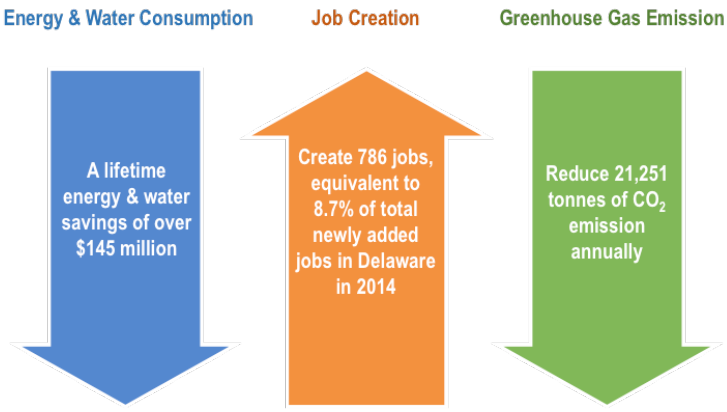

DESEU Energy Efficiency Revenue Bonds Series 2011:

Project Savings Analysis

Interim Report

Prepared for the Delaware Sustainable Energy Utility

May 2015

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Center for Energy and Environmental Policy

University of Delaware

May 2015

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Disclaimer

This study is not intended, nor shall it be construed, to express or render any opinion as to whether any contractual requirements related to the 2011 Energy Efficiency Revenue Bonds have been fulfilled. The analysis set forth herein does not assume the efficacy of, and does not promote, calculations that differ from those defined in signed contracts which underlie the 2011 SEU bond financing.

Table of Contents

Executive Summary

The Delaware Sustainable Energy Utility (DESEU), on behalf of three state agencies (Office of Management and Budget, The Department of Corrections, Department of Services for Children Youth and their Families) and two institutions of higher learning (Delaware State University and Delaware Technical and Community College), issued the Energy Efficiency Revenue Bonds Series in 2011. It raised $72.5 million in private capital, helping to fund eight energy efficiency projects. Nearly all of the projects are now complete or nearing completion. To provide greater evidence prior to completion of all projects, the Center for Energy & Environmental Policy (CEEP) prepared this savings analysis for the DESEU.

This analysis includes four methods of savings estimations. Under each method, both the physical unit savings and the associated dollar savings are estimated.

- **GESA Guaranteed Savings**: Guaranteed Savings is the total amount of avoided energy and water usages guaranteed by the ESCOs (Energy Service Companies), as defined by the GESAs (Guaranteed Energy Savings Agreements). GESA guaranteed savings is always greater than the finance payments to support the projects.
- **ESCO Verified Savings**: ESCO Verified Savings are retrieved from the ESCOs' post-installation savings reports. The estimation method of each project depends on the contracted M&V methodologies.
- **Performance Year Savings Using GESA Base Year Consumption**: Savings is estimated by comparing the performance year consumption against the GESA base year consumption. The baseline here is constant, as it is defined by the GESA. Two sets of performance year data will be used—the Portfolio Manager entry data and original utility billing data.
- **Performance Year Savings Using Weather Normalization**: In this case, weather normalized baseline consumption is established using consumption data from Portfolio Manager entries and weather data in both base year and performance year. Savings is estimated by subtracting this number by the performance year consumption. Two normalization methods will be employed.

The first two methods of savings data are collected from GESA and ESCOs savings reports, respectively, while the latter two methods of savings estimations are conducted by CEEP researchers.

For all completed projects financed by the 2011 Energy Efficiency Revenue Bond, energy conservation measures (ECMs) are found to be properly installed, commissioned, and have the ability to generate the expected energy savings. ESCO verified cost savings of all completed projects exceeds the GESA guaranteed cost savings by 3%. Importantly, the utility savings analysis found that the performance year cost savings of the completed state projects are higher than the GESA guaranteed cost savings.

This study also measures the economic and environmental impacts of the projects. A total of 786 jobs were created during the design, construction and monitoring processes of these projects. Out of the total number of jobs created, at least 430 were filled by Delawareans. Annual energy savings for the eight projects causes a total annual emission reduction of 46,849,463 lbs of CO_2.

1 Introduction

The Delaware Sustainable Energy Utility (SEU), on behalf of three state agencies (Office of Management and Budget, The Department of Corrections, Department of Services for Children Youth and their Families) and two institutions of higher learning (Delaware State University and Delaware Technical and Community College), issued the Energy Efficiency Revenue Bonds Series in 2011. It raised $72.5 million in private capital, helping to fund $75 million in energy efficiency improvements. Nearly all of the projects that were funded through the DESEU Bond Series in 2011 are now complete or nearing completion. One way to provide greater evidence prior to completion of all projects is to conduct a post-installation savings analysis. The purpose of this savings analysis is to evaluate the actual energy savings performance of all the bond projects and measure the progress and achievement.

To produce a comprehensive and unbiased analysis, the data from both the energy service companies (ESCOs) and participating agencies will be collected. Savings in terms of physical units (i.e. kWh, therms and gals) and dollars will be estimated.

The savings analysis will include four methods of savings estimations:

- **GESA Guaranteed Savings**: defined by the Guaranteed Energy Savings Agreement (GESA).
- **ESCO Verified Savings**: retrieved from the post-installation measurement and verification (M&V) reports or construction period updates provided by the ESCOs.
- **Performance Year Savings using GESA Base Year Consumption**: based on the post-installation 12-month utility data provided by the agencies.
- **Performance Year Savings using Weather Normalization**: based on the post-installation 12-month utility data provided by the agencies.

In this savings analysis, we will firstly give an overview on all the projects, including the project profile and a brief summary for project energy conservation measures (ECMs). In Section 3, the four savings methods will be discussed in greater detail. Section 4 will present the savings results in both physical units and in dollars and compare the savings results of four methods. Section 5 will evaluate the economic and environmental impacts of the Bond projects. Section 6 will introduce three case studies to show some of the best practices adopted by these Bond projects. Some recommendations for future DESEU bonds are provided in Section 7. Section 8 discusses the data-related needs, which could not be achieved as of the date of this report. As a result, this report is an interim report. A final report will be issued once these data-related needs are satisfied.

We intend to use a uniform category to present the savings results through out the reports. But the scope of energy efficiency upgrade and project progress varies among the Bond project. Therefore, in the following cases, the numbers will be denoted N/A:

- When the breakdown data is not yet available;
- When the scope of energy efficiency upgrade does not involve a certain type of utility;
- When the project is not fully completed and the corresponding savings cannot be reported.

Before introducing the analysis, it is important to note that utility savings analysis, which is adopted in the methods of Savings using GESA Base Year Consumption and Savings using Weather Normalization, is not contractually required for most of the projects. Also, the utility data for DSU, DTCC-Terry and DTCC-WS projects was not received when this analysis was conducted. Therefore, these three projects are not included in these two methods.

In this report, all units are converted to a common basis for easy interpretation and comparison. The unit conversion factors are listed in Table 1-1.

Table 1-1 Unit Conversion Factors

Energy Unit	Equivalent Value
1 MMBtu	1,000,000 Btu
1 kWh	3,413 Btu
1 therm	100,000 Btu
1 ccf natural gas	1.03 therms
1 gallon No.2 Fuel Oil	140,000 Btu
1 gallon propane	92,000 Btu (0.92 therms)

2 Overview of Bond Financed Projects

2.1 Project Profiles

The Energy Efficiency Revenue Bonds, issued by the SEU, raised over $72.5 million in 2011 and financed a total of eight energy efficiency improvement projects. For each project, a Guaranteed Energy Savings Agreement (GESA) was made between the Energy Service Companies (ESCOs) and the participating agency to implement the energy conservation measures (ECMs) and provide measurement and verification (M&V) services to the agency. In the GESAs, the ESCOs guarantee a fixed amount of energy & water savings to the agencies during each guaranty period.

The participating agencies are listed as follows:

- Department of Correction (DOC)
- Delaware Legislative Mall (Legislative Mall)
- Carvel State Office Building and the Richardson and Robbins Building (Carvel & RR)
- Sussex County Courthouse Facilities (Sussex County)
- Delaware Department of Services for Children, Youth and Their Families (DSCYF)
- Delaware State University (DSU)
- Delaware Technical and Community College Terry Campus (DTCC-Terry)
- Delaware Technical and Community College Wilmington and Stanton Campuses (DTCC-WS)

The selected ESCOs are listed as follows:

- NORESCO, LLC
- Ameresco, Inc.
- Trane U.S., Inc.
- Johnson Controls, Inc.
- Honeywell International Inc.
- Pepco Energy Services, Inc.

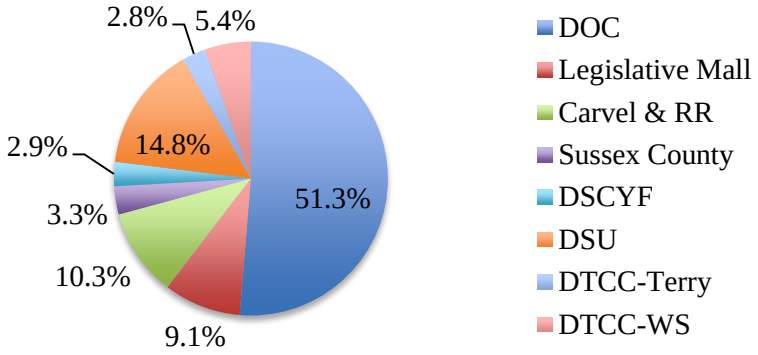

Figure 2-1 Investment Distribution of the Bonds

Figure 2-1 shows the bonds investment distribution across the eight projects. With a project cost of $39,069,088, the DOC project is the largest one among this bond issuance, accounting for 51.3% of the total investment, followed in size by the projects of DSU (14.8%) and Carvel and Richardson & Robins (10.3%).

Table 2-1 summarizes key information of the projects. As of February 2015, six of the eight projects were officially completed. The two projects were still under construction:

- DOC: ECM# 2, the largest ECM of the entire project, was still under construction, while the rest of ECMs were fully implemented.
- Carvel & RR projects: The energy upgrades of Carve & RR project were completed. However, the final sign-off was held up by the ECM#18- LEED Certification. Ameresco is now in the process of hiring a consultant to assist them in the LEED certification. It is estimated that the information will be submitted to the USGBC for review in 6 to 12 months (July 2015-December 2015).

Table 2-1 Project Profiles

Project	ESCOs	Project Cost	Date of Completion[(a)]	First Guarantee Year[(b)]	Estimate Lifetime Savings [(c)]
DOC	NORESCO	$39,069,088	Expected March 2015	N/A	$80,720,704
Legislative Mall [(d)]	Honeywell	$6,947,954	11/15/2013	01/2014-12/2014	$10,817,256
Carvel & RR	Ameresco	$7,868,090	Expected later 2015	N/A	$13,720,814
Sussex County	Trane	$2,535,000	09/27/2013	10/2013 – 09/2014	$3,446,678
DSCYF	NORESCO	$2,185,416	10/22/2012	11/2012 – 10/2013	$3,820,971
DSU	Johnson Controls	$11,260,925	10/31/2013	02/2014- 01/2015	$24,611,552
DTCC-Terry	Pepco	$2,134,614	10/25/2013	11/2013 -10/2014	$2,354,509
DTCC-WS	Pepco	$4,145,338	1/6/2014	02/2014 – 01/2015	$5,712,474

Note: (a) The Final Completion Certification of each project was collected to confirm their exact completion dates.

(b) The completion date is used to determine the first guarantee year (also called the first performance period).

(c) The lifetime savings listed here are the estimates in the GESA, which may not exactly match with the actual savings.

(d) The original contract cost of Legislative Mall project was $6,692,504. According to the Change Orders signed by both parties, the final contract cost became $6,947,954, while the guaranteed savings remain the same.

2.2 Summary of Project ECMs

2.2.1 Department of Correction

This project covers three Delaware Department of Correction facilities: James T. Vaughn Correctional Center (JTVCC), Sussex Correctional Institution (SCI) and Howard R Young Correctional Institution (HRYCI). NORESCO has implemented 15 ECMs for reducing the electricity, natural gas, propane and water & sewer consumption:

- **Lighting:** Install energy efficient luminaires and modify existing fluorescent; install occupancy sensors in areas where occupancy is infrequent to automatically shut off lights
- **Fuel:** Replace propane heating with natural gas—install gas lines, natural gas burners, gauges, regulators, furnaces, dryers, domestic hot water tanks, etc
- **Air Handling:** Refurbish air-handling systems and heating & ventilation units; install digital control units & demand control ventilation; upgrade kitchen make-up air units
- **Energy Management:** Upgrade hardware and software to improve communications and reduce unscheduled service calls; install programmable thermostats; provide on-site training for the engineering staff

Among all of the ECMs, ECM # 2 of decentralize steam system is the largest one, accounting for more than two thirds of the total project cost. It include the following scopes: decommissioning the existing central plant and stream/condensate distribution system; provide a new natural gas distribution system; refurbish the existing air-handlers and replace motors and sheaves for the supply fans; replace eight laundry steam dryers with seven gas-fired equivalents; convert the propane-fueled buildings to natural gas usage.

