Energy Savings Plan

As part of an Energy Savings Improvement Program (ESIP)

Presented to:

West Deptford Public Schools

West Deptford, NJ

Prepared by:

Schneider Electric

Draft: 6/6/16

Table of Contents

1.0 Executive Summary

Schneider Electric has completed Phase II of the Investment Grade Audit process for West Deptford School District's Energy Savings Improvement Program (ESIP). We would like to thank Kevin Kitchenman, William Thompson, Deborah Trasatti, Myron Hall and Tom Tucci for providing their time and assistance.

The purpose of this Energy Savings Plan is to provide an overview of the District's Energy Savings Improvement Program (ESIP). Our proposed ESIP will allow West Deptford School District to accomplish the following:

- Allow students to complete homework assignments even while power is lost at the high school and middle school by providing IT backup power generation at the high school and middle school.
- Significantly enhance the learning environment through updated LED lighting.
- Reduce energy and operational costs by over $250,000 annually
- Minimize risk and exposure to volatile energy prices
- Expand the West Deptford School District's reputation as a sustainable leader among school districts throughout the region.

Based upon months of analysis, development, and discussion, the following energy conservation measures (ECMs) are included in this Energy Savings Plan:

Energy Conservation Measure	Redbank ES	Green-Fields	Oakview	Middle School	High School
Lighting - Interior (excluding gyms)	■	■	■	■	■
Lighting - Exterior	■	■	■	■	■
Lighting - Gyms	■	■	■	■	■
Lighting Sensors	■	■	■	■	■
PPA Program Capital Funding		■	■	■	■
HVAC System Retrocommissioning	■	■	■	■	■
Building Envelope	■	■	■	■	■
VFD Installation			■		
Standby Generator for IT Loads				■	■
Walk In Cooler Upgrades	■			■	■
Energy Procurement			■	■	■
Solar PPA		■	■	■	■
Smart Start Rebates	■	■	■	■	■

In order for the District to move forward with the implementation phase of the ESIP, the following steps are required:

1. 3rd party review and approval of this Energy Savings Plan by Concord Engineering.
2. BPU review and approval of this Energy Savings Plan
3. WDSD to issue an RFP for lease purchase financing for the ESIP
4. WDSD to execute ESIP Construction Contract, Performance Assurance Support Services (PASS) agreement, and financing contract to authorize the Implementation of the project

2.0 Financial Analysis

2.1 Financial Summary

The intent of this project is to maximize savings opportunities, fund capital improvements, and achieve the strategic goals of the District. The following energy conservation measures have been developed to maximize savings and meet the District's needs within a self-funding ESIP.

FORM II

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ENERGY CONSERVATION MEASURES (ECMs) SUMMARY FORM
West Deptford BOARD OF EDUCATION
ENERGY SAVING IMPROVEMENT PROGRAM

Proposed Preliminary Energy Savings Plan: ECMs (Base Project)	Estimated Installed Hard Costs (1) $	Estimated Annual Savings $	Estimated Simple Payback (years)
Redbank Elementary School			
Redbank ES Interior Lighting (excluding Gyms)	$ 70,958	$ 7,977	8.9
Redbank ES Exterior Lighting	$ 21,196	$ 1,409	15.0
Redbank ES Gym Lighting	$ 7,816	$ 728	10.7
Redbank ES Lighting Sensors	$ 9,258	$ 729	12.7
HVAC System Retrocommissioning	$ 17,438	$ 15,741	1.1
Building Envelope	$ 19,276	$ 2,110	9.1
Walk in Cooler Upgrades	$ 6,526	$ 941	6.9
Green Fields Elementary School			
Greenfields ES Interior Lighting (excluding Gyms)	$ 117,012	$ 10,720	10.9
Greenfields ES Exterior Lighting	$ 28,646	$ 2,144	13.4
Greenfields ES Gym Lighting	$ 4,931	$ 438	11.3
Greenfields ES Lighting Sensors	$ 5,748	$ 341	16.9
HVAC System Retrocommissioning	$ 20,160	$ 33,751	0.6
Building Envelope	$ 29,273	$ 3,242	9.0
Oakview Elementary School			
Oakview ES Interior Lighting (excluding Gyms)	$ 67,354	$ 7,582	8.9
Oakview ES Exterior Lighting	$ 18,384	$ 938	19.6
Oakview ES Gym Lighting	$ 16,980	$ 165	102.9
Oakview ES Lighting Sensors	$ 4,286	$ 226	19.0
HVAC System Retrocommissioning	$ 18,514	$ 6,345	2.9
Building Envelope	$ 23,404	$ 2,350	10.0
VFD Installation CHW	$ 61,196	$ 3,140	19.5
VFD Installation HW	$ 31,611	$ 1,209	26.1
Middle School			
Middle School Interior Lighting (excluding Gyms)	$ 348,080	$ 29,206	11.9
Middle School Exterior Lighting	$ 70,981	$ 5,180	13.7
Middle School Gym Lighting	$ 41,551	$ 1,320	31.5
Middle School Lighting Sensors	$ 16,865	$ 761	22.2
HVAC System Retrocommissioning	$ 22,344	$ 46,742	0.5
Building Envelope	$ 74,263	$ 6,434	11.5
Standby Generator for IT Loads	$ 120,292		
Walk in Cooler Upgrades	$ 8,331	$ 1,212	6.9
High School			
High School Interior Lighting (excluding Gyms)	$ 208,312	$ 23,395	8.9
High School Exterior Lighting	$ 87,603	$ 4,121	21.3
High School Gym Lighting	$ 30,537	$ 654	46.7
High School Lighting Sensors	$ 16,899	$ 416	40.6
HVAC System Retrocommissioning	$ 35,515	$ 40,023	0.9
Building Envelope	$ 34,025	$ 1,760	19.3
Standby Generator for IT Loads	$ 179,789		
Walk in Cooler Upgrades	$ 10,336	$ 966	10.7
All Sites			
PPA Program Capital Funding	$ 960,000	$ -	
Smart Start Rebates (a)	$ 12,483	$ 93,435	0.1
PPA RFP Development and Execution	$ 99,658	29,311	3.4
Energy Procurement (b)	$ 1,376	$ 41,307	0.0
Project Summary:	$ 2,979,205	$ 264,415	11.3

Notes:
(a) Savings not included in Bottom line project summary as savings is not expected for more than 1 year.
(b) Savings not included in Bottom line project summary as savings is not expected for more than 3 years.

This project will pay for itself from the energy and operational savings realized over a 15 year term. Please see the following page for a list of scope included by building.

Fee Category	Fees (1) Dollar ($) Value	Percentage of Hard Costs
Estimated Value of Hard Costs[2]:	$ 2,979,205	
Project Service Fees		
Investment Grade Energy Audit	$ 74,480	2.50%
Design Engineering Fees	$ 163,856	5.50%
Construction Management & Project Administration	$ 148,960	5.00%
System Commissioning	$ 81,928	2.75%
Equipment Initial Training Fees	$ 14,896	0.50%
ESCO Overhead	$ 357,505	12.00%
ESCO Profit	$ 223,440	7.50%
ESCO Termination Fee[3]	$ -	0.00%
Project Service Fees Sub Total	$ 484,121	16.25%
TOTAL PROJECT COSTS:	$ 4,044,271	35.75%

2.2 Cash Flow Analysis

FORM VI

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCOS PRELIMINARY PROJECT COST FORM FOR BASE CASE PROJECT
WEST DEPTFORD BOARD OF EDUCATION
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: Schneider Electric

Note: Respondents must use the following assumptions in all financial calculations:
(a) The cost of all types of energy should be assumed to inflate at **2.4% natural gas, 2.2%** electric per year; and
1. Term of Agreement: 15 years
2. Construction Period (2) (months 14 months
3. Cash Flow Analysis Format:

Project Cost (1) $ 4,044,271 Interest Rate to Be Used for Proposal Purposes: 2.75%

