FEBRUARY 8, 2019

INVESTMENT GRADE AUDIT SUMMARY REPORT

SCHOOL DISTRICT OF BOROUGH OF MORRISVILLE

in support of Act 77/39 Guaranteed Energy Savings Agreement (GESA)

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Investment Grade Audit Summary

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Investment Grade Audit Summary

Overview

Reynolds Energy Services (RES) has completed an Investment Grade Audit (IGA) for the School District of Borough of Morrisville (SDBM) at its Intermediate/High School and Grandview Elementary School. During this process, RES has analyzed the overall potential for energy and cost savings; developed detailed scopes of work; estimated pricing and savings estimates; and has compiled the financial analysis. This document summarizes the utility analysis, scope of work and project financial analysis for the project.

The goal of this project is to improve energy and water utilization, reduce maintenance costs, improve infrastructure and the overall learning environment, and utilize and associated cost savings to help defer the cost of the planned improvements.

A majority of the work will occur at the Intermediate/High School, with limited work at Grandview Elementary. The project at the IS/HS will consist of installing new lighting systems and controls in corridors and other select areas; installing a new air-cooled variable speed chiller, chilled water pumps and piping; replacing select HVAC equipment; updating the building controls for new work; replacing toilets, flush valves, drinking fountains, sinks and faucets; replacing the existing electrical service entrance feeders, transformer and switchgear; replacing antiquated power panels and refeeding existing-to-remain panels throughout the building. The project at the IS/HS will consist of replacing drinking fountains only.

All of the new equipment installed will provide more efficient and reliable operation, reduce maintenance, and extend the life of existing systems.

This project will be implemented under a guaranteed energy savings agreement (GESA) with a guaranteed fixed price for construction and implementation. The following pages include a summary of the key information about this project, including the utility basis for savings, a summary of the scope of work, the expected annual energy and cost savings produced from project implementation, and the financial justification for the project.

Utility Analysis

The following tables and figures illustrate the total baseline energy use and cost of the Intermediate/High School and Grandview Elementary School. This baseline represents the projected energy use and costs without implementing any energy saving measures. This becomes the baseline or starting point for savings estimates and financial analysis.

The starting point for the energy audit was to assess the current annual energy usage of each building. To begin this process we examined and analyzed 17 months (January 2017 through May 2018) of utility bills for both buildings. The table belows contain the annual utility summary for the two sites.

TABLE: Annual Utility Summary by Building

	Electric			Fuels		TOTAL	
Building Name	kWh	kW	$	ccf	$	$	$/sf-yr
Intermediate/High Schoo	1,028,800	328	$ 88,811	48,430	$ 28,801	**$ 117,611**	$ 0.78
Grandview Elementary	176,960	88	$ 19,228	11,221	$ 8,025	**$ 27,253**	$ 0.97
TOTAL	**1,205,760**		**$ 108,039**	**59,651**	**$ 36,826**	**$ 144,864**	**$ 0.81**

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Costs used in the analysis are indicative of utility information provided by SDBM. PECO provides distribution services for both the natural gas and electricity. The electric commodity charges are provided through Constellation Energy. The natural gas commodity charges are provided by PECO. Using the given bills, electric consumption rates were derived to be $0.059/kWh for the Intermediate/High School building, and $0.68/kWh for Grandview Elementary School. Demand charges were $7.01/kW for the Intermediate/High School building and $8.00/kW for Grandview. Based on the gas billing, a combined distribution and commodity rate of $6.80/MCF was used for all accounts.

Energy Benchmarking Analysis

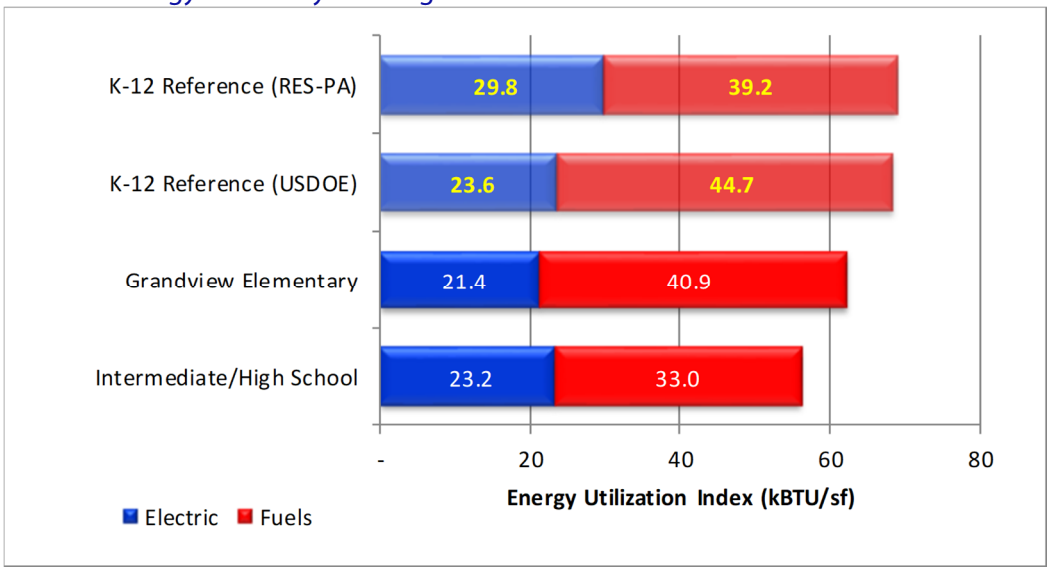
The next step is to analyze how and where the energy is being used in the building by evaluating its energy use intensity (EUI). The EUI of the building is compared to average or expected use of peer buildings in similar climate conditions as well as to other Pennsylvania school buildings in our database. The following table summarizes the energy and cost indices for SDBM.

TABLE: Resource and Cost Indices By Building

	RESOURCES			COSTS
	Electric	Fuels	Total Energy	Energy
Building Name	kBTU/sf-yr	3TU/sf-y	kBTU/sf-yr	$/sf-yr
Intermediate/High School	23.2	33.0	56.2	$ 0.78
Grandview Elementary	21.4	40.9	62.3	$ 0.97
K-12 Reference (USDOE)	***23.6***	***44.7***	***68.3***	***na***
K-12 Reference (RES-PA)	***29.8***	***39.2***	***69.0***	***na***
ALL BUILDINGS	**22.9**	**34.2**	**57.2**	**$ 0.81**

As the figure below indicates, minimal savings potential exists in both electrical usage and fuel usage.

FIGURE: Energy Indices by Building



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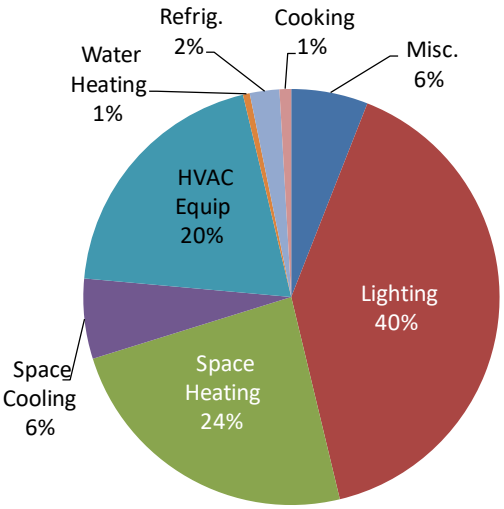
End-Use Analysis

Once the overall usage of the facility has been analyzed we can begin to look at how and where the energy is being used in the building, this is referred to as "End Use Analysis".

The following table and chart illustrate the energy cost breakdown by end use at each building. This analysis is presented by the percentage of energy dollars spent. In viewing the costs in this manner, we can better understand where the energy dollars are being spent and where savings efforts should be focused.

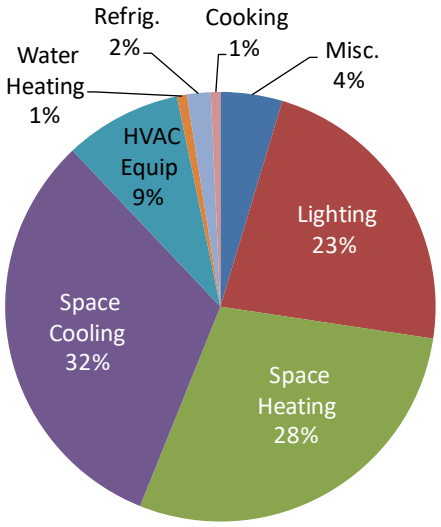
END USE UTILITY COST – INTERMEDIATE/HIGH SCHOOL

Component	Modeled Annual %	Estimated Annual Cost
Misc.	6.0%	$ 7,004
Lighting	40.3%	$ 47,412
Space Heating	23.9%	$ 28,161
Space Cooling	6.2%	$ 7,302
HVAC Equip	19.8%	$ 23,322
Water Heating	0.5%	$ 639
Refrig.	2.3%	$ 2,694
Cooking	0.9%	$ 1,078
TOTAL		**$ 117,611**



END USE UTILITY COST – GRANDVIEW ELEMENTARY SCHOOL

Component	Modeled Annual %	Estimated Annual Cost
Misc.	4.6%	$ 1,267
Lighting	22.7%	$ 6,196
Space Heating	28.7%	$ 7,825
Space Cooling	31.9%	$ 8,681
HVAC Equip	8.8%	$ 2,402
Water Heating	0.7%	$ 200
Refrig.	1.8%	$ 487
Cooking	0.7%	$ 195
TOTAL		**$ 27,253**



The pie chart helps further validate that most of costs and savings potential lies within the HVAC and lighting components of the facility's utility expenditures. The proposed HVAC replacements, along with new lighting and building temperature control, will impact these areas in energy usage and cost savings.

Scope of Work Summary

The main goal of this IGA is to identify and develop a scope of work that meets the needs of the District, be cost effective, and fit within the project's overall financial constraints. At the same time, it should also maximize savings to be leveraged toward buying down the overall renovation project.

The following section summarizes the scope of work broken down by energy efficiency measure (EEM). All measures are to occur at the Intermediate/High School unless specifically noted for Grandview Elementary.

EEM #1 – Lighting System Improvements

Interior lighting work includes replacing lighting in all corridors and select additional spaces where ceilings are being removed to accommodate the installation new chilled water distribution piping. Occupancy sensors will be provided for corridor lighting control in all classroom areas.

EEM #2 – HVAC and Plumbing System Improvements

Chilled Water System Installation

The District has pre-purchased a 275-ton, air-cooled, variable speed chiller. That chiller will be installed as part of this project. New insulated chilled water distribution piping will be added to the building to feed existing classroom unit ventilator chilled water coils. The new chilled water plant will include new duple variable speed chilled water pumps with variable frequency drives.

