KWH	17.687 KWH	/SQFT-YR GROSS-AREA	17.687 KWH	/SQFT-YR NET-AREA
TOTAL NATURAL-GAS	139970. THERM	0.552 THERM	/SQFT-YR GROSS-AREA	0.552 THERM	/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 7.32
 PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.00
 HOURS ANY ZONE ABOVE COOLING THROTTLING RANGE = 90
 HOURS ANY ZONE BELOW HEATING THROTTLING RANGE = 552

NOTE: ENERGY IS APPORTIONED HOURLY TO ALL END-USE CATEGORIES.

AGT REBATE ANALYSIS

MARGIN CALCULATION

Firm Sales Service

Rates for Effect Dec 1, 2008							
	Customer Charge (Monthly)	Demand Rate (MADQ Th)	Distribution \$		Embedded Gas Cost	Head Margin (per Th)	Tail Margin (per Th)
			Head (Th)	Tail (Th)			
1 SMALL LOW LOAD FACTOR	\$ 22.00	\$ -	\$ 0.5431	\$ 0.2242	\$ -	\$ 0.5431	\$ 0.2242
2 SMALL HIGH LOAD FACTOR	\$ 22.00	\$ -	\$ 0.5431	\$ 0.2242	\$ -	\$ 0.5431	\$ 0.2242
3 MEDIUM LOW LOAD FACTOR	\$ 70.00	\$ 1.3000	\$ 0.1865	\$ -	\$ -	\$ 0.1865	
4 MEDIUM HIGH LOAD FACTOR	\$ 70.00	\$ 1.3000	\$ 0.1865	\$ -	\$ -	\$ 0.1865	
5 LARGE LOW LOAD FACTOR	\$ 175.00	\$ 1.3000	\$ 0.1727	\$ -	\$ -	\$ 0.1727	
6 LARGE HIGH LOAD FACTOR	\$ 175.00	\$ 1.8000	\$ 0.1007	\$ -	\$ -	\$ 0.1007	
7 EXTRA LARGE LOW LOAD FACTOR	\$ 425.00	\$ 1.3000	\$ 0.0328	\$ -	\$ -	\$ 0.0328	
8 EXTRA LARGE HIGH LOAD FACTOR	\$ 425.00	\$ 1.8000	\$ 0.0256	\$ -	\$ -	\$ 0.0256	

Calculation of Current Distribution Margin							
MADQ-Current (Th)	26,266	Customer Charge	Demand	Distribution \$			TOTAL MARGIN
Month	Current (Th)			M, L, XL	Small Low	Small High	
Jan	814,239	\$ 425	\$ 47,278	\$ 20,845	-	-	\$ 68,548
Feb	713,326	\$ 425	\$ 47,278	\$ 18,261	-	-	\$ 65,965
Mar	771,750	\$ 425	\$ 47,278	\$ 19,757	-	-	\$ 67,460
Apr	635,224	\$ 425	\$ 47,278	\$ 16,262	-	-	\$ 63,965
May	631,286	\$ 425	\$ 47,278	\$ 16,161	-	-	\$ 63,864
Jun	637,478	\$ 425	\$ 47,278	\$ 16,319	-	-	\$ 64,023
Jul	625,631	\$ 425	\$ 47,278	\$ 16,016	-	-	\$ 63,720
Aug	625,898	\$ 425	\$ 47,278	\$ 16,023	-	-	\$ 63,726
Sep	594,280	\$ 425	\$ 47,278	\$ 15,214	-	-	\$ 62,917
Oct	596,348	\$ 425	\$ 47,278	\$ 15,267	-	-	\$ 62,970
Nov	620,901	\$ 425	\$ 47,278	\$ 15,895	-	-	\$ 63,598
Dec	704,221	\$ 425	\$ 47,278	\$ 18,028	-	-	\$ 65,731
TOTAL	7,970,582	\$ 5,100	\$ 567,341	\$ 204,047	\$ 0	\$ 0	\$ 776,488

average distribution margin / Th \$ 0.097

Off Peak=May-Oct 3,710,921 Rate Classification 8 EXTRA LARGE HIGH LOAD FACTOR
Off Peak / Total 47% Load Factor 1

Small C/I Breaks (Th)
Peak 135 Off Peak 20
Small Low Load 65
Small High Load 30

Calculation of Proposed Distribution Margin							
MADQ-Proposed (Th)	40,743	Customer Charge	Demand	Distribution \$			TOTAL MARGIN
Month	Proposed (Th)			M, L, XL	Small Low	Small High	
Jan	1,263,044	\$ 425	\$ 73,338	\$ 32,334	-	-	\$ 106,097
Feb	1,128,997	\$ 425	\$ 73,338	\$ 28,902	-	-	\$ 102,665
Mar	1,258,293	\$ 425	\$ 73,338	\$ 32,212	-	-	\$ 105,975
Apr	1,112,689	\$ 425	\$ 73,338	\$ 28,485	-	-	\$ 102,248
May	1,211,862	\$ 425	\$ 73,338	\$ 31,024	-	-	\$ 104,787
Jun	1,226,560	\$ 425	\$ 73,338	\$ 31,400	-	-	\$ 105,163
Jul	1,268,664	\$ 425	\$ 73,338	\$ 32,478	-	-	\$ 106,241
Aug	1,243,527	\$ 425	\$ 73,338	\$ 31,834	-	-	\$ 105,597
Sep	1,179,193	\$ 425	\$ 73,338	\$ 30,187	-	-	\$ 103,950
Oct	1,109,531	\$ 425	\$ 73,338	\$ 28,404	-	-	\$ 102,167
Nov	1,110,803	\$ 425	\$ 73,338	\$ 28,437	-	-	\$ 102,200
Dec	1,206,836	\$ 425	\$ 73,338	\$ 30,895	-	-	\$ 104,658
TOTAL	14,319,999	\$ 5,100	\$ 880,056	\$ 185,327	\$ 0	\$ 0	\$ 1,251,748

average distribution margin / Th \$ 0.087

Off Peak=May-Oct (Th) 7,239,337 Rate Classification 8 EXTRA LARGE HIGH LOAD FACTOR
Off Peak / Total 51% Load Factor 1.00

Incremental Distribution Margin per year \$ 475,261
Equipment Life (years) 20
Net Present Value of Margin over Equipment Life: \$4,274,289

Rate= 0.1005

No Deduct

1 \$ 475,261
2 \$ 475,261
3 \$ 475,261
4 \$ 475,261
5 \$ 475,261
6 \$ 475,261
7 \$ 475,261
8 \$ 475,261
9 \$ 475,261
10 \$ 475,261
11 \$ 475,261
12 \$ 475,261
13 \$ 475,261
14 \$ 475,261
15 \$ 475,261
16 \$ 475,261
17 \$ 475,261
18 \$ 475,261
19 \$ 475,261
20 \$ 475,261

NPV1-20 \$4,032,393
NPVremaining \$4,032,393
75% of above \$3,024,295
Less: Construction \$ \$249,482
\$2,774,813

Total Customer Bill		Firm Sales Service				
Rates Eff. May 1, 2005		Customer Charge (Monthly)	Demand Rate (MADQ Ccf)	Distribution \$		GCR (Th)
				Head Block (Th)	Tail Block (Th)	
1	SMALL LOW LOAD FACTOR	\$ 22.00	\$ -	\$ 0.5431	\$ 0.2242	\$ 0.6725
2	SMALL HIGH LOAD FACTOR	\$ 22.00	\$ -	\$ 0.5431	\$ 0.2242	\$ 0.6725
3	MEDIUM LOW LOAD FACTOR	\$ 70.00	\$ 1.3000	\$ 0.1865	\$ -	\$ 0.6725
4	MEDIUM HIGH LOAD FACTOR	\$ 70.00	\$ 1.3000	\$ 0.1865	\$ -	\$ 0.6725
5	LARGE LOW LOAD FACTOR	\$ 175.00	\$ 1.3000	\$ 0.1727	\$ -	\$ 0.6725
6	LARGE HIGH LOAD FACTOR	\$ 175.00	\$ 1.8000	\$ 0.1007	\$ -	\$ 0.6240
7	EXTRA LARGE LOW LOAD FACTOR	\$ 425.00	\$ 1.3000	\$ 0.0328	\$ -	\$ 0.6725
8	EXTRA LARGE HIGH LOAD FACTOR	\$ 425.00	\$ 1.8000	\$ 0.0256	\$ -	\$ 0.6240

Calculation of Current Bill								
MADQ-Current (Th)		Customer Charge	Demand	Distribution \$		GCR	TOTAL BILL	
Month	Current (Th)			M, L, XL				
Jan	814,239	\$ 425	\$ 47,278	\$ 20,845	-	\$ 508,085	\$ 576,633	
Feb	713,326	\$ 425	\$ 47,278	\$ 18,261	-	\$ 445,115	\$ 511,080	
Mar	771,750	\$ 425	\$ 47,278	\$ 19,757	-	\$ 481,572	\$ 549,032	
Apr	635,224	\$ 425	\$ 47,278	\$ 16,262	-	\$ 396,380	\$ 460,345	
May	631,286	\$ 425	\$ 47,278	\$ 16,161	-	\$ 393,922	\$ 457,787	
Jun	637,478	\$ 425	\$ 47,278	\$ 16,319	-	\$ 397,786	\$ 461,809	
Jul	625,631	\$ 425	\$ 47,278	\$ 16,016	-	\$ 390,394	\$ 454,113	
Aug	625,898	\$ 425	\$ 47,278	\$ 16,023	-	\$ 390,560	\$ 454,287	
Sep	594,280	\$ 425	\$ 47,278	\$ 15,214	-	\$ 370,831	\$ 433,748	
Oct	596,348	\$ 425	\$ 47,278	\$ 15,267	-	\$ 372,121	\$ 435,091	
Nov	620,901	\$ 425	\$ 47,278	\$ 15,895	-	\$ 387,442	\$ 451,041	
Dec	704,221	\$ 425	\$ 47,278	\$ 18,028	-	\$ 439,434	\$ 505,165	
TOTAL	7,970,582	\$ 5,100	\$ 567,341	\$ 204,047	\$ 0	\$ 4,973,643	\$ 5,750,131	

average charge / Th \$ 0.721

Off Peak=May-Oct 3,710,921 Rate Classification 8 EXTRA LARGE HIGH LOAD FACTOR
Off Peak / Total 47% Load Factor 1

Calculation of Proposed Bill								
MADQ-Proposed (Th)		Customer Charge	Demand	Distribution \$		Distribution Charges		TOTAL BILL
Month	Proposed (Th)			M, L, XL		Small Low	Small High	
Jan	1,263,044	\$ 425	\$ 73,338	\$ 32,334	-	-	\$ 788,139	\$ 894,236
Feb	1,128,997	\$ 425	\$ 73,338	\$ 28,902	-	-	\$ 704,494	\$ 807,159
Mar	1,258,293	\$ 425	\$ 73,338	\$ 32,212	-	-	\$ 785,175	\$ 891,150
Apr	1,112,689	\$ 425	\$ 73,338	\$ 28,485	-	-	\$ 694,318	\$ 796,566
May	1,211,862	\$ 425	\$ 73,338	\$ 31,024	-	-	\$ 756,202	\$ 860,989
Jun	1,226,560	\$ 425	\$ 73,338	\$ 31,400	-	-	\$ 765,373	\$ 870,536
Jul	1,268,664	\$ 425	\$ 73,338	\$ 32,478	-	-	\$ 791,646	\$ 897,887
Aug	1,243,527	\$ 425	\$ 73,338	\$ 31,834	-	-	\$ 775,961	\$ 881,558
Sep	1,179,193	\$ 425	\$ 73,338	\$ 30,187	-	-	\$ 735,816	\$ 839,767
Oct	1,109,531	\$ 425	\$ 73,338	\$ 28,404	-	-	\$ 692,347	\$ 794,514
Nov	1,110,803	\$ 425	\$ 73,338	\$ 28,437	-	-	\$ 693,141	\$ 795,341
Dec	1,206,836	\$ 425	\$ 73,338	\$ 30,895	-	-	\$ 753,066	\$ 857,724
TOTAL	14,319,999	\$ 5,100	\$ 880,056	\$ 366,592	\$ 0	\$ 0	\$ 8,935,679	\$ 10,187,428

average charge / Th \$ 0.711

Off Peak=May-Oct 7,239,337 Rate Classification 8 EXTRA LARGE HIGH LOAD FACTOR
Off Peak / Total 51% Load Factor 1

AGT Rebate Calculations based on:

- 75% of the difference in Capital Cost and
- An amount resulting in a 1.5 year Simple Payback

75% of the difference between the Base and Alternate Energy Projects' capital costs

$$\begin{aligned}
 &= (\$22,700,000) - (\$0) \times 75\% \\
 &= \boxed{\$17,025,000} - \$249,482 = \$16,775,518 \\
 &\quad \text{Constr Cost}
 \end{aligned}$$

An amount resulting in a simple payback of 1.5 years

$$\begin{aligned}
 &= (\$22,700,000 - \$0) / (\$0 - -\$1,612,053) \\
 &= \$22,700,000 / \$1,612,053 \\
 &= 14.0814229 \text{ years} = \text{Simple payback of Base Energy Project}
 \end{aligned}$$

Rebate Amount

$$\begin{aligned}
 &= (14.0814229 - 1.5) \times (\$0 - -\$1,612,053) \\
 &= 12.5814229 \times \$1,612,053 \\
 &= \boxed{\$20,281,921} - \$249,482 = \$20,032,439 \\
 &\quad \text{Constr Cost}
 \end{aligned}$$

AGT FINANCIAL ANALYSIS

Miscellaneous notes on the AGT Financial Analysis for Applications Falling in the Small, Medium, Large or Extra Large Rate Classification

- 1 Model is set up for Customers in the Small, Medium, Large and Extra Large Rate classifications both on a current basis and with the added AGT Program load
- 2 Heat Recovery:
 - If the proposed application will have heat recovery which displaces existing gas heat, the displaced therms will be factored into the margin calculation.
 - The model distributes the displaced Ccf in the same relationship to when the proposed load uses gas since that is when the heat is generated
- 3 Bill Calculation
 - The bill calculation sheet can be used to get a gas energy cost for the customer.
- 4 Separate meter:
 - If the application is to be separately metered run model with no current load to get the right rate calculation for the new account and see Pricing for help with loss of existing margin due to heat recovery from new application.

New England Gas Company Rhode Island Demand Side Management Program Financial Analysis

Inputs for IRP Financial Analysis

Date:
Customer Name: Aspen Aeorgels
Address: East Providence, RI
Account # :

Equipment Type: CHP Engine
Equipment Life (years): 20
Current gas load saved due to heat recovery (Ccf)
MADQ - Current: 1,946 Th
- Proposed: 3,239 Th

	<u>CHP Project</u>	<u>Base</u>	
Capital Cost	\$3,600,000	\$0.00	
Operating Cost	\$772,524	\$1,631,988.20	\$859,463.90

Results of Analysis

Incremental Distribution Margin Year 1	\$ 45,727	
Net Present Value based on equipment life	\$ 464,749	
Rebate based on 75% of NPV	\$ 330,288	
Rebate based on 75% of Capital Cost Difference	\$ 2,700,000	
Rebate resulting in 1.5 year Simple Payback	\$ 2,310,804	
	\$ 330,288	= REBATE

Rate Classification:

Current:
Proposed:

Month	CY 2014 Proposed Load (Th)	Current Base Load (Th)	Adjustment to current for Heat Recovery	Proposed Adjusted
Jan	100,127	59,835		40,292
Feb	90,679	54,235		36,444
Mar	100,227	59,894		40,333
Apr	97,033	58,386		38,647
May	99,746	59,922		39,824
Jun	97,129	58,034		39,096
Jul	100,639	60,246		40,393
Aug	100,292	59,922		40,370
Sep	96,057	58,034		38,024
Oct	100,077	60,246		39,831
Nov	96,350	57,833		38,517
Dec	99,812	60,174		39,637
TOTAL	1,178,168	706,760	0	471,407

*
*
*
*
*

New England Gas Company Rhode Island Demand Side Management Program Financial Analysis

Inputs for IRP Financial Analysis

Date:
Customer Name: Crowne Plaza
Address: Warwick, RI
Account # : _____

Equipment Type: CHP Engine
Equipment Life (years): 20
Current gas load saved due to heat recovery (Ccf): _____
MADQ - Current: 1,078 Th
- Proposed: 1,170 Th

	<u>CHP Project</u>	<u>Base</u>	
Capital Cost	\$424,000	\$0.00	
Operating Cost	\$78,065	\$0.00	-\$78,064.88

Results of Analysis

Incremental Distribution Margin Year 1	\$ 8,446	
Net Present Value based on equipment life	\$ 85,843	
Rebate based on 75% of NPV	\$ 64,382	
Rebate based on 75% of Capital Cost Difference	\$ 318,000	
Rebate resulting in 1.5 year Simple Payback	\$ 306,903	
	\$ 64,382	= REBATE

Rate Classification:

Current:
Proposed:

Month	CY 2014 Proposed Load (Th)	Current Base Load (Th)	Adjustment to current for Heat Recovery	Proposed Adjusted
Jan	22,175	19,278	0	2,897
Feb	32,762	30,188	0	2,574
Mar	31,059	28,205	0	2,854
Apr	24,513	21,683	0	2,830
May	21,073	18,616	0	2,457
Jun	14,611	12,479	0	2,132
Jul	12,466	10,383	0	2,083
Aug	11,031	8,948	0	2,083
Sep	10,534	8,519	0	2,015
Oct	11,024	8,380	0	2,644
Nov	16,085	13,222	0	2,863
Dec	19,665	16,786	0	2,879
TOTAL	226,998	196,687	0	30,311

Redacted
Division 1-2

Request:

Re: The Direct Testimony of Witness Ann E. Leary at page 7, line 12, though page 8, line 10, please provide a list of each project presently being considered by the Company for inclusion in the AGT program and provide:

- a. The name of the customer (may be provided subject to confidentiality restrictions);
- b. The projected annual gas use volumes for the proposed facility;
- c. The dollar amount of anticipated AGT funding for the project by year;
- d. Description of the advanced technology that would be utilized;
- e. Any workpapers, studies and analyses relied upon to support the Company's assessment of the proposed project.