Year	TOTAL SAVINGS (Annual Electric Savings)	Annual Natural Gas Savings	Annaul PPA Savings	Annual O&M Savings	Energy Rebates/ Incentives	Total Annual Savings	Annual Project Costs	Board Costs	Annual Service Costs (3)	Net Cash-Flow to Client	Cumulative Cash Flow
Installation	$ 74,209	$ 22,157		$ 41,307		$ 137,673				$ -	$ -
1	$ 203,710	$ 60,705	$ 29,311	$ 44,518	$ 93,435	$ 338,244	$ 453,917		$ -	$ 22,000	$ 22,000
2	$ 208,192	$ 62,162	$ 29,311	$ 44,518		$ 344,183	$ 322,183		$ -	$ 22,000	$ 44,000
3	$ 212,772	$ 63,654	$ 29,311	$ 3,211		$ 308,948	$ 286,948		$ -	$ 22,000	$ 66,000
4	$ 217,453	$ 65,181	$ 29,311	$ 3,211		$ 315,157	$ 293,157		$ -	$ 22,000	$ 88,000
5	$ 222,237	$ 66,746	$ 29,311	$ 3,211		$ 321,505	$ 299,505		$ -	$ 22,000	$ 110,000
6	$ 227,126	$ 68,348	$ 29,311			$ 324,785	$ 302,785		$ -	$ 22,000	$ 132,000
7	$ 232,123	$ 69,988	$ 29,311			$ 331,422	$ 309,422		$ -	$ 22,000	$ 154,000
8	$ 237,230	$ 71,668	$ 29,311			$ 338,209	$ 316,209		$ -	$ 22,000	$ 176,000
9	$ 242,449	$ 73,388	$ 29,311			$ 345,148	$ 323,148		$ -	$ 22,000	$ 198,000
10	$ 247,783	$ 75,149	$ 29,311			$ 352,243	$ 330,243		$ -	$ 22,000	$ 220,000
11	$ 253,234	$ 76,953	$ 29,311			$ 359,498	$ 337,498		$ -	$ 22,000	$ 242,000
12	$ 258,805	$ 78,800	$ 29,311			$ 366,916	$ 344,916		$ -	$ 22,000	$ 264,000
13	$ 264,499	$ 80,691	$ 29,311			$ 374,501	$ 352,501		$ -	$ 22,000	$ 286,000
14	$ 270,318	$ 82,627	$ 29,311			$ 382,256	$ 360,256		$ -	$ 22,000	$ 308,000
15	$ 276,265	$ 84,610	$ 29,311			$ 390,186	$ 368,186		$ -	$ 22,000	$ 330,000
Totals	**$ 3,574,197**	**$ 1,080,670**		**$ 98,669**	**$ 93,435**	**$ 4,846,971**	**$ 5,000,874**	**$ -**	**$ -**	**$ 330,000**	

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by Board during the construction period.
(3) This figure should equal the value indicated on the ESCO's PROPOSED "FORM V". DO NOT include in the Financed Project Cost
(4) Rebates are not included in financed amount due to uncertainty of Smart Start Program.

2.3 Incentives, Rebates, and Curtailment Services

NJ Clean Energy Program – Smart Start:

Both the Pay for Performance (P4P) and the Smart Start programs were evaluated. Based upon the scope and/or schedule, this project would not qualify for the Pay for Performance Program, but would qualify for Smart Start incentives. The following rebates were calculated for this project:

Scope Item	Amount ($)
Lighting Rebates	$ 91,035
VFD Rebates	$ 2,400

*The Smart Start program is scheduled to change in the summer of 2016. For this reason rebates were not included in the cash flow.

PJM Capacity Market Program (Demand Response):

The capacity market program stems from the need for utilities to balance electric supply with electric demand on the grid. Because there is a finite amount of generating capacity, demand response was created to allow consumers to shed demand when needed by PJM. Consumers must work with Curtailment Service Providers (CSPs) to shed electrical load when needed by PJM, in order to generate revenue. The load-shaving can be done through a variety of measures including energy efficiency, on-site generation, or manual shutdown.

Based upon review of historical demand, it has been deemed that demand response is likely not an option for the District. Accounts typically have to be able to shed several hundred kW to qualify for the program. The only accounts with peak summer demands in excess of 200kw were West Deptford High School and Middle School. The potential Solar PPA combined with the efficiency measures implemented through the ESIP will reduce the peak load contribution and the ability to incorporate demand response for all schools within District.

PJM Energy Efficiency Program:

The Energy Efficiency program is designed to provide financial benefit to the consumer for permanent reductions in electrical load. Examples of energy efficiency projects include upgrading to more efficient lighting, or replacing HVAC systems with more efficient ones, or other ECMs that reduce electrical load.

West Deptford School District will see permanent reductions in peak kW, primarily from the lighting upgrades. Based on these kW reductions, Schneider Electric will help secure rebates for West Deptford School District. Due to the program closing for 2016 very soon, we will engage WDSD in the process in late 2016 for the 2017 program. Because of the unknowns of the 2017 program, no dollar estimates are provided at this time.

3.0 Energy Conservation Measures

3.1 ECM Descriptions

ECM: Lighting Upgrades – LED (includes interior, exterior and lighting sensors)

Overview

This section provides a description of existing lighting systems at West Deptford High School, West Deptford Middle School, Green-Field, Oakview Elementary, and Red Bank Elementary. Throughout the District, the majority of the lamps being used are 32W T8 lamps, with a few T12 fixtures still in use in select areas. In general, lighting will be upgraded to new LED lamps. A description of existing conditions found in each of the schools is provided below.

West Deptford High School

- Two typical lighting systems exist in classrooms:
  - Pendant or surface mounted narrow wraparound fixtures mounted end to end, using (2) T8 lamps in cross section and specular reflectors. Individual rows are switched separately. Light levels range from 50foot candles (fc) to 65fc.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
  - Recessed parabolic troffers using (3) T8 lamps. Switching is typically (2) zones per room, and light levels are between 74fc and 94fc.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- Main gym uses (3) lamp T5 high output (HO) highbays. Light level measured 42fc.
  - Proposed retrofit is new 12,000 lumen LED highbay with integral occupancy sensor.
- Cafeteria uses a system of surface mounted 1x4 luminaires with lenses mounted in rows and (2) T8 lamps in cross section. Light level measured was 39fc. Ceiling appears to be a glue on tile, or spline ceiling, 1x1 tiles.
  - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- The library has been upgraded to new LED recessed 2x2 troffers and LED downlights. Local wall control stations providing dimming throughout the library.
  - No modifications are proposed in the library.
- Offices are illuminated with a variety of fixture types with varying quantities of 32W T8 lamps. The main office has been retrofit with LED 2x4 center basket fixtures. About half of the office category fixture quantities are controlled with wall mounted occupancy sensors.
  - In general, the proposed solution is a lamp for lamp retrofit with low ballast factor ballasts. 2x2 luminaires will be retrofit with reflector kits and new 2' LED lamps. Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Corridors are typically (2) lamp troffers with lenses, spaced 16' on center (in some cases, spacing is 12').
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts, and the addition of ceiling mounted occupancy sensors.
- Bathrooms typically use surface mounted fixtures with (2) or (3) T8 lamps in cross section. A few rooms already utilize wall switch mounted occupancy sensors.

        - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts and the addition of ceiling mounted occupancy sensors.
- Exterior has a variation of HID wall mounted and pole mounted lighting, as well as a series of compact fluorescent surface and recessed canopy luminaires.
    - Some surface mounted wall packs have been replaced with new LED wallpacks by Hubbell. These fixtures will remain as is.
    - Original surface wallpacks are typically 150Watt (W) to 250W High Pressure Sodium (HPS).
        - These luminaires will be replaced with new LED wallpacks, ideally to match the Hubbell wallpack used by the district.
    - Some wallpacks are semi-recessed into the exterior walls, and are estimated at 250W.
        - Proposed solution is to remove these luminaires, install a plate over the opening, and install a surface mounted LED wallpack, ideally to match the existing Hubbell LED wall packs used by the district.
    - Surface and recessed canopy luminaires are proposed to be replaced with low profile LED canopy luminaires.
    - Pole mounted lights are typically cobra heads on mast arms at 250W or 400W. A combination of high pressure sodium and metal halide sources are used.
        - Proposed solution is to replace the cobra head fixtures one for one with 14,000 lumen for the 400W, or 9,000 lumen for the 250W LED shoebox heads.

<u>West Deptford Middle School</u>

- Classroom lighting is typically (2) lamp 1x4 recessed troffers run in rows spaced 5’ to 7’ apart. Switching is zoned per row, up to 3 zones per classroom. Light levels range from 80 to 100+ fc at desk height.
    - This ECM is a lamp for lamp retrofit with low ballast factor ballasts.
- Main gym uses (3) lamp T5HO highbays. Light level was measured 42fc.
    - Proposed retrofit is new 12,000 lumen LED highbay with integral occupancy sensor.
- Cafeteria uses recessed 2x4 troffers with lenses and (4) T8 lamps. Some fixtures appear to have (2) lamps with a specular reflector. Light level measured 30fc at table height.
    - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Library uses recessed 2x4 troffers with lenses and (4) T8 lamps. Light levels ranged from 45fc to 57fc.
    - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Offices are illuminated with a variety of fixture types with (2) to (4) 32W T8 lamping. Some recessed troffers utilize specular reflectors. The board office area uses recessed troffers with inefficient mini-cube parabolic louvers. About half of the office category fixture quantities are controlled with wall mounted occupancy sensors.
    - In general, the proposed solution is a lamp for lamp retrofit with low ballast factor ballasts. Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
    - The recessed fixtures with mini-cube louvers will be retrofit with new volumetric style lens assemblies and (2) LED lamps.
- Corridors are typically (2) lamped troffers with lenses, spaced 12’ on center. These appear to be 4-lamp fixtures with only (2) lamps installed.
        - Proposed solution is a (2) lamp retrofit with low ballast factor ballasts, and the addition of ceiling mounted occupancy sensors.