Table 2-2 ECM Summary of DOC[1]

ECM #	ECM Description	Cost	Guaranteed Annual Savings	Payback
1	Booster Pumps	$152,715	-$ 4,231	-
2	Decentralize Steam System	$27,360,930	$1,575,886	17.4
3	Demand Control Ventilation	$53,117	$6,364	8.3
5	Energy Management Communications Upgrade	$368,725	-	
6	Energy Management Temp Setup/Setback	$56,603	$69,966	0.8
7	Energy Management Training for Existing System	$7,609	-	-
8	Existing EMS Retro Commissioning	$28,979	-	-
9	Ice Machines	$211,580	$29,613	7.1
10	Install Programmable Thermostats and Program Setback	$22,735	$8,159	2.8
11	Lighting Upgrades	$2,264,675	$189,343	12.0
12	Ozone Laundry	$586,210	$32,268	18.2
13	Pre-Rinse Sprayers	$1,811	$3,174	0.6
14	Propane to Natural Gas Conversion	$1,433,984	$277,635	5.2
17	Water Conversion with I-Con	$6,450,247	$904,531	7.1
18	Water Filter	$69,167	-	-
Total		$39,069,088	$3,092,708	12.6

[1] GESA DOC Technical Audit Report Volume 2, July 2011.


Figure 2-2 Vaughn Rooftop Unit Digging & Replacement

2.2.2 Delaware Legislative Mall

Originally, Honeywell was contracted to implement 12 ECMs for reducing the electricity, natural gas, and water consumption. Due to the deletion of the ECMs at the Legislative Hall Building during construction, ECM # 14-19 were substituted in its place. Also, ECM#10 was removed with the removal of Legislative Mall. These changes did not affect the total guaranteed savings.

Table 2-3 ECM Summary of Legislative Mall[2]

ECM #	ECM Description	Total Cost	Guaranteed Annual Savings	Simple Payback
1	Lighting Retrofit and Motion Sensors	$1,631,354	$149,051	10.94
2	Water Conservation	$110,927	$11,641	9.53
3	Control System Upgrades	$1,867,457	$178,766	10.45
4	Building Envelope Improvements	$191,569	$12,482	15.35
5	Boiler Retrofits	$36,070	$18,482	1.95
7	Domestic Hot Water	$18,582	$1,750	10.62
8	Cooling Retrofits	$863,517	$29,400	29.37
9	Cooling Tower Retrofits	$76,241	$573	133.06
10	Air Handling Unit Retrofits	$41,498	$2,507	16.55
11	Water Source Heat Pump Retrofits	$1,642,834	$7,748	212.03
12	Power Factor Correction	$62,656	$4,284	14.63
13	Transformer Replacements	$149,799	$11,245	13.32
14	Additional Lighting Retrofits	Note	-	-
15	Williams Service Center Retrofit and Setbacks	Note	-	-
16	Window Film	Note	-	-
17	Agriculture Lab Retrofits	Note	-	-
18	O'Neill Retrofits	Note	-	-
19	Tatnall Cooling Tower Retrofit	Note	-	-

Note: ECM#14-19 were added to this project after the deletion of the ECMs at the Legislative Hall Building; thus, there is not cost or guaranteed savings associated with them in the original contract.

[2] Delaware Legislative Mall, Investment Grade Energy Audit Volume 2, July 2011.

Figure 2-3 Old and Replacement AHU of O'Neill Building

2.2.3 Carvel and Richardson & Robbins Buildings

Ameresco has contracted to implement 18 ECMs in Carvel and Richardson & Robbins Buildings:

- **Lighting**: Replace existing fixtures with efficient lamps, existing exit signs with LED signs; retrofit HID fixture with high efficient technology; install new lighting controls
- **PV Power**: install two 10 kW PV power generating stations
- **Building**: retrofit the energy management control system and commission the HVAC equipment; replace windows, install low-e film and cover the roof material; insulate the domestic hot water piping
- **HVAC**: Recondition the fume hoods; recondition AHU

Table 2-4 ECM Summary of Carvel & RR[3]

ECM #	ECM Description	Direct Cost	Guaranteed Annual Savings	Payback
1	Lighting System Improvements	$370,875	$91,856	4.04
2	Lighting Controls	$77,903	$11,248	6.93
3	Upgrade EMS & Recommission	$695,225	$171,089	4.06
4	Fume Hood Controls	$387,126	$75,820	5.11
5	Cooling Tower Measures	$275,946	$23,067	11.96
6	Premium Efficiency Motors	$20,636	$1,116	18.49
7	Insulate Piping	$7,058	$1,066	6.62
8	Variable Volume Pumping	$222,403	$45,279	4.91
9	Energy Efficient Transformers	$103,280	$8,581	12.04
10	Water Conservation	$58,179	$9,680	6.01
11	Replace Heat Pumps	$1,777,162	$29,471	60.30
12	Photovoltaic Power Generation	$119,823	$3,804	31.50
13	Energy Star Appliances	$24,816	$1,144	21.69
14	Envelope Measures	$128,238	$179	716.41
15	Boiler Plant Upgrade	$153,712	$22,356	6.88
16	HVAC Unit Upgrades	$181,787	-	
17	Customer Managed Contingency	$150,000	-	

[3] Carvel and Richardson & Robbins buildings GESA, Appendix 9, Technical Audit Report.

18	LEED Certification Costs	$35,000	-	

2.2.4 Sussex County

This project covers three locations, Sussex County Courthouse & Annex, Sussex County Court of Chancery and Sussex County Family Court. An overview of the ECMs for the Courthouse:

- **Fuel**: Installation of a high efficient natural gas-fired boilers including providing gas service to the building; removal of underground oil storage tanks.
- **Chillers**: Interconnect the chilled water systems in the east and west mechanical rooms; Install new chiller
- **Air Handling**: Change filter type to electrostatic dynamic air filters and reduce the amount of outside air supplied by the air handlers; providing two-way valves for the air handlers.
- **Control systems**: Change/modify control sequence to provide efficient operation; provide time-of-day scheduling for the mechanical operation; calibrate and/or replace control devices; provide programming for enthalpy economizer; providing variable frequency drives on the chilled water pumps, cooling towers and heating water pumps.
- **Lighting**: Retrofit existing lighting fixtures; replace lamps with high efficiency lamps; install occupancy sensors for lighting control; provide "emergency lighting control" unit.

Table 2-5 ECM Summary of Sussex County[4]

Buildings	ECM #	ECM Description	Cost	Expected Annual Savings	Payback
Courthouse	1	Chilled Water Plant Upgrades	$447,800	$12,016	37.27
	2	Optimize Heating Water System	$339,700	$29,780	11.41
	3	Replace Filters	$52,000	$6,977	7.45
	4	Upgrade Control System and Commission	$247,800	$54,077	4.58
	5	Modify Lighting	$149,400	$4,964	30.10
Courthouse Annex	1	Replace Filters	$24,200	$930	26.02
	2	Modify Lighting	$34,600	$878	39.42
	3	Upgrade Control System and Commission	$158,900	$452	351.20
	4	Existing DX Rooftop Unit Replacement	$168,700	$724	233
Chancery	1	Replace Filters	$26,000	$2,827	9.2
	2	Upgrade Control System and Commission	$145,700	$12,560	11.6
	3	Modify Lighting	$55,800	$1,010	55.25
	4	Install Boiler	$139,000	$9,656	14.40
	5	DX to Chilled Water Plant Conversion	$367,300	$1,366	268.97
Family Court	1	Modify Lighting	$103,400	$6,900	14.98
	5	Install High Efficiency Condensing Gas Boiler	$74,700	$589	126.85
Total			$2,535,000	$113,804	22.28

[4] Sussex County Courthouse Facilities IGA Technical Audit Report Volume 2, Schedule VII.

2.2.5 Delaware Department of Services for Children, Youth and Their Families

NORESCO has implemented 11 ECMs for reducing the energy and water consumption at the three locations, Main Campus, Terry Center and Stevenson House of DE DSCYF:

- **Lighting Improvements**: Replace existing fixtures with high performance ones; replace incandescent lamps with compact fluorescent lamps; replace incandescent EXIT signs with efficient LED signs; install lighting sensors in areas of infrequent occupancy to ensure lights get turned lights off
- **Water Conservation**: install new toilets and flush valves, and provide faucet sink flow controls and new plumbing fixtures to reduce unnecessary water use, minimize maintenance requirements
- **Air Handling**: Install and program variable frequency drives (VFDs) for supply and return fans in the Terry Center and Ferris School
- **Controls Systems**: Convert existing building automation systems with an automated logic system in the Stevenson house to enable night setbacks, optimize the flow to the chillers, enable more accurate control of exhaust fans, make- up air fans

Table 2-6 ECM Summary of DSCYF[5]

ECM #	Description	Cost	Guaranteed Annual Savings	Payback
1	Lighting Improvements	$472,214	$24,414	19.3
2	Lighting Controls	$15,081	$1,755	8.6
3	Water Conservation	$196,240	$25,983	7.6
4	Replace Cooling Tower	$185,220	$428	432.8
5	Variable Speed Condenser Water Pumping	$197,667	$12,143	16.4
6	Replace Variable Frequency Drives on AHUs	$291,339	$19,672	14.9
7	Renovate VAV Systems	$180,563	$11,075	16.4
8	Automate Cooling Tower Bypass Valves	$136,545	$11,815	11.6
9	Full Controls System Replacement	$456,239	$33,170	13.8
10	Controls Retro-Commissioning	$29,923	$9,050	3.3
11	Renovate Handicap Entrance	$24,384	$75	325.1
Total		$2,185,416	$149,580	14.6

2.2.6 Delaware State University

Johnson Controls, Inc. has implemented 18 ECMs for reducing electricity, natural gas, oil, and water consumption at Delaware State University:

- **Lighting:** retrofit the existing lighting system with newer technology energy-efficient lamps, ballasts, compact fluorescent lamps, and energy efficient lighting fixtures; installation of dual-technology occupancy sensors

[5] DSCYF Technical Audit Report, July 2011, Section I.

- **Energy Management:** upgrades and retrofits to the Building Management System and integration to an Energy Management Head System for central monitoring and control; installation of PC management controls, energy and emissions controls, kitchen hood controls, occupancy-based vending machine controls and energy efficient motors
- **Air Handling:** locating and sealing of cracks, gaps and openings; inspect and adjust or replace each exterior, fire, hatch, garage, shaft and mechanical door; install weather stripping; re-weather strip windows; seal A/C units; raise attic insulation to R-40; seal penetrations and roof/wall intersections; installation of ventilation control systems, variable frequency drive; replacement of air handling units and chiller and cooling towers
- **Water:** replace the dual-fuel boilers; implement water conservation measures including toilets, valves, aerators, and showerheads; provide a new domestic hot water system and light commercial and commercial heating system economizers for all the heating systems

Table 2-7 ECM Summary of DSU[6]

ECM	ECM Description	Total Cost	Guaranteed Savings	Payback
1	Lighting Systems Upgrade	$995,793	$197,209	5.05
2	Lighting Occupancy Controls	$493,218	$50,588	9.75
3	Vending Machine Controls	$18,474	$4,215	4.38
5	Building Envelope	$542,628	$69,108	7.85
6	Demand Control Ventilation	$1,137,389	$199,110	5.71
8	Controls Upgrade	$1,505,177	$65,968	22.82
9	Boiler Replacement	$388,076	$4,106	94.51
11	Domestic Water Upgrades	$398,880	$91,674	4.35
13	Kitchen Hood Controls	$19,335	$1,712	11.29
14	Variable Frequency Drives	$248,706	$19,124	13.00
15	Roof Replacement	$708,205	$502	1410.77
17	Chiller and/or Tower	$430,490	$12,676	33.96
19	HVAC Unit Replacement	$117,206	$24,645	4.76
21	Summer DHW Heater	$26,631	$780	34.14
23	Energy Efficient Motor Replacement	$40,202	$5,522	7.28
25	Boiler Controls	$189,861	$30,460	6.23
26	PC Management	$37,936	$26,850	1.41
30	E2MS	$257,768	-	-
Total		$11,265,970	$794,249	14.18

2.2.7 Delaware Technical and Community College – Terry Campus

An overview of the ECMs for DTCC–Terry Campus:

- **Lighting:** retrofit the existing lighting system with newer technology energy-efficient lamps, ballasts, compact fluorescent lamps, and energy efficient lighting fixtures

[6] Delaware State University, Investment Grade Energy Audit, Volume 2.