Select HVAC Equipment Replacement

HVAC equipment replacement will include four (4) fan coil units, five (5) cabinet unit heaters, six (6) unit heaters, two (2) ductless split air-conditioning units and one (1) exhaust fan.

Automatic Temperature Controls

Provide new controls for chilled water coils in existing unit ventilators, and for all replaced equipment and new chiller. The main control panels will be upgraded to the most current controller series. Update graphics to include cooling in each unit ventilator and the chilled water plant.

Plumbing System Improvements

Sinks and faucets, water closets and flush valves and urinal flush valves will be replaced throughout except in the condemned E gang toilets.

Drinking fountains will be replaced throughout both the Intermediate/High School and Grandview Elementary.

EEM #3 – Electrical System Improvements

Normal Power Systems

Much of the power distribution infrastructure at the IS/HS is antiquated and in need of replacement. Power distribution work includes

- replacing the existing building service entrance feeders, transformer and switchgear
- replacing select antiquated power panels throughout the building that were not replaced in the 2009 renovation.
- refeeding existing to remain power panels with new feeders
- providing power connections to the new HVAC equipment.

Emergency Power Systems

Install a new emergency generator and provide emergency power to new and existing controls equipment.

Tie all low voltage (fire alarm, HVAC controls, security, clock and PA) systems as well as kitchen walk-in freezer and cooler to emergency power.

Other Services Included in this Energy Project

- Energy analysis, engineering and architectural design
- Commissioning of all HVAC and control systems
- Project management and site supervision throughout construction
- Permitting, bonding and warranty
- Savings guarantee
- Performance assurance services, including monitoring of energy performance, measurement and verification of savings, and periodic reporting
- Training of district staff on operation and maintenance of new equipment and controls
- Fixed price contract
- No change orders unless initiated by customer, or necessitated by design modifications.

Savings Summary

Implementation of this project is estimated to result in annual electricity, fossil fuel and maintenance savings totaling $15,439. A breakdown of the savings by measure is provided in the following table:

TABLE: Annual Energy and Cost Savings by Measure

EEM	ELECTRIC			FUELS		O&M	TOTAL
	kWh	kW	$	ccf	$	$	$
1 Lighting System Improvements	16,639	-	$ 998	-	$ -	$ 1,400	**$ 2,398**
2 HVAC System Improvements	139,334	225	$ 9,589	484	$ 285	$ 550	**$ 10,423**
3 Electrical System Improvements	10,288	-	$ 617	-	$ -	$ 2,000	**$ 2,617**
TOTAL	**166,260**	**225**	**$ 11,204**	**484**	**$ 285**	**$ 3,950**	**$ 15,439**

Note: a negative savings value represents an increase in a resource, such as propane gas, that is being offset by reducing or eliminating another resource such as diesel fuel. (1) Units for EEM 6 in this column are gallons of propane used.

The total amount of guaranteed savings can be found in Schedule C of the GESA.

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Financial Summary

The following table shows the financial overview for the project in terms of estimated construction cost, resource, and operational savings. Resource savings are the sum total of all savings associated with utilities (e.g., electric, fuel). Operational savings primarily include the maintenance costs avoided due to equipment being replaced or altogether removed.

Morrisville School District

Energy Project Financial Overview

EEM #	EEM Name	EEM Construction Cost	Annual Resource Savings	Annual Operational Savings (1)	Potential Act 129 Incentive
Intermediate/High School					
1	Lighting System Improvements	$ 275,900	$ 998	$ 1,400	$ 288
2	HVAC/Plumbing Improvements	$ 3,872,567	$ 9,873	$ 550	$ 625
3	Electrical System Improvements	$ 2,074,533	$ 617	$ 2,000	$ -
	PROJECT TOTALS	**$ 6,223,000**	**$ 11,489**	**$ 3,950**	**$ 913**

NOTES: (1) Operational savings primarily include avoided costs of maintaining removed equipment and reduced costs for replacing lighting lamps and ballasts.

Projected Cash Flow

A cash flow analysis is provided on the following page based on the current project costs and savings estimates. The cash flow assumes a 20-year term.

SCHEDULE B
Cash Flow Analysis

MORRISVILLE SCHOOL DISTRICT
Guaranteed Energy Savings Contract

Financed Project Cost (1):	**$ 6,223,000**
Finance Term (years):	20
Annualized Interest Rate:	3.750%
Accrued Construction Interest:	$ 0

Escalation Rates by Utility & Fuel	
Electric:	3.0%
Natural Gas:	3.0%
Fuel Oil:	3.0%
Water:	3.0%
Other:	3.0%
Operational:	3.0%
Escalation Rates for Annual Fees:	2.5%

Year	Electric Cost Savings	Natural Gas Cost Savings	Water Cost Savings	Operational Cost Savings	Total Cost Savings	Guaranteed Savings	Avoided Capital Savings	Annual M&V Fees	Financing Payment	Net Savings
1	$ 11,204	$ 285	$ -	$ 3,950	$ 15,439	$ 14,290	$ 428,455		$ (442,745)	$ -
2	$ 11,540	$ 293	$ -	$ 4,069	$ 15,902	$ 14,719	$ 429,571	$ (1,544)	$ (442,745)	$ -
3	$ 11,886	$ 302	$ -	$ 4,191	$ 16,379	$ 15,160	$ 429,168	$ (1,582)	$ (442,745)	$ -
4	$ 12,243	$ 311	$ -	$ 4,316	$ 16,870	$ 15,615	$ 428,752	$ (1,622)	$ (442,745)	$ -
5	$ 12,610	$ 320	$ -	$ 4,446	$ 17,376	$ 16,083	$ 428,325	$ (1,663)	$ (442,745)	$ -
6	$ 12,989	$ 330	$ -	$ 4,579	$ 17,898	$ 16,566	$ 427,884	$ (1,704)	$ (442,745)	$ -
7	$ 13,378	$ 340	$ -	$ 4,717	$ 18,435	$ 17,063	$ 427,429	$ (1,747)	$ (442,745)	$ -
8	$ 13,780	$ 350	$ -	$ 4,858	$ 18,988	$ 17,575	$ 426,961	$ (1,790)	$ (442,745)	$ -
9	$ 14,193	$ 360	$ -	$ 5,004	$ 19,557	$ 18,102	$ 426,479	$ (1,835)	$ (442,745)	$ -
10	$ 14,619	$ 371	$ -	$ 5,154	$ 20,144	$ 18,645	$ 425,981	$ (1,881)	$ (442,745)	$ -
11	$ 15,057	$ 382	$ -	$ 2,654	$ 18,094	$ 16,550	$ 428,123	$ (1,928)	$ (442,745)	$ -
12	$ 15,509	$ 394	$ -	$ 2,734	$ 18,637	$ 17,047	$ 427,675	$ (1,976)	$ (442,745)	$ -
13	$ 15,974	$ 406	$ -	$ 2,816	$ 19,196	$ 17,558	$ 427,213	$ (2,026)	$ (442,745)	$ -
14	$ 16,454	$ 418	$ -	$ 2,900	$ 19,772	$ 18,085	$ 426,737	$ (2,076)	$ (442,745)	$ -
15	$ 16,947	$ 430	$ -	$ 2,987	$ 20,365	$ 18,627	$ 426,246	$ (2,128)	$ (442,745)	$ -
16	$ 17,456	$ 443	$ -	$ 1,538	$ 19,438	$ 17,648	$ 427,279	$ (2,181)	$ (442,745)	$ -
17	$ 17,979	$ 457	$ -	$ 1,585	$ 20,021	$ 18,177	$ 426,804	$ (2,236)	$ (442,745)	$ -
18	$ 18,519	$ 470	$ -	$ 1,632	$ 20,621	$ 18,722	$ 426,315	$ (2,292)	$ (442,745)	$ -
19	$ 19,074	$ 484	$ -	$ 1,681	$ 21,240	$ 19,284	$ 425,810	$ (2,349)	$ (442,745)	$ -
20	$ 19,646	$ 499	$ -	$ 1,732	$ 21,877	$ 19,863	$ 425,291	$ (2,408)	$ (442,745)	$ -
TOTAL	**$ 301,059**	**$ 7,647**	**$ -**	**$ 67,542**	**$ 376,248**	**$ 345,377**	**$ 8,546,498**	**$ (36,970)**	**$ (8,854,906)**	**$ -**

NOTES:
1. Financed Project Cost reflects the guaranteed fixed price of the scope executed under the Guaranteed Energy Savings Agreement, including the first year of measurement and verification of savings.
2. Avoided Capital Savings includes the ammortized annual cost of capital equipment replacement or repairs that would be realized by the Owner within the lifetime of the Energy Project, but will instead be completed and financed through the Energy Project. Savings include the total costs for all design, bidding, bonding, permitting, equipment and installation labor required to complete the work.
3. Estimated payment from PECO Act 129 rebate programs based on information published by PECO and applied to this project. Rebates are not included in the cash flow.

Potential Subcontractor List

TRADE	COMPANY
HVAC & Plumbing	Myco Mechanical
Electrical	Philips Brothers Electrical Contractors, Inc.
Drywall and Ceiling	Klover, Inc.
Painting	C Anthony Painting, Inc., Castle Painting
Sitework	Torrado Construction, Construction Masters Services, LLC
Millwork	Reed Associates
Demolition	Power Component Systems
Final Cleaning	Interstate Cleaning

SCOPE OF WORK

1.0 MECHANICAL SYSTEMS (IS/HS only)

1.1. Demolition

A. Select existing HVAC equipment, piping and associated controls will be removed and replaced with new systems as described herein.
B. The existing boilers in both buildings were installed in 2009 and will remain.
C. Steam system infrastructure in the 1963 section including all steam and condensate piping located in the crawlspace and boiler room will be removed.
D. The water-cooled chiller plant and all associated equipment (pumps, cooling tower, etc.) in the 1972 section will be removed.

1.2. General Ventilation Systems

A. Ventilation is provided in each classroom through the existing to remain unit ventilators.
B. Large spaces such as the cafeteria and gymnasium will continue to be ventilated via existing to remain rooftop and/or split AHUs.
C. Exhaust ventilation for toilet rooms, mechanical rooms, electrical rooms, janitor's closets, etc. will continue to be provided by existing exhaust fans.

1.3. Central Heating System

A. No work is planned for the central heating system. Buderus boilers and new pumps, appurtenances and controls were installed in 2009. This equipment is in excellent condition.

1.4. Central Cooling System

A. The Owner pre-purchased a Carrier Model 30XV, 275-on outdoor air-cooled chiller. Chiller installation will be completed under this contract. New distribution piping will be installed between this new chiller and all existing classroom unit ventilators under this project. All new chiller water piping shall be insulated.
B. The chiller will be located at grade and mounted on a concrete pad directly outside the main mechanical room and kitchen. The chiller shall be fenced in. Fenced in area will be filled with stoneto eliminate the need for lawn care.