Response:

- a) [REDACTED] is the only customer currently working towards an offering of an AGT rebate. The Company has also discussed the Advanced Gas Technology (AGT) program with other customers, including two manufacturing facilities, but the Company has not studied their proposed gas usages as of yet to see how and if they would qualify to accept such applications.
- b) [REDACTED] projected annual gas increase in volume is [REDACTED] therms.
- c) The Company will offer the [REDACTED] project a rebate of [REDACTED]. The Company used the table provided in Attachment DIV 1-2-1 to determine the offer to the customer. The gas usage qualifies for 55 percent and at a rate of \$0.63 for an Extra High Load Factor customer.
- d) The advanced technology that would be used is combined heat and power.
- e) In support of the project's rebate, please see the attached AGT table provided in Attachment DIV 1-2-1 and the applicable Technical Assistance Study provided in Confidential Attachment DIV 1-2-2.

REDACTED

		therms non heat	total therms Increase	% consumed	\$ Actual offered	\$ Proposed Table	CHP size		
	Rate	31%	35%	Percent Consumed in May-Oct Months					
			40%	45%	50%	55%	60%	65%	70%+
SMALL LOW LOAD FACTOR	\$ 1.25	\$ 1.38	\$ 1.50	\$ 1.63	\$ 1.75	\$ 1.88	\$ 2.00	\$ 2.13	\$ 2.25
SMALL HIGH LOAD FACTOR	\$ 1.25	\$ 1.38	\$ 1.50	\$ 1.63	\$ 1.75	\$ 1.88	\$ 2.00	\$ 2.13	\$ 2.25
MEDIUM LOW LOAD FACTOR	\$ 1.00	\$ 1.13	\$ 1.25	\$ 1.38	\$ 1.50	\$ 1.63	\$ 1.75	\$ 1.88	\$ 2.00
MEDIUM HIGH LOAD FACTOR	\$ 1.00	\$ 1.13	\$ 1.25	\$ 1.38	\$ 1.50	\$ 1.63	\$ 1.75	\$ 1.88	\$ 2.00
LARGE LOW LOAD FACTOR	\$ 0.25	\$ 0.38	\$ 0.50	\$ 0.63	\$ 0.75	\$ 0.88	\$ 1.00	\$ 1.13	\$ 1.25
LARGE HIGH LOAD FACTOR	\$ 0.25	\$ 0.38	\$ 0.50	\$ 0.63	\$ 0.75	\$ 0.88	\$ 1.00	\$ 1.13	\$ 1.25
EXTRA LARGE LOW LOAD FACTOR	\$ 0.25	\$ 0.25	\$ 0.25	\$ 0.38	\$ 0.50	\$ 0.63	\$ 0.75	\$ 0.88	\$ 1.00
EXTRA LARGE HIGH LOAD FACTOR	\$ 0.25	\$ 0.25	\$ 0.25	\$ 0.38	\$ 0.50	\$ 0.63	\$ 0.75	\$ 0.88	\$ 1.00

Incremental Therms estimated during
May-Oct months times \$/therms

TECHNOLOGY	APPLICATION
Air Compressor	Product cooling or movement
Compressed Natural Gas	Personal or fleet cars and trucks
Engine-Driven Pump	Municipal water pumping
Convection Oven & Burner	Curing, drying and forming
Absorption/Engine Driven Chiller	Office air conditioning or process cooling
Desiccant Dehumidifier	Office or process dehumidification
Engine-Driven Generator	Cogeneration
Catalytic Infra-Red Heater	Curing, drying and forming
Incinerator	Solid waste or air pollutant destruction
Boiler & Burner	Process heating (i.e., steam, hot water, etc.)

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 4846
2018 Distribution Adjustment Charge Filing
Responses to Division's First Set of Data Requests
Issued August 30, 2018

Attachment DIV 1-2-2

REDACTED

Division 1-3

Request:

Re: The Direct Testimony of Witness Ann E. Leary at page 7, line 12, though page 8, line 10, please provide a list of each project during the last three years that have applied for but been denied rebates under the AGT program including:

- a. The name of the customer (may be provided subject to confidentiality restrictions);
- b. The projected annual gas use volumes for the proposed facility;
- c. Description of the advanced technology that would be utilized;
- d. Reason for project denial;
- e. Requested Rebate amount.

Response:

Over the last three years, no customers have applied for a rebate under the Advanced Gas Technology program and been denied.

Division 1-4

Request:

Re: The Direct Testimony of Witness Ann E. Leary at page 29, lines 4 though 8, please:

- a. Provide the detail of the forecast from which the referenced 39,347,340 Dths of forecasted throughput;
- b. Provide actual throughput by month for the current DAC year and for each of the three immediately preceding DAC years.

Response:

- a. To clarify, the forecasted throughput referenced in the August 1, 2018 direct testimony of Company witness Ann E. Leary at page 29, lines 4 through 8, is 39,668,606 dekatherms (Dth), rather than 39,347,340 Dth indicated in this request. In addition, in the August 31, 2018 supplemental testimony of Ms. Leary at page 10, the Company increased the annual forecast by 18,426 Dth, for a total of 39,687,032 Dth. Please see Attachment DIV 1-4(a) for the monthly throughput by rate classification for the period November 2018 through October 2019. Please note this information was also provided in the Company's 2018 Gas Cost Recovery filing, Docket No. 4872, filed on August 31, 2018 at Attachment AEL-1, Page 12. The forecast presented in this filing was prepared by Company witness, Theodore E. Poe.
- b. Please see Attachment DIV 1-4(b) for the actual monthly throughput for the each of the Distribution Adjustment Charge years during November 2014 through July 2018. The Company previously provided the actual monthly throughput for the period November 2014 through October 2017 in Schedule 6 of the October Monthly Deferred Reports filed on November 20, 2015 in Docket No. 4520; November 18, 2016 in Docket No. 4576; and November 20, 2017 in Docket No. 4647. The Company also provided the monthly throughput data for the period November 2017 through July 2018 in Schedule 6 of the July Monthly Deferred Report filed on August 17, 2018 in Docket No. 4719.

**National Grid - RI Gas
Gas Cost Recovery (GCR) Filing
Forecasted Throughput (Dth)**

Rate Class	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-Oct
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
<u>SALES</u>													
(1) Residential Non-Heating	22,227	35,614	47,291	40,666	38,648	37,807	26,709	21,502	16,823	16,284	17,571	16,077	337,218
(2) Residential Heating	1,271,942	2,396,453	3,427,224	3,653,832	3,123,499	2,122,108	1,225,830	619,954	435,361	397,039	439,559	532,719	19,645,520
(3) Small C&I	125,069	293,293	453,403	454,861	389,113	258,015	116,773	65,276	40,925	36,380	48,446	52,987	2,334,542
(4) Medium C&I	200,308	392,753	606,014	526,512	452,808	383,665	197,339	125,789	98,066	94,334	97,543	110,966	3,286,097
(5) Large LLF	44,361	92,278	119,512	130,436	117,009	85,027	49,006	18,991	11,143	9,807	13,893	16,841	708,304
(6) Large HLF	19,715	23,207	31,558	27,637	23,504	22,820	19,033	15,521	13,976	13,402	16,077	16,190	242,642
(7) Extra Large LLF	2,541	5,897	5,728	7,685	6,516	3,854	3,652	1,426	342	84	293	847	38,865
(8) Extra Large HLF	9,650	4,484	-	4,654	1,128	-	8,824	6,431	5,706	6,321	5,860	8,592	61,651
(9) Total Sales	1,695,814	3,243,979	4,690,730	4,846,283	4,152,227	2,913,296	1,647,166	874,890	622,341	573,652	639,241	755,220	26,654,839
<u>TRANSPORTATION</u>													
(10) FT- Small	12,566	20,010	25,711	27,397	23,943	17,207	11,753	5,273	2,876	2,532	2,898	6,015	158,180
(11) FT- Medium	173,197	315,865	411,364	369,590	342,996	260,713	155,362	95,839	75,553	73,024	76,357	92,379	2,442,238
(12) FT- Large LLF	176,854	296,272	358,609	352,261	309,727	189,270	115,275	50,934	34,456	32,191	43,742	83,995	2,043,586
(13) FT- Large HLF	72,228	99,002	112,191	98,705	100,840	78,821	67,676	59,185	50,762	58,565	58,743	59,808	916,525
(14) FT- Extra Large LLF	122,430	178,864	194,162	182,450	157,144	96,228	62,805	27,050	21,711	20,914	29,069	80,905	1,173,733
(15) FT- Extra Large HLF	561,571	629,875	608,190	524,520	597,555	475,819	466,687	479,539	493,717	517,144	445,471	497,844	6,297,932
(16) Total FT Transportation	1,118,847	1,539,888	1,710,227	1,554,923	1,532,205	1,118,057	879,557	717,819	679,075	704,370	656,281	820,946	13,032,193
<u>Total THROUGHPUT</u>													
(17) Residential Non-Heating	22,227	35,614	47,291	40,666	38,648	37,807	26,709	21,502	16,823	16,284	17,571	16,077	337,218
(18) Residential Heating	1,271,942	2,396,453	3,427,224	3,653,832	3,123,499	2,122,108	1,225,830	619,954	435,361	397,039	439,559	532,719	19,645,520
(19) Small C&I	137,635	313,303	479,114	482,258	413,056	275,222	128,526	70,548	43,801	38,912	51,344	59,002	2,492,721
(20) Medium C&I	373,505	708,618	1,017,378	896,102	795,805	644,377	352,701	221,628	173,618	167,358	173,900	203,345	5,728,335
(21) Large LLF	221,214	388,549	478,120	482,697	426,737	274,298	164,280	69,925	45,599	41,998	57,635	100,837	2,751,890
(22) Large HLF	91,944	122,209	143,749	126,342	124,344	101,641	86,709	74,706	64,738	71,967	74,820	75,997	1,159,166
(23) Extra Large LLF	124,972	184,761	199,890	190,135	163,660	100,082	66,456	28,476	22,053	20,999	29,362	81,753	1,212,598
(24) Extra Large HLF	571,222	634,359	608,190	529,174	598,683	475,819	475,511	485,970	499,423	523,465	451,331	506,436	6,359,583
(25) Total Throughput	2,814,661	4,783,867	6,400,956	6,401,206	5,684,431	4,031,353	2,526,723	1,592,708	1,301,416	1,278,022	1,295,522	1,576,166	39,687,032

Actual Dth Usage for Filing

THROUGHPUT (Dth)

Rate Class

	Nov-17 Actual (a)	Dec-17 Actual (b)	Jan-18 Actual (c)	Feb-18 Actual (d)	Mar-18 Actual (e)	Apr-18 Actual (f)	May-18 Actual (g)	Jun-18 Actual (h)	Jul-18 Actual (i)	Total Actual (m)
1 SALES										
2 Residential Non-Heating	25,799	36,375	54,883	49,588	42,810	41,610	30,778	20,876	17,267	319,985
3 Residential Non-Heating Low Income	506	908	1,479	1,192	1,139	1,176	992	550	458	8,399
4 Residential Heating	1,049,547	2,123,640	3,918,609	3,156,062	2,437,110	2,449,113	1,306,376	501,624	399,062	17,341,142
5 Residential Heating Low Income	85,126	174,014	295,095	237,817	192,552	191,545	117,403	50,413	40,182	1,384,149
6 Small C&I	111,854	277,727	585,108	440,831	334,818	319,554	154,805	52,206	43,437	2,320,339
7 Medium C&I	195,033	383,557	660,534	533,358	424,687	414,692	234,444	118,691	99,018	3,054,013
8 Large LLF	32,729	77,403	145,182	120,731	101,572	99,605	52,679	10,910	15,118	655,929
9 Large HLF	19,260	22,406	29,939	26,984	20,449	27,181	21,738	20,612	15,327	207,897
10 Extra Large LLF	1,662	7,001	9,784	6,318	10,337	11,137	5,738	1,636	966	54,580
11 Extra Large HLF	9,191	7,841	5,969	3,560	3,292	3,705	4,618	5,200	5,396	48,773
12 Total Sales	1,530,707	3,110,872	5,696,582	4,576,441	3,572,766	3,559,318	1,929,572	782,719	636,232	25,395,207
13 TSS										
14 Small	26	327	1,270	1,577	928	895	409	5	0	5,437
15 Medium	1,986	6,054	11,692	11,398	12,266	11,034	8,187	27	234	62,877
16 Large LLF	501	5,293	10,605	10,619	8,523	8,523	4,065	0	0	48,576
17 Large HLF	0	464	629	4,300	771	(164)	2,302	0	0	8,301
18 Extra Large LLF	0	0	0	0	0	0	0	0	0	0
19 Extra Large HLF	0	0	0	0	0	0	0	0	0	0
20 Total TSS	2,513	12,138	24,197	27,895	22,935	20,288	14,962	31	234	125,192
21 Sales & TSS THROUGHPUT										
22 Residential Non-Heating	25,799	36,375	54,883	49,588	42,810	41,610	30,778	20,876	17,267	319,985
23 Residential Non-Heating Low Income	506	908	1,479	1,192	1,139	1,176	992	550	458	8,399
24 Residential Heating	1,049,547	2,123,640	3,918,609	3,156,062	2,437,110	2,449,113	1,306,376	501,624	399,062	17,341,142
25 Residential Heating Low Income	85,126	174,014	295,095	237,817	192,552	191,545	117,403	50,413	40,182	1,384,149
26 Small C&I	111,880	278,053	566,379	442,408	335,746	320,449	155,214	52,211	43,437	2,325,776
27 Medium C&I	197,019	389,610	662,226	544,756	436,953	425,727	242,631	118,718	99,252	3,116,891
28 Large LLF	33,230	82,697	155,787	131,351	110,543	108,127	56,744	10,910	15,118	704,505
29 Large HLF	19,260	22,871	30,568	31,285	25,220	27,017	24,039	20,612	15,327	216,199
30 Extra Large LLF	1,662	7,001	9,784	6,318	10,337	11,137	5,738	1,636	966	54,580
31 Extra Large HLF	9,191	7,841	5,969	3,560	3,292	3,705	4,618	5,200	5,396	48,773
32 Total Sales & TSS Throughput	1,533,220	3,123,009	5,720,779	4,604,335	3,595,701	3,579,606	1,944,533	782,750	636,465	25,520,398
33 FT-1 TRANSPORTATION										
34 FT-1 Small	0	0	0	0	0	0	0	0	0	0
35 FT-1 Medium	30,639	60,057	94,202	106,674	70,928	79,406	56,114	28,324	22,817	549,159
36 FT-1 Large LLF	34,759	97,785	156,615	188,114	117,763	131,498	92,626	28,406	18,764	866,328
37 FT-1 Large HLF	32,023	38,641	51,303	58,673	41,269	46,793	38,856	32,470	28,689	368,716
38 FT-1 Extra Large LLF	48,732	127,674	194,739	224,079	151,917	171,030	126,757	46,116	25,013	1,116,058
39 FT-1 Extra Large HLF	433,197	494,103	573,189	623,062	499,034	544,355	492,894	435,486	425,787	4,521,106
40 Default	4,332	9,934	11,836	12,359	9,199	10,571	8,376	1,824	1,291	69,721
41 Total FT-1 Transportation	583,682	828,194	1,081,884	1,212,960	890,109	983,653	815,622	572,624	522,361	7,491,089
42 FT-2 TRANSPORTATION										
43 FT-2 Small	6,121	14,942	30,920	23,834	18,268	17,792	9,661	3,132	1,963	126,633
44 FT-2 Medium	115,362	220,831	362,383	302,105	252,568	225,062	142,061	67,418	55,558	1,743,348
45 FT-2 Large LLF	60,802	159,214	267,279	214,763	179,315	174,043	107,417	33,875	20,295	1,217,001
46 FT-2 Large HLF	36,322	47,803	63,254	59,154	50,624	53,196	39,633	30,068	27,451	407,505
47 FT-2 Extra Large LLF	126	2,476	4,034	3,026	2,471	2,597	1,203	0	0	15,902
48 Total FT-2 Transportation	47,318	52,276	60,012	46,226	43,247	46,933	39,757	42,217	31,497	409,482
49 Total FT-2 Transportation	266,050	497,542	787,882	649,107	546,463	519,623	339,732	176,710	136,764	3,919,872
50 Total THROUGHPUT										
51 Residential Non-Heating	25,799	36,375	54,883	49,588	42,810	41,610	30,778	20,876	17,267	319,985
52 Residential Non-Heating Low Income	506	908	1,479	1,192	1,139	1,176	992	550	458	8,399
53 Residential Heating	1,049,547	2,123,640	3,918,609	3,156,062	2,437,110	2,449,113	1,306,376	501,624	399,062	17,341,142
54 Residential Heating Low Income	85,126	174,014	295,095	237,817	192,552	191,545	117,403	50,413	40,182	1,384,149
55 Small C&I	118,001	292,995	617,299	466,242	354,014	338,241	164,875	55,343	45,400	2,452,409
56 Medium C&I	343,020	670,498	1,118,811	953,535	760,448	730,194	440,806	214,459	177,627	5,409,398
57 Large LLF	128,791	339,695	579,680	534,227	407,621	413,668	256,787	73,190	54,177	2,787,835
58 Large HLF	87,605	109,315	145,125	149,112	117,113	127,007	102,528	83,150	71,467	992,420
59 Extra Large LLF	50,519	137,151	208,557	233,422	164,695	184,765	133,699	47,753	25,980	1,186,540
60 Extra Large HLF	489,706	554,220	639,171	672,847	545,573	594,993	537,269	482,903	462,680	4,979,361
61 Total Throughput	2,382,952	4,448,745	7,590,544	6,466,403	5,032,272	5,082,882	3,099,887	1,532,085	1,295,590	36,931,360