- **Air Handling:** demolish and replace the existing AC pad mount units at the Terry building with new units; replace chiller; packaged rooftop unit replacement; windows replacement; building envelope

Table 2-8 ECM Summary of DTCC-Terry[7]

ECM #	ECM Description	Total Cost	Guaranteed Annual Savings	Payback
1	Lighting Retrofit/ Control	$416,032	$50,533	8.23
12	DX AC Unit Replacement "8.5 Tons"	$38,852	$2,912	13.34
13	DX AC Unit Replacement "15 Tons" Option 1	$57,544	$2,569	22.40
18	Premium Efficiency Motors	$23,950	$4,507	5.31
27	DX Coil to CW Coil New Chiller SET	$1,223,465	$37,695	32.46
28	Packaged Rooftop Unit Replacement	$74,276	$4,534	16.38
36	Windows Replacement	$151,480	$14,814	10.23
38	Building Envelope Improvements	$149,018	$13,718	10.86
Total		$2,134,614	$131,302	16.26

2.2.8 Delaware Technical and Community College –Wilmington and Stanton Campuses

An overview of the ECMs for DTCC – Wilmington Campus:

- **Lighting:** lighting retrofit/control
- **Water:** retrofit water conserving fixtures; installation of variable volume condenser water loop, condensing domestic water heater, solar domestic hot water system, new chiller VFD, sports field irrigation system and variable volume chilled water pumping
- **Air Handling:** lab fume hood retrofit; installation of variable speed cooling tower fan and new VAV boxes; building envelope improvements
- **Energy Management:** installation of management system in kitchen walk-in cooler and freezer, demand based ventilation, kitchen hood controls, and premium efficiency motors; ice machine energy recovery; replace emergency generator

[7] Delaware Technical and Community College – Terry Campus, Investment Grade Energy Audit – Volume II.

Table 2-9 ECM Summary of DTCC-WS[8]

ECM #	ECM Description	Total Cost	Guaranteed Annual Savings	Payback
1	Lighting Retrofit	$1,019,553	$78,599	12.97
2	Water Conservation	$176,750	$36,262	4.87
3	Variable Cond Water Loop for WSHP	$767,285	$62,272	12.32
5	Transformer Replacement	$313,083	$16,181	19.35
7	Lab Fume Hood Retrofit	$430,812	$33,078	13.02
9	Variable Speed Cooling Tower Fan	$119,207	$21,788	5.47
12	Walk-In Box Energy MG System	$34,464	$1,347	25.59
13	Ice Machine Energy Recovery	$3,148	$323	9.75
15	Emergency Generator Replacement	$52,394	$1,860	28.17
16	Variable Volume Chilled Water Pumping	$384,334	$12,299	31.25
17	CV To VAV Conversion	$291,904	$21,638	13.49
18	Condensing DHWH	$109,777	$5,308	20.68
19	VDF Chiller	$78,023	$7,420	10.52
20	Premium Efficiency Motors	$114,280	$3,403	33.58
24	Building Envelope Improvements	$49,710	$6,383	7.79
25	Solar DHW System	$65,256	$530	123.12
27	Demand Based Ventilation Control	$15,970	$1,037	15.40
28	Kitchen Hood VAV	$42,433	$8,837	4.80
31	Sports Field Irrigation System	$46,844	$0	-
Total		$4,145,338	$318,564	13.01

[8] Delaware Technical and Community College – Wilmington and Stanton Campuses, Investment Grade Energy Audit – Executive Summary.

3 Methods of Savings Analysis

This report includes four methods of savings —Guaranteed Savings, ESCO Verified Savings, Performance Year Savings using GESA Base Year Consumption, Performance Year Savings using Weather Normalization. Under each method, both of the physical unit savings and the associated dollar savings will be presented.

3.1 Physical Unit Savings

3.1.1 Methods

The first two methods of savings data are collected from GESA and ESCOs post-installation savings reports, respectively.

- **GESA Guaranteed Savings**: Guaranteed Savings is the total amount of avoided energy and water usages guaranteed by the ESCO, as defined in the GESAs. In guaranty period, the baseline and the energy savings in physical units are constant for each project.

- **ESCO Verified Savings**: ESCO Verified Savings are retrieved from the ESCOs' post-installation savings reports. The estimation method depends on the contractual M&V methodologies. ESCOs may adjust the baseline according to changes in building utilization or weather changes.

The two methods below are the savings estimations conducted by CEEP researchers using utility savings analysis. Before introducing the analysis, it is important to note that this kind of utility savings analysis is not contractually required for most of the projects. The results of these two methods serve only as additional evidence to demonstrate the project performance. Moreover, the utility data for DSU, DTCC-Terry and DTCC-WS projects was not received when this interim report was finished. Therefore, these three projects are not included in the analyses of these two methods.

- **Performance Year Savings Using GESA Base Year Consumption**: Savings is estimated by comparing the performance year utility consumption against the GESA base year consumption. The baseline here is also constant, as it is defined in the GESA. Two sets of performance year data will be used—the Portfolio Manager entries and original utility billing data.

Performance Year Savings using GESA Base Year Consumption= Base Year Energy Consumption – Performance Year Energy Consumption

- **Performance Year Savings Using Weather Normalization:** In this case, the weather normalized baseline consumption is established using utility consumption data from Portfolio Manager entries data and weather data in both base year and performance year. The weather normalized baseline shows how much energy a facility would have used under current weather conditions without energy upgrades. Savings is estimated by subtracting this number by the performance year consumption. Two weather normalization methods will be employed.

Performance Year Savings Using Weather Normalization = Weather Normalized Baseline Energy Consumption – Performance Year Energy Consumption

Table 3-1 shows the major differences between these four methods.

Table 3-1 Physical Unit Savings Estimation

Method	**Baseline**	**Physical Unit Savings Estimation**	**Data Sources**
Guaranteed Savings	Constant	Constant	GESA
ESCO Verified Savings	Constant or Modified	Use M&V method defined in GESA	ESCO Post-Installation Savings Report
Performance Year Savings Using GESA Base Year Consumption	Constant	Utility Savings Analysis	Portfolio Manager Entries or Utility Bills
Performance Year Savings Using Weather Normalization	Constant	Utility Savings Analysis	Portfolio Manager Entries or Utility Bills, Weather Data

3.1.2 Performance Period

Table 3-2 shows the performance period used in this analysis:

- The DOC and Carvel & RR projects were not officially completed when the analysis was conducted. Thus, the most recent available 12 months for the two projects is used here.
- The performance period for projects of Legislative Mall, Sussex County, DSCYF, DSU, DTCC-Terry and DTCC-WS is their first performance year.

Table 3-2 Performance Period

Project	Performance Period	Description
DOC	11/01/2013-10/31/2014	Most Recent Available 12 Months
Legislative Mall	01/01/2014-12/31/2014	Guarantee Year One
Carvel & RR	01/01/2014-12/31/2014	Most Recent Available 12 Months
Sussex County	10/01/2013-09/30/2014	Guarantee Year One
DSCYF	11/01/2012-10/31/2013	Guarantee Year One
DSU	02/01/2014- 01/31/2015	Guarantee Year One
DTCC-Terry	11/01/2013 -10/31/2014	Guarantee Year One
DTCC-WS	02/01/2014 – 01/31/2015	Guarantee Year One

3.1.3 Data Collection

(1) Guaranteed Energy Savings Agreements

Guaranteed Energy Savings Agreements for all eight projects are provided by DESEU. In Schedule C of Energy Savings Guarantee of each GESA, ESCO guarantees the annul savings throughout the 20-year guarantee period. GESA guaranteed savings is sufficient enough to meet the finance payment of the project. Each GESA also include the Investment Grade Audit Report

(also named as Energy Audit Report or Technical Audit Report), in which detailed guaranteed savings in physical units and dollars are listed. This set of savings will be included in the following analysis as *GESA Guaranteed Savings*.

In addition, each GESA defines the base year period and base year energy consumption in Schedule E as well as in the Investment Grade Audit Report. The base year energy consumption will be used as baseline to estimate the *Savings Using GESA Base Year Consumption*.

(2) ESCO Post-Installation Savings Report

Since October 2014, the CEEP researchers have been contacting all the ESCOs to gather the savings data. Meanwhile, a letter from Thomas J. Cook, Secretary of Finance in the State of Delaware was sent to the ESCOs and the participating agencies to explain the importance of actual savings data and request them to share this data (See Appendix I). By the end of March 2015, the following savings reports or related documents are received from the ESCOs:

Table 3-3 Savings Documents Checklist

Project	ESCOs	Post-Installation Report	Additional Monitoring Report	Annual Savings Report	Construction Period Savings
DOC	NORESCO				✔
Legislative Mall	Honeywell	✔			
Carvel & RR	Ameresco	✔			
Sussex County	Trane		✔	✔	
DSCYF	NORESCO	✔		✔	
DSU	Johnson Controls			✔	✔
DTCC-Terry	Pepco	✔		✔	
DTCC-WS	Pepco	✔			

- **Post Installation Report (PIR):** Within 90 days following the completion, the ESCO prepares a Post Installation Report. This report provides an overview of the project and the implemented ECMs, and reviews the project's actual potential for generating the guaranteed savings based on the post installation M&V. The projected savings in PIR will be referred to as *Post-Installation Projected Savings for Year One* hereinafter.
- **Additional Monitoring Report:** For the Sussex County project, there is no PIR since it is all Option C for M&V; instead, Trane submitted a quarterly M&V report.
- **Annual Savings Statement:** An annual savings statement is required within 90 days after the first guarantee year, with an exception of the DSU project (the annual statement for DSU is due within 120 days). This statement covers the first performance period and documents the verified savings for the energy conservation measures (ECMs) installed. The actual savings in the annual statement will be referred to as *Verified Savings for Year One* hereinafter.
- **Construction Period Savings:** As the DOC project is still under construction, a savings update has been received from NORESCO, reflecting the most recent available 12

months of construction period saving. Also, for the DSU, Johnson Controls provided an installation savings report presenting the 24-months of construction period savings.

(3) Portfolio Manager Entries or Billing Data

For the *Savings Using GESA Base Year Consumption* and *Savings Using Weather Normalization*, we will use Portfolio Manager entry data or utility billing data. The DESEU sent a letter to the Delaware Office of Management and Budget (OMB) to request previous utility on December 18 2014 (See Appendix II). On March 24 2015, the Portfolio Manager entry data for the five state projects was received from OMB. The Portfolio Manager is an online utility management tool, in which state agencies input their monthly electricity and fuel utility bill consumption and costs. The data was provided in the form of an excel spreadsheet.

The CEEP research team received a separate excel spreadsheet, 32 in total, for each of the buildings in the participating state projects, listing each utility meter, monthly physical unit utility bill consumption, and monthly utility bill cost. The data periods for most of the buildings are from January 2007 to January 2015. The Portfolio Manager entries include the data for electricity, natural gas, heating oil and propane, but not water usage and electric demand. Therefore, water usage and electric demand savings included in calculations in the analyses of these two methods are taken from the ESCO Verified Savings.

It is important to note that the Portfolio Manager entries are the secondary data rather than primary data. Secondary entry data can include errors. Experiences at other state facilities by CEEP's researchers indicate that entry errors can be significant. Also, it allocates meter data when the same building is supplied by more than one meter or when more than one building is on the same meter.

Two of the OMB managed state facility projects presented data analysis problems for the utility savings analysis. The DOC project is not completed and thus has not gone through its first performance year (please see below for definition). Natural gas and propane savings will be the most affected by the remaining construction scope. As a result, the utility savings analysis in several places only report the result of electric savings for DOC project. The fuel savings for DOC will be denoted N/A. Meanwhile, the Portfolio Manager entries contain data for only four of the five buildings under DSCYF project. Therefore the data reported for the DSCYF project is partial; representing only four of the five buildings that received sustainable energy upgrades.

Because OMB was unable to furnish consistent data across all the projects, the reader is cautioned about drawing implications from the utility savings analysis.

Considering these data concerns on the Portfolio Manager entries, the CEEP intends to collect the original utility billing data in the performance period. As of May 2015, the performance period utility billing data for DOC and Sussex County Projects were received. In the following analyses, the two sets of performance period data will be discussed for these two projects.

3.2 Cost Savings

3.2.1 Methods

The dollar savings associated with the physical unit savings will also be estimated. Table 3-4 summarizes the methods of cost savings estimation. Similar to the GESA Guaranteed Savings in Physical Units, the GESA Guaranteed Cost Savings is also directly listed in GESA. The total cost savings ($) in GESA escalates annual through out the 20-year guarantee period based on the contractual escalation rates. For the other three methods, the Cost Savings are estimated by applying the escalated utility rates to physical unit savings.