1.5. Individual Space HVAC Systems

A. **Classrooms** – Existing floor-mounted, 4-pipe unit ventilators located on the exterior will remain. These unit ventilators were installed in 2009 and were configured with hot water and chilled water coils. Only the hot water coils were piped in 2009. The chilled water coils came with 2-way control valves.
B. **Gymnasium** – Two (2) existing air handling units (one for each space when divided) with hot water heating and ventilation will remain.
C. **Auditorium** – The existing indoor air handling unit with hot water heating and DX cooling and air-cooled condenser will remain.
D. **Library/Cafeteria/Serving Area** – Existing constant volume air handling unit with hot water heating and DX cooling will remain.
E. **Main Office Suite (includes Reception, Principals Office and Nurses office, Guidance, etc.)** – Existing rooftop units serving these areas will remain. Existing fan coil units will replaced in select administration locations.
F. **IT Closets** – Provide ductless split air-conditioning units.

1.6. Building Energy Management System – Provide new controls for chilled water coils in unit ventilators, all replaced equipment and new chiller. Upgrade main control panels to current controller series. Update graphics to include cooling in each unit ventilator and to include the chiller.

1.7. Architectural work incidental to the mechanical construction scope includes

A. Corridor ceiling demolition as well as ceiling demolition in select additional spaces to accommodate installation of the new chilled water distribution piping.
B. Re-installation of ceilings in location described in the previous item. This ceiling re-installation includes several locations that require the installation of drywall bulkheads and soffits to conceal new chilled water piping.
C. Installation of vertical drywall chases to conceal chilled water piping.
D. Removal and replacement of existing horizontal metal piping enclosures with new taller metal enclosures capable of concealing both the existing heating hot water piping and the new chilled water piping.
E. Miscellaneous painting.
F. Site work associated with the chiller and emergency generator (grading, concrete work, fencing, landscaping).

1.8. Provide test, adjust and balancing (TAB) service for all air-side and water-side HVAC systems.

1.9. Provide initial chemical treatment charge to water systems. Chemical treatment shall adhere to HVAC equipment manufacturer specifications.

2.0 PLUMBING SYSTEMS

2.1. Fixture Replacements (IS/HS only)

A. Fixtures (toilets, sinks and urinal flush valves) shall be replaced in kind with low-flow fixtures in both gang and single toilet rooms.
B. Fixtures shall be installed to meet ADA standards with to respect to mounting heights only.
C. Water closets shall be floor-mounted vitreous china (to match existing) with battery operated flush valves. Flush valves shall be low flow type, 1.28 GPF.
D. Urinals shall remain but have each urinal flush valve replaced with a battery-operated flush valve. Flush valves shall be low flow type, 0.5 GPF.

2.2. Drinking fountains (IS/HS and Grandview Elementary building) – All existing drinking fountains shall be replaced.

2.3. Hot Water Generation – Existing domestic water heaters will remain. These units are relatively new.

2.4 Domestic Water Distribution – Existing domestic water (hot, cold and hot water return) distribution piping throughout the building shall remain.

2.5 Water Softener – Existing water softener shall remain.

2.6 Sanitary System - Existing sanitary system shall remain.

2.7 Natural Gas Piping – Existing natural gas service shall remain.

3.0 ELECTRICAL SYSTEMS (IS/HS Schools only)

3.1 Service entrance and switchgear

A. Current secondary service is 120/208V. Remove existing service entrance cabling and primary service transformer. Install new PECO 4160V HT service from the end of Oak Street on the west side of the school property. Install 1000 kVA, 4160V-480/277V PECO compliant transformer. Provide secondary 480/277V feeders from new transformer to a new 1600A main switchboard. From this new switchboard, back feed the existing 120/208V existing main secondary switchboard. All feeders between the existing main secondary switchboard and existing to remain main distribution panels will be replaced.

3.2 Subpanels – Replace and refeed all existing original subpanels. Panels recessed into existing construction will be retrofit into the existing space to avoid having to demolish walls to accommodate larger panels.

3.3 Emergency generator – Provide a new emergency generator and transfer switch. New generator shall be sized for life safety and other critical power loads (i.e., walk-in coolers, freezers, all low voltage systems). The unit will be located at grade and mounted on a concrete pad directly outside the main electrical room next to the new chiller. The generator shall be included in the fenced in area.

3.4 New equipment – Provide power to all new HVAC and lighting equipment.

3.5 Interior Lighting

A. Corridors – Corridors receiving new ceilings will also receive new recessed LED light fixtures. Provide occupancy sensor control of all corridor lighting.
B. Select spaces that will be receiving new ceilings – Provide new LED fixtures and manual switching.

Schedule B: Costs and Cash Flow

Morrisville School District

Energy Project Financial Overview

EEM #	EEM Name	EEM Construction Cost	Annual Resource Savings	Annual Operational Savings (1)	Potential Act 129 Incentive
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NOTES: (1) Operational savings primarily include avoided costs of maintaining removed equipment and reduced costs for replacing lighting lamps and ballasts.

SCHEDULE B
Cash Flow Analysis

MORRISVILLE SCHOOL DISTRICT
Guaranteed Energy Savings Contract

Financed Project Cost (1): **$ 6,223,000**
Finance Term (years): 20
Annualized Interest Rate: 3.750%
Accrued Construction Interest: $ 0

Escalation Rates by Utility & Fuel

Electric:	3.0%
Natural Gas:	3.0%
Fuel Oil:	3.0%
Water:	3.0%
Other:	3.0%
Operational:	3.0%
Escalation Rates for Annual Fees:	2.5%

Year	Electric Cost Savings	Natural Gas Cost Savings	Water Cost Savings	Operational Cost Savings	Total Cost Savings	Guaranteed Savings	Avoided Capital Savings	Annual M&V Fees	Financing Payment	Net Savings
1	$ 11,204	$ 285	$ -	$ 3,950	$ 15,439	$ 14,290	$ 428,455		$ (442,745)	$ -
2	$ 11,540	$ 293	$ -	$ 4,069	$ 15,902	$ 14,719	$ 429,571	$ (1,544)	$ (442,745)	$ -
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6	$ 12,989	$ 330	$ -	$ 4,579	$ 17,898	$ 16,566	$ 427,884	$ (1,704)	$ (442,745)	$ -
7	$ 13,378	$ 340	$ -	$ 4,717	$ 18,435	$ 17,063	$ 427,429	$ (1,747)	$ (442,745)	$ -
8	$ 13,780	$ 350	$ -	$ 4,858	$ 18,988	$ 17,575	$ 426,961	$ (1,790)	$ (442,745)	$ -
9	$ 14,193	$ 360	$ -	$ 5,004	$ 19,557	$ 18,102	$ 426,479	$ (1,835)	$ (442,745)	$ -
10	$ 14,619	$ 371	$ -	$ 5,154	$ 20,144	$ 18,645	$ 425,981	$ (1,881)	$ (442,745)	$ -
11	$ 15,057	$ 382	$ -	$ 2,654	$ 18,094	$ 16,550	$ 428,123	$ (1,928)	$ (442,745)	$ -
12	$ 15,509	$ 394	$ -	$ 2,734	$ 18,637	$ 17,047	$ 427,675	$ (1,976)	$ (442,745)	$ -
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16	$ 17,456	$ 443	$ -	$ 1,538	$ 19,438	$ 17,648	$ 427,279	$ (2,181)	$ (442,745)	$ -
17	$ 17,979	$ 457	$ -	$ 1,585	$ 20,021	$ 18,177	$ 426,804	$ (2,236)	$ (442,745)	$ -
18	$ 18,519	$ 470	$ -	$ 1,632	$ 20,621	$ 18,722	$ 426,315	$ (2,292)	$ (442,745)	$ -
19	$ 19,074	$ 484	$ -	$ 1,681	$ 21,240	$ 19,284	$ 425,810	$ (2,349)	$ (442,745)	$ -
20	$ 19,646	$ 499	$ -	$ 1,732	$ 21,877	$ 19,863	$ 425,291	$ (2,408)	$ (442,745)	$ -
TOTAL	**$ 301,059**	**$ 7,647**	**$ -**	**$ 67,542**	**$ 376,248**	**$ 345,377**	**$ 8,546,498**	**$ (36,970)**	**$ (8,854,906)**	**$ -**

NOTES:
1. Financed Project Cost reflects the guaranteed fixed price of the scope executed under the Guaranteed Energy Savings Agreement, including the first year of measurement and verification of savings.
2. Avoided Capital Savings includes the ammortized annual cost of capital equipment replacement or repairs that would be realized by the Owner within the lifetime of the Energy Project, but will instead be completed and financed through the Energy Project. Savings include the total costs for all design, bidding, bonding, permitting, equipment and installation labor required to complete the work.
3. Estimated payment from PECO Act 129 rebate programs based on information published by PECO and applied to this project. Rebates are not included in the cash flow.

Reynolds

Schedule C: Guaranteed Energy Savings

Reynolds Energy Services (RES) guarantees that the Customer will achieve savings in Year 1 as listed in the following table. Escalation rates will be applied to future year savings according to the Cash Flow Analysis included in Schedule B.

TABLE: Guaranteed Annual Energy Savings by Measure and Resource

		ELECTRIC				FUELS				TOTAL	
EEM				Calculated	Guaranteed		Calculated	Guaranteed		Calculated	Guaranteed
		kWh	kW	$	$	ccf	$	$		$	$
1	Lighting System Improvements	16,639	-	$ 998	$ 898	-	$ -	$ -		$ 998	$ 898
2	HVAC/Plumbing Improvements	139,334	225	$ 9,589	$ 8,630	484	$ 285	$ 256		$ 9,873	$ 8,886
3	Electrical System Improvements	10,288	-	$ 617	$ 556	-	$ -	$ -		$ 617	$ 556
	TOTAL	**166,260**	**225**	**$ 11,204**	**$ 10,084**	**484**	**$ 285**	**$ 256**		**$ 11,489**	**$ 10,340**

The guaranteed savings shall be calculated as shown in Schedule F for the term of the Agreement. RES will pay the Customer the difference between the annual amount guaranteed and the amount of actual energy savings achieved in accordance with the provisions provided within the GESA as mutually agreed upon by RES and Customer. Payments for any savings shortfall will be paid to the Customer by RES in accordance with Section 4.2 of the GESA. Stipulated savings are savings that have been calculated and agreed upon by RES and Customer. Operational, maintenance and avoided capital savings are stipulated, and as such will not be tracked or measured. Rebates from utilities or any other source are not guaranteed by RES.

Operational and Maintenance (O&M) Savings

Operational and maintenance (O&M) savings primarily include the maintenance costs avoided due to old or problematic equipment being replaced with new equipment or if equipment is altogether removed. Savings also include reduction in maintenance expense for materials during the new equipment warranty period.