Actual Dth Usage for Filing

THROUGHPUT (Dth)		Rate Class											
Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Total	
Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	(m)	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)		
1 SALES													
2 Residential Non-Heating	27,860	38,287	50,638	50,625	47,073	44,256	24,258	19,200	17,698	18,669	16,470	384,370	
3 Residential Non-Heating Low Income	708	1,220	1,697	1,646	1,406	1,429	683	486	438	1,424	(624)	11,518	
4 Residential Heating	1,105,743	2,028,011	2,935,054	2,884,975	2,623,389	2,276,588	986,291	656,511	369,201	375,999	385,111	17,041,537	
5 Residential Heating Low Income	99,712	178,044	250,781	238,178	213,710	194,021	67,120	43,824	38,781	40,198	37,443	1,501,938	
6 Small C&I	116,386	260,153	412,737	405,424	368,672	315,479	66,481	43,307	37,212	39,210	39,210	2,207,054	
7 Medium C&I	202,328	353,053	502,001	473,805	444,548	395,382	189,716	97,779	93,200	95,519	101,259	3,089,120	
8 Large LLF	38,117	70,274	111,810	100,523	94,633	80,576	30,177	20,339	9,086	10,365	10,185	586,342	
9 Large HLF	17,053	21,083	26,215	26,803	24,099	20,948	19,724	17,792	12,615	16,358	14,763	232,549	
10 Extra Large LLF	3,267	6,464	12,229	12,069	10,129	4,291	2,883	1,059	479	336	607	61,229	
11 Extra Large HLF	10,464	5,556	6,078	3,679	3,582	7,836	10,647	7,815	6,744	5,843	8,751	80,755	
12 Total Sales	1,621,637	2,962,145	4,309,240	4,195,075	3,831,181	3,340,569	1,473,313	651,008	587,934	603,893	613,175	25,196,411	
13 TSS													
14 Small	1	820	1,643	1,720	1,352	1,660	341	74	33	12	17	7,767	
15 Medium	1,651	2,542	5,657	6,588	6,566	8,327	4,570	134	118	1,024	806	38,058	
16 Large LLF	1,104	2,207	5,122	5,623	8,641	7,726	1,932	150	204	0	586	33,195	
17 Large HLF	360	986	(7,763)	781	852	1,594	987	0	0	0	0	(2,204)	
18 Extra Large LLF	0	0	0	0	0	0	0	0	0	0	0	0	
19 Extra Large HLF	0	0	0	0	0	0	0	0	0	0	0	0	
20 Total TSS	3,116	6,555	4,658	14,712	17,411	19,307	7,830	359	355	1,036	1,409	76,816	
21 Sales & TSS THROUGHPUT													
22 Residential Non-Heating	27,860	38,287	50,638	50,625	47,073	44,256	24,258	19,200	17,698	18,669	16,470	384,370	
23 Residential Non-Heating Low Income	708	1,220	1,697	1,646	1,406	1,429	683	486	438	1,424	(624)	11,518	
24 Residential Heating	1,105,743	2,028,011	2,935,054	2,884,975	2,623,389	2,276,588	986,291	656,511	369,201	375,999	385,111	17,041,537	
25 Residential Heating Low Income	99,712	178,044	250,781	238,178	213,710	194,021	100,127	43,824	38,781	40,198	37,443	1,501,938	
26 Small C&I	116,387	260,972	414,380	407,145	370,024	315,140	66,574	43,381	37,246	39,193	39,228	2,214,821	
27 Medium C&I	203,978	355,596	503,658	480,393	450,709	414,114	194,286	97,914	93,318	96,543	102,065	3,127,178	
28 Large LLF	39,221	72,481	116,932	106,146	103,274	88,301	32,109	10,406	9,289	10,365	10,771	619,536	
29 Large HLF	17,413	22,069	18,451	27,584	24,951	22,542	20,711	17,792	12,615	16,358	14,763	230,345	
30 Extra Large LLF	3,267	6,464	12,229	9,417	10,069	10,129	7,836	4,291	2,883	336	607	61,229	
31 Extra Large HLF	10,464	5,556	6,078	3,679	3,582	7,836	10,647	7,815	6,744	5,843	8,751	80,755	
32 Total Sales & TSS Throughput	1,624,752	2,968,700	4,313,898	4,209,787	3,848,592	3,359,876	1,481,143	651,366	588,289	604,928	614,584	25,273,226	
33 FT-1 TRANSPORTATION													
34 FT-1 Small	0	0	0	0	0	0	0	0	0	0	0	0	
35 FT-1 Medium	15,039	57,778	91,539	92,513	76,349	87,997	45,854	23,293	21,970	23,698	23,592	593,076	
36 FT-1 Large LLF	30,674	85,561	138,218	139,766	118,745	139,253	64,270	19,071	15,474	16,660	18,918	825,791	
37 FT-1 Large HLF	34,229	46,585	45,978	45,978	41,018	46,755	30,869	28,414	25,530	30,959	30,186	391,729	
38 FT-1 Extra Large LLF	49,729	116,405	178,743	179,983	159,841	186,388	98,443	28,207	20,162	21,762	25,305	1,127,465	
39 FT-1 Extra Large HLF	26,686	49,114	557,480	552,086	489,501	569,383	456,839	434,173	445,240	452,915	391,880	5,305,050	
40 Default	1,315	5,384	7,861	7,933	6,877	8,043	8,305	4,092	2,189	2,326	2,196	59,028	
41 Total FT-1 Transportation	126,573	790,470	1,020,427	1,018,260	892,330	1,037,818	704,581	601,811	538,906	548,191	492,207	8,302,140	
42 FT-2 TRANSPORTATION													
43 FT-2 Small	5,763	12,400	19,816	18,921	18,027	14,840	5,565	2,460	2,299	2,308	2,343	109,702	
44 FT-2 Medium	113,132	196,524	277,630	266,892	257,186	228,063	111,699	51,690	51,122	50,384	54,721	1,738,976	
45 FT-2 Large LLF	90,345	164,245	224,090	204,116	189,418	154,331	66,850	39,593	18,450	19,167	27,361	1,229,642	
46 FT-2 Large HLF	36,219	43,989	56,893	59,620	56,196	46,493	33,574	25,720	24,257	26,620	27,286	469,169	
47 FT-2 Extra Large LLF	42,225	49,991	7,574	6,675	7,985	6,478	2,108	936	423	(782)	142	37,264	
48 FT-2 Extra Large HLF	289,058	469,135	636,607	604,218	582,335	503,579	37,837	36,026	34,521	41,438	36,599	520,588	
49 Total FT-2 Transportation								156,426	131,072	139,134	148,452	4,105,341	
50 Total THROUGHPUT													
51 Residential Non-Heating	27,860	38,287	50,638	50,625	47,073	44,256	24,258	19,200	17,698	18,669	16,470	384,370	
52 Residential Non-Heating Low Income	708	1,220	1,697	1,646	1,406	1,429	683	486	438	1,424	(624)	11,518	
53 Residential Heating	1,105,743	2,028,011	2,935,054	2,884,975	2,623,389	2,276,588	986,291	656,511	369,201	375,999	385,111	17,041,537	
54 Residential Heating Low Income	99,712	178,044	250,781	238,178	213,710	194,021	67,120	43,824	38,781	40,198	37,443	1,501,938	
55 Small C&I	122,150	273,372	434,196	426,066	388,051	329,980	110,717	71,536	39,544	41,501	41,570	2,324,523	
56 Medium C&I	332,149	609,897	876,827	839,797	784,649	719,769	351,839	172,897	166,411	170,625	180,378	5,459,230	
57 Large LLF	160,240	322,287	479,241	450,028	411,438	381,885	163,229	91,095	43,213	46,193	57,051	2,674,969	
58 Large HLF	56,763	100,288	121,930	133,181	122,164	115,789	78,509	66,410	64,883	73,937	72,235	1,091,242	
59 Extra Large LLF	54,369	127,856	198,546	196,075	175,805	202,996	104,842	30,203	21,064	23,316	26,054	1,225,958	
60 Extra Large HLF	79,375	543,661	614,162	603,758	548,696	623,524	502,512	481,595	486,504	500,195	437,230	5,906,393	
61 Default	1,315	5,384	7,861	7,933	6,877	8,043	8,305	4,092	2,189	2,196	2,326	59,028	
Total Throughput	2,040,383	4,228,306	5,970,932	5,832,264	5,323,257	4,898,277	2,443,356	1,346,698	1,249,926	1,292,254	1,255,243	37,680,707	

Actual Dth Usage for Filing

THROUGHPUT (Dth)													Rate Class																																																																																																														
1	SALES	2	Residential Non-Heating	3	Residential Non-Heating Low Income	4	Residential Heating	5	Residential Heating Low Income	6	Small C&I	7	Medium C&I	8	Large LLF	9	Large HLF	10	Extra Large LLF	11	Extra Large HLF	12	Total Sales	13	TSS	14	Small	15	Medium	16	Large LLF	17	Large HLF	18	Extra Large LLF	19	Extra Large HLF	20	Total TSS	21	Sales & TSS THROUGHPUT	22	Residential Non-Heating	23	Residential Non-Heating Low Income	24	Residential Heating	25	Residential Heating Low Income	26	Small C&I	27	Medium C&I	28	Large LLF	29	Large HLF	30	Extra Large LLF	31	Extra Large HLF	32	Total Sales & TSS Throughput	33	FT-1 TRANSPORTATION	34	FT-1 Small	35	FT-1 Medium	36	FT-1 Large LLF	37	FT-1 Large HLF	38	FT-1 Extra Large LLF	39	FT-1 Extra Large HLF	40	Default	41	Total FT-1 Transportation	42	FT-2 TRANSPORTATION	43	FT-2 Small	44	FT-2 Medium	45	FT-2 Large LLF	46	FT-2 Large HLF	47	FT-2 Extra Large LLF	48	FT-2 Extra Large HLF	49	Total FT-2 Transportation	50	Total THROUGHPUT	51	Residential Non-Heating	52	Residential Non-Heating Low Income	53	Residential Heating	54	Residential Heating Low Income	55	Small C&I	56	Medium C&I	57	Large LLF	58	Large HLF	59	Extra Large LLF	60	Extra Large HLF	61	Default	62	Total Throughput