Table 3-4 Cost Savings Estimations

Method	Cost Savings Estimation	Savings
Guaranteed Savings	Savings are defined in GESA; Escalate Annually	Collected from GESA
ESCO Verified Savings	Physical Unit Savings * Escalated Utility Rate	Collected from ESCO Report
Performance Year Savings using GESA Base Year Consumption	Physical Unit Savings * Escalated Utility Rate	Calculated by CEEP Researchers
Performance Year Savings usingWeather Normalization	Physical Unit Savings * Escalated Utility Rate	Calculated by CEEP Researchers

The escalated utility rates are based on the baseline utility rates and the contractual escalation rate. Both of the two elements are defined in GESAs. In this analysis, a uniform method is adopted to escalate the utility rates for all the projects. Starting from 2011, all the utility rates escalate at an annual rate of 2.5% during construction and each subsequent year thereafter. The following formulas were utilized in calculating the cost savings associated with the energy and water savings.

$$\textit{Electric Savings (\$)} = \textit{Physical Unit Savings (kWh)} * \textit{Baseline Rate (\$/kWh)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

$$\textit{Demand Savings (\$)} = \textit{Physical Unit Savings (kW)} * \textit{Baseline Rate (\$/kW)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

$$\textit{Natural Gas Savings (\$)} = \textit{Physical Unit Savings (therms)} * \textit{Baseline Rate (\$/therm)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

$$\textit{Oil Savings (\$)} = \textit{Physical Unit Savings (gal)} * \textit{Baseline Rate (\$/gal)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

$$\textit{Propane Savings (\$)} = \textit{Physical Unit Savings (gal)} * \textit{Baseline Rate (\$/gal)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

$$\textit{Water Savings (\$)} = \textit{Physical Unit Savings (kgal)} * \textit{Baseline Rate (\$/kgal)} * (1+2.5\%)^{(\textit{Performance Year-2011})}$$

3.2.2 Baseline Utility Rates

The baseline utility rates are the mutually agreed-upon rates as defined by the GESA. Based on the contract, the baseline utility rates will be cumulatively escalated at 2.5% annually for all five state projects. This escalation rate is fixed for the full term of the projects. The baseline utility rates of five state projects are listed in Table 3-5. Since the three university projects are not included in the utility savings analysis. Their baseline rates are not listed below.

Table 3-5 Baseline Utility Rates by Projects and Buildings

	Building	Electric Consumption	Natural Gas	Oil	Propane
		$/kWh	$/Therm	$/Gal	$/Gal
DOC	JTVCC	$0.0757	$1.143		$2.460
	SCI	$0.0757	$0.868		$1.197
	HRYCI	$0.0757	$1.284		
Legislative Mall	Jesse Cooper	$0.0915	$1.194		
	Townsend Building	$0.0915	$1.252		
	Credit Union	$0.0915	$1.291		
	WAR Building	$0.0915		$1.500	
	Tatnall Building	$0.0915	$1.107		
	Sykes Building	$0.0915	$1.184		
	Biggs Museum	$0.0915			
	Public Archives	$0.0915	$1.029		
	Supreme Court & O'Neil	$0.0915	$1.233		
	Haslet Armory	$0.0915	$1.068		
	Kirk Building	$0.0915	$1.155		
	Kent County Family Court	$0.0915	$1.078		
	Ag Building	$0.0500	$1.000		
	Ag Lab	$0.0500	$1.233		
	Fire Marshal's Office	$0.0500	$1.272		
	Fire School	$0.0500	$1.272		
	James Williams Service Center	$0.0915	$0.718		
	Thomas Collins	$0.0915	$0.922		
	William Penn	$0.0915	$0.718		
	Short Building	$0.0915	$1.146		
Carvel &RR	Carvel	$0.0973	$1.295	$2.930	
	Richard & Robbins	$0.0925	$1.611		
Sussex County	All Participating Buildings	$0.0920	$2.100	$3.668	$2.769
DSCYF	Ferris School & NCCDC	$0.0970	$1.166		
	Ferris Administration	$0.0970	$1.166		
	Stevenson House	$0.0950	$1.009		

4 Savings Analysis

4.1 GESA Guaranteed Savings

For each project, a Guaranteed Energy Savings Agreement (GESA) was made between the Energy Service Companies (ESCOs) and the participating agency. In the GESAs, the ESCOs guarantee a fixed amount of energy & water savings to the agencies during each guaranty period.

The guaranteed savings is typically based on ESCO's Investment Grade Audit Report, which is incorporated in the GESAs.

Table 4-1 lists the GESA Guaranteed Savings in Physical Unit for all the Bond projects.

Table 4-1 GESA Guaranteed Savings in Physical Units

Savings	Electric (kWh)	Demand (kW)	Natural Gas (therm)	Oil (Gal)	Propane (Gal)	Water & Sewer (kGal)
DOC	2,810,865	5,212	795,342	N/A	638,970	120,274
Legislative Mall [(a)]	N/A	N/A	N/A	N/A	N/A	N/A
Carvel & RR	3,136,884	4,406	62,911	13,880	N/A	2,453
Sussex County[(b)]	723,191	N/A	15,679	N/A	N/A	N/A
DSCYF	1,133,222	1,376	29,681	N/A	N/A	1,949
DSU	5,544,788	614	208,951	3,523	N/A	9,331
DTCC-Terry	836,225	3,000	11,988	N/A	N/A	N/A
DTCC-WS	2,793,975	7,150	21,210	N/A	N/A	2,736

Note: (a) Guaranteed Savings in Physical Unit is not available for the Legislative Mall Project
(b) Sussex County project, in fact, includes natural gas, oil and propane savings. But in the GESA, the three were combined together and named as natural gas savings.

Table 4-2 lists the GESA Guaranteed Savings in Dollars for all the Bond projects. In addition to energy and water savings, four of the projects (Carvel & RR, DSU, DTCC-Terry and DTCC-WS) include operational & maintenance cost savings into the total guaranteed cost savings.

Table 4-2 GESA Guaranteed Savings in Dollars

Savings	Electric ($)	Demand ($)	Natural Gas ($)	Oil ($)	Propane ($)	Water & Sewer ($)	O&M ($)	Total ($)
DOC	$234,716	$17,115	$1,160,286	N/A	$899,618	$848,249	N/A	**$3,159,984**
Legislative Mall[(a)]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**$427,928**
Carvel & RR	$298,153	$21,554	$98,774	$40,604	N/A	$17,085	$19,587	**$495,757**
Sussex County[(a)]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**$113,806**
DSCYF	$93,054	$3,620	$29,916	N/A	N/A	$22,990	N/A	**$149,580**
DSU	$483,017	$6,907	$229,845	$7,856	N/A	$66,623	$10,000	**$804,249**
DTCC-Terry	$75,337	$38,752	$14,173	N/A	N/A	N/A	$3,043	**$131,303**
DTCC-WS	$223,697	$20,775	$28,213	N/A	N/A	$32,266	$13,613	**$318,564**

Note: (a) Breakdown Cost Savings is not available for the Legislative Mall and Sussex County Projects.

4.2 ESCO Verified Savings

4.2.1 ESCO M&V Options

According to the GESAs, ESCOs use contractual M&V methods to verify the project savings. Before presenting the results of ESCO Verified Savings, it is important to briefly introduce the different M&V Options used for each project.

The International Performance Measurement & Verification Protocol (IPMVP)[9] provides guidelines for the most widely accepted and used M&V methods to verify energy savings. The M&V for the installed ECMs are based on the methods described in this protocol. These approaches include four Options, A, B, C and D, which can be used to determine savings. Both Option A and B are retrofit isolation measurements based mainly on engineering calculations. Option A is appropriate for ECMs that have energy use that can be readily quantified, such as lighting. Option B can produce more definitive results than Option A, as it is generally more difficult and costly. On the contrary, Option C measures the savings by analyzing the utility meters. Option C is intended for projects where expected savings are large compared to the random or unexplained energy variations which occur at the whole-facility level or for the ECMs whose individual energy is difficult to separately measure or excessively complex to measure by Options A or B. Since Option D is not used in any of the Bond projects, it is not discussed here.

Table 4-3 M&V Option Summary

M&V Option	Performance Verification Techniques
Option A Retrofit Isolation: Key Parameter Measurement	Engineering calculations (possibly including spot measurements) with stipulated values.
Option B Retrofit Isolation: All Parameter Measurement	Engineering calculations with spot or short-term metering throughout term of contract.
Option C Whole Facility	Whole building/utility meter billing analysis- using techniques from simple comparison to multivariable regression analysis.

Option A –Retrofit Isolation: Key Parameter Measurement

Savings are determined by field measurement of the key performance parameters that define the energy use of ECMs. These measurements may be short term or continuous. This type of measurement is typically applied through engineering calculations with direct energy measurement values taken from a sample of the ECM equipment. Typical applications of this M&V option are periodic measurements of lighting retrofits and the estimation of light operating

[9] International Performance Measurement and Verification Protocol- Concepts and Options for Determining Energy and Water Savings Volume 1. Prepared by Efficiency Valuation Organization. 2012. http://www.eeperformance.org/uploads/8/6/5/0/8650231/ipmvp_volume_i__2012.pdf

hours based on facility occupancy and schedule. Parameters that vary independently (i.e. weather) should be treated as estimates in calculations.

Option B – Retrofit Isolation: All Parameter Measurement

Savings are determined by the measurement of the energy use of the ECM separate from the rest of the facility in which it is installed. Measurement is made through the combination of engineering calculations and short term or continuous measurements of baseline and reporting period energy. Typical applications of this M&V option include the measurement of energy use of variable speed drive and controls to a motor to adjust pump flow. Parameters that vary independently (i.e. weather) should be treated as estimates in calculations.

Option C – Whole Facility

Savings are determined by analyzing the utility meters of the whole facility or sub-facility. This method measures the savings impact of all the ECMs by the energy meter collectively, not individually. Savings reported under this method also include the energy impact of any other changes made to the daily use of the facility. Typical applications of this M&V option include energy efficiency measures that affect many systems throughout the facility, and measurement of energy use through gas and water meters. Independent variables (i.e. weather) should be included in adjustments when determining savings.

Table 4-4 shows the M&V Options adopted by each project. Option A is the most frequently used method. Most of the Bond projects use Option A to measure ECMs associated with electric savings and use Option C to measure ECMs associated with natural gas savings. Option B is employed in two cases—measuring the benefits from control upgrades and variable frequency drives in DSU and solar Domestic Hot Water system in DTCC-WS. Notably, Sussex County is the only project that uses Option C for the entire project.

Table 4-4 M&V Options of the Bond Projects

Project	ESCOs	M&V Options	Details
DOC	NORESCO	A, C	Option A for electricity Option C for natural gas & water
Legislative Mall	Honeywell	A	Option A for all ECMs
Carvel & RR	Ameresco	A	Option A for all ECMs
Sussex County	Trane	C	Option C for all ECMs
DSCYF	NORESCO	A	Option A for all ECMs
DSU	Johnson Controls	A, B	Option A for most of the ECMs Option B for control upgrades and variable frequency drives
DTCC-Terry	Pepco	A, C	Option A for electricity Option C for natural gas
DTCC-WS	Pepco	A, B, C	Option A for electricity & water Option B for solar DHW system Option C for natural gas

Savings from some of the ECMs not only depend upon the improved efficiency of new equipment, but also some variables, such as weather data, operational changes, occupied/unoccupied hours, etc. Thus, the detailed M&V methodology for each ECM is usually based on a contractually agreed upon model and variables.

4.2.2 ESCO Verified Savings

The ESCO Verified Savings are shown in the table below. For DSU, DTCC-Terry, Sussex County and DSCYF, the listed savings are *Verified Year One Savings* in their annual savings statements. For DTCC-WS, Legislative Mall and Carvel & RR, the listed savings are *Post-Installation Projected Savings For Year One* based on their post-installation M&V reports. In addition, the most recent available 12-months savings data during construction period for the DOC project is listed.

In Table 4-5, there are three types of ESCO Verified Savings depending on the project progress and data availability, as labeled in the table:

(1) Most Recent Available 12-months of Construction Period Savings
(2) Post-Installation Projected Savings for Year One
(3) Verified Savings for Year One

Table 4-5 ESCO Verified Savings in Physical Units

Savings	Electric (kWh)	Demand (kW)	Natural Gas (therm)	Oil (Gal)	Propane (Gal)	Water & Sewer (kGal)
DOC[(1) (a)]	3,464,081	8,105	N/A	N/A	N/A	124,211
Legislative Mall[(2)]	2,656,775	5,634	68,538	201	N/A	1,268
Carvel & RR[(2)]	3,136,884	4,406	62,911	13,880	N/A	2,453
Sussex County[(3)(b)]	661,045	N/A	17,401	N/A	N/A	N/A
DSCYF[(3)]	1,164,315	1,366	29,980	N/A	N/A	2,114
DSU[(3)]	N/A	N/A	N/A	N/A	N/A	N/A
DTCC-Terry[(3)]	1,080,720	3,454	10,669	N/A	N/A	N/A
DTCC-WS[(2)]	2,882,116	7,125	19,621	N/A	N/A	2,736

Note: (a) The fuel savings of DOC is the most affected by the remaining construction scope. Thus, it is not reported here.