TABLE: Projected Operational & Maintenance Cost Savings (Year 1)

EEM		NATURE OF COSTS AVOIDED OR SAVINGS GENERATED	ANNUAL SAVINGS
			$
1	Lighting System Improvements	Equipment not replaced/repaired during warranty period	$ 1,400
2	HVAC/Plumbing Improvements	Elimination of maintenance on air handling unit due to replacement	$ 550
3	Electrical System Improvements	Net maintenance impact of adding new equipment, replacing old equipment	$ 2,000
	TOTAL		**$ 3,950**

Avoided Capital Cost Savings

Avoided capital cost savings are defined as cost realized in the present to replace building equipment or components at or near the end of their useful lives that would otherwise need to be paid for as a future capital expense in absence of the project.

Avoided capital cost savings include the amortized annual cost of capital equipment replacement or repairs that would be realized by the Owner within the lifetime of the Energy Project but will instead be completed and financed through this project. Savings include the total costs for all design, bidding, bonding, permitting, equipment and installation labor required to complete the work.

Utility Rates

Guaranteed dollar amounts are calculated for each performance year using the baseline year utility rates listed below and the escalation factors listed in Schedule B. Reynolds reserves the right to utilize the higher between the performance year utility rates or the baseline year rates escalated for the performance period.

Rate tariffs/avoided utility costs utilized in calculation of guaranteed energy savings
After the project, the Intermediate/High School will fall under PECO High Tension Power rate (HT). The following table shows PECO published tariffs for the rate. Natural gas rates were derived from utility bills from January 2017 through May 2018.

Intermediate/High School

Provider	Utility	Description	Unit	Cost/Unit
PECO	Electric	Distribution	kW	$4.67
Constellation	Electric	Total Generation Charge w/tax	kWh	$0.06
PECO	Gas	Gas Commercial Service	MCF	$3.41
TBD	Gas	Commodity Charges	MCF	$4.00*

*Commodity charges shown in the table is an assumed value, these bills were not available at the time of the agreement. Rates will be re-evaluated before performance period begins.

Utility accounts that will be tracked for the guaranteed energy savings

Site name	Service	Provider	Account #	Rate
Intermediate/High School	Electric	PECO	55375-00305	100kW-500kW
Intermediate/High School	Natural Gas	PECO Gas	08825-00603	Gas Commercial

It should be noted that water and sewer savings are not shown above. Minimal cost savings will be achieved through the scope provided as a result of this project.

Guaranteed Savings Reconciliation

The guarantee term will commence on the Commencement Date as defined in Section 3.1 and be referred to as the "savings guarantee commencement date".

RES will monitor monthly utility usage for the guarantee period, within sixty (60) days of receiving pertinent utility bills. RES will provide Annual Savings Reports to the Customer, which shall include the initial calculation of the total dollar savings, the measurement and verification calculations and any other reasonable information requested by the Customer. Upon the submittal of the annual savings report, reconciliation (if necessary) will be in accordance with Section 4.2 of the GESA.

The Customer agrees to

1. Provide or cause its utility suppliers to provide periodic utility usage and cost in a timely manner. Preferably within two (2) weeks of the "Read Date" shown on the bill. RES will initiate data requests.
2. Execute all Customer responsibilities as set forth in the Agreement.
3. Provide RES full access to all pertinent facilities and information required for RES to perform its responsibilities. Access shall include but not be limited to the following:
    a. All areas of all buildings included in the project
    b. All utility meters included in the guarantee
    c. All personnel responsible for operating and maintaining facilities
    d. Remote access to building automation systems via credentials assigned to RES. Full access is required for commissioning and troubleshooting purposes. Access may be changed to read-only for monitoring at the conclusion of the commissioning process at the discretion of the Customer.
    e. Actual monthly invoices for utilities
    f. Inventories of material changes made within the facility as defined in Section 15 of the GESA.

Breakdown of Monthly Estimated Billings by EEM

Morrisville School District
SCHEDULE OF VALUES and DRAW

EEM#	EEM Description	EEM Value	Feb-19		Mar-19		Apr-19		May-19	
			%	Draw $	%	Draw $	%	Draw $	%	Draw $
	Mobilization	$ 622,300	50%	$ 311,150	50%	$ 311,150		$ -		$ -
1	Lighting System Improvements	$ 234,515		$ -		$ -	5%	$ 11,726	10%	$ 23,451
2	HVAC/Plumbing Improvements	$ 3,291,682		$ -		$ -	10%	$ 329,168	10%	$ 329,168
3	Electrical System Improvements	$ 1,763,353		$ -		$ -	5%	$ 88,168	10%	$ 176,335
	Close Out	$ 311,150		$ -		$ -		$ -		$ -
	Total	**$ 6,223,000**	**5%**	**$ 311,150**	**5%**	**$ 311,150**	**7%**	**$ 429,062**	**9%**	**$ 528,955**

EEM#	Jun-19		Jul-19		Aug-19		Sep-19		Oct-19		Nov-19	
	%	Draw $	%	Draw $	%	Draw $	%	Draw $	%	Draw $	%	Draw $
		$ -		$ -		$ -		$ -		$ -		$ -
1	20%	$ 46,903	25%	$ 58,629	25%	$ 58,629	10%	$ 23,451	5%	$ 11,726		$ -
2	20%	$ 658,336	20%	$ 658,336	20%	$ 658,336	15%	$ 493,752	5%	$ 164,584		$ -
3	20%	$ 352,671	25%	$ 440,838	25%	$ 440,838	10%	$ 176,335	5%	$ 88,168		$ -
		$ -		$ -		$ -		$ -	25%	$ 77,788	75%	$ 233,363
	17%	**$1,057,910**	**19%**	**$1,157,803**	**19%**	**$1,157,803**	**11%**	**$ 693,539**	**6%**	**$ 342,265**	**4%**	**$ 233,363**

Actual billing shall be for work put in place in a given month as accepted by the Customer. Invoices are issued on the 1st of following month, with payment due 30 days following the invoice date.

Summary of Monthly Estimated Billings

MONTH	MONTHLY DRAW	CUMULATIVE DRAW	DRAW %
Feb-19	$ 311,150	$ 311,150	**5%**
Mar-19	$ 311,150	$ 622,300	**10%**
Apr-19	$ 429,062	$ 1,051,362	**17%**
May-19	$ 528,955	$ 1,580,317	**25%**
Jun-19	$ 1,057,910	$ 2,638,227	**42%**
Jul-19	$ 1,157,803	$ 3,796,030	**61%**
Aug-19	$ 1,157,803	$ 4,953,833	**80%**
Sep-19	$ 693,539	$ 5,647,372	**91%**
Oct-19	$ 342,265	$ 5,989,637	**96%**
Nov-19	$ 233,363	$ 6,223,000	**100%**
TOTAL	**$ 6,223,000**		

Schedule of Measurement and Verification (M&V) fees

Annual fees are escalated at a rate of 2.5% per year.

Performance Year	Annual Fee
2020	$ -
2021	$ 1,544
2022	$ 1,582
2023	$ 1,622
2024	$ 1,663
2025	$ 1,704
2026	$ 1,747
2027	$ 1,790
2028	$ 1,835
2029	$ 1,881
2030	$ 1,928
2031	$ 1,976
2032	$ 2,026
2033	$ 2,076
2034	$ 2,128
2035	$ 2,181
2036	$ 2,236
2037	$ 2,292
2038	$ 2,349
2039	$ 2,408

Schedule E: Baseline Energy Consumption

Electricity and Fuels Baselines

The following table reflects the energy and costs baseline used in the calculation of energy savings for the Morrisville Intermediate/High School based on historical energy use and current utility rates. Annual usage and costs have been reorganized to reflect June 2017 through May 2018 billing.

Morrisville Intermediate/High School – Monthly Energy Consumption Profile

	ELECTRIC			FUELS		
	kWh	kW	$	ccf	gals-oil	$
Jan	97,600	264	$ 7,737	13,010	-	$ 7,390
Feb	92,400	252	$ 7,184	9,210	-	$ 5,306
Mar	85,600	248	$ 6,892	7,230	-	$ 4,220
Apr	82,000	244	$ 6,811	7,080	-	$ 4,138
May	82,000	284	$ 6,998	2,620	-	$ 1,692
Jun	78,800	320	$ 8,634	580	-	$ 435
Jul	76,400	256	$ 7,855	450	-	$ 333
Aug	76,800	284	$ 6,838	490	-	$ 360
Sep	75,600	284	$ 6,789	490	-	$ 360
Oct	95,200	328	$ 7,879	500	-	$ 367
Nov	83,200	296	$ 7,172	1,190	-	$ 833
Dec	103,200	280	$ 8,021	5,580	-	$ 3,367
	1,028,800	**3,340**	**$ 88,811**	**48,430**	**-**	**$ 28,801**

Adjusted Baseline Analysis for Additional Cooling Requirements
Morrisville Intermediate/High School

The existing conditions have been modeled based on the equipment schedules and assumed operating hours. This "End Use Analysis" is shown in Schedule E - page 2. As the model indicates, the overall annual usage accuracy is within ± 10% for both electricity and natural gas usage.

To accurately calculate energy usage savings, an adjustment is required to the baseline energy use to account for and for expanding air conditioning to the entire building.

The following parameters were used to adjust the existing baseline energy and costs.

Cooling Load Added ~ 275 tons @ 1.5 kW/ton efficiency (added to existing cooling)

The adjusted baseline "End Use Analysis" is shown in Schedule E – page 3 and is summarized in the table below. The "Adjusted Baseline" will be used to calculate savings as indicated in Schedules C and F.