Actual Dth Usage for Filing

THROUGHPUT (Dth)Rate Class

	<u>Nov-14</u> <u>Actual</u> (a)	<u>Dec-14</u> <u>Actual</u> (b)	<u>Jan-15</u> <u>Actual</u> (c)	<u>Feb-15</u> <u>Actual</u> (d)	<u>Mar-15</u> <u>Actual</u> (e)	<u>Apr-15</u> <u>Actual</u> (f)	<u>May-15</u> <u>Actual</u> (g)	<u>Jun-15</u> <u>Actual</u> (h)	<u>Jul-15</u> <u>Actual</u> (i)	<u>Aug-15</u> <u>Actual</u> (j)	<u>Sep-15</u> <u>Actual</u> (k)	<u>Oct-15</u> <u>Actual</u> (l)	<u>Total</u> (m)
1 SALES													
2 Residential Non-Heating	56,635	74,913	97,349	123,153	116,760	83,622	45,364	29,503	23,827	21,194	20,827	24,491	717,638
3 Residential Non-Heating Low Income	2,753	2,976	4,006	4,900	4,353	2,939	2,015	1,051	787	728	593	828	29,320
4 Residential Heating	954,909	2,132,202	2,877,504	3,747,011	3,449,650	2,298,799	1,005,002	502,341	400,977	346,347	343,276	450,190	18,508,206
5 Residential Heating Low Income	100,792	213,885	282,745	352,717	318,259	247,469	109,620	61,630	49,907	40,759	40,160	50,642	1,868,584
6 Small C&I	113,249	292,468	439,525	597,057	549,888	338,002	125,776	58,890	47,382	42,914	43,390	52,565	2,701,105
7 Medium C&I	178,359	381,774	521,529	651,611	613,387	408,835	197,016	114,481	88,610	76,911	82,998	101,609	3,417,120
8 Large LLF	33,489	86,758	120,493	141,284	147,542	101,589	45,229	11,989	10,474	25,083	11,388	11,263	746,580
9 Large HLF	15,270	18,169	22,930	24,633	25,819	31,088	15,252	19,782	8,379	11,262	11,420	19,984	223,991
10 Extra Large LLF	5,189	9,565	16,279	19,829	11,954	12,084	(4,815)	14,341	1,735	(628)	1,821	2,420	89,774
11 Extra Large HLF	(152,203)	160,465	108,923	59,429	53,908	47,657	23,721	31,883	23,815	17,991	16,165	14,386	406,140
12 Total Sales	1,308,441	3,373,175	4,492,986	5,719,920	5,291,519	3,573,474	1,564,179	845,891	655,892	583,040	571,562	728,379	28,708,459
13 TSS													
14 Small	301	854	1,327	1,920	2,089	1,345	378	220	185	192	0	56	8,866
15 Medium	9,178	21,446	29,294	38,027	37,104	25,222	11,865	10,534	6,483	5,923	3,175	10,365	208,615
16 Large LLF	2,777	5,722	7,098	13,537	8,055	8,378	3,976	2,274	1,144	1,112	628	1,018	55,719
17 Large HLF	2,532	2,704	4,072	3,674	3,313	2,402	1,277	1,687	1,357	1,310	1,478	1,574	27,379
18 Extra Large LLF	0	0	0	0	0	0	0	0	0	0	0	0	0
19 Extra Large HLF	264	532	743	837	769	616	245	218	159	125	0	0	4,509
20 Total TSS	15,052	31,258	42,532	57,995	51,330	37,964	17,740	14,933	9,328	8,662	5,281	13,013	305,088
21 Sales & TSS THROUGHPUT													
22 Residential Non-Heating	56,635	74,913	97,349	123,153	116,760	83,622	45,364	29,503	23,827	21,194	20,827	24,491	717,638
23 Residential Non-Heating Low Income	2,753	2,976	4,006	4,900	4,353	2,939	2,015	1,051	787	728	593	828	29,320
24 Residential Heating	954,909	2,132,202	2,877,504	3,747,011	3,449,650	2,298,799	1,005,002	502,341	400,977	346,347	343,276	450,190	18,508,206
25 Residential Heating Low Income	100,792	213,885	282,745	352,717	318,259	247,469	109,620	61,630	49,907	40,759	40,160	50,642	1,868,584
26 Small C&I	113,550	293,321	440,852	598,976	551,977	339,347	126,153	59,110	47,568	42,914	43,581	52,622	2,709,971
27 Medium C&I	187,537	403,220	550,823	689,638	650,491	434,057	208,882	125,015	95,093	82,834	86,173	111,974	3,625,735
28 Large LLF	36,266	92,480	127,590	154,821	155,597	109,967	49,205	14,263	11,618	26,195	12,016	12,281	802,299
29 Large HLF	17,802	20,873	28,704	26,603	29,132	33,491	16,528	21,469	9,736	12,576	12,898	21,558	251,371
30 Extra Large LLF	5,189	9,565	16,279	19,829	11,954	12,084	(4,815)	14,341	1,735	(628)	1,821	2,420	89,774
31 Extra Large HLF	(151,939)	160,997	109,666	60,266	54,678	48,274	23,965	32,101	23,974	18,116	16,165	14,386	410,649
32 Total Sales & TSS Throughput	1,323,493	3,404,433	4,535,518	5,777,914	5,342,849	3,611,438	1,581,919	860,825	665,221	591,702	576,843	741,392	29,013,547
33 FT-1 TRANSPORTATION													
FT-1 Small	0	0	0	0	0	0	0	0	0	0	0	0	0
34 FT-1 Medium	57,966	96,104	100,233	135,188	122,498	75,806	21,313	6,857	21,051	24,285	24,512	24,527	710,339
35 FT-1 Large LLF	85,682	184,327	260,376	376,016	333,587	204,857	107,703	60,396	49,330	46,825	45,603	58,466	1,118,857
36 FT-1 Large HLF	44,200	22,241	61,570	68,016	59,201	45,155	24,369	25,331	33,188	26,564	31,062	34,626	475,524
37 FT-1 Extra Large LLF	90,099	219,158	190,733	271,669	152,936	112,130	41,421	41,421	3,936	18,237	19,300	26,775	1,187,815
38 FT-1 Extra Large HLF	387,524	526,905	485,557	1,114,383	199,614	595,745	354,609	415,032	428,855	457,334	452,386	408,034	5,825,983
39 Default	19,277	5,635	11,253	12,896	13,353	7,386	195	261	835	(1,362)	5,248	165	75,141
40 Total FT-1 Transportation	684,748	1,059,227	1,033,672	1,862,528	722,803	927,081	475,494	522,488	505,627	541,270	544,083	514,638	9,393,658
41 FT-2 TRANSPORTATION													
FT-2 Small	2,128	4,905	8,211	16,127	14,606	7,807	3,208	1,627	1,503	1,431	1,445	1,686	64,684
43 FT-2 Medium	112,126	178,320	249,026	302,723	291,842	204,857	107,703	60,396	49,330	46,825	45,603	58,466	1,707,215
44 FT-2 Large LLF	77,258	143,077	207,088	238,144	233,339	114,024	62,983	29,165	11,198	13,175	15,590	25,658	1,170,700
45 FT-2 Large HLF	32,198	45,275	50,064	52,770	67,514	50,722	35,421	37,616	27,338	31,531	21,841	24,725	477,015
46 FT-2 Extra Large LLF	5,357	4,119	11,008	13,007	15,952	8,322	3,613	1,404	833	833	435	839	65,983
47 FT-2 Extra Large HLF	13,412	16,035	16,606	16,189	21,989	16,367	26,776	17,265	22,552	19,024	37,093	31,609	254,918
48 Total FT-2 Transportation	242,480	391,730	542,002	638,960	645,241	402,099	239,705	147,473	113,016	112,819	122,007	142,982	3,740,514
49 Total THROUGHPUT													
50 Residential Non-Heating	56,635	74,913	97,349	123,153	116,760	83,622	45,364	29,503	23,827	21,194	20,827	24,491	717,638
51 Residential Non-Heating Low Income	2,753	2,976	4,006	4,900	4,353	2,939	2,015	1,051	787	728	593	828	29,320
52 Residential Heating	954,909	2,132,202	2,877,504	3,747,011	3,449,650	2,298,799	1,005,002	502,341	400,977	346,347	343,276	450,190	18,508,206
53 Residential Heating Low Income	100,792	213,885	282,745	352,717	318,259	247,469	109,620	61,630	49,907	40,759	40,160	50,642	1,868,584
54 Small C&I	115,678	298,227	449,062	615,104	566,582	347,154	129,362	60,737	49,071	45,013	44,359	54,307	2,774,655
55 Medium C&I	357,629	677,643	900,081	1,127,548	1,064,830	714,720	337,898	192,267	165,473	153,944	156,287	194,967	6,043,288
56 Large LLF	199,207	424,741	519,005	653,341	564,137	314,850	145,774	77,015	40,575	55,581	39,181	58,450	3,091,857
57 Large HLF	94,200	88,389	140,338	147,390	155,847	129,368	76,319	84,416	70,262	70,672	65,801	80,908	1,203,909
58 Extra Large LLF	100,645	232,842	234,505	232,842	180,842	218,020	57,165	40,220	6,765	12,536	21,557	30,034	1,343,572
59 Extra Large HLF	248,997	703,937	611,829	1,190,838	276,281	660,386	405,351	464,398	475,385	494,475	505,645	454,030	6,491,551
60 Default	19,277	5,635	11,253	12,896	13,353	7,386	195	261	835	(1,362)	5,248	165	75,141
61 Total Throughput	2,250,721	4,855,391	6,111,192	8,279,403	6,710,893	4,940,618	2,297,118	1,530,785	1,283,863	1,245,791	1,242,933	1,399,012	42,147,720

Division 1-5

Request:

Re: The Direct Testimony of Witness Ann E. Leary Schedule AEL-7, please provide the workpapers, including electronic spreadsheet files, used in the development of the Company's RDM reconciliations, customer transfer adjustments, and normalizations.

Response:

The Company provided the Division of Public Utilities and Carriers (Division) with Excel files associated with the Revenue Decoupling Mechanism (RDM) reconciliation filing on June 29, 2018, and again in the Distribution Adjustment Charge (DAC) filing on August 1, 2018 and the Supplemental DAC filing on August 31, 2018. Please note that, as indicated in the RDM testimony of Ann E. Leary submitted on June 29, 2018 at Page 6 of 8 (and also included in Schedule AEL-7, Page 11 of 19 of the August 1, 2018 DAC filing), the Company did not make any adjustments to reflect customer transfers and normalizations because the Company has identified all Residential Heating customers who were incorrectly on the Residential Non-Heating rate class during the rate year February 2013 through January 2014, so no further adjustments were needed. Please see the Excel version of Attachment DIV 1-5, which is the same electronic spreadsheet provided on August 31, 2018, with additional detail supporting the actual revenues and customer counts used to compute the RDM adjustment.

Division 1-6

Request:

Re: The August 1, 2018 Direct Testimony of Witness Ann E. Leary at page 15, lines 11, through 21, please provide:

- a. The Witness' definition of Distribution Adjustment Charge related bad debt;
- b. The Witness' definition of energy efficiency related bad debt;
- c. The amount of Distribution Adjustment Charge related bad debt for each of the last three years;
- d. The amount of energy efficiency related bad debt for each of the last three years.

Response:

- a. The Distribution Adjustment Charge (DAC)-related bad debt referenced in the direct testimony of Ann E. Leary on Page 15 is the revenue associated with the uncollectible component of the DAC. In each DAC filing, the Company adjusts the DAC (excluding the Revenue Decoupling Adjustment factor) by the uncollectible percentage approved in the Company's most recent rate proceeding, pursuant to the Company's tariff, RIPUC NG-GAS No. 101, Section 3, Schedule A, Item 2.0.
- b. The energy efficiency-related bad debt referenced in Ms. Leary's direct testimony on Page 15 is the revenue associated with the uncollectible component of the Energy Efficiency Surcharge (EES). In each Energy Efficiency Program filing, the Company adjusts the EES by the uncollectible percentage approved in the Company's most recent rate proceeding, pursuant to the Company's tariff, RIPUC NG-GAS No. 101, Section 1, Schedule C, Item 4.0.
- c. Please see Attachment DIV1-6 (c) for the uncollectible revenues associated with the DAC for the past three years. Please note that while preparing this response, the Company discovered that the amount shown in Schedule AEL-6, Page 2, Line (3) should have been \$1,204,071, and not \$1,165,424. This small revision will increase the Total Allowable Bad Debt in Schedule AEL-6, Page 2, Line (5)

Division 1-6, page 2

- d. to \$11,237,878, which is still higher than the Actual Net Charge Off in Schedule AEL-6, Page 2, Line (6), therefore, precluding the Company from recovering any of the costs associated with the participants who successfully completed the Arrearage Management Program.
- e. Please see Attachment DIV1-6 (d) for the uncollectible collections associated with energy efficiency for the past three years.

DAC Uncollectible Collections		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
(1)	2014	\$23,052	\$23,621	\$21,893	\$10,982	\$14,181	\$7,553	\$5,731	\$5,870	\$5,679	\$8,133	\$10,977	\$16,319	\$153,990
(2)	2015	\$20,009	\$25,078	\$23,598	\$35,117	\$38,414	\$15,854	\$13,817	\$12,626	\$12,656	\$15,340	\$33,302	\$64,697	\$310,507
(3)	2016	\$83,489	\$105,464	\$89,729	\$76,392	\$62,835	\$33,061	\$23,718	\$21,648	\$21,916	\$28,520	\$64,772	\$125,733	\$737,277
(4)	2017	\$180,995	\$173,718	\$157,062	\$156,235	\$83,108	\$56,683	\$38,308	\$35,351	\$37,273	\$36,884	\$84,249	\$164,203	\$1,204,071

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		Energy Efficiency Uncollectible Collections												
(1)	2014	\$97,663	\$120,231	\$110,191	\$84,556	\$43,592	\$25,608	\$9,126	\$33,693	\$15,456	\$33,389	\$38,505	\$85,812	\$697,823
(2)	2015	\$100,591	\$190,788	\$157,043	\$117,042	\$52,421	\$31,185	\$28,354	\$27,461	\$27,376	\$31,514	\$54,650	\$89,870	\$908,296
(3)	2016	\$107,098	\$118,392	\$103,519	\$76,282	\$49,932	\$29,378	\$22,801	\$21,087	\$22,268	\$27,080	\$52,449	\$86,471	\$716,758
(4)	2017	\$133,419	\$157,782	\$134,353	\$129,211	\$55,406	\$43,680	\$32,225	\$30,972	\$32,281	\$32,603	\$63,428	\$121,491	\$966,849

Division 1-7

Request:

Re: The August 1, 2018 Direct Testimony of Witness Ann E. Leary at page 17, lines 5 though 9, please provide:

- a. The referenced July 31, 2018, FY 2018 Annual Service Quality Report;
- b. The referenced June 22, 2018, request for relief.

Response:

- a. Please refer to Attachment DIV 1-7 (a) for a copy of the Company's Fiscal Year 2018 Annual Report on Service Quality Plan filed on July 31, 2018 in Docket No. 3476.
- b. Please refer to Attachment DIV 1-7 (b) for a copy of the Company's Request for Relief from Penalty Because of Exogenous and/or Force Majeure Event filed on June 22, 2018 in Docket No. 3476.



Robert J. Humm
Senior Counsel

July 31, 2018

VIA HAND DELIVERY & ELECTRONIC MAIL

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

RE: Docket 3476 – Fiscal Year 2018 Annual Report on Service Quality Plan

Dear Ms. Massaro:

Enclosed for filing are 10 copies of National Grid's¹ annual performance results for fiscal year (FY) 2018² for its gas operations in Rhode Island under the Service Quality Plan established in the above-referenced docket. The enclosed annual report covers the period of July 1, 2017 through June 30, 2018. The annual report also establishes updated benchmarks to be used in measuring performance for FY 2019, which covers the period of July 1, 2018 through June 30, 2019.

Attachment 1, Page 2 provides a summary of the Service Quality performance for both the fourth quarter and overall FY 2018, while Attachment 2 provides month-by-month details for each measure. As shown on Attachment 1, Page 2, Column (8), National Grid's fourth quarter performance was within one standard deviation of the established benchmarks in all areas. In addition, as shown on Attachment 1, Page 2, Column (12), National Grid's FY 2018 performance was within one standard deviation of the established benchmarks in all areas except for On-Cycle Meter Reads. On June 22, 2018, National Grid filed with the Public Utilities Commission (PUC) a request for relief from the penalty associated with its FY 2018 On-Cycle Meter Reads performance as a result of an exogenous and/or force majeure event. At the time of this filing, the PUC has not ruled on the Company's request for relief from the penalty. On July 30, 2018, the Division of Public Utilities and Carriers (Division) filed a Memorandum recommending the approval of the Company's request for relief from the penalty.

The benchmark for Meter Testing is based on a calendar year basis, and was revised in October 2012 to reflect the Division's Rules and Regulations Prescribing Standards for Gas Utilities, Master Meter Systems, and Jurisdictional Propane Systems. National Grid has tested a total of 8,291 meters during the period of January 2018 through June 2018, as shown on Attachment 1, Page 2. National Grid will report the final calendar year results for this measure in

¹ The Narragansett Electric Company d/b/a National Grid (National Grid or the Company).

² The fiscal year in Docket No. 3476 runs from July 1 through June 30.

Luly E. Massaro, Commission Clerk
Docket 3476 – FY 2018 Annual Report
July 31, 2018
Page 2 of 2

its second quarter report for FY 2019. In addition, the After Business Hours benchmarks were modified effective January 1, 2013 and continue to be fixed at a mean of 95.27%, with a penalty threshold of 94.38%.

As noted above, National Grid has also updated the performance benchmarks for FY 2019 to incorporate the results of the most recent 12 months of data. Attachment 3 summarizes the benchmarks that will be used to measure performance for the period from July 1, 2018 through June 30, 2019. Attachment 4 provides National Grid's monthly statistics used to calculate the new benchmarks based on the most recent 36 months of data. Please note that National Grid completed 100% of the customer-requested meter tests within 15 days during the 36 months of the benchmark period, generating a standard deviation of zero and a benchmark of 100%. Establishing a benchmark of 100%, however, would not be reasonable or practical. Accordingly, for this measure only (customer-requested meter tests), National Grid proposes to continue use a mean benchmark of 99.60% with a penalty threshold of 94.04%, as it has used in prior years.

Finally, please note that the figure for Scheduled Meters to be read for July 2017 has been updated from the figure previously reported in the first quarter report. As a result, the On-Cycle Meter Reads metrics for that month have been updated for this annual report. The overall FY 2018 performance reflects the most up-to-date figures.

Thank you for your attention to this filing. If you have any questions, please contact me at 401-784-7415.