- Primary fixture type in toilet rooms is a surface mounted wraparound fixture mounted in rows, using (2) lamps in cross section.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts and the addition ceiling mounted occupancy sensors.
- Exterior has a variation of HID wall mounted and pole mounted lighting, as well as a series of compact fluorescent surface and recessed canopy luminaires.
    - Original surface wallpacks are typically 150W to 250W HPS.
        - These luminaires will be replaced with new LED wallpacks, ideally to match the Hubbell wallpack used by the district.
    - Surface and recessed canopy luminaires are proposed to be replaced with low profile LED canopy luminaires.
    - Pole mounted lights are shoebox heads at 250W. Most fixtures are single head on a pole with a small quantity of double-headed poles.
        - Proposed solution is to replace the shoebox fixtures one for one with 9,000 lumen LED shoebox heads.

Oakview Elementary School

- Classroom fixtures are surface mounted narrow wraparound fixtures mounted end to end, using (2) T8 lamps in cross section and specular reflectors. Individual rows are switched separately. Light levels range from 50fc to 57fc.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- Main gym/all purpose room/cafeteria uses (3) lamp T5HO highbays. Light level measured 18-21fc.
    - Proposed retrofit is new 18,000 lumen LED highbay with integral occupancy sensor. This solution is intended to raise light levels 50% to ~35fc.
- The Library uses recessed 2x4 troffers with lenses and (4) T8 lamps on 8'x6' spacing. Light level is 75fc. Local toggle switches provide 3 zones of control.
    - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Offices are illuminated with recessed (2) to (4) lamp troffers with lenses or (2) lamp surface mounted wraparound fixtures. About half of the office category fixture quantities are controlled with wall mounted occupancy sensors.
    - Existing (2) lamp fixtures will receive a lamp for lamp retrofit with low ballast factor ballasts. Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Majority of corridors use (2) lamp recessed troffers with lenses and specular reflectors, spaced 16' apart. Light levels in these corridors are around 20fc. Newer areas of the school utilize (4) lamp recessed troffers with lenses. Light levels range from 22fc to 45fc.
    - (2) lamp fixtures will be retrofit lamp for lamp, with low ballast factor ballasts, and the addition of ceiling mounted occupancy sensors.
    - Existing (4) lamp fixtures will typically be delamped to (2) lamps, with a low ballast factor ballast.
- Toilet rooms typically use recessed (2) lamp and (4) lamp troffers with lenses.
    - (2) lamp fixtures will be retrofit lamp for lamp, with low ballast factor ballasts, and the addition of ceiling mounted occupancy sensors.
    - Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.

- Most exterior wallpacks have been replaced with LED wallpacks. Some ceiling mounted and recessed CFL canopy lights are used, as are 400W HID floodlights for parking lot and field lighting.
    - Remaining HID wallpacks will be replaced with new LED wallpacks, ideally to match the existing LED wallpacks.
    - Floods will be replaced with 10,000 lumen LED floodlights.
    - CFL canopy lights will be replaced with LED low profile surface mounted canopy lights.

Green-Fields Elementary School

- Classroom fixtures are pendant mounted narrow wraparound fixtures mounted end to end, using (2) T8 lamps in cross section and specular reflectors. Individual rows are switched separately. Light levels range from 70fc to 75fc. Some classrooms utilize pendant mounted "Miller" style indirect direct luminaires. Light levels in these rooms are about 60fc.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- Main gym/all purpose room/cafeteria uses recessed LED troffers in the gymnasium space, and suspended linear architectural up/down luminaires with (2) lamps in cross section.
    - Existing LED troffers will remain as-is.
    - Suspended linear fixtures will be retrofit lamp for lamp with low ballast factor ballasts.
- Library lighting has a very "architectural" feel, utilizing a series of suspended linear up/down lights over the stacks and seating areas; recessed 1x4 parabolic troffers using (2) lamps that are stacked vertically in the circulation area; and decorative surface bowl type fixtures using (2) magnetic ballasted 13W CFL lamps in the entry lobby space.
    - Suspended linear fixtures and recessed 1x4 fixtures will be retrofit lamp for lamp with low ballast factor ballasts.
    - Decorative bowl fixtures will be retrofit with new dedicated LED lamp/driver retrofit kits.
- Offices are illuminated with a variety of fixture types with (2) to (4) 32W T8 lamping. Some recessed troffers utilize specular reflectors. Nearly all of the office category fixture quantities are controlled with wall mounted occupancy sensors.
    - In general, the proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
    - Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
    - (3) lamp parabolic fixtures will be retrofit lamp for lamp with low ballast factor ballasts.
- Majority of corridors use (2) lamp recessed troffers with lenses and specular reflectors, spaced 16' apart. Light levels in these corridors are around 20fc. Newer areas of the school utilize (4) lamp recessed troffers with lenses. Light levels range from 22fc to 45fc.
    - (2) lamp fixtures will be retrofit lamp for lamp, with low ballast factor ballasts, and the addition of ceiling mounted occupancy sensors.
    - Existing (4) lamp fixtures will typically be delamped to (2) lamps, with a low ballast factor ballast.
- Primary fixture type in toilet rooms is a surface mounted wraparound fixture.
    - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts and the addition ceiling mounted occupancy sensors.
- About half of the exterior wallpacks have been replaced with LED wallpacks. Remaining wallpacks are 70W to 150W HID. Some ceiling mounted and recessed CFL canopy lights are used, as are 250W HID floodlights for parking lot and field lighting.
    - Remaining HID wallpacks will be replaced with new LED wallpacks, ideally to match the existing LED wallpacks.
    - Floods will be replaced with 7,000 lumen LED floodlights.

- CFL canopy lights will be replaced with LED low profile surface mounted canopy lights.

Red Bank Elementary

- Classroom fixtures are surface mounted narrow wraparound fixtures mounted end to end, using (2) T8 lamps in cross section and specular reflectors. Individual rows are switched separately. Light levels range from 50fc to 80fc.
  - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- Main gym/all purpose room/cafeteria uses (3) lamp recessed troffers and lenses in sloped ceilings. Light level measured 44-58fc.
  - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Library uses recessed 2x4 troffers with lenses and (4) T8 lamps on 8'x6' spacing. Light levels ranged from 60fc-94fc. Local toggle switches provide 3 zones of control.
  - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Offices are illuminated with a variety of surface and recessed fixture types with (2) to (4) 32W T8 lamping. About half of the office category fixture quantities are controlled with wall mounted occupancy sensors.
  - In general, the proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
  - Existing (4) lamp fixtures will typically be retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Corridors are typically (4) lamp recessed troffers with lenses on 14' spacing. Light levels measured between 23fc and 40fc.
  - Proposed solution is to retrofit with reflector kits, delamped to (2) LED lamps, and high ballast factor ballasts.
- Toilet room fixtures are typically surface mounted wraparounds with (2) lamps.
  - Proposed solution is a lamp for lamp retrofit with low ballast factor ballasts.
- Most exterior wallpacks have been replaced with LED wallpacks. Some ceiling mounted and recessed CFL canopy lights are used, as are 175W and 250W HID floodlights for field lighting. Pole mounted cobra head fixtures on mast arms are used for parking areas, using 250W and 400W metal halide lamping.
  - Remaining HID wallpacks will be replaced with new LED wallpacks, ideally to match the existing LED wallpacks.
  - Floods will be replaced with 5,000 lumen and 7,000 lumen LED floodlights.
  - CFL canopy lights will be replaced with LED low profile surface mounted canopy lights.
  - Cobra head fixtures will be replaced one for one with 14,000 lumen for the 400W, or 9,000 lumen for the 250W LED shoebox heads.

Scope

For the facilities noted above, interior and exterior lighting will be upgraded to LED. Please note that the high school auditorium metal halide lighting will not be included in this project. The low number of burn hours for that lighting system increased the payback of the scope. For a detailed scope of work for all spaces, please see lighting line by lines located in the Appendix.

ECM: HVAC System Retrocommissioning

Overview

The following items were identified during Schneider Electric's survey.

- Energy Recovery Wheels – A number of units were identified with broken drive belts. Schneider Electric will work with the Director of Facilities to ensure each energy recovery wheel is working correctly.
- Set point addition – The building automation system will be modified to include a set point for second shift staff. This set point will allow the building to drift but maintain a reasonable level of comfort. Current savings assume a 65°F heating and 76°F cooling set point for second shift employees.
- Optimal Start/Stop – Equipment start times are normally set earlier than necessary to ensure proper comfort is maintained even during hot or cold weather. The Optimal Start feature automatically compensates building start times for changes in weather. If weather is extreme, then equipment is started early enough to properly condition the building before it is occupied. During mild weather, equipment start times can be delayed to obtain more energy savings.
- Demand Controlled Ventilation – Demand controlled ventilation is a means of reducing the outdoor air being delivered to the buildings to meet the actual occupancy density. The carbon dioxide levels will be continuously measured in the building and outside air and the ventilation rate adjusted to maintain between indoor and outdoor carbon dioxide levels. The table below shows the differences between constant ventilation airflow and demand controlled ventilation airflow for a typical office building.