(b) Sussex County project, in fact, includes natural gas, oil and propane savings. But in the ESCO annual savings report, the three were combined together and named as natural gas savings.

It is worth mentioning that the DOC project was still under construction when the data was retrieved. Therefore, the savings numbers presented herein are preliminary and have not been normalized for population, weather, etc. Moreover, the savings of Sussex County included a baseline adjustment in response to changes to the facilities' schedule of operating and operating parameters deviating from the Standard of Comfort as per the Agreement. It leads to an additional 17,810 kWh in electricity consumption and 993 therms in natural gas consumption in baseline.

Table 4-6 ESCO Verified Savings in Dollars

Savings	Electric ($)	Demand ($)	Natural Gas ($)	Oil ($)	Propane ($)	Water & Sewer ($)	O&M ($)	**Total ($)**
DOC	$262,058	$42,112	N/A	N/A	N/A	$884,757	N/A	**N/A**
Legislative Mall	$263,121	$88,454	$76,989	$302	N/A	$9,051	N/A	**$437,917**
Carvel & RR	$298,153	$21,554	$98,774	$40,604	N/A	$17,085	$19,587	**$495,757**
Sussex County	$60,813	N/A	$62,127	N/A	N/A	N/A	N/A	**$122,943**
DSCYF	$92,606	$3,365	$32,634	N/A	N/A	$25,509	N/A	**$154,114**
DSU	N/A	N/A	N/A	N/A	N/A	N/A	$10,000	**$832,245**
DTCC-Terry	$84,393	$44,348	$12,782	N/A	N/A	N/A	$3,043	**$143,865**
DTCC-WS	$230,516	$20,574	$26,182	N/A	N/A	$32,266	$13,613	**$323,152**

4.3 Performance Year Savings using GESA Base Year Consumption

4.3.1 GESA Base Year Energy Consumption

The Investment Grade Audit (IGA) report in the GESA defines the base year period and base year energy consumption. Table 4-2 lists the base year energy consumption collected from the GESA for each of the five state projects. As mentioned in Section 3, the three university projects will not be included in this method due to lack of utility data.

As shown in the table below, three of the projects, Legislative Mall, Carvel & RR and Sussex County, use 12 consecutive months as the base year, while the DOC and DSCYF projects use the average annual consumption of two or three years.

Table 4-7 GESA Base Year Energy Consumption[(a)]

Project	Base Year	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Non-Weather Normalized Baseline (MMBTU)
DOC	07/01/2008-06/30/2010	33,004,322	2,684,755	N/A	638,726	439,882
Legislative Mall[(b)]	06/01/2009-05/31/2010	16,827,867	331,580	1,486	N/A	90,800
Carvel & RR	07/01/2007-06/30/2008	12,021,965	162,936	34,608	N/A	62,170
Sussex County	08/01/2009-07/31/2010	2,006,258	N/A	18,404	9,457	10,294
DSCYF_ partial[(c)]	05/01/2007-04/30/2010[(d)]	5,687,963	216,000	N/A	N/A	41,013

Note: (a) The base year water consumption and electric demand are not included here.
(b) For Legislative Mall project, the ECMs in Delaware Legislative Hall Building were removed and replaced by seven other buildings. In this case, an updated GESA base year data was provided by the ESCO. The base year for the additional seven buildings is 06/01/2010-05/31/2011.
(c) Due to lack of performance year data for Terry Center in DSCYF project, this building is excluded from this analysis.
(d) The Base Year for Stevenson House in DSCYF project is 05/01/2009-04/30/2010.

4.3.2 Performance Year Energy Consumption

Table 4-8 lists the performance year energy consumption for each project collected from Portfolio Manager entries using the corresponding performance period. With an exception of DOC, all other facilities no long use oil or propane in performance year.

Table 4-8 Performance Year Energy Consumption (based on Portfolio Manager Entries)

Project	Performance Period	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total (MMBTU)
DOC[(a)]	11//012013-10/31/2014	29,540,958 [(b)]	N/A	N/A	N/A	N/A
Legislative Mall[(c)]	01/01/2014-12/31/2014	13,888,523	268,979	N/A	N/A	74,299
Carvel & RR	01/01/2014-12/31/2014	7,352,282	125,080	N/A	N/A	37,601
Sussex County	10/01/2013-09/30/2014	1,310,805	24,454	N/A	N/A	6,919
DSCYF—partial	11/01/2012-10/31/2013	4,909,388	168,047	N/A	N/A	33,560

Note: (a) The fuel savings of DOC is the most affected by the remaining construction scope. Thus, it is not reported here.

(b) An entry error is found in the Portfolio Manager entries for DOC. The electric usage of JTVCC in 12/03/2013 should be 1,280,000 kWh, instead of 128,000 kWh. The revised total electric consumption is 29,540,958 kWh, which is close to the data collected from the utility bill in Table 4-9.

(c) For Legislative Mall, the numbers here include the data for all the buildings received the energy upgrades from the common data source.

In addition to Portfolio Manager entry data, CEEP research team also received the original performance year utility billing data for DOC and Sussex County projects, listed in Table 4-9. The energy usage in the DOC's utility bills is slightly different from that in the Portfolio Manager entries. The utility bills of Sussex County project give the same energy consumption values as the Portfolio Manager entries do. Since the Portfolio Manager entries of these two projects are very close to the number taken from utility bills, only the Portfolio Manager entries will be used in the following analyses.

Table 4-9 Performance Year Energy Consumption (based on Utility Bills)

Project	Performance Period	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total (MMBTU)
DOC[(a)]	11//012013-10/31/2014	29,540,234	N/A	N/A	N/A	N/A
Sussex County	10/01/2013-09/30/2014	1,310,805	24,454	N/A	N/A	6,919

Note: (a) the exact data period for each building under DOC Project varies due to their different billing cycles (JTVCC: 10/31/2013-09/30/2014; SCI: 11/19/2013-10/19/2014; HRYCI: 11/25/13-10/23/14).

4.3.3 Savings Using GESA Base Year Consumption

The performance year savings are calculated using the formula below:

*Base Year Savings = Base Year Energy Consumption (*Table 4-7*) – Performance Year Energy Consumption (*Table 4-8*)*

Table 4-10 Performance Year Savings in Physical Units Using GESA Base Year Consumption (based on Portfolio Manager Entries)

Project	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Non-Weather Normalized Savings (MMBTU)
DOC [(a)]	3,464,364	N/A	N/A	N/A	N/A
Legislative Mall	2,939,344	62,601	1,486	N/A	16,500
Carvel & RR	4,669,683	37,856	34,608	N/A	24,568
Sussex County	695,453	-24,454	18,404	9,457	3,375
DSCYF–partial	778,575	47,953	N/A	N/A	7,453

Note: (a) Full year post-installation data for DOC's fuel consumption is not available. Thus, their savings are not listed in the analyses here and below.

The physical unit savings analysis above does not include savings from reduction in electricity demand (i.e. kW savings), reduced water consumption due to lack of performance year data. Therefore, in Table 4-11, the demand savings ($), water savings ($) as well as O&M savings ($), if applicable, are added to the total energy savings using ESCO verified numbers[10] to get the grand total savings ($). The same approach will be used in Section 4.4.3 to estimate the grant total savings using the method of weather normalization.

Table 4-11 Performance Year Savings in Dollars using GESA Base Year Energy Consumption (based on Portfolio Manager Entries)

Project	Electricity ($)	Natural Gas ($)	Oil ($)	Propane ($)	Total ($)	Grand Total ($)
DOC	$282,149	N/A	N/A	N/A	N/A	N/A
Legislative Mall	$275,120	$62,859	$2,400	N/A	$340,379	$445,625
Carvel & RR	$475,978	$66,918	N/A	N/A	$542,896	$605,599
Sussex County	$68,901	-$55,302	$72,695	$28,201	$114,495	$114,495
DSCYF–partial	$79,100	$56,939	N/A	N/A	$136,039	$165,635

4.4 Performance Year Savings using Weather Normalization

4.4.1 Weather Normalization

Weather is one of the most common variables that impact the energy consumption of a building. Therefore, a weather-normalized baseline is established to compare against the performance year energy consumption. Weather data in the form of cooling degree days (CDDs) and heating

[10] ESCO verified demand, water and O&M savings ($) are modified by applying the uniform utility rates escalating method; see detailed discussion in Section 4.5.

degree days (HDDs)[11] for Delaware weather stations was collected from the database of National Oceanic and Atmospheric Association (NOAA)[12].

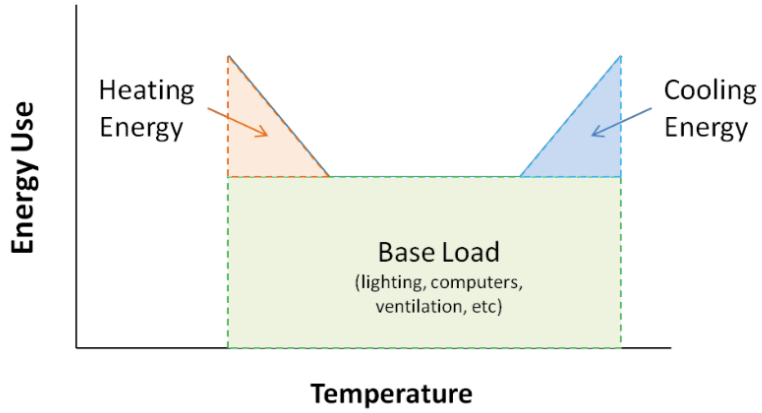

Figure 4-1 Typical Building Profile for Energy and Temperature
(Source: Energy Star, 2014. Climate and Weather Effects.)

As shown in the graph, a building's energy consumption typically consists of the non-weather dependent load, also known as base load, such as electricity for lighting and appliances, and the weather dependent load, such fuel and electricity for heating and cooling. Using the regression, we could separate the weather dependent load from the non-weather dependent load and adjust the weather changes accordingly. A linear regression between energy usage and CDD and/or HDD in the base year will be performed to find a best fit and build a baseline equation for each type of utility.

The weather normalized baseline equations are listed as follows:

$$\textit{Electric: Baseline kWh} = \underbrace{\textit{a kWh/Day* \#Day}}_{\text{Base Load}} + \underbrace{\textit{b kWh/CDD * \#CDD}}_{\text{Cooling Load}} + \underbrace{\textit{(c kWh/HDD * \#HDD)}}_{\text{Heating Load}}$$

$$\textit{Natural Gas: Baseline therms} = \underbrace{\textit{a therms/Day* \#Day}}_{\text{Base Load}} + \underbrace{\textit{b therms/HDD * \#HDD}}_{\text{Heating Load}}$$

$$\textit{Oil \& Propane: Baseline gal} = \underbrace{\textit{a therms/Day* \#Day}}_{\text{Base Load}} + \underbrace{\textit{b therms/HDD * \#HDD}}_{\text{Heating Load}}$$

[11] Cooling degree days are calculated as how much warmer the mean temperature at a location is than 65°F on a given day, while heating degree days are calculated as how much colder the mean temperature at a location is than 65°F on a given day.

[12] The base year weather data came from National Climate Data Center's Climate Data Online at (http://www.ncdc.noaa.gov/cdo-web/datasets) from the Dover, Greenwood and Wilmington New Castle weather stations. Performance year weather data came from the NOAA's National Climate Data Center at (http://www.weather.gov/climate/getclimate.php?date=&wfo=phi&sid=ILG&pil=CF6&recent=&specdate=2014-11-30+11%3A11%3A11 and http://www.weather.gov/climate/getclimate.php?date=&wfo=phi&sid=ILG&pil=CF6&recent=&specdate=2014-11-30+11%3A11%3A11), or NOAA's National Environmental Satellite, Data, and Information Service Monthly Climatological Summaries for Dover, Prime Hook, and Wilmington.

Two weather normalization methods are adopted in the savings:

- Method 1: The regression equations for each building are generated using 12 months of weather data and energy consumption data in the GESA base year.
- Method 2: The regression equations for each building are generated using 36 months of pre-construction Portfolio Manager entries.

By inserting the performance year CDD and HDD data into the equations, we could project a weather normalized baseline.