Very truly yours,



Robert J. Humm

Enclosures

cc: Docket 3476 Service List
Leo Wold, Esq.
John Bell, Division
Al Mancini, Division

National Grid - Gas
RIPUC Docket No. 3476
Service Quality Report
Fourth Quarter FY18
Attachment 1
Page 1 of 2

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY PERFORMANCE
FISCAL YEAR 2018 - FOURTH QUARTER REPORT (2nd Quarter CY2018) *

<u>SERVICE QUALITY MEASURES</u>	<u>Apr-18</u>	<u>May-18</u>	<u>Jun-18</u>	<u>Total or Weighted Average</u>	<u>Benchmark</u>	<u>Penalty Threshold</u>
<u>CALL CENTER RESPONSIVENESS</u>						
Total Calls Answered	47,681	51,900	45,836	145,417		
Abandoned Calls	<u>1,125</u>	<u>1,458</u>	<u>1,074</u>	<u>3,657</u>		
Total Calls Offered	48,806	53,358	46,910	149,074		
% Abandoned Calls	2.31%	2.73%	2.29%	2.45%	3.68%	6.59%
Answered in 60 Seconds	42,676	44,475	40,356	127,507		
% Calls Answered in 60 Seconds	87.44%	83.35%	86.03%	85.53%	82.40%	71.60%
<u>METER READS</u>						
Scheduled Meters	278,913	278,928	279,140	836,981		
Meters Read	275,587	275,629	275,869	827,085		
% On-Cycle Meter Reads	98.81%	98.82%	98.83%	98.82%	98.70%	98.53%
<u>METER TESTING**</u>						
<= 500 Cfh*** (180 month test interval)	1,680	1,526	1,296	4,502	<u>CALENDAR YTD</u> 7,389	<u>CY2018 GOAL</u> 31,701
> 500 Cfh (120 month test interval)	221	156	144	521	902	3,091
Meters Not Tested (Attempts Exhausted)					21,677	
Inactive Meters					1,629	
Total					31,597	34,792
<u>CUSTOMER REQUESTED TESTS</u>						
Customer Requested Tests	0	0	1	1		
Tests Completed in 15 Days	0	0	1	1		
% Completed in 15 Days	100.00%	100.0%	100.0%	100.0%	99.60%	94.04%
<u>SERVICE APPOINTMENTS</u>						
Scheduled Service Appointments	3,078	3,369	3,071	9,518		
Completed Service Appointments	2,913	3,141	2,951	9,005		
% Service Appointments Met	94.64%	93.23%	96.09%	94.61%	95.00%	93.40%
<u>SAFETY</u>						
Leak-Call Response:						
Normal Business Hours:						
- Total Calls	389	373	318	1,080		
- Response in 30 Minutes or Less	372	354	307	1,033		
% in 30 Minutes or Less	95.63%	94.91%	96.54%	95.65%	95.28%	93.96%
After Business Hours****:						
- Total Calls	298	274	268	840		
- Response in 45 Minutes or Less	289	262	256	807		
% in 45 Minutes or Less	96.98%	95.62%	95.52%	96.07%	95.27%	94.38%

* Note: Docket No. 3476 fiscal year runs July 1 through June 30.

** The meter testing measure is compiled on a calendar year basis. The final calendar year results will be adjusted to reflect the total of attempted periodic tests of meters and will be provided at calendar year end.

*** The definition of commercial and residential meters changed in October 2012 to reflect the revised Division 2006 Regulations. Under those regulations, meters with a capacity greater than 500 cubic feet per hour (Cfh) are classified as commercial, and meters with a capacity less than or equal to 500 Cfh are classified as residential.

**** The After Business Hours benchmarks were modified effective January 1, 2013 and are now fixed at a mean 95.27% with a penalty threshold of 94.38%.

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY PERFORMANCE
FISCAL YEAR 2018 - FOURTH QUARTER REPORT

Benchmarks & Penalties				Quarterly Performance					Annual Performance			
Benchmark (Mean) (1)	Standard Deviation (2)	Penalty Threshold (3)	Penalty Weight (4)	Maximum Penalty (5)	4th Quarter Performance (6)	Variance from Mean (7)	# Standard Deviations (8)	Penalty (9)	Fiscal YTD Performance (10)	Variance from Mean (11)	# Standard Deviations (12)	Penalty (13)
3.68%	2.91%	6.59%	12%	\$150,000	2.45%	1.23%	0.4216	\$0	2.04%	1.64%	0.5634	\$0
82.40%	10.80%	71.60%	12%	\$150,000	85.53%	3.13%	0.2901	\$0	88.62%	6.22%	0.5764	\$0
98.70%	0.17%	98.53%	6%	\$75,000	98.82%	0.12%	0.6921	\$0	97.37%	-1.33%	7.8416	\$75,000
			6%	\$75,000				\$0				\$0
31,701					4,502				7,389			
3,091					521				902			
99.60%	5.56%	94.04%	4%	\$50,000	100.00%	0.40%	0.0719	\$0	100.00%	0.40%	0.0719	\$0
95.00%	1.60%	93.40%	12%	\$150,000	94.61%	-0.39%	0.2436	\$0	94.47%	-0.53%	0.3288	\$0
95.28%	1.32%	93.96%	24%	\$300,000	95.65%	0.37%	0.2789	\$0	95.26%	-0.02%	0.0150	\$0
95.27%	0.89%	94.38%	24%	\$300,000	96.07%	0.80%	0.9005	\$0	95.91%	0.64%	0.7206	\$0
			100%	\$1,250,000				\$0				\$75,000

Service Quality Measures

Customer Service and Billing:

- Abandoned Calls
- Calls Answered in 60 Seconds
- On-Cycle Meter Reads
- Meter Testing¹⁴
- Total Meters <=500 Cfh Tested (180 month test interval)
- Total Meters >500 Cfh Tested (120 month test interval)
- Customer Requested Meter Tests
- Service Appointments Met
- Safety - Leak Call Response:
- Normal Business Hours-30 min or less
- After Business Hours¹⁵ -45 min or less

Notes:

- (1)-(5) Submitted in the Annual Service Quality Report filed on July 31, 2017 (see Attachment 3, Cols. (1) - (3) for fiscal year (FY) 2018 Benchmark, Standard Deviation, and Penalty Threshold data).
- (6) Fourth quarter of FY 2018 performance data.
- (7) Calculated as (6) plus or minus (1), where positive results reflect above-average performance.
- (8) Calculated as (7) divided by (2).
- (9) Penalties are assessed when performance exceeds one standard deviation from the mean, with the maximum penalty assessed at two standard deviations from the mean. Only the penalties related to the safety measures are assessed quarterly.
- (10) Year-to-date performance data for FY 2018 (i.e., July 2017 - June 2018) except Meter Testing. See Note (14).
- (11) Calculated as (10) plus or minus (1), where positive results reflect above-average performance.
- (12) Calculated as (11) divided by (2).
- (13) Penalties are assessed when performance exceeds one standard deviation from the mean, with the maximum penalty assessed at two standard deviations from the mean. At the time of this filing, the Company's request for relief from the On-Cycle Meter Reads penalty as a result of an exogenous and/or force majeure event is pending in Docket No. 3476.
- (14) The meter testing measure is compiled on a calendar year basis. Therefore, the FY 2018 Report reflects activity between January 2018 through June 2018. The final calendar year results will be adjusted to reflect the total of attempted periodic tests of meters and will be provided at calendar year end.
- (15) The After Business Hours benchmarks were modified effective January 1, 2013 and are now fixed at a mean of 95.27% with a penalty threshold of 94.38%.

National Grid - Gas
RIPUC Docket No. 3476
Service Quality Report
Attachment 2

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY PERFORMANCE
FISCAL YEAR 2018 - ANNUAL PERFORMANCE DATA

	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Total or Weighted Average
SERVICE QUALITY MEASURES													
CALL CENTER RESPONSIVENESS													
Total Calls Answered	33,766	36,777	35,203	39,408	41,512	38,843	45,543	40,946	46,737	47,681	51,900	45,836	504,152
Abandoned Calls	1,242	475	532	509	955	490	862	867	912	1,125	1,458	1,074	10,501
Total Calls Offered	35,008	37,252	35,735	39,917	42,467	39,333	46,405	41,813	47,649	48,806	53,358	46,910	514,653
% Abandoned Calls	3.55%	1.28%	1.49%	1.28%	2.25%	1.25%	1.86%	2.07%	1.91%	2.31%	2.73%	2.29%	2.04%
Answered in 60 Seconds	27,288	34,344	32,960	37,281	37,514	36,639	41,823	37,933	42,822	42,676	44,475	40,356	456,111
% Calls Answered in 60 Seconds	77.95%	92.19%	92.23%	93.40%	88.34%	93.15%	90.13%	90.72%	89.87%	87.44%	83.35%	86.03%	88.62%
METER READS													
Scheduled Meters	278,541	277,635	277,635	277,798	278,026	278,470	298,194	278,698	280,524	278,913	278,929	279,140	3,362,503
Meters Read	274,489	273,488	273,679	273,698	231,236	275,015	294,679	275,240	275,356	275,587	275,630	275,869	3,273,966
% On-Cycle Meter Reads	98.55%	98.51%	98.58%	98.52%	83.17%	98.76%	98.82%	98.76%	98.16%	98.81%	98.82%	98.83%	97.37%
METER TESTING*													
<= 500 Cfh** (180 month test interval)	1,252	945	856	925	761	296	542	1,138	1,207	1,680	1,526	1,296	12,424
> 500 Cfh (120 month test interval)	97	78	105	132	50	57	113	122	146	221	156	144	1,421
Total Meters Tested*	1,349	1,023	961	1,057	811	353	655	1,260	1,353	1,901	1,682	1,440	13,845
CUSTOMER REQUESTED TESTS													
Customer Requested Tests	1	2	0	0	0	0	0	0	1	0	0	1	5
Tests Completed in 15 Days	1	2	0	0	0	0	0	0	1	0	0	1	5
% Completed in 15 Days	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
SERVICE APPOINTMENTS													
Scheduled Service Appointments	2,656	2,946	2,804	2,840	3,206	2,198	2,533	2,591	2,891	3,078	3,369	3,071	34,183
Completed Service Appointments	2,528	2,749	2,619	2,665	3,014	2,086	2,376	2,503	2,749	2,913	3,141	2,951	32,294
% Service Appointments Met	95.18%	93.31%	93.40%	93.84%	94.01%	94.90%	93.80%	96.60%	95.09%	94.64%	93.23%	96.09%	94.47%
SAFETY													
Leak-Call Response:													
Normal Business Hours:													
- Total Calls	389	465	445	512	632	561	570	380	367	389	373	318	5,401
- Response in 30 Minutes or Less	360	449	435	485	608	525	535	364	351	372	354	307	5,145
% in 30 Minutes or Less	92.54%	96.56%	97.75%	94.73%	96.20%	93.58%	93.86%	95.79%	95.64%	95.63%	94.91%	96.54%	95.26%
After Business Hours***:													
- Total Calls	307	333	304	359	489	513	561	317	355	298	274	268	4,378
- Response in 45 Minutes or Less	295	317	284	343	471	490	539	310	343	289	262	256	4,199
% in 45 Minutes or Less	96.09%	95.20%	93.42%	95.54%	96.32%	95.52%	96.08%	97.79%	96.62%	96.98%	95.62%	95.52%	95.91%

* The Meter Testing measure is compiled on a calendar year basis.

** The definition of commercial and residential meters changed in October 2012 to reflect the revised Division 2006 Regulations. Under those regulations meters with a capacity greater than 500 cubic feet per hour (Cfh) are classified as commercial, and meters with a capacity less than or equal to 500 Cfh are classified as residential.

*** The After Business Hours benchmarks were modified effective January 1, 2013 and are now fixed at a mean of 95.27% with a penalty threshold of 94.38%.

National Grid - Gas
RIPUC Docket No. 3476
Service Quality Report
Attachment 3

NATIONAL GRID - GAS OPERATIONS
REVISED SERVICE QUALITY BENCHMARKS
FISCAL YEAR 2019

Measures

Customer Service and Billing:

Abandoned Calls

Calls Answer in 60 Seconds

On-Cycle Meter Reads

Meter Testing*

<= 500 Cfh (180 month test interval)

> 500 Cfh (120 month test interval)

Customer Requested Meter Tests**

Service Appointments Met

Safety - Leak Call Response:

Normal Business Hours-30 min or less

After Business Hours***-45 min or less

Benchmark (Mean) FY19	Standard Deviation (+/-)	Penalty Threshold
2.93%	2.55%	5.48%
85.62%	8.80%	76.82%
98.26%	2.59%	95.67%
<u>CY2018 GOAL</u>		
31,701		
3,091		
99.60%	5.56%	94.04%
94.94%	1.41%	93.53%
95.33%	1.23%	94.10%
95.27%	0.89%	94.38%

*The Meter Testing measure is compiled on a calendar year basis. The final calendar year results will be adjusted to reflect the total of attempted periodic tests of meters and will be provided at calendar year

**Most recent 36 months of data generate an unpractical benchmark of 100%. National Grid proposes to use a mean benchmark of 99.60% with a penalty threshold of 94.04%, as in prior years.

***The After Business Hours benchmarks were modified effective January 1, 2013 and are now fixed at a mean of 95.27% with a penalty threshold of 94.38%.

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY BENCHMARKS

SERVICE QUALITY MEASURES
CALL CENTER RESPONSIVENESS

Total Calls Answered
Abandoned Calls
Total Calls Offered
% Abandoned Calls
Answered in 60 Seconds
% Calls Answered in 60 Seconds

METER READS
Scheduled Meters
Meters Read
% On-Cycle Meter Reads

METER TESTING*
<= 500 Cfh (180 month test interval)
> 500 Cfh (120 month test interval)
Total Meters Tested
Customer Requested Tests
Tests Completed in 15 Days
% Completed in 15 Days

SERVICE APPOINTMENTS
Scheduled Service Appointments
Completed Service Appointments
% Service Appointments Met

SAFETY
Leak-Call Response:
Normal Business Hours:
- Total Calls
- Response in 30 Minutes or Less
% in 30 Minutes or Less
After Business Hours**:
- Total Calls
- Response in 45 Minutes or Less
% in 45 Minutes or Less

Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16
47,802	43,996	45,864	52,438	38,240	38,341	39,291	41,455	46,218	41,094	40,521	38,276	32,562
450	1,146	2,075	1,894	1,157	623	1,122	1,105	933	865	3,028	3,233	5,307
48,252	45,142	47,939	54,332	39,397	38,964	40,413	42,560	47,151	41,959	43,549	41,509	37,869
0.93%	2.54%	4.33%	3.49%	2.94%	1.60%	2.78%	2.60%	1.98%	2.06%	6.95%	7.79%	14.01%
45,792	38,271	37,683	43,882	33,170	35,835	34,058	37,584	41,916	37,378	31,042	27,936	21,724
94.90%	84.78%	78.61%	80.77%	84.19%	91.97%	84.27%	88.31%	88.90%	89.08%	71.28%	67.30%	57.37%
274,835	274,808	274,786	275,005	275,492	275,870	276,227	278,952	276,430	276,211	277,260	278,137	276,243
271,547	270,776	271,308	271,635	272,323	272,678	273,062	276,028	273,566	273,263	273,973	274,643	272,548
98.80%	98.53%	98.73%	98.77%	98.85%	98.84%	98.85%	98.95%	98.96%	98.93%	98.81%	98.74%	98.66%
124	142	195	173	215	114	716	188	424	397	534	334	192
59	78	45	65	52	116	71	101	122	94	95	80	57
183	220	240	238	267	230	787	289	546	491	629	414	249
0	2	1	0	1	1	0	0	0	0	1	0	0
0	2	1	0	1	1	0	0	0	0	1	0	0
100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1,709	1,562	1,883	2,504	2,230	2,232	1,812	1,512	1,990	1,687	1,652	1,743	1,411
1,634	1,456	1,773	2,342	2,083	2,177	1,758	1,453	1,922	1,649	1,600	1,685	1,367
95.61%	93.21%	94.16%	93.53%	93.41%	97.54%	97.02%	96.10%	96.58%	97.75%	96.85%	96.67%	96.88%
392	372	405	581	591	515	510	434	398	340	342	365	322
380	354	391	552	561	493	489	408	378	323	331	347	304
96.94%	95.16%	96.54%	95.01%	94.92%	95.73%	95.88%	94.01%	94.97%	95.00%	96.78%	95.07%	94.41%
308	370	317	530	482	433	519	476	306	292	269	248	235
298	356	308	510	460	417	504	438	299	283	251	243	228
96.75%	96.22%	97.16%	96.23%	95.44%	96.30%	97.11%	92.02%	97.71%	96.92%	93.31%	97.98%	97.02%

*The definition of commercial and residential meters changed in October 2012 to reflect the revised Division 2006 Regulations. Under these regulations, meters with a capacity greater than 500 cubic feet per hour (Cfh) are classified as commercial, and meters with a capacity less than or equal to 500 Cfh are classified as residential. This measure is compiled on a calendar year basis.

**The After Business Hours benchmarks were modified effective January 1, 2013 and are now fixed at a mean of 95.27% with a penalty threshold of 94.38%.