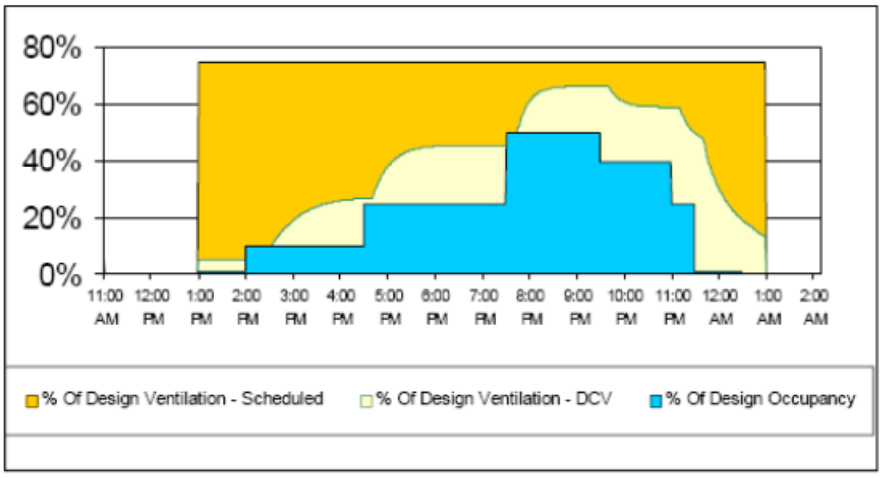


Figure 1 - Comparison of ventilation rates for different system designs

As seen in the Figure above, matching the ventilation airflow to the actual building occupancy can conserve a considerable amount of ventilation airflow and the energy necessary to condition that ventilation air.

This ECM is applicable to the following schools the table below further explains locations and current outdoor air:

- West Deptford High School
- Oakview Elementary School
- Green-Fields Elementary School
- Red Bank Elementary School

School	Location	Current OA CFM
WD High School	Gym	2,696
WD High School	Auditorium	5,000
WD High School	Library	1,629
WD High School	Cafeteria/Kitchen	4,000
Oakview Elementary School	Gym	2,970
Green-Fields Elementary	Café/Gym	2,244
Red Bank Elementary	Gym/Café/Multi-Purpose	6,000

ECM: Building Envelope

Overview

This ECM addresses the shell of the building and how well it is keeping conditioned air in and ambient air out. Our onsite testing and analysis of energy consumption indicate there is an opportunity to improve the indoor air quality, occupant comfort, and energy use by upgrading the existing air barrier systems. A tighter Building Envelope will provide the following advantages:

- Drafts will be reduced providing greater comfort for the building occupants. A tighter building envelope will lower the possibility of “hot” or “cold” spots brought on by unconditioned air infiltrating into conditioned spaces.
- Decreased Energy Consumption - Less conditioned air will be lost through the building envelope and the Heating and Cooling equipment will operate less to maintain the set point of the conditioned space. This will decrease the energy consumed and save on energy costs.
- Improved Air Quality – Decreasing infiltration of contaminated air promotes less humidity and greater air quality. This allows for the existing systems to run at peak performance and maintain the highest level of air quality for the occupants.
- Reduced Maintenance Costs – Reducing the “runtime” will increase the operating life of the heating and cooling equipment and increase the performance of new equipment.

Scope

The following is a breakout of the Weather Sealing scope by facility:

Infiltration Scope of Work Summary				
Buildings	# Door-Kits for Weather-stripping + Sweeps	Acrylic Latex Caulk Windows & Doors (Linear Feet)	Penetrations, Hatches	Wall Joints (SPF) Linear Feet
West Deptford High School	36	0	0	735
West Deptford Middle School	28	0	0	2,602
Green Fields Elementary	13	0	8	1,113
Oakview Elementary	17	0	0	1,019
Red Bank Elementary	14	0	18	848
TOTAL	108	0	26	6,317

ECM: VFD Installations at Oakview

Overview

VFDs allow pump motors to slow down and thus save energy. The piping and valve arrangements at Oakview Elementary school allow for low cost installations.

Scope

Schneider Electric proposes installing and/or validating new variable speed drives on the following motors at Oakview Elementary School.

- (2) 20 horsepower chilled water pumps
- (2) 7.5 horsepower hot water pumps

In addition, the following valves will be installed and/or validating to allow flow be reduced.

- (2) 2-way chilled water valves in the gymnasium

Figure M3: Existing 20HP chilled water pumps

ECM: Energy Procurement

Observations

West Deptford Public Schools currently purchases electricity with the ACES consortium. During Schneider Electric's review, three major accounts were found to be procuring energy directly from PSEG. We recommend that West Deptford procure energy through the New Jersey Energy Consortium, NJEC.

Scope

Schneider Electric has administered a preliminary RFP to identify current market conditions and believes based on the results, the best way to proceed is for West Deptford to release a formal RFP. Schneider Electric will work with West Deptford School District to secure the best overall energy rate through the NJEC.

ECM: Standby Generation for IT Loads

Observations

The multiple power interruptions to servers cause operations issues at the High School and Middle School. The addition of a natural gas generator along with Un-interruptible Power Supply, UPS(s) will provide continuous power to the servers when the building is without power. Since servers are located at the High School and Middle School that in combination allow students and faculty to access the resources on the Districts servers, standby generators will be installed at both locations.

Scope

Middle School

- Provide natural gas generator, extend gas piping from mechanical room and provide new electrical distribution and transfer switch. A 30KW Genset is planned which will power the servers through the existing UPS's, server room lights, telephone system, and associated room cooling system. There will be spare circuit breaker capacity in the panelboard.

High School

- Provide a mini-split air conditioning unit to cool the space since the existing 2 ton unit does not have sufficient cooling capacity. A 30kW natural gas generator with distribution components, concrete pad, bollards, and piping will be provided. This will provide power to the servers through the existing UPS's, sever room lights, telephone system and the new cooling system. Additionally, a new 3 ton Mini-split system Air Conditioner for IT area will be installed.

Please refer to the Appendix for preliminary drawings.

ECM: Solar Power Purchase Agreement (PPA) and PPA Program Capital Funding

Observations

West Deptford School District has an opportunity to secure savings by entering into a power purchase agreement. A PPA lowers the cost of conventional utility power since power generated by the solar system is at a lower cost.

Scope

Schneider Electric has administered, on behalf of West Deptford School District, a Request for Proposal (RFP) for a solar PPA. With cooperation from members of the West Deptford BOE, National Energy Partners was selected as the most qualified firm for the district to move forward with. Their RFP response is available upon request.

The PPA Program Capital Funding shown in form II will help cover the costs of the following for the solar power purchase agreement.

- Photovoltaic panels
- Inverters
- Interconnections
- Trenching
- Roofing work
- Design of Panels
- Engineering
- Permitting
- Interconnection agreements
- Construction management
- Equipment operation

ECM: Walk in Freezer

Overview

The walk-in coolers and freezers utilize an indoor evaporator, outdoor condensing unit, and electric door heaters to maintain the cooler and freezer temperatures and the door surface temperatures to avoid condensation and ice formation. This measure will install efficient Electronically Commutated Motors (ECM) on the indoor evaporator fans to replace the permanent split capacitor (PSC) motor. The ECM motor is able to maintain an efficiency of 65-75% versus a PSC motor of 12-45% efficiency. The electric door heaters currently are “on” all the time. This measure will also install a controller that measures the ambient temperature and relative humidity. It performs internal calculations to pulse the electrical power to the heaters such that the surfaces are kept above the temperature where moisture will form on the cooler and freezer door jambs and surrounding surfaces.

Scope

High School, Middle School, Red Bank

- The cooler and freezer evaporators will have their motors replaced with ECM motors
- The door heaters will be controlled to reduce the input power while keeping the temperature above the point where moisture will form on the door jamb surfaces.

3.2 ECMs Evaluated But Not Included

A wide variety of energy conservation measures and facility improvements were evaluated throughout the IGA. The following list contains ECMs that were investigated but ultimately were not included in the final project.