4.4.2 Weather Normalized Baseline Energy Consumption

(1) Weather Normalization Method 1—One Year Base
In Method 1, the regression equations for each building were generated using the monthly weather data and energy consumption data in the GESA base year. It should be noted that this baseline is built on an equation, which uses only 12 data points to estimate the parameters. The results of weather normalized consumption, using Method 1, are reported in the table below.

Table 4-12 Weather Normalized Baseline Energy Consumption using Method 1

Project	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Weather Normalized Baseline (MMBTU)	Total Non-Weather Normalized Baseline [(a)] (MMBTU)
DOC	33,099,295	2,683,395	N/A	615,772	437,958	439,882
Legislative Mall	17,026,830	323,802	1,603	N/A	90,717	90,800
Carvel & RR	11,799,997	178,885	40,577	N/A	63,843	62,170
Sussex County	1,920,616	N/A	22,401	8,461	10,470	10,294
DSCYF–partial	5,762,275	218,490	N/A	N/A	41,516	41,013

Note: (a) See Table 4-7.

(2) Weather Normalization Method 2—Three Year Base
A weather normalized baseline energy consumption was also developed using 36 months of pre-construction Portfolio Manager entries for each project (See the Appendix for the data period for each project). Compared with Method 1, this 3-year average baseline can be more accurate over a longer period of time, which would be partly reflected in the higher R^2 of the regression line.

In principle, Method 2 would improve the accuracy of baseline measurement. But in this case, it is unclear weather Method 2 is useful. First, we are applying the weather adjustment retroactively without the ability to recognize, for example, changes in buildings use or purpose over the three-year period. Second, there are missing consumption data in Portfolio Manager entries over the three-year period. Therefore, caution is recommended in the interpretation of baseline measurement using Method 2.

The results of weather normalized consumption, using Method 2, are reported in Table 4-13.

Table 4-13 Weather Normalized Baseline Energy Consumption using Method 2

Project	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Weather Normalized Baseline (MMBTU)	Total Non-Weather Normalized Baseline [(a)] (MMBTU)
DOC	32,892,872	2,654,801	N/A	614,806	434,306	439,882
Legislative Mall	17,625,964	339,948	1,716	N/A	94,392	N/A
Carvel & RR	11,117,312	157,328	32,549	N/A	58,233	62,170
Sussex County	2,190,230	N/A	20,138	10,979	11,305	10,294
DSCYF–partial	5,839,282	216,759	N/A	N/A	41,605	41,013

Note: (a) See Table 4-7.

4.4.3 Savings Using Weather Normalization

- Savings Using Weather Normalization Method 1

The savings are calculated using the formula below:

Savings Using Weather Normalization Method 1 = Weather Normalized Baseline 1 (Table 4-12) *–Performance Year Energy Consumption* (Table 4-8)

Table 4-14 Performance Year Savings using Weather Normalization Method 1

Project	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Weather Normalized Savings (MMBTU)
DOC	3,558,337	N/A	N/A	N/A	N/A
Legislative Mall	3,138,308	54,820	1,603	N/A	16,418
Carvel & RR	4,447,715	53,805	40,577	N/A	26,241
Sussex County	609,811	-24,454	22,401	8,461	3,550
DSCYF–partial	852,887	50,443	N/A	N/A	7,955

The electric demand, water and O&M savings ($) are added to the total energy savings to get the grand total savings ($), using the same approach mentioned in Section 4.3.3.

Table 4-15 Performance Year Cost Savings using Weather Normalization Method 1

Project	Electricity ($)	Natural Gas ($)	Oil ($)	Propane ($)	Total ($)	Grand Total ($)
DOC	$289,886	N/A	N/A	N/A	N/A	N/A
Legislative Mall	$299,731	$55,848	$2,589	N/A	$358,168	$463,414
Carvel & RR	$453,554	$93,056	N/A	N/A	$546,609	$609,312
Sussex County	$60,416	-$55,302	$88,486	$25,231	$118,831	$118,831
DSCYF–partial	$86,541	$60,131	N/A	N/A	$146,673	$176,268

- Savings Using Weather Normalization Method 2

The savings are calculated using the formula below:

Savings Using Weather Normalization Method 2 = Weather Normalized Baseline 2 (Table 4-13) *– Performance Year Energy Consumption* (Table 4-8)

Table 4-16 Performance Year Savings using Weather Normalization Method 2

Project	Electricity (kWh)	Natural Gas (Therms)	Oil (Gal)	Propane (Gal)	Total Weather Normalized Savings (MMBTU)
DOC	3,351,914	N/A	N/A	N/A	N/A
Legislative Mall	3,737,441	70,969	1,716	N/A	20,093
Carvel & RR	3,765,030	32,248	32,549	N/A	20,632
Sussex County	879,425	-24,454	20,138	10,979	4,386
DSCYF–partial	929,894	48,712	N/A	N/A	8,045

The electric demand, water and O&M savings ($) are added to the total energy savings to get the grand total savings ($), using the same approach mentioned in Section 4.3.3.

Table 4-17 Performance Year Cost Savings using Weather Normalization Method 2

Project	Electricity ($)	Natural Gas ($)	Oil ($)	Propane ($)	Total ($)	Grand Total ($)
DOC	$273,070	N/A	N/A	N/A	N/A	N/A
Legislative Mall	$349,732	$73,589	$2,772	N/A	$426,092	$531,338
Carvel & RR	$384,893	$55,355	N/A	N/A	$440,248	$502,951
Sussex County	$87,128	-$55,302	$79,547	$32,742	$144,115	$144,115
DSCYF–partial	$94,234	$58,302	N/A	N/A	$152,536	$182,132

4.5 Savings Comparison

The results of savings analysis for five state projects, using the four methods above, are compared in Table 4-18. For all five projects, the total cost savings are higher than their guaranteed savings.

One adjustment is made in order to compare across the four basic methods of savings analyses—GESA Guaranteed Savings, ESCO Verified Savings, Savings using GESA Base Year and Savings using Weather Normalization—in a consistent manner. After checking the ESCO verified cost savings ($), we learned that the application of escalation rates varied among different projects. The dollar savings in the ESCO reports for some projects use escalated utility rates while some do not; therefore, CEEP's researchers applied a uniform rule of utility escalation rates of 2.5% starting from 2011. As a result, the dollar savings in Table 4-18 are higher than the original ESCO verified savings listed in Section 4.2.2. This is noted in the label for the row—ESCO verified savings (modified). In communications with the ESCOs, CEEP's researchers are told that the ESCOs intend to apply the uniform escalator found in the GESA contracts.

Table 4-18 Savings Comparison of Five State Projects

Project	Method		Electric & Fuel Savings						Other Savings			Total Cost Savings ($)
			Electric Savings		Fuel Savings		Subtotal		Demand	Water	O&M	
			kWh	$	Therms	$	MMBTU	$	$	$	$	
DOC	GESA Guaranteed Savings		2,810,865	$234,716	1,383,194	$2,059,904	147,913	$2,294,620	$17,115	$848,249	N/A	$3,159,984
	ESCO Verified Savings (modified)		3,464,081	$282,208	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Savings using GESA Base Year Consumption		3,463,364	$282,149	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Savings using Weather Normalization	Method 1	3,558,337	$289,886	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Method 2	3,351,914	$273,070	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Legislative Mall	GESA Guaranteed Savings		Detailed data not available									$427,928
	ESCO Verified Savings (modified)		2,656,775	$283,353	68,819	$83,234	15,950	$366,586	$95,255	$9,991	N/A	$471,832
	Savings using GESA Base Year Consumption		2,939,344	$275,120	64,681	$65,259	16,500	$340,379	$95,255	$9,991	N/A	$445,625
	Savings using Weather Normalization	Method 1	3,138,307	$299,731	78,473	$58,437	18,558	$358,168	$95,255	$9,991	N/A	$463,414
		Method 2	3,737,441	$349,732	86,722	$76,361	21,428	$426,092	$95,255	$9,991	N/A	$531,338
Carvel & RR	GESA Guaranteed Savings		3,136,884	$298,153	82,343	$139,378	20,763	$437,531	$21,554	$17,085	$19,587	$495,757
	ESCO Verified Savings (modified)		3,136,884	$321,078	82,343	$150,095	18,940	$471,173	$23,211	$18,399	$21,093	$533,876
	Savings using GESA Base Year Consumption		4,669,683	$475,978	86,307	$66,918	24,568	$542,896	$23,211	$18,399	$21,093	$605,599
	Savings using Weather Normalization	Method 1	4,447,715	$453,554	110,613	$93,056	26,241	$546,609	$23,211	$18,399	$21,093	$609,312
		Method 2	3,765,030	$384,893	77,816	$55,355	20,632	$440,248	$23,211	$18,399	$21,093	$502,951
Sussex County	GESA Guaranteed Savings		723,191	N/A	15,679	N/A	4,036	$113,806	N/A	N/A	N/A	$113,806
	ESCO Verified Savings (modified)		661,045	$65,489	17,041	$66,904	3,960	$132,393	N/A	N/A	N/A	$132,393
	Savings using GESA Base Year Consumption		695,453	$68,901	10,011	$45,594	3,375	$114,495	N/A	N/A	N/A	$114,495
	Savings using Weather Normalization	Method 1	609,811	$60,416	14,692	$58,415	3,550	$118,831	N/A	N/A	N/A	$118,831
		Method 2	879,425	$87,128	13,841	$56,987	4,386	$144,115	N/A	N/A	N/A	$144,115
DSCYF	GESA Guaranteed Savings		1,133,222	$93,054	29,681	$29,916	6,836	$122,970	$3,620	$22,990	N/A	$149,580
	ESCO Verified Savings (modified)		1,164,315	$94,921	29,980	$33,450	6,972	$128,371	$3,449	$26,147	N/A	$157,967
	Savings using GESA Base Year Consumption –partial		778,575	$79,100	47,953	$56,939	7,453	$136,039	$3,449	$26,147	N/A	$165,635
	Savings using Weather Normalization –partial	Method 1	852,887	$86,541	50,444	$60,131	7,955	$146,673	$3,449	$26,147	N/A	$176,268
		Method 2	929,894	$94,234	48,713	$58,302	8,045	$152,536	$3,449	$26,147	N/A	$182,132

Meanwhile, for the DSU, DTCC-Terry and DTCC-WS projects, GESA Guaranteed Savings and ESCO Verified Savings are compared in Table 4-19. Since utility savings analysis does not incudes these three projects due to lack of data, the savings comparison here is partial. Once the utility data for the three projects are received, Savings Using GESA Base Year Consumption and Savings Using Weather Normalization will be reported here.

Table 4-19 Savings Comparisons of Three University Projects (Partial)

Project	Method	Electric		Demand		Natural Gas		Oil		Water		O&M	**Total**
		kWh	$	kW	$	Therms	$	Gal	$	KGal	$	$	**$**
DSU	Guaranteed Savings	5,544,788	$483,017	614	$6,907	208,951	$229,845	3,523	$7,856	9,331	$66,623	$10,000	**$804,249**
	ESCO Verified Savings	Breakdown numbers not yet available										$10,000	**$832,245**
DTCC-Terry	Guaranteed Savings	836,226	$75,337	2,999	$38,752	11,988	$14,173	N/A	N/A	N/A	N/A	$3,043	**$131,303**
	ESCO Verified Savings	1,080,720	$84,393	3,454	$44,348	10,699	$12,782	N/A	N/A	N/A	N/A	$3,043	**$143,865**
DTCC-WS	Guaranteed Savings	2,793,974	$223,697	7,149	$20,775	21,210	$28,213	N/A	N/A	2,736	$32,266	$13,613	**$318,564**
	ESCO Verified Savings	2,882,116	$230,516	7,125	$20,574	19,621	$26,182	N/A	N/A	2,736	$32,266	$13,613	**$323,152**

4.6 State Project Savings vs. Bond Debt Service

Table 4-20 lists the project savings and debt service for the five state projects. For each savings estimation method, the savings to date are greater than the debt service to date.

Table 4-20 Savings vs. Debt Service [(a)]

Project	Method	Total Cost Saving	Debt Service[(b)]	Surplus
Legislative Mall	GESA Guaranteed Savings	$427,928	$383,893	$44,035
	ESCO Verified Savings (modified)	$471,832		$87,939
	Savings using GESA Base Year Consumption*	$445,625		$61,732
	Savings using Weather Normalization Method 1*	$463,414		$79,521
	Savings using Weather Normalization Method 2*	$531,338		$147,445
Carvel & RR	GESA Guaranteed Savings	$495,757	$458,326	$37,431
	ESCO Verified Savings (modified)	$533,876		$75,550
	Savings using GESA Base Year Consumption*	$605,599		$147,273
	Savings using Weather Normalization Method 1*	$609,312		$150,986
	Savings using Weather Normalization Method 2*	$502,951		$44,625
Sussex County	GESA Guaranteed Savings	$113,806	$69,675	$44,131
	ESCO Verified Savings (modified)	$132,393		$62,718
	Savings using GESA Base Year Consumption*	$114,495		$44,820
	Savings using Weather Normalization Method 1*	$118,831		$49,156
	Savings using Weather Normalization Method 2*	$144,115		$74,440
DSCYF	GESA Guaranteed Savings	$149,580	$127,317	$22,263
	ESCO Verified Savings (modified)	$157,967		$30,650
	Savings using GESA Base Year Consumption*	$165,635		$38,318
	Savings using Weather Normalization Method 1—partial *	$176,268		$48,951
	Savings using Weather Normalization Method 2—partial *	$182,132		$54,815

Note: (a) The debt service data is collected from the Citigroup Post Pricing Book for the 2011 Delaware Sustainable Energy Utility Energy Efficiency Revenue Bonds Series. The period for debt service corresponds to the performance period of each project.