Morrisville Intermediate/High School			
	kWh	kW	$
Baseline	1,028,800	3,340	$ 88,811
Adjustment	498,175	1,800	$38,296

Schedule E: Baseline Energy Consumption

Middle School/High School

BUILDING: MIDDLE SCHOOL/HIGH SCHOOL

Square Footage: 151,261

	Nameplate Values Ton	kW	HP	Actual kW	HOURS	kWH	
Plug/Misc	0.4			60.5	2,000	121,009	12%
Lighting	1.6			242.0	2,200	532,439	53%
Cooling	78.1	82.0		82.0	1,000	81,998	8%
AHUs			27 1/2	23.1	2,200	50,711	5%
UVs			20 1/3	27.8	2,200	61,171	6%
CUHs/Coils			23	19.3	2,200	42,468	4%
Pumps			28	23.5	4,000	93,879	9%
EFs			7 2/5	6.2	2,200	13,677	1%

Peak kW: 484

Total kWH: 997,351

Modeled Accuracy	kW	kWH	CCF
Summer	0%	-4%	
Winter	8%	-2%	
Total		-3%	4%

% Error Shown

Baseline	Peak kW	kWH	Mths.
Summer	320	471,600	Apr.-Sep.
Winter	328	557,200	Oct.-Mar.
Total		1,028,800	

Modeled	Peak kW	Total - kWH	Mths.
Summer	322	451,640	Apr.-Sep.
Winter	357	545,711	Oct.-Mar.
		997,351	

Baseline CCF	48,430

Tag	MBH Total	Hours	CCF	
AHUs	1,397	720	11,692	23%
UVs	3,235	720	27,086	54%
CUH/FT	1,166	768	10,414	21%
DHW	400	240	1,116	2%

Conv. Factor: 100

Boiler Eff.: 86%

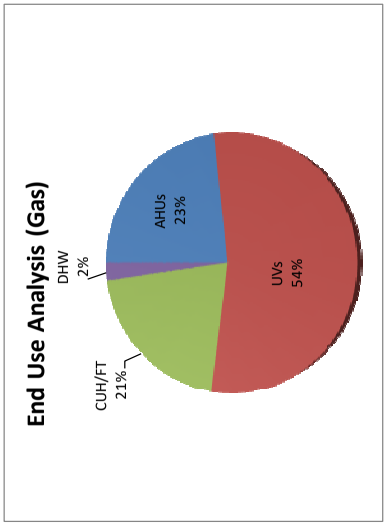
Modeled Gas CCF Used	50,308

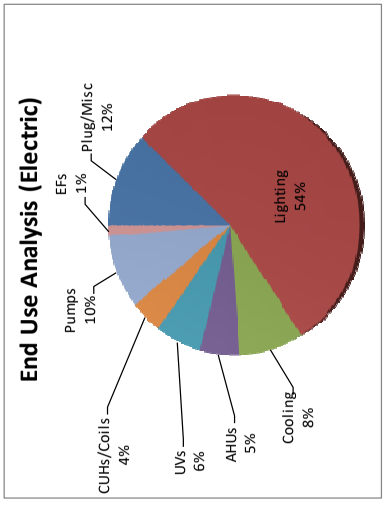
BASELINE ELECTRIC DATA

	kWh	kW	$
Jan	97,600	264	$ 7,737
Feb	92,400	252	$ 7,184
Mar	85,600	248	$ 6,892
Apr	82,000	244	$ 6,811
May	82,000	284	$ 6,998
Jun	78,800	320	$ 8,634
Jul	76,400	256	$ 7,855
Aug	76,800	284	$ 6,838
Sep	75,600	284	$ 6,789
Oct	95,200	328	$ 7,879
Nov	83,200	296	$ 7,172
Dec	103,200	280	$ 8,021
	1,028,800	3,340	$ 88,811

BASELINE NATURAL GAS DATA

	ccf	$
Jan	13,010	$ 7,390
Feb	9,210	$ 5,306
Mar	7,230	$ 4,220
Apr	7,080	$ 4,138
May	2,620	$ 1,692
Jun	580	$ 435
Jul	450	$ 333
Aug	490	$ 360
Sep	490	$ 360
Oct	500	$ 367
Nov	1,190	$ 833
Dec	5,580	$ 3,367
	48,430	$ 28,801





Schedule E: Baseline Energy Consumption

BUILDING: : MIDDLE SCHOOL/HIGH SCHOOL

Square Footage: 151,261

	Nameplate Values Ton	kW	HP	Actual kW	HOURS	kWH	
Plug/Misc	0.4			60.5	2,000	121,009	8%
Lighting	1.6			242.0	2,200	532,439	35%
Cooling	1.5	353.1	82.0	611.6	1,000	611,623	40%
AHUs			27 1/2	23.1	2,200	50,711	3%
UVs			20 1/3	27.8	2,200	61,171	4%
CUHs/Coils			23	19.3	2,200	42,468	3%
Pumps			28	23.5	4,000	93,879	6%
EFs			7 2/5	6.2	2,200	13,677	1%

Modeled Accuracy	kW	kWH	CCF
Summer	57%	108%	
Winter	8%	-2%	
Total	48%	4%	% Error Shown

Peak kW: 1,014

Total kWH: 1,526,976

Baseline	Peak kW	kWH	Mths.
Summer	320	471,600	Apr.-Sep.
Winter	328	557,200	Oct.-Mar.
Total		1,028,800	

Modeled	Peak kW	Total - kWH	Mths.
Summer	745	981,265	Apr.-Sep.
Winter	357	545,711	Oct.-Mar.
		1,526,976	

Baseline CCF	48,430

Tag	MBH Total	Hours	CCF	
AHUs	1,397	720	11,692	23%
UVs	3,235	720	27,086	54%
CUH/FT	1,166	768	10,414	21%
DHW	400	240	1,116	2%
Conv. Factor		100		
Boiler Eff.		86%		

Modeled Gas CCF Used	50,308

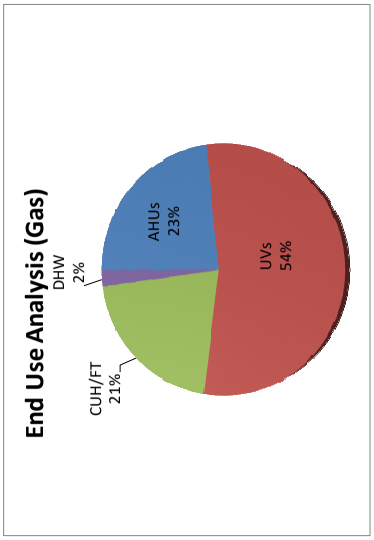
Middle School/High School

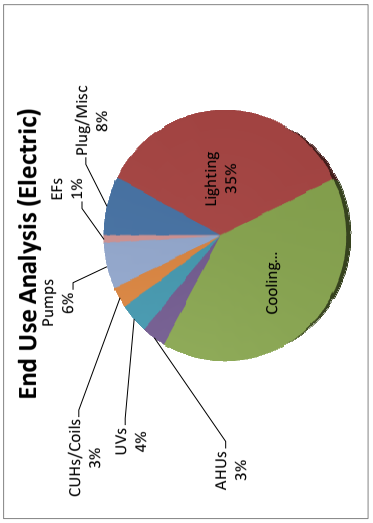
BASELINE ELECTRIC DATA

	kWh	kW	$
Jan	97,600	264	$ 7,737
Feb	92,400	252	$ 7,184
Mar	85,600	248	$ 6,892
Apr	82,000	244	$ 6,811
May	82,000	284	$ 6,998
Jun	78,800	320	$ 8,634
Jul	76,400	256	$ 7,855
Aug	76,800	284	$ 6,838
Sep	75,600	284	$ 6,789
Oct	95,200	328	$ 7,879
Nov	83,200	296	$ 7,172
Dec	103,200	280	$ 8,021
	1,028,800	3,340	$ 88,811

BASELINE NATURAL GAS DATA

	ccf	$
Jan	13,010	$ 7,390
Feb	9,210	$ 5,306
Mar	7,230	$ 4,220
Apr	7,080	$ 4,138
May	2,620	$ 1,692
Jun	580	$ 435
Jul	450	$ 333
Aug	490	$ 360
Sep	490	$ 360
Oct	500	$ 367
Nov	1,190	$ 833
Dec	5,580	$ 3,367
	48,430	$ 28,801





Schedule F: Measurement & Verification

Approach to Measurement and Verification of Savings

When preparing a guaranteed energy savings project, RES adheres to the most recent International Performance Measurement and Verification Protocol (IPMVP) as it applies to the given scope. The IPMVP is sponsored and maintained by a non-profit corporation known as the Efficiency Valuation Organization (EVO) and is the most recognized energy and water savings measurement and verification (M&V) protocol across the world. The IPMVP is a set of recommended guidelines and framework to evaluate energy and water efficiency projects. It does not define set standards for M&V on specific energy and water efficiency measures.

EVO has acknowledged that the IPMVP documents alone will not improve energy efficiency, but must be applied by qualified professionals who demonstrate knowledge and understanding of the protocol. Such individuals may have the designation as Certified Measurement and Verification Professionals (CMVP®) and are qualified to promote sound M&V plans as well as adhere to best practices for management programs. RES has addressed this and has a CMVP on staff to help facilitate the M&V planning and reporting for all projects, as well as train staff members on proper implementation and execution. RES has created a custom M&V plan for this project that follows the core principles of the IPMVP, including the following:

- Accurate
- Complete
- Conservative
- Consistent
- Relevant
- Transparent

Quarterly reports of the avoided energy costs will be provided based on the established M&V plans. The following section outlines the framework and various options involved when developing a proper M&V plan. It should be noted that RES has worked with the district to identify all other operational and avoided costs within the project. Those items are shown separately from the truly "measured and verified" components of the project and are found in Schedule C of the GESA.

When conducting this analysis, the important factors to consider in developing a M&V plan are as follows:

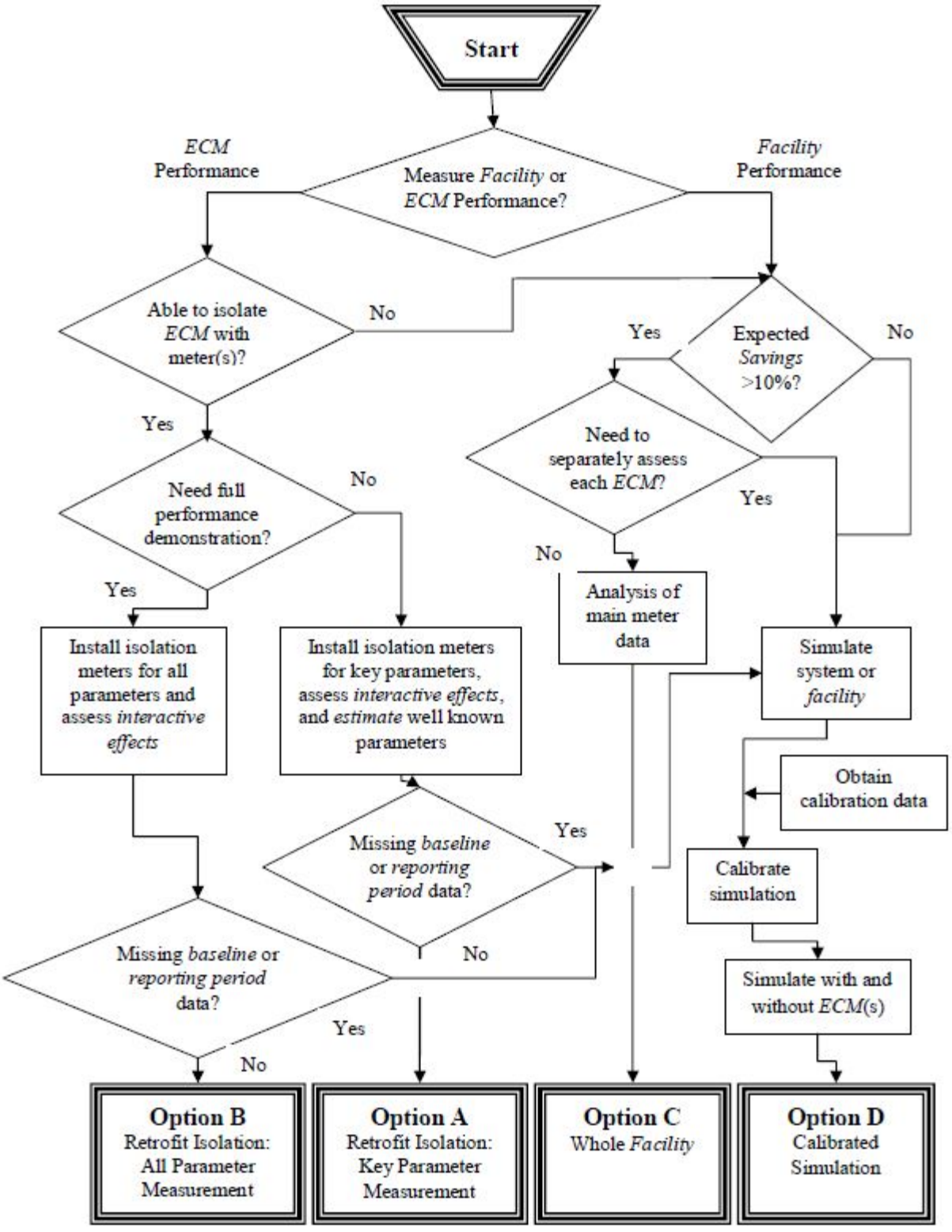
- Can the impact of the energy efficiency measures be isolated and measured easily?
- Is the whole building being impacted and are the savings interactive?
- How much will the measure(s) save compared to the baseline usage?
- How much will M&V cost for the measures applied?