West Deptford High School

- HVAC cooling in Gym/Locker
- HVAC cooling in kitchen
- Destratification Fans

West Deptford Middle School

- Kitchen Exhaust Hood (Fan Control)
- Optimize VFDs by Installing Valving at Units
- Window Film
- Destratification Fans

Green-Fields Elementary

- Lighting Upgrades (T8)
- Kitchen Exhaust Hood (Fan Control)
- Destratification Fans
- Solar Thermal DHW
- Window Film

Oakview Elementary

- Lighting Upgrades (T8)
- Kitchen Exhaust Hood (Fan Control)
- Destratification Fans
- Solar Thermal DHW
- Window Film

Red Bank Elementary

- Lighting Upgrades (T8)
- Kitchen Exhaust Hood (Fan Control)
- Destratification Fans
- Solar Thermal DHW
- Window Film

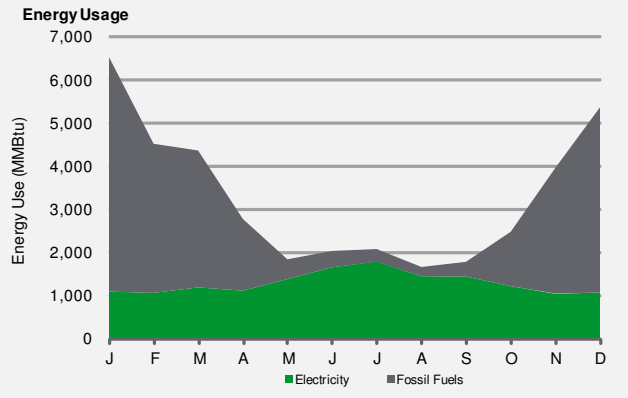
4.0 Energy Savings

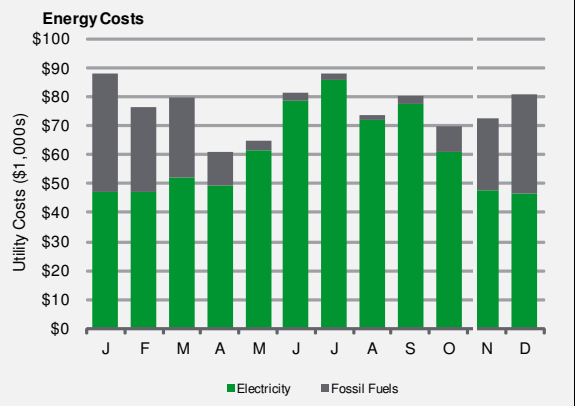
4.1 Baseline Energy Use

This baseline includes all schools and supporting facilities with the exception of the administration building. This was created by taking several years of utility data and performing the following:

- Prorating the usage into clean monthly bins
- Weather normalizing the baseline to represent a typical meteorological year

	Electricity			Fossil Fuels		Energy Total	
Month	Energy Use	Billed Demand	Cost	Energy Use	Cost	Energy Use	Cost
mmm	*kWh*	*kW*	*$*	*Therms*	*$*	*Mbtu*	*$*
Jan	318,945	848	$47,035	54,630	$41,025	6,551	$88,060
Feb	309,549	997	$47,319	34,763	$28,900	4,533	$76,219
Mar	346,536	1,133	$52,170	31,880	$27,470	4,370	$79,640
Apr	324,505	1,003	$49,396	16,681	$11,619	2,775	$61,015
May	403,774	1,329	$61,486	4,588	$3,569	1,836	$65,054
Jun	484,348	1,489	$78,339	3,785	$2,834	2,031	$81,174
Jul	522,527	1,369	$85,509	2,931	$2,305	2,076	$87,814
Aug	423,420	1,315	$71,697	2,141	$1,872	1,659	$73,569
Sep	420,316	1,608	$77,476	3,465	$2,844	1,781	$80,320
Oct	356,278	1,239	$60,893	12,616	$8,837	2,477	$69,730
Nov	304,737	1,060	$47,613	29,256	$25,122	3,965	$72,735
Dec	312,394	930	$46,760	43,155	$34,271	5,381	$81,031
Year	4,527,329	14,321	$725,693	239,891	$190,668	39,436	$916,361





Annual Energy Summary - Per Site							
	Energy Baseline				Cost Baseline		
Building Title	Electricity	Natural Gas	Total Energy	Electricity	Electricity	Natural Gas	Total
Name	*kWh*	*Mbtu*	*Mbtu*	*kW*	*$*	*$*	*$*
Green-Fields Elementary School	655,829	3,333	5,638	2,157	$110,831	$32,570	$143,401
Oakview Elementary	505,201	2,677	4,455	1,449	$76,888	$21,519	$98,407
Red Bank Elementary School	432,748	1,809	3,322	1,510	$75,156	$13,632	$88,788
West Deptford High School	1,616,016	8,382	14,060	4,532	$242,497	$65,805	$308,302
West Deptford Middle School	1,317,535	7,317	11,961	4,674	$220,321	$57,142	$277,464
Total	4,527,329	23,519	39,436	14,321	$ 725,693	$ 190,668	$ 916,361

4.2 Energy Savings

The following table highlights projected energy savings as a result of implementing the recommended measures.

Energy Cost Savings

Energy and Water Indices

	Energy	Cost
	kBtu/ft2	*$/ft2*
Baseline	100.2	$2.36
Post Project	64.0	$1.83
% Savings	**36.1%**	**22.3%**

Project Summary

Project	Electricity Energy Use	Electricity Actual Demand	Fossil Fuels Energy Use	Energy Total Cost
Phase	*kWh*	*kW*	*Mbtu*	*$*
Baseline	4,527,329	14,321	23,519	$916,361
Post Project	3,025,452	11,715	14,583	$711,835
Projected Savings, Units	**1,501,877**	**2,606**	**8,936**	**$204,526**
Projected Savings, %	**33.2%**	**18.2%**	**38.0%**	**22.3%**

1) Does not include Energy Procurement
2) Does not include O&M Savings, rebates or PJM

To estimate savings from the proposed project, Schneider Electric used engineering formulas and modeling software. We used Excel spreadsheets to accurately quantify savings for measures that have low interactivity. For measures that are significantly affected by interactions of different components, such as the controls ECM, Schneider Electric utilized eQuest. eQuest is a software program that was developed through funding by the United States Department of Energy (USDOE) and is the preferred tool for energy modeling in the energy performance contracting industry. Using this modeling tool allows for the unique ability to model existing conditions and proposed retrofits to assess potential energy savings.

Please refer to the Appendix for detailed savings calculations for each ECM.

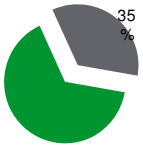
This graphic depicts savings by unit for each ECM.

Savings Summary							
School Name	Energy Conservation Measure	Electric	Electric	NG	Electric	NG	O&M
name	*name*	*kWh*	*KW*	*Therm*	*$*	*$*	*$*
Redbank ES	Redbank ES Interior Lighting (excluding Gyms)	49,471	202	(305)	$ 8,160	$ (183)	$ 644
Redbank ES	Redbank ES Exterior Lighting	10,074			$ 1,409		
Redbank ES	Redbank ES Gym Lighting	5,104	20	(179)	$ 836	$ (108)	
Redbank ES	Redbank ES Lighting Sensors	5,248	7	(102)	$ 790	$ (61)	
Redbank ES	HVAC System Retrocommissioning	85,590	(62)	6,961	$ 11,550	$ 4,191	
Redbank ES	Building Envelope	9,683		1,257	$ 1,354	$ 756	
Redbank ES	Walk in Freezer	6,401	7		$ 941		
Green Fields ES	Greenfields ES Interior Lighting (excluding Gyms)	73,325	298	(1,365)	$ 12,010	$ (1,290)	$ 644
Green Fields ES	Greenfields ES Exterior Lighting	15,330			$ 2,144		
Green Fields ES	Greenfields ES Gym Lighting	2,930	12	(44)	$ 480	$ (42)	
Green Fields ES	Greenfields ES Lighting Sensors	2,791		(52)	$ 390	$ (49)	
Green Fields ES	HVAC System Retrocommissioning	118,625	(21)	18,457	$ 16,306	$ 17,446	
Green Fields ES	Building Envelope	12,226		1,621	$ 1,710	$ 1,532	
Oakview ES	Oakview ES Interior Lighting (excluding Gyms)	48,816	189	(998)	$ 8,184	$ (602)	$ 644
Oakview ES	Oakview ES Exterior Lighting	11,680			$ 938		
Oakview ES	Oakview ES Gym Lighting	1,031	4	(29)	$ 182	$ (17)	
Oakview ES	Oakview ES Lighting Sensors	2,674	1	(66)	$ 266	$ (40)	
Oakview ES	HVAC System Retrocommissioning	54,180	(51)	5,003	$ 3,371	$ 2,974	
Oakview ES	Building Envelope	4,243		3,224	$ 416	$ 1,934	
Oakview ES	VFD Installation CHW	19,682	68		$ 3,140		
Oakview ES	VFD Installation HW	14,716	24	(821)	$ 1,706	$ (497)	
Middle School	Middle School Interior Lighting (excluding Gyms)	174,841	901	(1,746)	$ 30,253	$ (1,047)	$ 644
Middle School	Middle School Exterior Lighting	37,035			$ 5,180		
Middle School	Middle School Gym Lighting	8,032	33	(18)	$ 1,331	$ (11)	
Middle School	Middle School Lighting Sensors	5,062	12	(50)	$ 791	$ (30)	
Middle School	Building Envelope	32,897		3,055	$ 4,601	$ 1,883	
Middle School	Standby Generator for IT Loads						
Middle School	HVAC System Retrocommissioning	226,953	248	22,369	$ 33,327	$ 13,416	
Middle School	Walk in Freezer	7,813	19		$ 1,212		
High School	High School Interior Lighting (excluding Gyms)	154,747	556	(2,642)	$ 25,046	$ (1,651)	$ 644
High School	High School Exterior Lighting	54,989			$ 4,121		
High School	High School Gym Lighting	4,358	16	(86)	$ 708	$ (54)	
High School	High School Lighting Sensors	4,319	5	(101)	$ 479	$ (63)	
High School	HVAC System Retrocommissioning	212,244	81	34,249	$ 18,752	$ 21,271	
High School	Building Envelope	6,789		1,770	$ 662	$ 1,098	
High School	Standby Generator for IT Loads						
High School	Walk in Freezer	7,145	11		$ 966		
All Sites	Smart Start Rebates				$ 93,435		
All Sites	Energy Procurement				$ 41,307		
	Solar PPA Savings				$ 33,636		
All	Total Savings	1,491,044	2,579	89,362	$ 372,089	$ 60,756	$ 3,220