(b) Since the DOC project does not have a full year of post-installation data, it is not included in this comparison.

(c) An asterisk indicates that savings are based on Portfolio Manager entries taken from utility bills. As noted in Section 3.1.3, errors can occur during the entry of utility bill data into Portfolio Manager.

In addition, the utility payment reduction to date was estimated using utility payment data from Portfolio Manager entries provided by OMB. In order to use a common database for this estimation, base year consumption is also drawn from Portfolio Manager entries.

Utility Payment Reduction = Base Year Total Utility Payment – Performance Year Total Utility Payment

Base Year Total Utility Payment=Data Provided by Portfolio Manager

Performance Year Total Utility Payment= Data Provided by Portfolio Manager

Table 4-21 lists the estimated utility payment reductions compared with debt service. Utility payment reductions in Table 4-21 are based on Portfolio Manager entries without escalator or weather normalization. Additionally, utility payment reductions do not consider baseline information in consumption in physical units in the GESA.

Payment reduction for most of the projects is higher than savings reported in Table 4-20. However, it should be noted that when this method of savings definition is used, estimated savings can vary as a result of volatility in fuel pricing. Moreover, this approach is not consistent with contractual agreements signed by the participating parties.

Table 4-21 Estimated Utility Payment Reductions vs. Debt Service

Project	Estimated Utility Payment Reduction	Debt Service	Surplus
DOC[(a)]	N/A	$3,162,639	N/A
Legislative Mall	$885,716	$383,893	$501,823
Carvel & RR	$956,967	$458,326	$498,641
Sussex County[(b)]	N/A	$69,675	N/A
DSCYF–partial	$248,033	$127,317	$120,716

Note: (a) Since the DOC project does not have a full year of post-installation data, the estimated utility payment reduction is not reported here.

(b) Portfolio Manager entries do not include the monthly utility payments made before January 2010 for Sussex County. 5 of 12 month cost data are missing; thus, the results of Sussex County cannot be reported.

5 Economic and Environmental Impacts

5.1 Job Creation

Investment in the energy efficiency projects can help promote a more robust economy by supporting higher level of employment. As an outcome of the Bond projects, a total of 786 jobs were created during the design, construction and monitoring processes. Out of the total number of jobs created, at least 430 were filled by Delawareans.

It should be noted that there was no pre-established and agreed upon method for collecting jobs data. The job data presented is based on the mutual agreement between the SEU and the ESCOs.

Table 5-1 Job Creation

Project	Total Jobs	Delaware Jobs
DOC[(a)]	425	185
DSU[(b)]	105	91
DTCC-Terry[(b)]	36	22
DTCC-WS[(b)]	65	43
Legislative Mall[(b)]	52	no data
Carvel & RR[(b)]	19	19
Sussex County[(c)]	55	54
DSCYF[(a)]	29	16
Total	786	430

Note: (a) Job estimates here come from the SEU survey in 2013.
(b) Data provided by the ESCOs in February 2015.
(c) Job data retrieved from the Fact Sheet about Sussex County Courthouse Infrastructure Improvements, September 2012.

5.2 Carbon Emission Savings

Improving the energy efficiency of the participating buildings can also reduce the greenhouse gas emissions. The annual energy savings of the eight projects can lead to a total annual emission reduction of 46,849,463 lbs of CO_2.

Table 5-2 Annual Carbon Emission Reduction[13]

Project [(a)]	CO_2
DOC	20,836,353
Legislative Mall [(b)]	4,073,251
Carvel & RR	4,927,865
Sussex County	1,072,608
DSCYF	1,740,564
DSU	9,347,075
DTCC-Terry	1,168,398
DTCC-WS	3,683,349
Total	46,849,463

Note: (a) Emission reductions of projects are based on energy savings of GESA Guaranteed Savings in physical units, with an exception of Legislative Mall.

(b) The breakdown numbers of guaranteed savings for Legislative Mall are not available. Thus, its emission savings is based on ESCO post-installation projected energy savings for Year One.

[13] Source of electricity emission factors: PJM Regional Average Disclosure Label for 2008.
Source of natural gas emission factors: Energy Information Agency (EIA) - Natural Gas Issues and Trends 1998:
http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/natural_gas_1998_issues_trends/pdf/chapter2.pdf
Source of fuel oil emission factors: EPA AP-42 Emission Factors:
http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s03.pdf
Source of propane emission factors: EPA AP-42 Emission Factors:
http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s05.pdf

6 Case Studies: Best Practices

6.1 DOC: ECM 17- Water Conservation with I-Con

With a total cost of $6,450,247, the ECM 17- Water Conservation with I-Con is the second largest ECM of the DOC project. Despite the fact that the DOC project is still under construction, this single ECM has been proved to be a success. As of November 2014, the most recent available 12 months of construction period water saving of ECM 17 was 124,211 kGal, exceeding the corresponding guaranteed unit savings by 16%. The savings are measured by NORESCO through Option C. Given the fact that the baseline water consumption of all three DOC facilities together is 304,540 kGal, this ECM alone will be able to help DOC save almost 40% of its water consumption annually.

Table 6-1 Water Savings Comparison of ECM 17 at DOC

Guaranteed water savings of ECM 17	103,557 kGal
Most recent available 12 months of construction period water savings of ECM 17	119,772 kGal

The great performance of ECM 17 can be attributed to the correct diagnosis of existing issues and the installation of the appropriate measures. Water consumption at the DOC facilities was high due to uncontrolled usage and the inefficiency of current plumbing devices:

- The majority of the plumbing fixtures were found to be old, and less water efficient.
- The toilets and lavatories in DOC facilities were an aspect of inmate activities that are "uncontrolled" and the result was high use and abuse of plumbing fixtures.

Thus, to reduce water consumption, NORESCO installed and retrofitted with new low flow plumbing fixtures and controls. As shown in the following table, NORESCO provided new toilets that include new flush values, new faucet sink flow controls, and new showerheads. All the fixtures and valves are ultra low-flow devices that meet or exceed the latest federal and Department of Energy (DOE) WaterSense standards.

Table 6-2 Usage Rates of Plumbing Fixtures

Type	Federal Standard	DOE Standard	Per-existing Equipment	New Equipment
Toilet	1.6 gpf	1.28gpf	3.5gpf	1.1-1.28gpf
Faucet	2.2 gpm	1.5 gpm	2.0 gpm	0.5-1.0 gpm
Showerhead	2.5 gpm	2 gpm	2.5-3.8 gpm	1.75 gpm

In addition, with the I-CON electronic plumbing control system, the control of the plumbing fixtures is put in the hands of those operating the facility, and out of the hands of the inmates. I-CON plumbing control products could provide significant energy conservation. Overall, the upgrades could reduce unnecessary water use, minimize maintenance requirements, and provide the facilities with new, more attractive plumbing fixtures.

6.2 Sussex County: Family Court Building

The Family Court is the best performing building in the Sussex County Project relative to the total annual savings, running over $9,000 above the Year One target. The ESCO verified dollar saving of $ 16,382 is more than twice the guaranteed level of $7,084.

Table 6-3 Savings Comparison of Family Court Building

	Electric (kWh)	Natural Gas (therms)
Guaranteed Year One savings	171,975	-3,980
ESCO Verified Year One savings	237,733	-2,614

Two ECMs were installed at the Family Court:

- Retrofit existing lighting fixtures to be high efficient fixtures. Replace lamps with high efficiency lamps. Install occupancy sensors for lighting control. Provide "emergency lighting control" unit to eliminate wasted energy during unoccupied periods
- Remove existing electric boiler and install high efficient natural gas-fire boilers.

This building did not have gas prior to the project and used an electric boiler, and so the expected outcome was more gas usage (compared to zero gas usage prior) but significant savings on electricity. Electric savings have in fact been more than modeled and guaranteed. Additionally, the new boiler uses less gas than expected, so both utilities are outperforming. Trane believes this is due to conservative modeling during the IGA, as well as commissioning efforts during the project to improve the operation of the outdoor air unit on the roof of the building and in the process capture energy savings that weren't originally modeled during the IGA[14].

6.3 Legislative Mall: Remote Inspection

For the projects using Option A, the savings is determined from short-term measurements, engineering calculations, and estimated factors. Post-retrofit measurements are made only once. Thus, it is extremely important to make sure that all equipment is performing and operating as expected during the guarantee term. The timely communication between ESCO and agency is one of the key factors contributing to the performance of the energy efficiency project. The Legislative Mall example here shows the additional M&V effort made by the ESCO to assist the agency to follow the contract operating factors.

Honeywell conducts a DDC remote inspection twice a year, in addition to the mid-year site visit and year-end site visit. The inspections will take place at the end of the first and the third quarters of each guarantee year. The purpose of this inspection is to examine whether operating parameters in each building meet the contract specified parameters. These operating parameters, including HVAC operating schedule and temperature setbacks, are key to the savings and need to be maintained at the specified condition. If Honeywell finds any abnormal parameter, they will notify the facility manager to fix it.

The third quarter DDC remote inspection report for 2014 was received from Honeywell. The report shows that several buildings or units were left running when the buildings were not occupied or were set at a higher temperature. For example, the HVAC operating schedule was found to be 4AM-6 PM 7 days in Kent Family Courthouse, as opposed to the contract specified schedule of 6AM-6PM Monday-Friday. With such inspection, the ESCO can work with the agency quickly to fix the issue and keep the system operating properly.

[14] Sussex County Courthouse Campus Third Quarter M&V Update, July 2014.

7 Recommendations for Future SEU Bond Projects

- ***Require uniform job & subcontractor reports***

Job creation is one of major economic outcomes of energy efficiency project. It is also another justification for investing in energy efficiency. Carrying out an accurate and comprehensive job creation assessment can demonstrate how the projects can yield a positive benefit for the employment and local economy. However, the contract of 2011 Bond does not require the ESCOs to submit a standard job report to the SEU. It causes some difficulties in collecting the information on the actual job count & subcontractor. Moreover, there is no uniform job definition for these projects, compromising the accuracy of comparing or summarizing the job count.

Therefore, it is recommended that the future bond contract should require the submission of a uniform job creation and subcontractor report that uses the same job definition. Also, it should be noted that energy efficiency projects could create both direct and indirect jobs. Direct jobs are created as workers are deployed to develop and install the efficiency measures. Indirect jobs are subsequently created in the supply chain in facilities and with manufacturers such as plumbing suppliers[15]. A standard multiplier could be used to estimate the indirect jobs.

- ***Provide the SEU with utility bills***

This report relies on the accuracy of data that was manually inputted to Portfolio Manager. There could be input errors in this process, as well as billing cycle errors and meter allocation issues. It would be a more efficient data analysis if the SEU were given the actual utility bills to analyze the program performance. For this reason, it is recommended that for future bond financings, participating agencies be required to provide the SEU directly with copies of their buildings' utility bills during the GESA base year and the performance year.

- ***Adopt standard weather normalization methodology***

The reports by the ESCOs are unclear for the question of weather normalization. Data analysis would be more accurate if a common normalization method is used. Therefore, it is recommended that the future bond financings adopt a standard weather normalization method. It is further recommended that the adopted weather normalization method include three years of weather data in order to capture the sensitivity of program performance on weather variability.

- ***Apply uniform fuel and water price escalators***

During the process of analyzing ESCOs' data for this report, it was learned that the escalator rates are either varied or were not used in determining capital savings. Therefore, it is recommended that future bond financings require the use of a standard starting date and a common fuel and water price escalators, and require ESCOs to use escalator rates in calculating Verified Savings.

[15] Bell, C. 2012. "Energy Efficiency Job Creation: Real World Experiences". ACEEE

- ***Define guaranteed energy savings in both dollars and physical units***

Among the eight projects, seven of them use total energy cost savings ($) as the Energy Savings Guarantee. The only exception is the Sussex County project, for which Trane only guarantees the total energy savings in terms of kWh and therms. The calculated monetary value of the annual energy savings was listed in GESA, but Trane does not guarantee it. The monetary value of guaranteed savings and the actual energy savings were calculated using the combination of Baseline Utility Rates and the Current Applicable Utility Rates.