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY BENCHMARKS

SERVICE QUALITY MEASURES	
CALL CENTER RESPONSIVENESS	
Total Calls Answered	
Abandoned Calls	
Total Calls Offered	
% Abandoned Calls	
Answered in 60 Seconds	
% Calls Answered in 60 Seconds	
METER READS	
Scheduled Meters	
Meters Read	
% On-Cycle Meter Reads	
METER TESTING*	
<= 500 Cfh (180 month test interval)	
> 500 Cfh (120 month test interval)	
Total Meters Tested	
Customer Requested Tests	
Tests Completed in 15 Days	
% Completed in 15 Days	
SERVICE APPOINTMENTS	
Scheduled Service Appointments	
Completed Service Appointments	
% Service Appointments Met	
SAFETY	
Leak-Call Response:	
Normal Business Hours:	
- Total Calls	
- Response in 30 Minutes or Less	
% in 30 Minutes or Less	
After Business Hours**:	
- Total Calls	
- Response in 45 Minutes or Less	
% in 45 Minutes or Less	

Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17
40,735	34,541	40,143	36,196	36,514	38,881	35,880	42,893	37,937	45,202	39,183	33,766
1,444	494	379	411	285	740	928	869	671	1,813	3,187	1,242
42,179	35,035	40,522	36,607	36,799	39,621	36,808	43,762	38,608	47,015	42,370	35,008
3.42%	1.41%	0.94%	1.12%	0.77%	1.87%	2.52%	1.99%	1.74%	3.86%	7.52%	3.55%
35,737	32,917	38,893	34,704	35,330	34,937	30,555	38,656	34,489	37,028	28,409	27,288
84.73%	93.95%	95.98%	94.80%	96.01%	88.18%	83.01%	88.33%	89.33%	78.76%	67.05%	77.95%
276,302	276,315	279,383	276,880	282,457	299,485	279,335	281,014	278,658	281,522	278,158	278,541
272,380	272,163	275,384	272,986	278,065	295,734	275,757	277,300	274,875	277,617	273,922	274,489
98.58%	98.50%	98.57%	98.59%	98.45%	98.75%	98.72%	98.68%	98.64%	98.61%	98.48%	98.55%
333	578	1,056	398	371	450	837	1,521	1,830	2,036	1,140	1,252
41	65	63	23	33	103	139	137	250	203	102	97
374	643	1,119	421	404	553	976	1,658	2,080	2,239	1,242	1,349
2	0	1	0	0	0	0	0	0	0	0	1
2	0	1	0	0	0	0	0	0	0	0	1
100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1,748	2,412	2960	2493	2417	2190	2620	3855	3,165	3,175	3,079	2,656
1,652	2,316	2,791	2,324	2,249	2,099	2,515	3,672	3,031	3,034	2,887	2,528
94.51%	96.02%	94.29%	93.22%	93.05%	95.84%	95.99%	95.25%	95.77%	95.56%	93.76%	95.18%
453	442	516	515	591	497	362	384	384	437	491	389
438	412	495	480	564	475	346	377	364	417	467	360
96.69%	93.21%	95.93%	93.20%	95.43%	95.57%	95.58%	98.18%	94.79%	95.42%	95.11%	92.54%
311	269	385	389	534	437	371	391	294	300	294	307
305	261	372	378	506	421	361	359	289	290	283	295
98.07%	97.03%	96.62%	97.17%	94.76%	96.34%	97.30%	91.82%	98.30%	96.67%	96.26%	96.09%

NATIONAL GRID - GAS OPERATIONS
SERVICE QUALITY BENCHMARKS

SERVICE QUALITY MEASURES CALL CENTER RESPONSIVENESS												36 Month Average	Standard Deviation	Penalty Threshold	Maximum Penalty
Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18					
Total Calls Answered	36,777	35,203	39,408	41,512	38,843	45,543	40,946	46,737	47,681	51,900	45,836	41,065			
Abandoned Calls	475	532	509	955	490	862	867	912	1,125	1,458	1,074	1,241			
Total Calls Offered	37,252	35,735	39,917	42,467	39,333	46,405	41,813	47,649	48,806	53,358	46,910	42,306			
% Abandoned Calls	1.28%	1.49%	1.28%	2.25%	1.25%	1.86%	2.07%	1.91%	2.31%	2.73%	2.29%	2.93%	2.55%	5.48%	8.03%
Answered in 60 Seconds	34,344	32,960	37,281	37,514	36,639	41,823	37,933	42,822	42,676	44,475	40,356	36,223			
% Calls Answered in 60 Seconds	92.19%	92.23%	93.40%	88.34%	93.15%	90.13%	90.72%	89.87%	87.44%	83.35%	86.03%	85.62%	8.80%	76.82%	68.02%
METER READS															
Scheduled Meters	277,635	277,798	277,798	278,026	278,470	298,194	278,698	280,524	278,913	278,929	279,140	278,952			
Meters Read	273,488	273,679	273,698	231,236	275,015	294,679	275,240	275,356	275,587	275,630	275,869	274,097			
% On-Cycle Meter Reads	98.51%	98.58%	98.52%	83.17%	98.76%	98.82%	98.76%	98.16%	98.81%	98.82%	98.83%	98.26%	2.59%	95.67%	93.08%
METER TESTING*															
<= 500 Cfh (180 month test interval)	945	856	925	761	296	542	1,138	1,207	1,680	1,526	1,296	8,907			
> 500 Cfh (120 month test interval)	78	105	132	50	57	113	122	146	221	156	144	1,205			
Total Meters Tested	1,023	961	1,057	811	353	655	1,260	1,353	1,901	1,682	1,440	10,112			
Customer Requested Tests	2	0	0	0	0	0	0	1	0	0	1	0			
Tests Completed in 15 Days	2	0	0	0	0	0	0	1	0	0	1	0			
% Completed in 15 Days	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.00%	0.00%	100.00%	100.00%
SERVICE APPOINTMENTS															
Scheduled Service Appointments	2,946	2,804	2,840	3,206	2,198	2,533	2,591	2,891	3,078	3,369	3,071	2,451			
Completed Service Appointments	2,749	2,619	2,665	3,014	2,086	2,376	2,503	2,749	2,913	3,141	2,951	2,327			
% Service Appointments Met	93.31%	93.40%	93.84%	94.01%	94.90%	93.80%	96.60%	95.09%	94.64%	93.23%	96.09%	94.94%	1.41%	93.53%	92.12%
SAFETY															
Leak-Call Response:															
Normal Business Hours:															
- Total Calls	465	445	512	632	561	570	380	367	389	373	318	446			
- Response in 30 Minutes or Less	449	435	485	608	525	535	364	351	372	354	307	425			
% in 30 Minutes or Less	96.56%	97.75%	94.73%	96.20%	93.58%	93.86%	95.79%	95.64%	95.63%	94.91%	96.54%	95.33%	1.23%	94.10%	92.87%
After Business Hours**:															
- Total Calls	333	304	359	489	513	561	317	355	298	274	268	365			
- Response in 45 Minutes or Less	317	284	343	471	490	539	310	343	289	262	256	351			
% in 45 Minutes or Less	95.20%	93.42%	95.54%	96.32%	95.52%	96.08%	97.79%	96.62%	96.98%	95.62%	95.52%	96.05%	1.52%	94.53%	93.01%



Robert J. Humm
Senior Counsel

June 22, 2018

VIA HAND DELIVERY & ELECTRONIC MAIL

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

RE: Docket 3476 – Quarterly Report on Service Quality Plan
Request for Relief from Penalty Because of Exogenous and/or Force Majeure Event

Dear Ms. Massaro:

On behalf of National Grid,¹ I am enclosing the Company's request for relief from a penalty under the Gas Service Quality Plan (the Service Quality Plan) as a result of an exogenous and/or force majeure event. Pursuant to Rhode Island Public Utilities Commission (PUC) Order No. 17605 (November 21, 2003) regarding the Service Quality Plan in Docket No. 3476, if the Company "contends that an exogenous event or a force majeure occurred, it must seek relief from the Commission and the burden of proof will be on [the Company]." The Company's November 2017 performance for On-Cycle Meter Reads fell below the penalty threshold established in Order No. 17605 as a result of an exogenous and/or force majeure event, namely the October 29-30, 2017 wind and rain storm (the October Storm). The October Storm required the reallocation of the Company's meter reading workforce to provide emergency wires down support during the week of October 30, during which the Company responded to more than 5,000 wires down calls. As a result of the five days of estimated meter reads incurred during the Company's response to the October Storm, the Company will not be able to achieve the annual On-Cycle Meter Reads target under the Service Quality Plan. Accordingly, the Company requests relief from the PUC from the On-Cycle Meter Reads penalty as a result of the exogenous and/or force majeure event.

This request is supported by the pre-filed direct testimony of Gary Bennett, Director of Customer Meter Services, New England South and West.

Thank you for your attention to this filing. If you have any questions, please contact me at 401-784-7415.

Very truly yours,

A handwritten signature in blue ink, appearing to read "RJ Humm", with a long horizontal flourish extending to the right.

Robert J. Humm

Enclosure

cc: Docket 3476 Service List
Leo Wold, Esq.

¹ The Narragansett Electric Company d/b/a National Grid (National Grid or the Company).

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett

PRE-FILED DIRECT TESTIMONY

OF

GARY BENNETT

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett

Table of Contents

I.	Introduction	1
II.	Purpose of Testimony	2
III.	Request for Relief from Penalty Because of Exogenous and/or Force Majeure Event	3
IV.	Conclusion	9

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 1 of 9

I. Introduction

Q. Please state your name and business address.

A. My name is Gary Bennett. My business address is 280 Melrose Street, Providence, Rhode Island 02907.

Q. By whom are you employed and in what capacity?

A. I am employed by National Grid USA Service Company, Inc. (Service Company) as Director of Customer Meter Services, New England South and West. In this role, I manage the Customer Meter Services department in Rhode Island and Southern and Western Massachusetts. Among other responsibilities, I oversee the work performed for the gas and electric service quality measures set forth in The Narragansett Electric Company's (the Company) service quality plans, including the execution of meter reading.

Q. Please describe your educational background and professional experience.

A. I earned a Bachelor of Science degree in Marine Engineering from Massachusetts Maritime Academy in 1982. In 1987, I earned a Master's degree in Business Administration from Rensselaer Polytechnic Institute. Before working at National Grid, I worked at General Dynamics as a Nuclear Test Engineer from 1982 to 1988, and at LTXX as a Manufacturing Supervisor from 1988 to 1991. In 1991, I began working at National Grid – namely, its predecessor companies Boston Gas Company (Boston Gas)

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 2 of 9

1 and KeySpan Corporation (KeySpan). At Boston Gas, I held the following positions:
2 Budget Analyst in the Field Customer Service department; Field Coordinator for the
3 Distribution department; and Supervisor of Gas Dispatch. At KeySpan Home Energy
4 Services, a division of KeySpan, I held the position of Manager of Field Operations and
5 Director of Support Services. I also held the position of Director of Call Center and
6 Billing at KeySpan. After National Grid merged with KeySpan, I held the following
7 positions: Director of Customer Meter Services, New England North; Director of
8 Dispatch; Director of Performance and Reporting; and my current position as Director of
9 Customer Meter Services, New England South and West. I assumed my current position
10 in 2016.

11
12 **Q. Have you previously testified before the Rhode Island Public Utilities Commission**
13 **(PUC) or any other regulatory commission?**

14 A. I have not previously testified before the PUC. However, in 2008, I testified before the
15 New Hampshire Public Utilities Commission as part of EnergyNorth Natural Gas, Inc.
16 d/b/a National Grid NH's rate case filing in Docket DG 08-009.

17
18 **II. Purpose and Structure of Testimony**

19 **Q. What is the purpose of your testimony in this docket?**

20 A. The purpose of my testimony is to describe the Company's fiscal year (FY) 2018 On-
21 Cycle Meter Reads performance as part of the overall Gas Service Quality Plan (the

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 3 of 9

Service Quality Plan). In particular, my testimony will demonstrate that the Company's On-Cycle Meter Reads performance fell below the penalty threshold established by the PUC in the Service Quality Plan in Docket No. 3476 as a result of an exogenous and/or force majeure event, namely the October 29-30, 2017 wind and rain storm (the October Storm). Accordingly, my testimony requests relief from the PUC, pursuant to Order No. 17605 in Docket No. 3476, from the On-Cycle Meter Reads penalty as a result of the exogenous and/or force majeure event.

Q. How is the testimony structured?

A. Section I of my testimony presents the Introduction. Section II describes the purpose and structure of my testimony. Section III presents the Company's request for relief from the PUC as a result of the occurrence of an exogenous and/or force majeure event, including the background and reasons for the request. Section IV is the conclusion of my testimony.

III. Request for Relief from Penalty Because of Exogenous and/or Force Majeure Event

Q. What is the purpose of the Service Quality Plan?

A. The purpose of the Service Quality Plan is to ensure that the Company's gas customers receive a reasonable level of service. The Service Quality Plan is comprised of the following five key aspects: service measures, benchmark standards, a penalty amount for not meeting the benchmark standards, the penalty weight for each measure, and the time

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 4 of 9

1 period for measuring performance to assess a penalty. To meet these standards, the
2 Company's Service Quality Plan includes the following eight service quality measures to
3 monitor the quality of service to customers: Abandoned Call Rate; Average Speed of
4 Answer; On-Cycle Meter Reads; Testing of Meters; Customer Requested Meter Tests
5 Completed; Service Appointments Met as Scheduled; Leak Call Responsiveness –
6 Normal Business Hours; and Leak Call Responsiveness – After Normal Business Hours.

7
8 **Q. What is the On-Cycle Meter Reads service quality measure?**

9 A. The On-Cycle Meter Reads percentage measures the ratio of actual meter reads to the
10 number of meters assigned to be read.

11
12 **Q. What is the current service quality benchmark for On-Cycle Meter Reads, and how**
13 **was that benchmark established?**

14 A. The current service quality benchmark for On-Cycle Meter Reads is 98.70 percent over
15 the Service Quality Plan fiscal year,¹ with a penalty threshold of 98.53 percent. When the
16 PUC established the Service Quality Plan in 2003, the PUC originally set a benchmark of
17 94.52 percent for On-Cycle Meter Reads, with a penalty threshold of 93.30 percent,
18 based on a three-year meter reading performance utilizing one standard deviation as a
19 means to set the penalty threshold. The Company has consistently achieved and/or

¹ The Service Quality Plan fiscal year is July 1 through June 30, as set forth in Docket No. 3476.

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 5 of 9

1 exceeded the On-Cycle Meter Reads benchmark each year since its inception. As a
2 result, the On-Cycle Meter Reads benchmark has increased to its current level of 98.70
3 percent with a much narrower penalty threshold.

4
5 **Q. Please describe the process for how the Company completes the On-Cycle Meter**
6 **Reads?**

7 A. The Company reads all of its approximately 795,000 gas and electric meters in Rhode
8 Island each month, including approximately 278,000 gas meters each month.² The gas
9 meter reading schedule is divided into 20 cycles per month. The Company uses two
10 methods to read gas meters. First, more than 99 percent of the gas meters are read by an
11 Automated Meter Reading process. Automated Meter Reading uses an Encoded
12 Receiver Transmitter device installed on the meter that transmits a radio signal to a meter
13 reading application located on a Company vehicle as the vehicle passes by the meter.
14 Second, the remaining meters are read through an Electronic Meter Reading process.
15 Under the Electronic Meter Reading process, a pedestrian meter reader manually reads a
16 meter and enters the information into a handheld meter reading device. Gas meters must
17 be read within three days of their scheduled reading date before the window is closed for
18 customer billing. Any meter that is not read within the three day window will be

² The same Company employees read both gas and electric meters.

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 6 of 9

provided an estimated read on a customer's bill. The Company uses between 15 and 17 employees to read all gas and electric meters each month.

Q. During week of October 30, 2017, how many gas meters were assigned to be read and how many actual meter reads occurred?

A. The table below sets forth the schedule of gas meters assigned to be read, and actual meter reads, during the week of October 30, 2017:

Date	Meters Assigned to be Read	Actual # of Meters Read
October 30 (Cycle 20)	9,974 meters assigned	0 meters read
October 31 (Cycle 1)	20,183 meters assigned	0 meters read
November 1 (Cycle 2)	10,448 meters assigned	0 meters read
November 2 (Cycle 3)	21,697 meters assigned	0 meters read
November 3 (Cycle 4)	12,379 meters assigned	0 meters read

Thus, none of the gas meters scheduled to be read during the week of the October Storm were actually read.