4.3 Environmental Impact

The following graphic shows the environmental impact of the project.

Environmental Benefits			
	Scope 1	Scope 2	
Total Energy (Mbtu)	23,989	15,452	-
Total Emission (Tons CO_2e)	1,400	3,024	-
Total Savings (Tons CO_2e)	527	1,003	-



Savings

1,530
eTons GHG

329
Cars Removed

197
Equivalent Houses

* Emissions factors are derived from EPA eGrids database and represent the Sub Region of USA
Totals include 5 Project Sites and a total of 49 ECMs
Scope 1 emissions reflects the direct emissions
Scope 2 emissions are indirect emissions
GHG: Greenhouse Gas

5.0 Performance Assurance Support Services (PASS)

The purpose of the Performance Assurance Support Services is to measure, verify, and provide the necessary support services to sustain savings over time. Per NJ ESIP law, the PASS Agreement must be a separate contract from the ESIP Construction Contract. This section includes a description of the proposed M&V Methodology and PASS Agreement.

5.1 Description of Services

The following is a description of services and terms that are used within this section.

Measurement and Verification Services with Savings Reporting (Option A)

The International Performance Measurement & Verification Protocol (IPMVP) was created to determine standards and best practices in the measurement & verification of energy efficiency investments. The IPMVP Option A, Partial Retrofit Isolation, involves a pre and post measurement of a single variable used to determine energy savings.

Commission and Verify (C&V)

This process is used to qualify and validate the installation, function, operation and performance of ECMs. The protocol consists of a planned process with a deliberate combination of steps which systematically identify, test and challenge various key aspects used to verify the performance objectives of an installed ECM against an established design criterion. Benefits include an improved controls interface, reduced energy demand and consumption, and improve occupancy comfort.

Resource Advisor

Resource Advisor is Schneider Electric's enterprise-level application providing secure access to data reports and summaries to drive the District’s energy and sustainability programs. Resource Advisor combines quality assurance and data capture capabilities of utility information into one energy management solution.

5.2 Measurement & Verification (M&V) Plan

The following is an outline of the recommended M&V options by facility.

	Recommended M&V Option	Commission & Verify Activities
West Deptford High School	Option A Lighting, Stipulate O&M, Energy Procurement, Solar PPA, Commission & Verify BAS and Envelope	Yes
West Deptford Middle School	Option A Lighting, Stipulate O&M, Energy Procurement, Solar PPA, Commission & Verify BAS and Envelope	Yes
Redbank Elementary School	Option A Lighting, Stipulate O&M, Commission & Verify BAS and Envelope	Yes
Green-Fields Elementary School	Option A Lighting, Stipulate O&M, Solar PPA, Commission & Verify BAS and Envelope	Yes
Oakview Elementary School	Option A Lighting, Stipulate O&M, Commission & Verify BAS and Envelope	Yes

5.3 Ongoing Maintenance

Under the New Jersey ESIP legislation, all maintenance contracts are required to be procured separately from the ESIP. Schneider Electric will properly commission all equipment, provide training, review manufacturer maintenance requirements, and provide an owner's manual to ensure proper maintenance of the equipment.

Schneider Electric will work with West Deptford BOE to ensure the energy recovery bands are checked when filters are changed (approximately 3-4 times a year). A single training session will be held for West Deptford staff members.

6.0 Implementation

6.1 Design & Compliance Issues

This project was calculated using the proper Building Codes, Energy Codes, and Electrical Codes. Safety is of the utmost important to Schneider Electric, not only for the customer, but also for our employees and subcontractors. We will comply with all the required safety codes and protocols to ensure a successful implementation.

6.2 Assessment of Risks

This assessment of risks is meant to provide the customer an idea of the potential risks that could lie with the ESIP project. By no means is this an effort to eliminate responsibility of the ESCO to provide an Energy Savings Plan that meets industry standards of engineering, energy analysis, and expertise. This is included to allow the customer to know where potential failure points could be that would result in savings not being achieved.

- If the actual operation of the buildings deviates significantly from the parameters outlined in the Energy Savings Plan with respect to temperature set-points and time of occupancy, then energy savings will be affected. Lighting and space temperature savings are based on a current occupancy and usage derived from data loggers placed in the buildings over a specific period of time. The temperature set-points used to derive energy savings were within the parameters of the District's guidance. Should that policy change, it could affect energy savings.

- Building Automation System sequences of operation must not be over-ridden or changed permanently. Over-rides are certainly permitted for maintenance or special occasions but must be re-set to maintain energy savings.

- Demand Controlled Ventilation will provide the proper ventilation required by building codes at a minimum energy usage. Savings are based on an assumed level of existing ventilation.

7.0 Appendices

7.1 Savings Calculations & Documentation

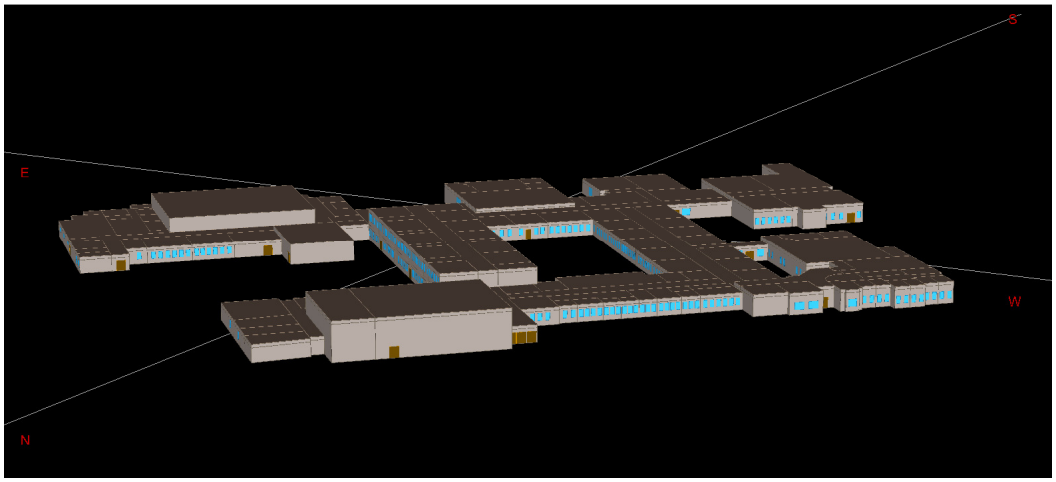
Cost savings methodology.