These questions help identify which (if any) of the four IPMVP options are taken into consideration. The following tables outline these options and are taken from the "IPMVP – Concepts and Options for Determining Energy and Water Savings – Volume 1, January 2012."

IPMVP Option	How Savings Are Calculated	Typical Applications
A. Retrofit Isolation: Key Parameter Measurement *Savings* are determined by field measurement of the key performance parameter(s) which define the *energy* use of the *ECM*'s affected system(s) and/or the success of the project. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the measured parameter, and the length of the *reporting period*. Parameters not selected for field measurement are *estimated*. *Estimates* can based on historical data, manufacturer's specifications, or engineering judgment. Documentation of the source or justification of the *estimated* parameter is required. The plausible *savings* error arising from *estimation* rather than measurement is evaluated.	Engineering calculation of *baseline* and *reporting period energy* from: ○ short-term or continuous measurements of key operating parameter(s); and ○ *estimated* values. *Routine* and *non-routine adjustments* as required.	A lighting retrofit where power draw is the key performance parameter that is measured periodically. Estimate operating hours of the lights based on *facility* schedules and occupant behavior.
B. Retrofit Isolation: All Parameter Measurement *Savings* are determined by field measurement of the *energy* use of the *ECM*-affected system. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the *savings* and the length of the *reporting period*.	Short-term or continuous measurements of *baseline* and *reporting-period energy*, and/or engineering computations using measurements of proxies of *energy* use. Routine and non-routine adjustments as required.	Application of a variable-speed drive and controls to a motor to adjust pump flow. Measure electric power with a kW meter installed on the electrical supply to the motor, which reads the power every minute. In the *baseline period* this meter is in place for a week to verify *constant* loading. The meter is in place throughout the *reporting period* to track variations in power use.

IPMVP Option	How Savings Are Calculated	Typical Applications
C. Whole Facility *Savings* are determined by measuring energy use at the whole *facility* or sub-*facility* level. Continuous measurements of the entire *facility's energy* use are taken throughout the *reporting period*.	Analysis of whole *facility baseline* and *reporting period* (utility) meter data. *Routine adjustments* as required, using techniques such as simple comparison or regression analysis. *Non-routine adjustments* as required.	Multifaceted energy management program affecting many systems in a *facility*. Measure energy use with the gas and electric utility meters for a twelve month *baseline period* and throughout the *reporting period*.
D. Calibrated Simulation *Savings* are determined through simulation of the *energy* use of the whole *facility*, or of a sub-*facility*. Simulation routines are demonstrated to adequately model actual *energy* performance measured in the *facility*. This Option usually requires considerable skill in calibrated simulation.	Energy use simulation, calibrated with hourly or monthly utility billing data. (Energy end use metering may be used to help refine input data.)	Multifaceted energy management program affecting many systems in a facility but where no meter existed in the *baseline* period. Energy use measurements, after installation of gas and electric meters, are used to calibrate a simulation. *Baseline* energy use, determined using the calibrated simulation, is compared to a simulation of *reporting period* energy use.

The flow chart on the following page (also taken from the latest IPMVP version) outlines in more detail the evaluation process RES takes when developing a M&V plan.


Start
Measure *Facility* or *ECM* Performance?
ECM Performance
Facility Performance
Able to isolate *ECM* with meter(s)?
No
Yes
Need full performance demonstration?
No
Yes
Install isolation meters for all parameters and assess *interactive effects*
Install isolation meters for key parameters, assess *interactive effects*, and *estimate* well known parameters
Missing *baseline* or *reporting period* data?
Yes
No
Missing *baseline* or *reporting period* data?
Yes
No
Expected *Savings* >10%?
Yes
No
Need to separately assess each *ECM*?
Yes
No
Analysis of main meter data
Simulate system or *facility*
Obtain calibration data
Calibrate simulation
Simulate with and without *ECM*(s)
Option B
Retrofit Isolation: All Parameter Measurement
Option A
Retrofit Isolation: Key Parameter Measurement
Option C
Whole *Facility*
Option D
Calibrated Simulation

Establishing Baseline Energy Use

Establishing realistic baseline energy use is the key to a guaranteed energy savings project, in that it establishes the basis for all savings and creates the boundary conditions for the size of the savings opportunity. The baseline is more than the amount of energy used in the past, as reflected in a utility billing history; it is a prediction of how much energy a facility would use in the absence of the energy project during current and future operating parameters and weather conditions. The table below shows Reynolds' methods for establishing the energy baseline.

Reynolds Methods for Establishing Energy Baseline
Utility Meter Data Analysis: *Applied to Option C - Whole Building Metering.*
1. Establish energy use from utility bills over a two-year period prior to the project. 2. Construct a baseline energy model based on independent variables such as weather. 3. Apply normal weather data to the baseline energy model to determine the normalized annual energy baseline per applicable fuel type. 4. Adjust the baseline to compensate for operating abnormalities such as non-typical shut downs, code compliance, building alterations, or other events (such as summer school or night classes) that might affect typical year energy usage. **See Schedule E for Reynolds Energy Services evaluation of the existing HVAC system operation and adjusted baseline.** 5. Apply predetermined fuel rates to each utility type, aggregate costs to determine baseline energy costs. Apply predetermined escalation rates each year thereafter. 6. Adjust baseline monthly or yearly as required to compensate for operational changes.

Baseline Adjustments

The calculation methodology section of each M&V plan includes procedures for updating baseline or savings calculations during the project's performance period to compensate for the variables that affect savings. The generic methodologies shown in the following table are applied on a project and conservation measure specific basis:

Variable Affecting Savings	Post-Installation	Performance Period
Energy Prices: Neither Reynolds nor the owner has significant control over actual energy prices.	Energy prices and their escalation rates are fixed in the project's guarantee contract language.	
Operations: Beyond normal maintenance and operations, Owner's operating practices.	Savings calculations adjusted to reflect variance from the project's operational intent per the contract.	
Operating Hours: Changes in the length of operation of the facility, buildings, and systems.	Baseline and/or savings calculations adjusted to reflect variance from the project's operational intent per the contract.	
Loads: Changes in equipment and process loads not directly controlled by the building HVAC and lighting systems.	Baseline calculations adjusted to reflect changes from the project's operational intent per the contract.	
Preventive Maintenance, Repair and Replacement: In order to sustain energy savings, equipment/system performance must be maintained.	Not applicable	Savings calculations adjusted to reflect negative variance from equipment/systems performance criteria.
Major Changes to Facility: Changes such as reduction or increase in the number of students, facility closures, adding new wings, code non-compliance, or adding new loads (e.g., computers).	Baseline and/or savings calculations adjusted to reflect facility changes.	
Weather: Variations from "normalized" weather.	Not applicable	Baseline and/or savings calculations adjusted to reflect variance from normalized weather.

Weather Normalization Procedure

The normalization adjustment for weather is expressed as follows:

$$BEU_m = Base + (F1 \times HDD_m) + (F2 \times CDD_m)$$

Where,	BEU_m	=	Baseline energy use for month m
	Base	=	Constant, non-weather-related energy consumption per month
	F1	=	Heating degree day factor
	HDD_m	=	Number of heating degree days in month m
	F2	=	Cooling degree day factor
	CDD_m	=	Number of cooling degree days in month m

In the above equation, Base, F1, and F2 are determined from the regression. The heating and cooling degree days are determined from current weather data. The heating and cooling degree day calculations are calculated using a base temperature that fits the building. Other non-routine adjustment factors such as change of floor-space, change in use of space etc. can be adjusted using similar mathematical relationships of dependent and independent variables.

Maintaining Savings

Reynolds' M&V methods are designed to provide feedback loops regarding variance from the project's operational intent. Typically, RES includes technical assistance within measurement and verification fees; this enables the collaboration required between RES and facility Operations and Maintenance staff to maintain performance throughout the project's performance period.

Reports

Quarterly RES will provide energy performance updates. Annually, RES provides a report that reconciles savings per the projects M&V plan. The following information is provided in the report:

- Utility Data Analysis - As required by the project's M&V plan, analysis of utility meter(s) energy use data is provided.
- Savings and Guarantee Reconciliation - Savings calculations are updated per the project's M&V plan. Guarantee is updated to reflect refinements that have negatively impacted savings.
- Measurement and Verification Data - Performance Period measurement data.

Project Specific M&V Methodologies

Measurement and verification plans specific to individual or logical groupings of conservation measures are included in this schedule. The EEMs are indexed to IPMVP methods in the following table:

Energy Efficiency Measure	IMPVP Option A Partially Measured Retrofit Isolation	IPMVP Option B Retrofit Isolation	IPMVP Option C Whole Facility	IPMVP Option D Calibrated Simulation
EEM 1: Lighting System Improvements			X	
EEM 2: HVAC/Plumbing Improvements			X	
EEM 3: Electrical System Improvements			X	

Schedule G: Construction and Installation

Introduction

This schedule provides milestone dates for construction and installation of the scope of work included in Schedule A of this contract. The project will be completed over the summer break which will allow for very little schedule float. RES will require the entire building to be vacated during construction.