To keep consistency among all the projects, and more importantly, to maintain a stable monetary savings, it is suggested that all future bond projects consider defining the guaranteed savings in dollars in their contracts.

- ***Consider using Option B or C if financially and technically appropriate***

Another issue the 2011 Bond projects encountered is that some participating agencies have raised their concerns on the validity of the project performance and energy savings. Admittedly, the verified savings using Option A might not be reflected in the utility bill. For example, if the portion of electricity savings is small, the slight change of variables, such as operating schedule or weather, could overshadow the savings. The utility bill might not necessarily show the reductions. On the other hand, Option B or C by its nature should be able to assure the agencies that the verified savings they receive are 'real'. But Option B or C might have a higher associated M&V cost, compared to option A when applying to certain ECMs. Among the 2011 Bond projects, the Sussex County is using Option C for all the ECMs, which requires an M&V cost of $41,700 for Year One. On the contrary, the M&V cost for DSCYF project, a similar size project using Option A, is $17,324 for Year One.

Overall, M&V options should be selected based on the size of expected savings, the ECM types, and the project budget. If it is economically and technically appropriate, Option B or C can be considered as preferable to Option A for future bond projects to avoid any concerns. But Option A, as defined by IPMVP, should also be regarded as valid measurement.

- ***Adopt a consistent policy regarding O&M savings***

Four of the eight projects have included Operating & Maintenance Savings in their guaranteed savings. They are the DSU, DTCC-Terry, DTCC-WS, and Carvel & RR projects. The O&M savings in the four projects are calculated based on the reduction in material only. Most of them come from the lighting. With the installation of the new lamps and ballasts, the lighting system has longer burn hours and will result in fewer lamp replacements. While the remaining projects also have similar ECMs, they did not take into account the associated O&M savings in their guaranteed savings.

In well-regarded programs throughout the U.S., O&M savings are normally not included. Instead, they are considered as co-benefit of improved energy efficiency. This approach ensures that guaranteed savings in GESA-type programs will likely understate actual savings.

The SEU, participating agencies and ESCOs can decide together whether or not to include the O&M into future SEU Bond projects. But for the purpose of accurate aggregation of the savings, it is recommended to adopt a consistent policy regarding O&M savings among all projects. Also, it is worth mentioning here that the labor savings should not be included into the guaranteed savings.

- ***Do not include LEED certification as one ECM***

The project of Carvel and Richardson and Robbins buildings included LEED certification cost as one of the contract ECMs. LEED Certification is not in and of itself an energy savings measure; the added cost of certification becomes a cost burden that the other savings must cover. In this case it added $35,000 that needed to be cover through other measures. In addition commission and final certification can add many months to a project. In the case of Carvel & RR the energy efficiency upgrades were completed months ago, this entire project is still viewed as unfinished because of the LEED certification. As of right now, the ESCO is preparing the documents for the Green Building Certification Institute to review. The application process will take a few more months. It delays the first performance period and hence might affect the savings verification. Therefore, it is suggested that future bond projects do not include energy efficiency certification services into their contracts. If the certification service is needed, the ESCO can make a separated contract with the agency.

8 Future Work

There are three data-related needs, which could not be achieved as of the date of this report. The CEEP research team promised a final report once these data-related needs are satisfied. We briefly describe them below:

- ESCO verified savings for three projects are based on the post-installation projected Year One savings (Legislative Mall, Carvel &RR and DTCC-WS projects). The ESCO verified savings of these projects will be updated when the ESCOs issue their annual savings reports.
- The CEEP research team is in the process of collecting the utility data for DSU, DTCC-Terry and DTCC-WS projects. Once the data are received, these three projects will be included in the utility savings analysis.
- In addition to the Portfolio Manager entry data, the CEEP research team is also collecting original utility bill for all five OMB managed state projects. The final report will use the two sets of performance year data to estimate savings for all five state projects.

Appendix I Letter from Thomas J. Cook

STATE OF DELAWARE
DEPARTMENT OF FINANCE
OFFICE OF THE SECRETARY

THOMAS J. COOK, SECRETARY OF FINANCE
STATE OF DELAWARE, DEPARTMENT OF FINANCE
CARVEL STATE OFFICE BUILDING
820 N. FRENCH STREET, 8TH FLOOR
WILMINGTON, DELAWARE 19801
TOM.COOK@STATE.DE.US

Dear Friend:

In Executive Order No. 41, Governor Markell recognized that it is important for the State of Delaware to continue to reduce greenhouse gas emissions cost-effectively, while preparing for current and emerging climate risk. As one of the original participants of the SEU's bond financed energy performance contract program, we are anxious to determine the level of savings that have been achieved thus far.

Please share your actual savings tracking data with Tony DePrima of the SEU so that this valuable information can be collected and we can measure our progress. The evaluation of this data is important to any future decision we make with respect to financing energy performance contracts.

Thank you for your cooperation toward this important goal.

Sincerely,

Thomas J. Cook
Secretary of Finance

Appendix II Letter from the DESEU to the Office of Management and Budget

Delaware Sustainable Energy Utility

December 18, 2014

Ms. Ann S. Visalli
Delaware Office of Management and Budget
Haslet Armory
122 Martin Luther King Jr. Blvd. South
Dover, DE 19901

Dear Ms. Visalli:

As you may be aware the DE Sustainable Energy Utility (SEU) is conducting an analysis and study of actual energy savings from projects funded through the 2011 SEU Energy Efficiency Bond Series. We kicked this off in late September. All Agencies and Energy Service Companies (ESCO) who were a party to financing were notified and received from Secretary Tom Cook a letter of support (attached). We have decided to expand our analysis to include utility (electric, natural gas, water, waste water) billing data.

Pursuant to Article 3.3 of the "Construction Funding Agreement" among the DE Sustainable Energy Utility (SEU), the Agencies (including Delaware Office of Management and Budget (OMB)) and the contracted ESCOs:

> *The Agency shall provide to the SEU any information relating to the Project as the SEU may reasonably request.*

I am sending this request directly to you because OMB has been acting as the coordinating agency for other state agencies with the exception of Delaware State University and Delaware Technical and Community College. Given the expressed language of this contract I am requesting all previous utility statements as far back as the identified base year for each contract and future utility statements to the DE SEU.

In addition, I am requesting that data be provided to the relevant ESCO if it has not already been sent. Pursuant to Article 4.4 of the "Guaranteed Energy Savings Agreement" between the OMB and the ESCO:

> *Utility Bills. Agency will deliver to ESCO copies of all invoices received by Agency for energy consumption at the Premises promptly after receiving them.*

It is my understanding that this provision has not been followed in all cases.

I look forward to hearing from whoever you assign to coordinate this request for information, together we will make this as easy and efficient as possible.

Sincerely,

Anthony J. DePrima
DE SEU Executive Director

cc:
Tom Cook
Robert Scoglietti
Dennis Groom
Eboni Wimbush, Johnson Controls
Larry Doyle, Honeywell
Paul Carter, NORESCO
Shelley Cohen, AMERESCO
Wayne Leahy, Pepco Energy
Bob Furman

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Appendix III ESCO Document List

ESCO	Document	Date
Ameresco	Post-Installation M&V Report	Dec-14
Honeywell	Delaware Legislative Mall Post-Installation Conditions Report	15-Sep-14
	Delaware Legislative Mall Cost Avoidance by ECM	12-Nov-14
	Delaware Legislative Mall Pre Construction Photos	8-Jan-15
	Delaware Legislative Mall MV Site Visit Photos	16-Dec-14
	Honeywell - GESA - SEU Project Status - Final	14-Jan-15
	Delaware Legislative Mall DDC Remote Inspection 3rd Quarter 2014	2-Dec-14
	Legislative Mall Completion Certificate	19-Nov-14
Johnson Controls	DSU Certificate of Completion	31-Oct-13
	DSU PC Success Review	11-Jun-14
	DSU Savings	15-Dec-14
	DSU SEU jobs data total	11-Oct-14
	Delaware State University Energy Performance Project Year 1 Performance Contracting Value Report-Summary	15-Jan-15
NORESCO	Department of Corrections Project Photos	11-Dec-14
	State of Delaware Department of Services for Children, Youth and their Families Guaranteed Savings Reconciliation Report, Annual Verification Report - Year 1	28-Feb-14
	State of Delaware Department of Services for Children, Youth and their Families Post Installation Report	9-Oct-12
	Delaware Department of Corrections Savings Update	12-Nov-14
PEPCO	DTCC - Terry, Lights Performance Year 1	29-Jan-15
	DTCC - Terry Campus, Annual Energy Report	20-Feb-15
	DTCC Terry Completion Certificate	30-Jun-13
	DTCC - Terry Campus, Post-Installation Report	6-Mar-14
	DTCC - Wilmington and Stanton Campuses, Post-Installation Report	9-Jul-14
	DTCC Wilmington and Stanton Completion Certificate	18-Nov-13
	PEPCO Energy DTCC Job Data Summary	21-Jan-15
Trane	Sussex County Georgetown Project Final Completion Certificate	27-Sep-13
	Fact Sheet Construction Sussex County	21-Jan-15
	Sussex County Courthouse Campus Third Quarter Report Draft	15-Jul-14
	Sussex County Courthouse Facilities, Year 1 M&V Reconciliation Report	31-Dec-14

Appendix IV Building List for Savings Analysis

Project	Building	Zip Code	Location
DOC	James T. Vaughn Correctional Center	19977	Smyrna
	Sussex Correctional Institution	19947	Georgetown
	Howard R Young Correctional Institution	19801	Wilmington
Legislative Mall	Jesse Cooper	19901	Dover
	Townsend Building	19901	Dover
	Credit Union	19901	Dover
	WAR Building	19901	Dover
	Tatnall Building	19901	Dover
	Sykes Building	19901	Dover
	Biggs Museum	19901	Dover
	Public Archives	19901	Dover
	Supreme Court & O'Neil	19901	Dover
	Haslet Armory	19901	Dover
	Kirk Building	19901	Dover
	Kent County Courthouse	19901	Dover
	Ag Building	19901	Dover
	Ag Lab	19901	Dover
	Fire Marshal's Office	19904	Dover
	Fire School	19904	Dover
	James Williams Service Center	19901	Dover
	Thomas Collins	19901	Dover
	William Penn	19904	Dover
	Short Building	19901	Dover
Carvel & RR	Carvel Building	19801	Wilmington
	Richardson & Robbins Building	19901	Dover
Sussex County	Sussex County Courthouse & Annex	19947	Georgetown
	Sussex County Court of Chancery	19947	Georgetown
	Sussex County Family Court	19947	Georgetown
DSCYF	Ferris School	19805	Wilmington
	Administration	19805	Wilmington
	New Castle County Detention Center (NCCDC)	19805	Wilmington
	Terry Center	19720	New Castle
	Stevenson House	19963	Milford

Appendix V Weather Data

Project	Buildings	GESA Base Year			3 Year Average			Performance Year		
		HDD	CDD	Period	HDD	CDD	Period	HDD	CDD	Period
DOC	JTVCC	4200	1412	07/01/2008-06/30/2010	4044	1444	07/01/2007-06/30/2010	4480	1260	11/01/2013-10/31/2014
	SCI	4715	1055	07/01/2008-06/30/2010	4561	1187	07/01/2007-06/30/2010	4443	1148	11/01/2013-10/31/2014
	HRYCI	4672	1192	07/01/2008-06/30/2010	4578	1247	07/01/2007-06/30/2010	5086	1073	11/01/2013-10/31/2014
Legislative Mall	All Buildings	4133	1283	06/01/2009-05/31/2010	4046	1401	06/01/2007-05/31/2010	4460	1259	01/01/2014-12/31/2014
Carvel & RR	Carvel Bldg.	4391	1358	07/01/2007-06/30/2008	4578	1247	07/01/2007-06/30/2010	5017	1073	01/01/2014-12/31/2014
	R&R Bldg.	3791	1508	07/01/2007-06/30/2008	4044	1444	07/01/2007-06/30/2010	4460	1259	01/01/2014-12/31/2014
Sussex County	All Buildings	4126	1671	08/01/2009-07/31/2010	4044	1490	08/01/2007-07/31/2010	4531	1192	10/01/2013-09/30/2014
DSCYF	Ferris School/NCC DC & Admin	4578	1203	05/01/2007-04/30/2010	4578	1203	05/01/2007-04/30/2010	4684	1221	11/01/2012-10/31/2013
	Stevenson House	4580	1022	05/01/2009-04/30/2010	4570	1147	05/01/2007-04/30/2010	4283	1347	11/01/2012-10/31/2013