A detailed rate tariff simulation was used to calculate final savings to ensure the highest level of accuracy possible when predicting dollar savings. Please see the appendix for more information.

eQuest modeling

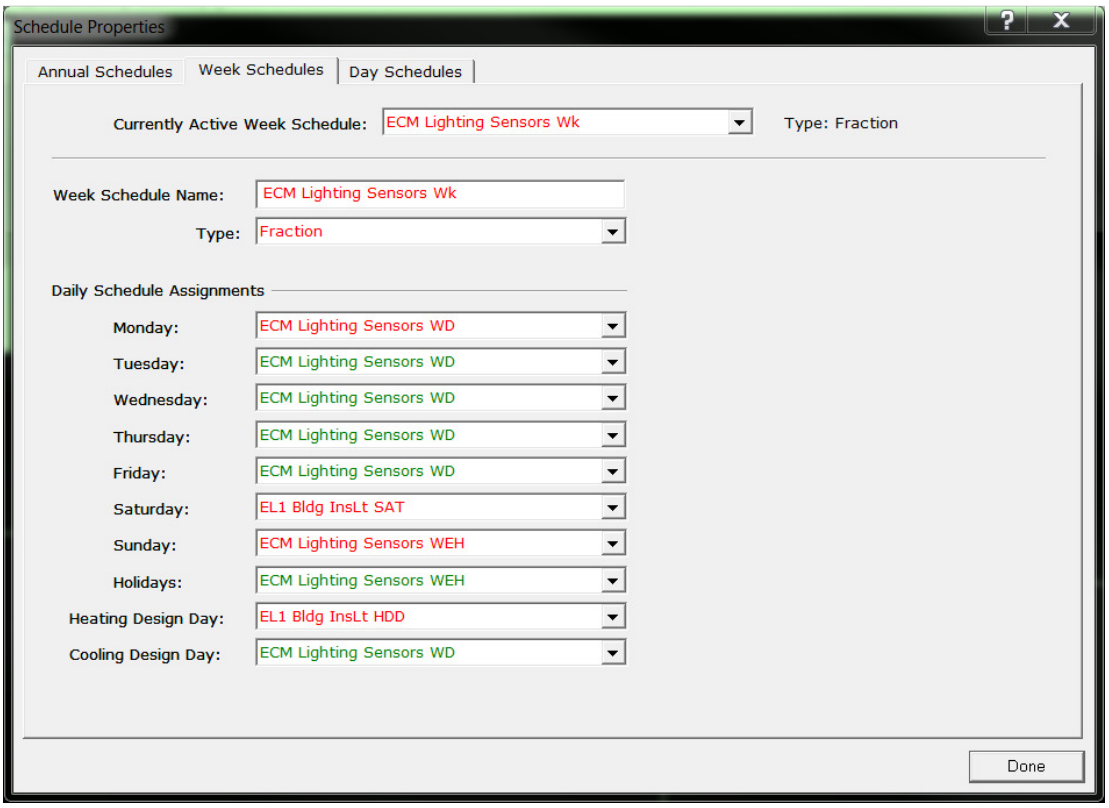
To estimate savings, Schneider Electric modeled energy use of buildings using eQuest. eQuest was developed through funding by the United States Department of Energy (USDOE) and is used as the preferred tool for energy modeling in the industry. This modeling tool provides the unique ability to model current conditions, including combined heat and power, and proposed retrofits in order to assess energy savings.

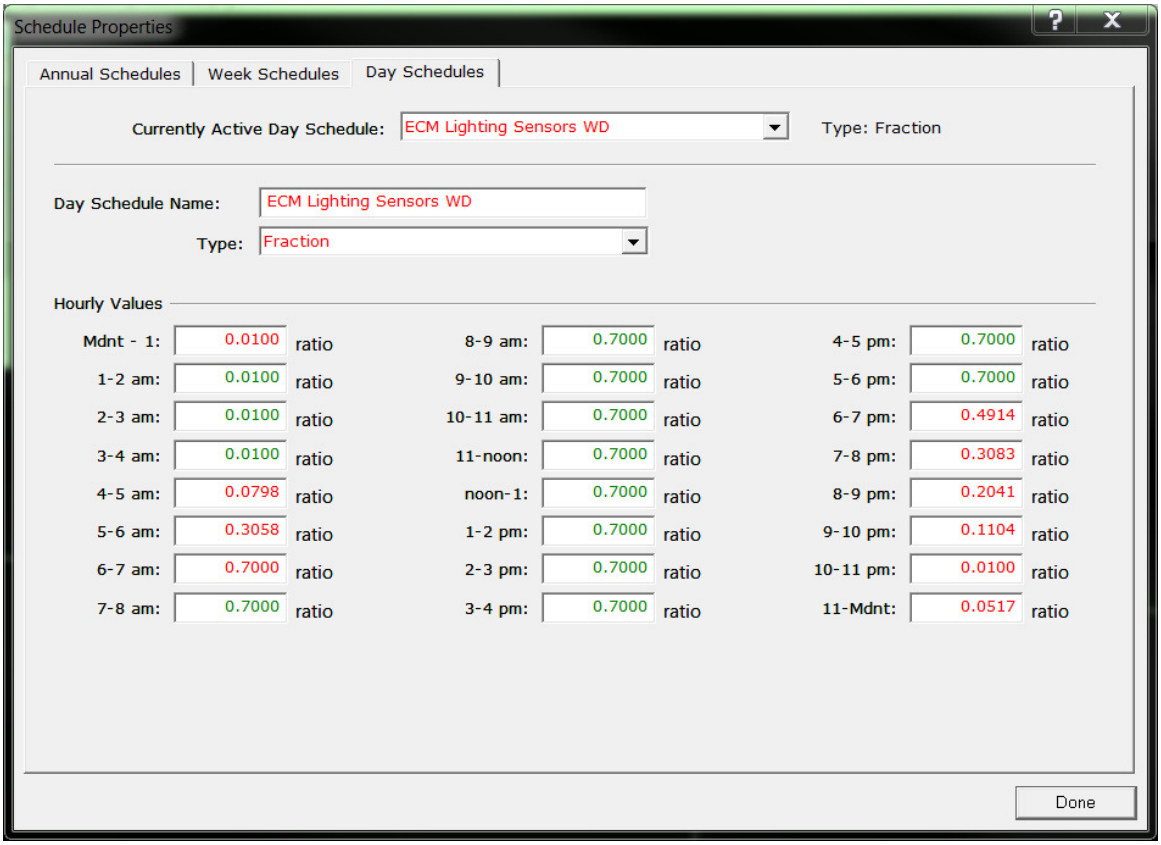
Spaces are defined by their construction to determine thermal conductivity and mass for heat loss/gain calculations. Also included are ventilation rates, lighting, equipment, and occupant loads and schedules. Individual spaces or groups of spaces are assigned to thermal zones that are served by an air distribution system. A thermal zone is defined by the conditioned area that is served by one thermostat controlling one terminal device (if applicable). Systems may include either a central air handler or distributed equipment such as water source heat pumps. Systems are then assigned to a loop that serves heating and/or cooling coils. Loops can include chillers, cooling towers, boilers, ground source wells, and all associated pumps. Plants are then assigned to a building. Below is a screen shot of West Deptford High School.



Defining accurate schedules is imperative to creating an accurate model. Schedules are used to describe when and to what capacity the building is operated and occupied. Varying load levels and runtime for

lighting, electrical equipment, occupancy, ventilation, fans, and temperature set-points are all modeled through the use of schedules. Below are two screen shots showing a typical lighting schedule.



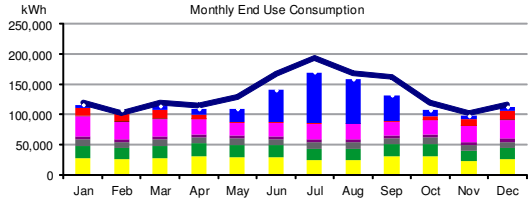


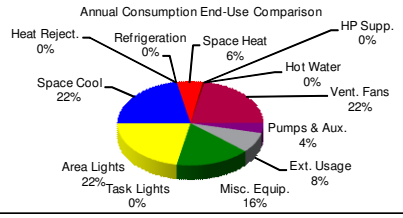
Calibrating the Model

In order to accurately predict the energy and demand savings of the project, the model must be calibrated to replicate closely the energy and demand use profiles of the baseline building. This is accomplished by first running the model as constructed. These results are then compared to the baseline energy consumption data described above to assess how closely the model matches the baseline. After examining the results, it becomes apparent where energy or demand is too high or too low and where adjustments may need to be made. The end goal is replicating all parameters such as electric energy, electric demand, and gas use to align simultaneously. These parameters typically involve adjusting operating schedules, internal loads, equipment efficiencies, and temperature set-points. The calibration process typically requires between fifteen and twenty iterations (possibly more for complex models) in order to achieve a satisfactorily calibrated model. The following graphic shows the output of the energy model vs. baseline for West Deptford High School.