Purpose

The purpose of this schedule is to maintain a controlled work site with the highest possible quality of construction services. The schedule is structured to allow the project to begin on March 11, 2019 **assuming board of School District of Borough of Morrisville approves GESA contract as scheduled on February 20, 2019, the school district and RES executes the Guaranteed Energy Savings Agreement, and appropriate notices are received by RES.** Based upon this schedule, subcontractor award and equipment submittals and approvals are projected to be completed for 2nd shift work starting on March 18, 2019. It is anticipated that all work will be substantially completed by August 23, 2019 in time for teachers to return and prepare for students.

Construction Sequence

The construction sequence was developed to allow work activities to commence as soon as the materials with the shortest lead times become available.

Work activities have been scheduled to occur at times that minimize impacts to occupied facilities. Furthermore, construction of the project has been sequenced such that various trade activities are properly staged to limit the effects of trade stacking on any particular work trade. This will allow the most qualified tradesmen to perform their work with a focus on high quality workmanship while minimizing impact to both the facility and its occupants. Our on-site Construction Manager will work closely with the designated representative from the District on a daily basis to ensure that all work activities commence and continue with the least possible intrusion into the daily activities of the functioning facility. RES will examine and address these concerns thoroughly while creating the detailed construction installation schedules and will maintain reasonable flexibility in those schedules to allow Morrisville School District to dictate reasonable changes needed as a result of events or unforeseen commitments of spaces.

As the project approaches completion, RES will deliver as-built documentation, and operations and maintenance (O&M) documents to the District and schedule and facilitate training sessions for facilities personnel. RES will coordinate and schedule final inspections and acceptance by the District as each major component of the project is completed.

Schedule H: Start Up and Commissioning

Introduction

The purpose of this document is to communicate the process and scope for commissioning services associated with the project. Confidence in building performance is created by executing the commissioning plan contained herein.

The commissioning (Cx) process executes the testing necessary to verify the project design, contractor and vendor performance, and the baseline performance of the installed systems. This documentation verifies the use of proper construction processes and documents resultant system and building performance. These data provide a comparative basis for analysis of the building performance over time. The commissioning process is summarized as follows:

- Define desired performance criteria.
- Prove design compliance with performance criteria.
- Collect actual performance data.
- Distill results into useful information.
- Strategize optimal performance.
- Take action to achieve predictable results.
- Train the user.

Strategy

Commissioning is applied at various phases of construction from design to completion and operation. The scope is defined by identifying the systems to be commissioned, system functional testing, and integrated systems acceptance testing for each scope item.

Systems to be Commissioned

The following table summarizes the types of systems and specific equipment to be commissioned at part of this project.

TABLE: Summary of Systems to be Commissioned

System Type	Equipment
EEM 1: Lighting System Improvements	
Lighting equipment	Any new LED fixtures replacing existing fixtures; occupancy sensors
EEM 2: HVAC/Plumbing System Improvements	
HVAC equipment	Chiller, chilled water pumps, VFDs, fan coil units, ductless split systems, cabinet unit heaters, unit heaters, exhaust fans
Domestic Water Fixtures	New sinks, toilets and urinal flush valves.
EEM 3: Electrical System Improvements	
Power distribution Emergency power	Switchgear, subpanels, emergency generator

Roles and Responsibilities

Project team member roles and responsibilities for each process of the service are summarized in the table below. All phases of the process may not be applicable to each component of the project:

TABLE: Roles and Responsibilities during Commissioning Process

Cx Phase/Process	Roles, Responsibilities, & Work Products
Pre-Design	
Develop Cx Plan	*Commissioning Authority (CxA)* develops a Commissioning Plan.
Document Performance Criteria	*CxA* issues written guidelines for format and content of performance criteria. *Design Team* develops performance criteria. *CxA* reviews performance criteria and quantifies non-performance issues. *Project Team* resolves non-performance issues quantified in the Project Issues List.
Design	
Engineering Analysis	During contract documents phase of design, *CxA* quantifies non-performance issues through preliminary and final reviews of design documents. *Project Team* resolves non-performance issues quantified in the Project Issues List.
Specify Performance Testing Requirements	*CxA* develops System Pre-Functional & Functional Performance test plan, Integrated Systems Acceptance Test Plan, and supporting technical specifications. *Design Team* approves plans and technical specifications.
Construction	
Manage Performance Testing	*CxA* creates and manages critical path performance testing schedule. *Owner, Project Team* resolves non-performance issues quantified in the Project Issues List during performance testing.
Review Contractor Submittal Documentation	*Design Team* and *CxA* quantify non-performance issues through review of *Construction Team's* submittal documentation. *Project Team* resolves non-performance issues quantified in the Project Issues List.
Develop Performance Testing Documentation	*CxA* develops Pre-Functional and Functional Performance Testing Manual(s) and Integrated System Acceptance Testing Manuals. *Design Team* approves manuals.
Pre-Functional & Functional Performance Testing	*CxA* quantifies non-performance issues by executing Pre-Functional and Functional Performance Testing.
Closeout	
Acceptance Performance Testing	*CxA* quantifies non-performance issues through execution of Integrated Systems Acceptance Performance Testing.
Review Contractor Closeout Documentation	*Design Team* and *CxA* quantify non-performance issues through review of *Construction Team's* closeout documentation. *Project Team* resolves non-performance issues quantified in the Project Issues List.
Communicate Performance Testing Final Results	*Design Team* updates performance criteria. *CxA* develops Commissioning Report for approval by *Design Team*. Commissioning Report submitted to *Owner Team* by *CxA*.

Functional Performance Testing

Each system commissioned is subjected to a phased functional performance testing process that quantifies its performance relative to design intent. The following table summarizes each phase of Functional Performance Testing (FPT):

TABLE: Functional Performance Testing Phases

FPT Phase	Description
Pre-Functional Testing	Verify that equipment and components associated with a specific system have been provided per contract documents and function independent of each other per design intent.
System Functional Testing	Verify that the equipment and components associated with a specific system function together per design intent.
Testing, Adjusting, Balancing, & Optimization	Measure, adjust, and document terminal equipment flow rates to attain design intent flows. Document performance and capacity of terminal and central equipment. Optimize system set points to minimize resource demand and consumption.
Training	Communicate system programming, design intent, and sequence of operations to Operations and Maintenance staff responsible for system performance. As required, augment communication with equipment or component factory training.

Functional Performance Testing is further explained in the following table.

TABLE: Summary of Functional Performance Tests

Description	Methods/Criteria
Pre-Functional Testing	
Equipment Verification	Visually inspect all equipment and components comprising the system. Verify consistency between specified, submitted, and installed equipment.
Installation Verification	Visually inspect all equipment and components comprising the system and verify installation per contract documents, maintainability, and operational availability.
Operation Verification	Test all equipment and components comprising the system to verify that their independent performance complies with design intent. Examples are duct leakage testing, pipe leakage testing, piping flushing, system controls startup, vendor equipment startup, etc.
System Functional Testing	
Fail Safe Functions	Test performance of each control function dedicated to “fail safe” system operation.
Equipment Protection, Interlocks, and Life Safety Interface	Test performance of each control function dedicated to protecting system equipment, interfacing with life safety system(s), and interlocking operation of system equipment and components.

Description	Methods/Criteria
Functions	
Hardware	Test performance of each system's controls device (e.g., Equipment Enable/Disable, Start/Stop, and Step, Equipment Modulation, Modulating Components, Step Components, Analog Sensors, Digital Sensors, etc.).
Schedule/Mode Switch Control Functions	Test performance of each control function dedicated to time scheduling, staging of the system mode, or staging of equipment and components. Examples of these control functions are optimal start/stop, occupied/unoccupied operation, automatic equipment alternation, etc.
Basic Control Functions	Test performance of each control function required for system operation. Examples of these control functions are: AHU discharge temperature control, AHU discharge static pressure control, hydronic system differential pressure control, etc.
Advanced Control Functions	Test performance of each control function included to optimize a system, but not required for system operation. Examples of these control functions are AHU discharge temperature reset, hydronic system temperature reset, etc.
Failures & Alarms Control Functions	Test performance of each control function dedicated to system failure and alarming.
Set points and/or Configuration	Verify system controls set points and/or configuration parameters (i.e. Verify set points and configuration parameters for fan-powered terminal unit).
Graphical User Interface	Test performance of system graphical user interface.
Testing, Adjusting, Balancing, & Optimization	
Measurement devices	Calibrate measurement devices (i.e., terminal unit primary airflow measurement stations, hydronic flow measurement stations, etc.)
Proportional Balance	Proportion airflow or hydronic flow to the identified system's terminal devices (e.g., grilles, registers, diffusers, coils, etc.) per contract documents.
Distribution Equipment Performance	Measure performance of distribution equipment (e.g., fans, pumps, etc.).
Production Equipment Performance	Measure performance of production equipment (e.g., boilers, chillers, cooling towers, etc.).
Heat Transfer Equipment Performance	Measure performance of heat transfer equipment (e.g., heat exchangers, coils, etc.).
Optimum set point(s)	Optimize set points (e.g., AHU discharge static pressure set point, hydronic system differential pressure, etc.) to minimize resource consumption and/or demand.
Training	
Design Intent	Summarize how the system is designed and operated to comply with the facility's Operational Intent.

Description	Methods/Criteria
Sequence of Operations	Summarize how the system is automated to comply with the facility's Operational Intent.
Equipment or Component Training	Provide specified vendor training for key equipment and components.

Industry Standards and Guidelines Utilized

Commissioning services are provided utilizing the following industry standards and guidelines:

- **ASHRAE Guideline 0-2013 – The Commissioning Process**
- **ASHRAE Standard 202-2013 – Commissioning Process for Buildings and Systems**
- **U.S. Green Building Council**
  - Leadership in Energy & Environmental Design (LEED) GreenBuilding Rating System
- **Building Commissioning Association**
  - Building Commissioning Attributes
- **California Commissioning Collaborative**
  - California Commissioning Guide: Existing Buildings
- **Portland Energy Conservation, Inc. (PECI)**
  - Model Commissioning Plan and Guide Specifications - 2005

Comfort Standards - Indoor

The interior occupant space conditions (temperature and humidity) will conform to industry-standard practices of the HVAC industry as set-forth by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) in the standard's publication entitled, ASHRAE Standard 55-2013: Thermal Environmental Conditions for Human Occupancy.

It is important to note that because of individual differences and personal preferences pertaining to comfort, the standard is designed to accommodate a minimum of 80% of the occupants. Comfort is a measure that factors both dry bulb temperature and relative humidity. The following table is a summary of acceptable indoor comfort conditions:

Relative Humidity	*Winter Temperature (indoor)*	*Summer Temperature (indoor)*
30%	68.5°F to 73.5°F	75.0°F to 80.0°F
40%	68.0°F to 73.5°F	74.5°F to 80.0°F
50%	68.0°F to 73.5°F	74.0°F to 79.0°F
60%	67.5°F to 72.0°F	74.0°F to 78.5°F

A set point of 76˚F will be utilized for cooling with a +/- of 2˚F the local thermostat allowing the **minimum cooling occupied temperature to be 74˚F** in the cooling mode. A set point of 70˚F will be utilized for heating with a +/- of 2˚F at the local thermostat allowing the **maximum heating occupied temperature to be 72˚F**. Night setback will be adjusted such that indoor comfort levels can be established by the start of the occupied hours.