Q. Why did the Company not read any of the scheduled meters during the week of the October Storm?

A. The October Storm required the reallocation of the Company's Customer Meter Services department, including the meter reading workforce, to provide emergency wires down support during the week of October 30, 2017. "Emergency wires down support" consists of dispatching a qualified person to respond to electric wires on the ground that could potentially pose a public safety hazard and to take appropriate action to make the area

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 7 of 9

safe, including guarding the fallen wire until a qualified crew can be dispatched to remediate the wires down issue. During the week of October 30, the Company responded to more than 5,000 wires down calls. As a result of the five days of estimated meter reads incurred during the Company's response to the October Storm, the Company will not be able to achieve the annual On-Cycle Meter Reads target.

Q. How does the Company's performance during the week of October 30, 2017 affect the Service Quality Plan annual benchmark for On-Cycle Meter Reads?

A. As a result of the five days the Company was unable to read meters because of the October Storm, the Company will not be able to achieve its required annual benchmark of 98.70 percent or annual penalty threshold of 98.53 percent, even if the Company were to achieve an On-Cycle Meter Reads rate of 100 percent for the remainder of the Service Quality Plan fiscal year.

Q. Why is the Company making this request for relief from the penalty?

A. Pursuant to Order No. 17605 in Docket No. 3476, if the Company "contends that an exogenous event or a force majeure occurred, it must seek relief from the Commission and the burden of proof will be on [the Company]." The October Storm is an exogenous and force majeure event. As such, the Company seeks relief from the penalty associated with not meeting the annual benchmark for the On-Cycle Meter Reads, which is the direct result of the impact of the October Storm.

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 8 of 9

1 **Q. Why is the October Storm an exogenous and force majeure event?**

2 A. The October Storm was a major wind and rain event that severely impacted the
3 Company's infrastructure throughout its service territory. Contrary to the forecasts, the
4 October Storm brought strong, hazardous wind gusts that affected the majority of the
5 Northeast during the night on Sunday, October 29 through Monday, October 30, 2017.
6 The October Storm impacted a total of approximately 176,247 customers in the
7 Company's Rhode Island service territory, with approximately 144,144 customers
8 impacted at the October Storm's peak. The Company experienced interruptions in all 38
9 communities it serves, with more than 200 distribution feeders affected and more than
10 5,000 wires down calls throughout the state. In fact, the October Storm impacted more
11 customers than Hurricane Sandy in 2012 and produced more physical damage to the
12 Company's poles than Tropical Storm Irene in 2011. Overall, the October Storm posed
13 significant challenges for the Company, as the weather rapidly escalated to a very severe
14 event beyond the expected forecasts, and impacted all of the Company's communities
15 within a very short timeframe.

16
17 **Q. But for the five-day period during the October Storm, would the Company have**
18 **incurred a penalty for its On-Cycle Meter Reads performance?**

19 A. No. To put the impact of the October Storm into context, the Company's inability to read
20 meters on November 1, 2, and 3 during the week of October 30, 2017 resulted in a
21 November 2017 meter read rate of 83.17 percent, comprised of 278,026 meters scheduled

The Narragansett Electric Company
d/b/a National Grid
RIPUC Docket No. 3476
In Re: Gas Service Quality Plan
Witness: Bennett
Page 9 of 9

1 to be read and 231,236 meters actually read. In comparison, for the past five years, the
2 Company had averaged an annual meter reading rate of approximately 98.70 percent.
3 Assuming the June 2018³ results are in line with historical experience, a typical meter
4 reading rate for the impacted week in November 2017 would have resulted in an annual
5 performance rate above the penalty threshold for the year. The last time the Company
6 fell below even a 98 percent annual On-Cycle Meter Reads rate for any one month was in
7 July 2013 (97.8 percent), which was still well above the annual benchmark and penalty
8 threshold at the time.

9
10 **IV. Conclusion**

11 **Q. Does this conclude your testimony?**

12 **A. Yes.**

³ The Company expects the June 2018 data will be available in mid-July 2018.

Division 1-8

Request:

Re: The August 1, 2018 Direct Testimony of Witness Ann E. Leary at page 18, lines 11 through 13, please provide:

- a. The current benchmark Target Revenue-Per-Customer for both Residential Heating and Residential Non-Heating rate classes;
- b. The benchmark Target Revenue-Per-Customer for both Residential Heating and Residential Non-Heating rate classes for each of the past three years;
- c. The benchmark Target Revenue-Per-Customers for both Residential Heating and Residential Non-Heating rate classes established in 4323;
- d. All workpapers, documents, and supporting calculations for the development of the current benchmark Target Revenue-Per-Customer for both the Residential Heating and Residential Non-Heating rate classes.

Response:

- a. Please see Attachment DIV 1-8(a) for the current benchmark Target Revenue-Per-Customer for both Residential Heating and Residential Non-Heating rate classes. Please note these are the same benchmarks approved in Docket No. 4708.
- b. Please see Attachment DIV 1-8(b) for the benchmark Target Revenue-Per-Customer for both Residential Heating and Residential Non-Heating rate classes for each of the past three years.
- c. Please see Attachment DIV 1-8(c) for the requested benchmarks established pursuant to the Settlement Agreement in Docket No. 4323 (2012 Rate Case). Please note that the Company provided the benchmark Target Revenue-Per-Customer in Docket No. 4514 in accordance with the approved Settlement Agreement in the 2012 Rate Case. Pursuant to Article III, Section C.4 of the Settlement Agreement in the 2012 Rate Case, the actual average rate year customer count and actual growth capital investment from the end of the test year to the end of the rate year was used for purposes of establishing the Revenue-Per-Customer targets used in the calculation of the Company's annual Revenue Decoupling Mechanism for the period commencing February 1, 2013, which was the effective date for the new base distribution rates in the 2012 Rate Case.

Division 1-8, page 2

- d. Please see the Excel version of Attachment DIV 1-8(d), which includes the workpapers used to develop the current benchmark Target Revenue-Per-Customer, as well as the benchmark Target Revenue-Per-Customer for the past three years and benchmarks established in Docket No. 4323, for both Residential Heating and Residential Non-Heating rate classes.

Gas Revenue Decoupling Targets Reflected in Docket No. 4846

	<u>Apr-17</u> (a)	<u>May-17</u> (b)	<u>Jun-17</u> (c)	<u>Jul-17</u> (d)	<u>Aug-17</u> (e)	<u>Sep-17</u> (f)	<u>Oct-17</u> (g)	<u>Nov-17</u> (h)	<u>Dec-17</u> (i)	<u>Jan-18</u> (j)	<u>Feb-18</u> (k)	<u>Mar-18</u> (l)	<u>Total</u> (m)
(1) Residential Non-Heat (incl Low-Income)													
(2) Number of Customers	26,197	26,140	26,085	26,015	25,964	25,969	25,980	26,058	26,107	26,125	26,234	26,255	
(3) Number of Accounts Transferred Nov 2014	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	
(4) Number of Accounts Transferred Jun 2015	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	
(5) Number of Accounts Transferred Jul 2016	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	
(6) Number of Customers	21,943	21,886	21,831	21,761	21,710	21,715	21,726	21,804	21,853	21,871	21,980	22,001	
(7) Final Revenue Requirement	\$551,147	\$480,518	\$440,626	\$421,958	\$404,421	\$411,267	\$425,590	\$468,132	\$543,736	\$608,707	\$619,002	\$604,058	\$5,979,163
(8) RPC	\$25.12	\$21.96	\$20.18	\$19.39	\$18.63	\$18.94	\$19.59	\$21.47	\$24.88	\$27.83	\$28.16	\$27.46	
(9) Residential Heating (incl Low-Income)													
(10) Number of Customers	206,526	205,560	204,853	204,218	203,713	203,918	204,929	206,779	208,036	208,864	206,524	206,734	
(11) Number of Accounts Transferred Nov 2014	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	
(12) Number of Accounts Transferred Jun 2015	970	970	970	970	970	970	970	970	970	970	970	970	
(13) Number of Accounts Transferred Jul 2016	684	684	684	684	684	684	684	684	684	684	684	684	
(14) Number of Customers	210,780	209,814	209,107	208,472	207,967	208,172	209,183	211,033	212,290	213,118	210,778	210,988	
(15) Final Revenue Requirement	\$11,157,590	\$7,202,607	\$5,097,052	\$4,502,584	\$4,237,221	\$4,306,645	\$4,692,464	\$7,051,595	\$11,560,624	\$14,908,187	\$15,552,475	\$14,470,701	\$104,739,746
(16) RPC	\$52.93	\$34.33	\$24.38	\$21.60	\$20.37	\$20.69	\$22.43	\$33.41	\$54.46	\$69.95	\$73.79	\$68.59	
(17) Small													
(18) Number of Customers	18,697	18,524	18,381	18,270	18,221	18,243	18,367	18,680	18,856	18,995	18,800	18,800	
(19) Final Revenue Requirement	\$1,457,117	\$928,852	\$615,286	\$579,616	\$538,554	\$536,429	\$588,115	\$875,701	\$1,472,999	\$2,206,366	\$1,901,912	\$1,957,612	\$13,658,058
(20) RPC	\$77.93	\$50.14	\$33.47	\$31.72	\$29.56	\$29.40	\$32.02	\$46.85	\$78.12	\$116.16	\$101.17	\$104.13	
(21) Medium C&I													
(22) Number of Customers	4,702	4,691	4,694	4,684	4,665	4,678	4,700	4,734	4,758	4,773	4,696	4,705	
(23) Final Revenue Requirement	\$1,838,057	\$1,438,900	\$1,215,685	\$1,068,436	\$1,004,164	\$1,064,655	\$1,178,537	\$1,510,387	\$1,910,148	\$2,404,616	\$2,432,687	\$2,334,238	\$19,400,509
(24) RPC	\$390.91	\$306.74	\$258.99	\$228.10	\$215.25	\$227.59	\$250.75	\$319.05	\$401.46	\$503.80	\$518.03	\$496.12	

Gas Revenue Decoupling Targets Reflected in Docket No. 4708

	<u>Apr-16</u> (a)	<u>May-16</u> (b)	<u>Jun-16</u> (c)	<u>Jul-16</u> (d)	<u>Aug-16</u> (e)	<u>Sep-16</u> (f)	<u>Oct-16</u> (g)	<u>Nov-16</u> (h)	<u>Dec-16</u> (i)	<u>Jan-17</u> (j)	<u>Feb-17</u> (k)	<u>Mar-17</u> (l)	<u>Total</u> (m)
(1) Residential Non-Heat (incl Low-Income)													
(2) Number of Customers	26,197	26,140	26,085	26,015	25,964	25,969	25,980	26,058	26,107	26,125	26,234	26,255	
(3) Number of Accounts Transferred Nov 2014	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	
(4) Number of Accounts Transferred Jun 2015	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	
(5) Number of Accounts Transferred Jul 2016	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	(684)	
(6) Number of Customers	21,943	21,886	21,831	21,761	21,710	21,715	21,726	21,804	21,853	21,871	21,980	22,001	
(7) Final Revenue Requirement	\$551,147	\$480,518	\$440,626	\$421,958	\$404,421	\$411,267	\$425,590	\$468,132	\$543,736	\$608,707	\$619,002	\$604,058	\$5,979,163
(8) RPC	\$25.12	\$21.96	\$20.18	\$19.39	\$18.63	\$18.94	\$19.59	\$21.47	\$24.88	\$27.83	\$28.16	\$27.46	
(9) Residential Heating (incl Low-Income)													
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(11) Number of Accounts Transferred Nov 2014	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	
(12) Number of Accounts Transferred Jun 2015	970	970	970	970	970	970	970	970	970	970	970	970	
(13) Number of Accounts Transferred Jul 2016	684	684	684	684	684	684	684	684	684	684	684	684	
(14) Number of Customers	210,780	209,814	209,107	208,472	207,967	208,172	209,183	211,033	212,290	213,118	210,778	210,988	
(15) Final Revenue Requirement	\$11,157,590	\$7,202,607	\$5,097,052	\$4,502,584	\$4,237,221	\$4,306,645	\$4,692,464	\$7,051,595	\$11,560,624	\$14,908,187	\$15,552,475	\$14,470,701	\$104,739,746
(16) RPC	\$52.93	\$34.33	\$24.38	\$21.60	\$20.37	\$20.69	\$22.43	\$33.41	\$54.46	\$69.95	\$73.79	\$68.59	
(17) Small													
(18) Number of Customers	18,697	18,524	18,381	18,270	18,221	18,243	18,367	18,680	18,856	18,995	18,800	18,800	
(19) Final Revenue Requirement	\$1,457,117	\$928,852	\$615,286	\$579,616	\$538,554	\$536,429	\$588,115	\$875,701	\$1,472,999	\$2,206,366	\$1,901,912	\$1,957,612	\$13,658,058
(20) RPC	\$77.93	\$50.14	\$33.47	\$31.72	\$29.56	\$29.40	\$32.02	\$46.85	\$78.12	\$116.16	\$101.17	\$104.13	
(21) Medium C&I													
(22) Number of Customers	4,702	4,691	4,694	4,684	4,665	4,678	4,700	4,734	4,758	4,773	4,696	4,705	
(23) Final Revenue Requirement	\$1,838,057	\$1,438,900	\$1,215,685	\$1,068,436	\$1,004,164	\$1,064,655	\$1,178,537	\$1,510,387	\$1,910,148	\$2,404,616	\$2,432,687	\$2,334,238	\$19,400,509
(24) RPC	\$390.91	\$306.74	\$258.99	\$228.10	\$215.25	\$227.59	\$250.75	\$319.05	\$401.46	\$503.80	\$518.03	\$496.12	

Gas Revenue Decoupling Targets Reflected in Docket No. 4634

	<u>Apr-15</u> (a)	<u>May-15</u> (b)	<u>Jun-15</u> (c)	<u>Jul-15</u> (d)	<u>Aug-15</u> (e)	<u>Sep-15</u> (f)	<u>Oct-15</u> (g)	<u>Nov-15</u> (h)	<u>Dec-15</u> (i)	<u>Jan-16</u> (j)	<u>Feb-16</u> (k)	<u>Mar-16</u> (l)	<u>Total</u> (m)
(1) Residential Non-Heat (incl Low-Income)													
(2) Number of Customers	26,197	26,140	26,085	26,015	25,964	25,969	25,980	26,058	26,107	26,125	26,234	26,255	
(3) Number of Accounts Transferred Nov 2014	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	(2,600)	
(4) Number of Accounts Transferred Jun 2015	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	(970)	
(5) Number of Customers	22,627	22,570	22,515	22,445	22,394	22,399	22,410	22,488	22,537	22,555	22,664	22,685	
(6) Final Revenue Requirement	\$551,147	\$480,518	\$440,626	\$421,958	\$404,421	\$411,267	\$425,590	\$468,132	\$543,736	\$608,707	\$619,002	\$604,058	\$5,979,163
(7) RPC	\$24.36	\$21.29	\$19.57	\$18.80	\$18.06	\$18.36	\$18.99	\$20.82	\$24.13	\$26.99	\$27.31	\$26.63	
(8) Residential Heating (incl Low-Income)													
(9) Number of Customers	206,526	205,560	204,853	204,218	203,713	203,918	204,929	206,779	208,036	208,864	206,524	206,734	
(10) Number of Accounts Transferred Nov 2014	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	
(11) Number of Accounts Transferred Jun 2015	970	970	970	970	970	970	970	970	970	970	970	970	
(12) Number of Customers	210,096	209,130	208,423	207,788	207,283	207,488	208,499	210,349	211,606	212,434	210,094	210,304	
(13) Final Revenue Requirement	\$11,157,590	\$7,202,607	\$5,097,052	\$4,502,584	\$4,237,221	\$4,306,645	\$4,692,464	\$7,051,595	\$11,560,624	\$14,908,187	\$15,552,475	\$14,470,701	\$104,739,746
(14) RPC	\$53.11	\$34.44	\$24.46	\$21.67	\$20.44	\$20.76	\$22.51	\$33.52	\$54.63	\$70.18	\$74.03	\$68.81	
(15) Small													
(16) Number of Customers	18,697	18,524	18,381	18,270	18,221	18,243	18,367	18,680	18,856	18,995	18,800	18,800	
(17) Final Revenue Requirement	\$1,457,117	\$928,852	\$615,286	\$579,616	\$538,554	\$536,429	\$588,115	\$875,201	\$1,472,999	\$2,206,366	\$1,901,912	\$1,957,612	\$13,658,058
(18) RPC	\$77.93	\$50.14	\$33.47	\$31.72	\$29.56	\$29.40	\$32.02	\$46.85	\$78.12	\$116.16	\$101.17	\$104.13	
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(21) Final Revenue Requirement	\$1,838,057	\$1,438,900	\$1,215,685	\$1,068,436	\$1,004,164	\$1,064,655	\$1,178,537	\$1,510,387	\$1,910,148	\$2,404,616	\$2,432,687	\$2,334,238	\$19,400,509
(22) RPC	\$390.91	\$306.74	\$258.99	\$228.10	\$215.25	\$227.59	\$250.75	\$319.05	\$401.46	\$503.80	\$518.03	\$496.12	