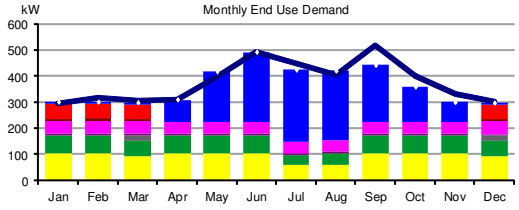
Electricity Data

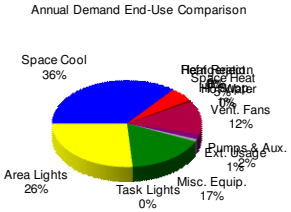
Electric Consumption														kWh
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	1
Space Cool	5,328	4,909	6,035	8,717	21,112	53,936	85,155	73,625	43,630	9,808	5,563	5,671	323,490	Space Cool
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0	Heat Reject.
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0	Refrigeration
Space Heat	12,859	13,529	14,830	7,584	1,885	320	102	353	773	6,851	10,812	15,041	84,938	Space Heat
HP Supp.	1,798	1,461	826	106	0	0	0	0	0	99	661	1,187	6,138	HP Supp.
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0	Hot Water
Vent. Fans	33,103	29,420	29,353	25,822	21,497	23,194	26,631	26,209	22,529	24,112	26,603	30,951	319,424	Vent. Fans
Pumps & Aux.	5,001	4,511	4,971	4,807	4,951	4,766	4,932	4,933	4,770	4,963	4,812	4,975	58,390	Pumps & Aux.
Ext. Usage	9,672	8,736	9,672	9,360	9,672	9,360	9,672	9,672	9,360	9,672	9,360	9,672	113,880	Ext. Usage
Misc. Equip.	20,748	19,159	20,748	21,885	21,248	20,795	19,305	19,305	21,433	21,748	17,885	19,748	244,004	Misc. Equip.
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0	Task Lights
Area Lights	27,549	25,811	27,549	30,661	28,656	28,203	24,255	24,255	29,643	29,763	21,802	25,334	323,482	Area Lights
Total	**116,058**	**107,537**	**113,983**	**108,942**	**109,021**	**140,574**	**170,051**	**158,351**	**132,138**	**107,016**	**97,498**	**112,578**	**1,473,746**	Total Model
Utility Baseline	119,142	101,672	119,707	114,489	129,396	167,114	193,897	168,079	162,905	119,976	102,648	116,991	1,616,016	Utility Baseline
Error	-3%	6%	-5%	-5%	-16%	-16%	-12%	-6%	-19%	-11%	-5%	-4%	-9%	





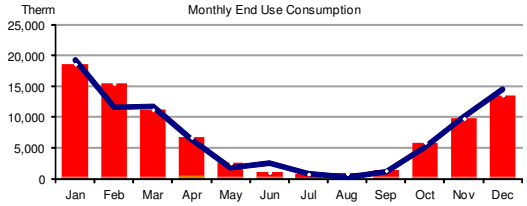
Electric Demand														kW
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	1
Space Cool	7	7	7	87	194	270	278	266	219	136	76	7	1,555	Space Cool
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0	Heat Reject.
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0	Refrigeration
Space Heat	57	57	57	0	0	0	0	0	0	0	0	56	228	Space Heat
HP Supp.	8	8	8	0	0	0	0	0	0	0	0	8	33	HP Supp.
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0	Hot Water
Vent. Fans	48	48	48	44	44	44	44	44	44	44	44	48	542	Vent. Fans
Pumps & Aux.	7	7	7	7	7	7	6	7	7	7	7	7	81	Pumps & Aux.
Ext. Usage	0	0	20	0	0	0	0	0	0	0	0	20	39	Ext. Usage
Misc. Equip.	68	68	59	67	67	67	38	45	67	67	68	59	743	Misc. Equip.
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0	Task Lights
Area Lights	105	105	93	105	105	105	58	58	105	105	105	93	1,143	Area Lights
Total	**301**	**301**	**298**	**310**	**417**	**493**	**424**	**420**	**442**	**359**	**300**	**297**	**4,363**	Total Model
Utility Baseline	297	318	308	311	398	492	450	406	517	400	332	302	4,532	Utility Baseline
Error	1%	-5%	-3%	0%	5%	0%	-6%	3%	-15%	-10%	-10%	-2%	-4%	

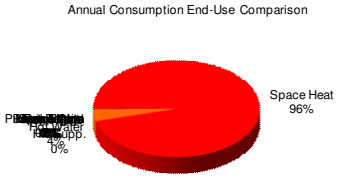




Natural Gas Energy Data

Natural Gas Consumption														Therm
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	E 100
Space Cool	0	0	0	0	0	0	0	0	0	0	0	0	0	Space Cool
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0	Heat Reject.
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0	Refrigeration
Space Heat	18,200	15,078	10,801	6,272	2,205	758	626	734	1,061	5,566	9,516	13,249	84,064	Space Heat
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0	HP Supp.
Hot Water	364	356	379	421	359	248	131	120	260	314	240	308	3,500	Hot Water
Vent. Fans	0	0	0	0	0	0	0	0	0	0	0	0	0	Vent. Fans
Pumps & Aux.	9	8	10	11	12	12	12	12	11	11	10	10	126	Pumps & Aux.
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0	Ext. Usage
Misc. Equip.	4	4	4	5	4	3	1	1	4	4	3	4	42	Misc. Equip.
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0	Task Lights
Area Lights	0	0	0	0	0	0	0	0	0	0	0	0	0	Area Lights
Total	**18,576**	**15,446**	**11,194**	**6,708**	**2,580**	**1,021**	**770**	**867**	**1,336**	**5,895**	**9,769**	**13,570**	**87,732**	Total Model
Utility Baseline	19,276	11,668	11,747	6,437	1,710	2,562	889	273	1,134	5,221	10,103	14,480	85,499	Utility Baseline
Error	-4%	32%	-5%	4%	51%	-60%	-13%	218%	18%	13%	-3%	-6%	3%	





Modeling the ECMs

After the model has been calibrated, changes are made to the model, which represent implementation of the proposed scope conditions of the energy and water conservation measure. ECMs are implemented and run individually to assess the energy savings of each ECM. All ECMs are modeled with consideration to potential overlap inflating modeled savings. ECMs are run sequentially, building upon each other. The result is a more accurate estimate of savings than if each ECM were run in comparison to the baseline.

ECMs outside of Energy Model

Some ECMs by nature do not fit well within the energy models. For example, savings from weather sealing or walk in freezer scope can be more accurately calculated by specialized approaches. When this is the case, in-house built tools are used to accurately estimate savings.

Building Envelope

Schneider Electric uses typical meteorological year (TMY) weather data, draft pressure, internal space temperatures (both occupied and unoccupied), and crack size to conduct savings calculations. Schneider Electric follows ASTM E1186-03 Standard Practices for air leakage in building envelope. ASHRAE Fundamentals 16.23-48 was used to calculate the flow rate and crack method for all envelope calculations.

Walk in Freezer Scope

Please refer to the appendices for more information regarding the savings calculations.

7.2 Lighting Line-By-Lines and Data Logger Reports

Please refer to the appendices for this detailed information.

7.3 Local Government Energy Audit (LGEA) from Concord Engineering Group

The LGEA has not been attached to this report, but can be provided upon request.

7.4 Blank Rebate Applications

The Smart Start Rebate Applications have not been attached to this report, but can be provided upon request. They will be filled out and processed upon award of contract and completion of work.

7.5 Drawings and Sketches

The drawings in the Appendix have been provided for reference.

7.6 Maintenance Savings

The Maintenance savings shown in financial Form VI consist of two parts.

Energy Procurement

Savings from this measure were used in the financial form for only two years plus construction. Per BPU rules the savings cannot be carried for any term longer than the supply contract. The school has used NJEC to find a supplier and has entered into an agreement on 6/1/2016 for a rate of $0.09911/kWh.

Savings were calculated by taking the post project consumption and multiplying it by the rate difference.

These rate savings are only applicable for the following schools and their current rates.

Energy Procurment Savings				
School	Post ESIP usage (1)	Pre Rate	Post Rate	Savings
name	kWh	$/kWh	$/kWh	$
High School	1171424	0.11250	0.09911	$ 15,687
Middle School	824903	0.12344	0.09911	$ 20,070
Oakview	348179	0.11505	0.09911	$ 5,550
Notes (1) Excludes PPA savings. Saving for PPA based off of post Energy Procurment Rate.				

Lighting Maintenance Savings

Savings from this measure were used in the financial form for years one through five. As part of this project the school will receive new lighting with a minimum of a five year warranty.

Maintenance savings were calculated by taking the average of the last two years worth of lighting purchases.

7.7 PPA Contract

Please see the attached 7.7 appendicle for the executed contract. All PPA Savings were based off the new NJEC supply rates plus other per kWh charges shown in the PSEG/distribution portion of the bill.

PPA Savings Calculation				
School	PPA Production	Pre Rate	PPA Rate	Savings
name	kWh	$/kWh	$/kWh	$
High School	587,730	0.12012	0.10500	$ 8,884
Middle School	749,892	0.12012	0.10500	$ 11,335
Oakview	386,958	0.12012	0.10500	$ 5,849
Greenfields	216,216	0.119995	0.10500	$ 3,242
Total	1,940,796			$ 29,311

7.8 Energy Procurement Contract

Please refer to the appendices for this executed contract.

7.9 Modeling and Post Project Set Points

Please refer to the appendices for this information.

7.10 Sample M&V Contract

Please refer to the appendices for this document.