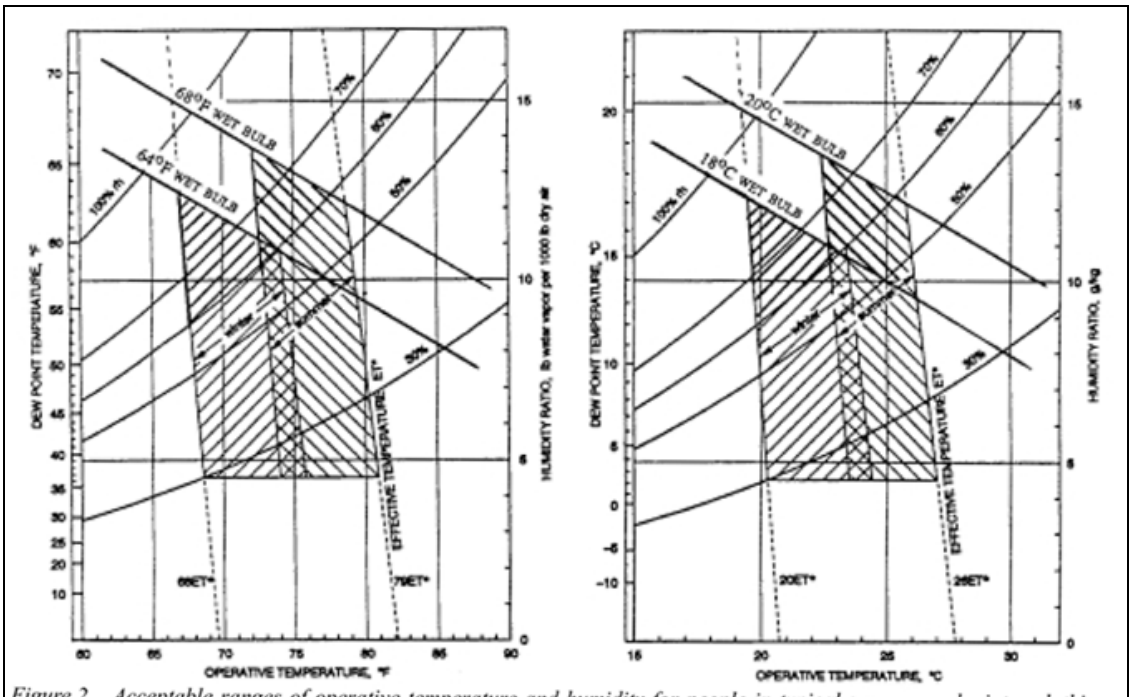


Figure 2 Acceptable ranges of operative temperature and humidity for people in typical summer and winter clothing during light, primarily sedentary activity (≤1.2 met). The operative temperature ranges are based on a 10% dissatisfaction criterion.

ANSI/ASHRAE Standard 55 – Acceptable Temperature Ranges for Winter and Summer Operation

Building Schedules and Set Points

This Section includes the building schedules and set points to be included for the various spaces located within the school. The following schedules and set points were used for baseline energy usage analysis and savings calculations. Any variance from these parameters may necessitate baseline adjustments.

Main Session – Refer to School Calendar for Exact Dates

Space Type	Hours		Occupied Setpoints		Unoccupied Setpoints	
	Occupied	Unoccupied	Heating	Cooling	Heating	Cooling
Office Areas	M-F: 7-4	Wkd./Hol.	70	76	60	85
Classrooms	M-F: 7-4	Wkd./Hol.	70	76	60	85
Cafeteria	M-F: 7-4	Wkd./Hol.	68	76	60	85
Library	M-F: 7-4	Wkd./Hol.	68	74	60	80
Gymnasium/LGI	M-F: 7-4	Wkd./Hol.	68	76	60	85
Hallways	M-F: 7-4	Wkd./Hol.	68		60	
Storage areas	M-F: 7-4	Wkd./Hol.	65		60	

Summer Session – Refer to School Calendar for Exact Dates

Space Type	Hours		Occupied Setpoints		Unoccupied Setpoints	
	Occupied	Unoccupied	Heating	Cooling	Heating	Cooling
Office Areas	M-F: 8-3	Wkd./Hol.		76		85
Classrooms		Weekday/Wkd./Hol.				85
Cafeteria		Weekday/Wkd./Hol.				85
Library		Weekday/Wkd./Hol.				80
Gymnasium/LGI		Weekday/Wkd./Hol.				
Hallways		Wkd./Hol.				
Storage areas		Weekday/Wkd./Hol.				

School Calendar

The school calendar provided on the following page identifies Main Session and Summer Session occupied, weekend and holiday days for the 2018-2019 school year. Each successive performance year shall assume the same number of day types as reflected in this calendar.

Schedule I: Standards of Comfort

School District of Borough of Morrisville
2018-2019 School Calendar

S	M	T	W	T	F	S
T 20	AUG / SEPT 2018					S 19
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

AUG - SEPT

27 Coordinators First Day / Mentor / New Teacher
28 First Teacher Day
29 First Student Day
31 School Closed - Labor Day Weekend
3 School Closed - Labor Day
10 Rosh Hashana
19 Yom Kippur

S	M	T	W	T	F	S
T 23	OCTOBER 2018					S 22
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

OCT

10 Teacher PD

S	M	T	W	T	F	S
T 19	NOVEMBER 2018					S 17
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

NOV

2 Early Dismissal / End of 1st Marking Period
6 Election Day-Offices Open, Teacher PD
12 School Closed -Veterans Day
20 Early Dismissal
21 Offices Open - Staff and Teachers Report
22-23 School Closed - Thanksgiving

S	M	T	W	T	F	S
T 15	DECEMBER 2018					S 15
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

DEC

24-31 Holiday Recess

S	M	T	W	T	F	S
T 20	JANUARY 2019					S 19
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22 *	23 *	24 *	25	26
27	28	29	30	31		

JAN

1-2 Holiday Recess
21 School Closed - MLK Day
22-24 Exams
24 Early Dismissal / End of Second Marking Period
25 Teacher PD

S	M	T	W	T	F	S
T 19	FEBRUARY 2019					S 19
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

FEB

18 School Closed - President's Day

S	M	T	W	T	F	S
T 21	MARCH 2019					S 21
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

MARCH

29 Early Dismissal / End of Third Marking Period

S	M	T	W	T	F	S
T 19	APRIL 2019					S 19
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

APRIL

18-22 School Closed - Spring Break

S	M	T	W	T	F	S
T 22	MAY 2019					S 21
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

MAY

21 Teacher PD
27 School Closed - Memorial Day

SBA - 8.22.2018

S	M	T	W	T	F	S
T 9	JUNE 2019					S 8
						1
2	3	4	5	6	7	8
9	10*	11*	12*	13	14	15
16	17	18	19	20	21	22

JUNE

10-13 Early Dismissal / Exams
12 Last Student Day
13 Last Teacher Day TBD

* = Exams
= District Closed
= Offices Open (Staff and Teachers Report)
= Early Dismissal (11:20 a.m. Mid/HS, 11:30 a.m. Elem/Int)
= No School, Teacher Professional Development (PD)
= Graduation

All days missed due to emergency closing will be made up on: 6/10,6/11,4/18.
Calendar subject to change in accordance with Collective Bargaining Agreement.
180 = Total Student Days **187 = Total Teacher Days**

Schedule J: Maintenance Responsibilities

RES will provide maintenance schedules, checklists and training necessary for the Customer to properly execute all maintenance activities for equipment installed under this Agreement.

Maintenance Responsibilities

RES will provide training for systems and equipment installed as part of the Guaranteed Energy Savings Agreement. RES will either conduct or arrange for this equipment training utilizing RES personnel, equipment vendors and subcontractors to provide the proper level of training for the type of training requested. The Customer will be asked to provide a list of those individuals that should receive training and to assist RES in notifying these individuals. The Customer will provide, as needed, any required meeting space.

Each training opportunity will be tailored to the needs of the Customer needs and can be geared toward maintenance training or building user training. The goal is to avoid maintenance or end user frustration in dealing with systems that are foreign to the present facilities infrastructure.

Maintenance, repair, and timely replacement of mechanical systems are integral to achieving equipment performance and obtaining long-term energy savings. The element and responsibilities for equipment maintenance are summarized as follows:

- ***Preventive Maintenance:*** Provide standard equipment and component maintenance to prevent degradation of fundamental building systems performance. Examples include inspection, lubrication, testing, and adjustment. All preventative maintenance will be performed by the Customer. RES will provide the Customer with a preventative maintenance best practices plan summarizing the type and frequency of maintenance activities recommended by the manufacturer.
- ***Planned Replacement:*** Replacement or major rebuild of equipment and components will be required near the end of the economic useful life of the equipment, which will vary for each system. All planned replacement will be performed by the Customer.
- ***Corrective Maintenance:*** Repairs and/or adjustment of equipment and components to correct non-performance discovered during the execution of preventive and/or responsive maintenance. RES will provide corrective maintenance that is a direct result of a warranty issue for equipment installed under this agreement during the warranty period. All corrective maintenance on equipment failure that is not caused by a warranty issue, existing equipment, and maintenance required following the warranty period will be performed by the Customer.
- ***Responsive Maintenance:*** On call response to non-performance of systems, equipment, and components. Typically, response is provided within a time frame that is dependent upon the severity of the issue. Priority response levels are determined by the critical nature of systems, equipment, and components. RES will be responsible for providing responsive maintenance that is a direct result of a warranty issue for equipment installed under this GESA during the warranty period. All responsive maintenance on equipment failures that were not caused by a warranty issue, existing equipment, and maintenance required following the warranty period will be performed by the Customer.

Warranty Summary

All equipment installed as part of this Guaranteed Energy Savings Project will be covered by a one-year warranty from the date of EEM completion, equipment startup and beneficial use by the Owner. Where new equipment is added to existing equipment or systems, only the new equipment will carry this one-year warranty. An equipment list will be prepared as part of the Operation and Maintenance (O&M) Manual for each EEM at project closeout which will detail all warranty dates including any manufacturers' warranties which exceed this one-year period. This document will also include any specific service details which might be required to keep these warranties in force. The fields will be completed at close-out to provide a quick reference for the overall warranty information for the project. Additionally, RES will provide manufacturer's warranty certificates for equipment which is warranted beyond the one-year construction warranty period. Final versions of these documents will be provided at project closeout both as part of the individual O&M manuals and as an insert to this document for a centralized record of warranty information.