Gas Revenue Decoupling Targets Reflected in Docket No. 4573

	<u>Apr-14</u> (a)	<u>May-14</u> (b)	<u>Jun-14</u> (c)	<u>Jul-14</u> (d)	<u>Aug-14</u> (e)	<u>Sep-14</u> (f)	<u>Oct-14</u> (g)	<u>Nov-14</u> (h)	<u>Dec-14</u> (i)	<u>Jan-15</u> (j)	<u>Feb-15</u> (k)	<u>Mar-15</u> (l)	<u>Total</u> (m)
(1) Residential Non-Heat (incl Low-Income)													
(2) Number of Customers	26,197 (2,600)	26,140 (2,600)	26,085 (2,600)	26,015 (2,600)	25,964 (2,600)	25,969 (2,600)	25,980 (2,600)	26,058 (2,600)	26,107 (2,600)	26,125 (2,600)	26,234 (2,600)	26,255 (2,600)	
(3) Number of Accounts Transferred Nov 2014													
(4) Adjusted Number of Customers	23,597	23,540	23,485	23,415	23,364	23,369	23,380	23,458	23,507	23,525	23,634	23,655	
(5) Final Revenue Requirement	\$551,147	\$480,518	\$440,626	\$421,958	\$404,421	\$411,267	\$425,590	\$468,132	\$543,736	\$608,707	\$619,002	\$604,058	\$5,979,163
(6) RPC	\$23.36	\$20.41	\$18.76	\$18.02	\$17.31	\$17.60	\$18.20	\$19.96	\$23.13	\$25.87	\$26.19	\$25.54	
(7) Residential Heating (incl Low-Income)													
(8) Number of Customers	206,526	205,560	204,853	204,218	203,713	203,918	204,929	206,779	208,036	208,864	206,524	206,734	
(9) Number of Accounts Transferred Nov 2014													
(10) Adjusted Number of Customers	209,126	208,160	207,453	206,818	206,313	206,518	207,529	209,379	210,636	211,464	209,124	209,334	
(11) Final Revenue Requirement	\$11,157,590	\$7,202,607	\$5,097,052	\$4,502,584	\$4,237,221	\$4,306,645	\$4,692,464	\$7,051,595	\$11,560,624	\$14,908,187	\$15,552,475	\$14,470,701	\$104,739,746
(12) RPC	\$53.35	\$34.60	\$24.57	\$21.77	\$20.54	\$20.85	\$22.61	\$33.68	\$54.88	\$70.50	\$74.37	\$69.13	
(13) Small													
(14) Number of Customers	18,697	18,524	18,381	18,270	18,221	18,243	18,367	18,680	18,856	18,995	18,800	18,800	
(15) Final Revenue Requirement	\$1,457,117	\$928,852	\$615,286	\$579,616	\$538,554	\$536,429	\$588,115	\$875,201	\$1,472,999	\$2,206,366	\$1,901,912	\$1,957,612	\$13,658,058
(16) RPC	\$77.93	\$50.14	\$33.47	\$31.72	\$29.56	\$29.40	\$32.02	\$46.85	\$78.12	\$116.16	\$101.17	\$104.13	
(17) Medium C&I													
(18) Number of Customers	4,702	4,691	4,694	4,684	4,665	4,678	4,700	4,734	4,758	4,773	4,696	4,705	
(19) Final Revenue Requirement	\$1,838,057	\$1,438,900	\$1,215,685	\$1,068,436	\$1,004,164	\$1,064,655	\$1,178,537	\$1,510,387	\$1,910,148	\$2,404,616	\$2,432,687	\$2,334,238	\$19,400,509
(20) RPC	\$390.91	\$306.74	\$258.99	\$228.10	\$215.25	\$227.59	\$250.75	\$319.05	\$401.46	\$503.80	\$518.03	\$496.12	

Gas Revenue Decoupling Targets Reflected in Docket No. 4514
Gas Revenue Decoupling Targets¹

Line No.	Feb-13 (a)	Mar-13 (b)	Apr-13 (c)	May-13 (d)	Jun-13 (e)	Jul-13 (f)	Aug-13 (g)	Sep-13 (h)	Oct-13 (i)	Nov-13 (j)	Dec-13 (k)	Jan-14 (l)	Total Feb 13 - Jan 14 (m)
1 Residential Non-Heat													
2 Number of Customers	26,234	26,255	26,197	26,140	26,085	26,015	25,964	25,969	25,980	26,058	26,107	26,125	
3 Actual Revenue	\$ 619,002	\$ 604,058	\$ 551,147	\$ 480,518	\$ 440,626	\$ 421,958	\$ 404,421	\$ 411,267	\$ 425,590	\$ 468,132	\$ 543,736	\$ 608,707	\$ 5,979,163
4 RPC	\$ 23.60	\$ 23.01	\$ 21.04	\$ 18.38	\$ 16.89	\$ 16.22	\$ 15.58	\$ 15.84	\$ 16.38	\$ 17.97	\$ 20.83	\$ 23.30	
5 Residential Heating (incl Low-Income)													
6 Number of Customers	206,524	206,734	206,526	205,560	204,853	204,218	203,713	203,918	204,929	206,779	208,036	208,864	
7 Actual Revenue	\$ 15,532,475	\$ 14,470,701	\$ 11,157,590	\$ 7,202,607	\$ 5,097,052	\$ 4,502,584	\$ 4,237,221	\$ 4,306,645	\$ 4,692,464	\$ 7,051,595	\$ 11,560,624	\$ 14,908,187	\$ 104,739,746
8 RPC	\$ 75.31	\$ 70.00	\$ 54.03	\$ 35.04	\$ 24.88	\$ 22.05	\$ 20.80	\$ 21.12	\$ 22.90	\$ 34.10	\$ 55.57	\$ 71.38	
9 Small													
10 Number of Customers	18,800	18,800	18,697	18,524	18,381	18,270	18,221	18,243	18,367	18,680	18,856	18,995	
11 Actual Revenue	\$ 1,901,912	\$ 1,957,612	\$ 1,457,117	\$ 928,852	\$ 615,286	\$ 579,616	\$ 538,554	\$ 536,429	\$ 588,115	\$ 875,201	\$ 1,472,999	\$ 2,206,366	\$ 13,658,058
12 RPC	\$ 101.17	\$ 104.13	\$ 77.93	\$ 50.14	\$ 33.47	\$ 31.72	\$ 29.56	\$ 29.40	\$ 32.02	\$ 46.85	\$ 78.12	\$ 116.16	
13 Medium C&I													
14 Number of Customers	4,696	4,705	4,702	4,691	4,694	4,684	4,665	4,678	4,700	4,734	4,758	4,773	
15 Actual Revenue	\$ 2,432,687	\$ 2,334,238	\$ 1,838,057	\$ 1,438,900	\$ 1,215,685	\$ 1,068,436	\$ 1,004,164	\$ 1,064,655	\$ 1,178,537	\$ 1,510,387	\$ 1,910,148	\$ 2,404,616	\$ 19,400,509
16 RPC	\$ 518.03	\$ 496.12	\$ 390.91	\$ 306.74	\$ 258.99	\$ 228.10	\$ 215.25	\$ 227.59	\$ 250.75	\$ 319.05	\$ 401.46	\$ 503.80	

¹ Actual revenue allocations from Schedule SLN-4 pg. 2

Base Revenue Requirement and Revenue Allocator

Line No.	Reference	Feb-13 (a)	Mar-13 (b)	Apr-13 (c)	May-13 (d)	Jun-13 (e)	Jul-13 (f)	Aug-13 (g)	Sep-13 (h)	Oct-13 (i)	Nov-13 (j)	Dec-13 (k)	Jan-14 (l)	Total Feb 13 - Jan 14 (m)
1	Residential Non-Heat													
2	Base Revenue	\$ 603,913	\$ 588,968	\$ 538,932	\$ 470,726	\$ 433,857	\$ 415,672	\$ 399,638	\$ 405,354	\$ 419,298	\$ 459,766	\$ 531,921	\$ 595,623	\$ 5,862,669
3	Allocator	10%	10%	10%	9%	8%	7%	7%	7%	7%	8%	9%	10%	100%
4	Low Income Residential Non-Heat													
5	Base Revenue	\$ 13,947	\$ 13,940	\$ 11,320	\$ 9,098	\$ 6,354	\$ 5,908	\$ 5,445	\$ 5,566	\$ 5,915	\$ 7,808	\$ 10,956	\$ 12,137	\$ 108,393
6	Adjusted Base Revenue ²	\$ 15,497	\$ 15,489	\$ 12,578	\$ 10,109	\$ 7,060	\$ 6,564	\$ 6,050	\$ 6,184	\$ 6,572	\$ 8,675	\$ 12,173	\$ 13,486	\$ 120,436
7	Allocator	13%	13%	10%	8%	6%	5%	5%	5%	5%	7%	10%	11%	100%
8	Residential Non-Heat (incl Low-Income)													
9	Base Revenue	\$ 617,861	\$ 602,908	\$ 550,252	\$ 479,824	\$ 440,210	\$ 421,580	\$ 404,083	\$ 410,920	\$ 425,213	\$ 467,574	\$ 542,877	\$ 607,760	\$ 5,971,062
10	Allocator	10%	10%	9%	8%	7%	7%	7%	7%	7%	8%	9%	10%	100%
11	Residential Heating													
12	Base Revenue	\$ 14,020,146	\$ 12,954,125	\$ 9,943,653	\$ 6,404,239	\$ 4,506,389	\$ 3,987,699	\$ 3,769,512	\$ 3,829,208	\$ 4,180,136	\$ 6,300,411	\$ 10,350,245	\$ 13,468,008	\$ 93,713,771
13	Allocator	15%	14%	11%	7%	5%	4%	4%	4%	4%	7%	11%	14%	100%
14	Low Income Residential Heating													
15	Base Revenue	\$ 1,408,471	\$ 1,392,249	\$ 1,113,617	\$ 732,135	\$ 541,223	\$ 471,900	\$ 428,941	\$ 437,828	\$ 469,958	\$ 689,384	\$ 1,111,176	\$ 1,324,319	\$ 10,121,201
16	Adjusted Base Revenue ²	\$ 1,564,468	\$ 1,546,944	\$ 1,237,352	\$ 813,484	\$ 601,359	\$ 524,333	\$ 476,601	\$ 486,475	\$ 524,176	\$ 765,982	\$ 1,234,640	\$ 1,471,465	\$ 11,245,779
17	Allocator	14%	14%	11%	7%	5%	5%	4%	4%	4%	7%	11%	13%	100%
18	Residential Heating (incl Low-Income)													
19	Base Revenue	\$ 15,428,617	\$ 14,346,375	\$ 11,057,270	\$ 7,136,374	\$ 5,047,612	\$ 4,459,599	\$ 4,198,453	\$ 4,267,036	\$ 4,650,094	\$ 6,989,795	\$ 11,461,421	\$ 14,792,327	\$ 103,834,972
20	Allocator	15%	14%	11%	7%	5%	4%	4%	4%	4%	7%	11%	14%	100%
21	Small													
22	Base Revenue	\$ 1,905,339	\$ 1,961,140	\$ 1,459,743	\$ 930,525	\$ 616,395	\$ 580,660	\$ 539,524	\$ 537,396	\$ 589,175	\$ 876,778	\$ 1,475,654	\$ 2,210,342	\$ 13,682,672
23	Allocator	14%	14%	11%	7%	5%	4%	4%	4%	4%	6%	11%	16%	100%
24	Medium C&I													
25	Base Revenue	\$ 2,434,281	\$ 2,335,767	\$ 1,839,262	\$ 1,439,843	\$ 1,216,481	\$ 1,069,136	\$ 1,004,822	\$ 1,065,352	\$ 1,179,309	\$ 1,511,377	\$ 1,911,309	\$ 2,406,191	\$ 19,413,220
26	Allocator	13%	12%	9%	7%	6%	6%	5%	5%	6%	8%	10%	12%	100%

Allocated Actual Revenue

Line No.	Reference	Feb-13 (a)	Mar-13 (b)	Apr-13 (c)	May-13 (d)	Jun-13 (e)	Jul-13 (f)	Aug-13 (g)	Sep-13 (h)	Oct-13 (i)	Nov-13 (j)	Dec-13 (k)	Jan-14 (l)	Total Feb 13 - Jan 14 (m)	Actual Revenue Requirement ³ (n)
27	Residential Non-Heat (incl Low-Income)														
28	Actual Revenue Requirement	\$ 619,002	\$ 604,058	\$ 551,147	\$ 480,518	\$ 440,626	\$ 421,958	\$ 404,421	\$ 411,267	\$ 425,590	\$ 468,132	\$ 543,736	\$ 608,707	\$ 5,979,163	\$5,979,163
29	Residential Heating (incl Low-Income)														
30	Actual Revenue Requirement	\$ 15,552,475	\$ 14,470,701	\$ 11,157,590	\$ 7,202,607	\$ 5,097,052	\$ 4,502,584	\$ 4,237,221	\$ 4,306,645	\$ 4,692,464	\$ 7,051,595	\$ 11,560,624	\$ 14,908,187	\$ 104,739,746	\$104,739,746
31	Small														
32	Actual Revenue Requirement	\$ 1,901,912	\$ 1,957,612	\$ 1,457,117	\$ 928,852	\$ 615,286	\$ 579,616	\$ 538,554	\$ 536,429	\$ 588,115	\$ 875,201	\$ 1,472,999	\$ 2,206,366	\$ 13,658,058	\$13,658,058
33	Medium C&I														
34	Actual Revenue Requirement	\$ 2,432,687	\$ 2,334,238	\$ 1,838,057	\$ 1,438,900	\$ 1,215,685	\$ 1,068,436	\$ 1,004,164	\$ 1,064,655	\$ 1,178,537	\$ 1,510,387	\$ 1,910,148	\$ 2,404,616	\$ 19,400,509	\$19,400,509

1 Base revenue requirement from Docket 4323 ("2012 Rate Case"); Book 2, Compliance Attachment 8C, Schedule PMN-7, page 4 of 5.

2 Low Income Residential Heat and Low Income Residential Non-Heat revenues are adjusted to remove the 10% discount.

3 Actual Revenue Requirement Feb 13-Jan 14, source: Schedule NAL-1.

**The Narragansett Electric Company
d/b/a National Grid
Computation of Class RDM Revenue per Customer
Rate Year Ending January 31, 2014**

Line No.		<u>Settled Rate Designed Class Rev Requirement</u> Col A	<u>Settled Growth Capital Rev Requirement</u> Col B	<u>Actual Growth Capital Revenue Requirement</u> Col C	<u>Actual Rate Year Rev Target</u> Col D = A - B + C	<u>Actual Avg. Rate Year Number of Customers</u> Col E	<u>Annual RDM Target</u> Col F = D/E
	RDM Classes						
1	Res Non HT (incl Low Income)	\$5,983,105	\$82,829	\$78,887	\$5,979,163	26,094	\$229.14
2	Res HT (incl Low Income)	\$104,959,550	\$1,453,041	\$1,233,238	\$104,739,746	205,888	\$508.72
3	C&I Small	\$13,682,672	\$189,420	\$164,807	\$13,658,058	18,570	\$735.51
4	C&I Medium	\$19,413,220	\$268,753	\$256,043	\$19,400,509	4,707	\$4,121.92
5							
6	Sub-Total RDM	\$144,038,546	\$1,994,044	\$1,732,975	\$143,777,477	255,258	

Column Notes

Column A - Per Settlement Agreement Rate Design without Low Income discount.

Column B - RDM Class related Growth Capital revenue requirement per Settlement from Page 2 Column E. Line 6 equals Page 2, Line 3E + Line 7E.

Column C - Actual RDM Class related Growth Capital revenue requirement for the Rate Year ending 1/31/14 from Page 3 Column E.

Column E - Actual Average number of customers for the Rate Year ending January 31, 2014 from Page 3 Column F.