Energy Savings Plan

As part of an Energy Savings Improvement Program

Presented to:

Salem Community College

Carneys Point, NJ

Prepared by:

Schneider Electric

August 2014

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1.0 Executive Summary

Schneider Electric has completed Phase II of the development process for Salem Community College's Energy Savings Improvement Program (ESIP). We would like to thank Ray Constantine, Shay Richardson, Bruce Watkins, John Morrison, Larry McKee, Spring McAllister Lloyd, and others for providing their time and assistance.

The purpose of this Energy Savings Plan is to provide an overview of the College's ESIP. Our proposed ESIP provides the following benefits to Salem Community College:

- $4,538,051 in self-funding facility improvements
- $287,925 in total annual savings
- Upgraded HVAC systems
- Implementation of a centralized building automation system (BAS) for web-access and improved operability of the HVAC systems
- A Solar Power Purchase agreement to reduce electric costs, and minimize SCC's exposure to volatile energy markets
- Backup power for the Public Safety office, Operations office, and IT center
- A new, more efficient and higher quality lighting system
- Renewed IT infrastructure to meet the computing needs of the College
- Long-term energy management and facilities support through a partnership with Schneider Electric

This Energy Savings Plan has been approved by the Salem Community College Board of Trustees on August 21, 2014. In order for the College to implement this plan, the following steps are necessary:

1. SCC to issue an RFP for financing of the project
2. SCC to issue an RFP, and select at the September BOT meeting, a qualified party to serve as the 3rd party reviewer of this ESP. SE will coordinate with the selected firm to ensure that this plan meets all of the requirements of the New Jersey ESIP law.
3. SE will work through the New Jersey Clean Energy Program's Pay for Performance (P4P) program to receive approval of the projected incentives. These figures will change slightly.
4. SE to have the Energy Savings Plan reviewed and approved by the Board of Public Utilities (BPU)
5. SCC to select Measurement & Verification (M&V) Option at September board meeting
6. SE & SCC execute contracts and implement the ESIP

2.0 Project Overview

Below is a matrix of all of the Energy Conservation Measures (ECMs) to be included in the ESIP:

Energy Conservation Measures:	Donaghay	Tillis	Contini	Nursing	Davidow	Salem Center	GEC
1. Mechanical Upgrades		X	X		X	X	
2. Building Automation System (BAS)	X	X	X	X	X	X	
3. Lighting Upgrades	X	X	X	X	X	X	X
4. Water Conservation Measures	X	X	X	X	X	X	X
5. Window Tinting	X					X	X
6. Building Weatherization	X				X	X	
7. Plug Load Control	X	X	X	X		X	X
8. IT Upgrades	X	X	X	X	X		
9. Solar PPA	X	X	X				
10. Energy Procurement	X	X	X		X		

X = Included in ESIP
X = Included in GO Bond project

Per New Jersey ESIP law, savings must cover costs over a 15 – 20 year term. This limits the amount of scope that can be included in a project. Schneider Electric recommends that SCC fund the Contini Mechanical upgrades separately from the ESIP, utilizing the GO Bond funds for Contini.

3.0 Financial Analysis

3.1 Financial Summary

The project contained within this ESP has been developed based upon significant interaction amongst SE and SCC. SCC's intent was to maximize the amount of capital improvements and other strategic goals that could be realized through the ESIP process. The following energy conservation measures are the best solution to maximizing savings and meeting the College's needs.

Financial Overview:

	Cost	% of Hard Costs
Investment Grade Energy Audit	$ 58,980	1.75%
Design Engineering Fees	$ 195,475	5.80%
Construction Management & Project Administration	$ 200,530	5.95%
System Commissioning	$ 42,128	1.25%
Equipment Initial Training Fees	$ 13,481	0.40%
ESCO Overhead	$ 387,580	11.50%
ESCO Profit	$ 269,621	8.00%

Total Implementation Costs	**$ 4,538,051**	
- Estimated Incentives during construction	$ 249,961	
= Financed Cost	$ 4,288,090	
- Estimated Incentives after construction	$ 73,792	
= Net Cost to SCC	**$ 4,214,298**	

This $4.5 million project will pay for itself from the energy and operational savings realized over the 20 year term.

The two remaining variables in this ESP are financing and actual incentives. Based upon the interest rate that comes back and the incentives that are secured, this project may change slightly. Schneider Electric will update SCC and the ESIP scope (if necessary) after these two steps happen, to ensure that the ESIP provides a positive cash flow to SCC.

The College may also qualify for Demand Response revenue through PJM. This would be in addition to the incentives noted above. This will be evaluated in December 2014 for 2015 enrollment, since enrollment for this calendar year has closed.

Salem Community College - ESIP

Energy Conservation Measures (ECMs), by Facility	Annual Savings	Cost	Payback
Donaghay Hall			
Only BAS Retrocommissioning	$ 7,052	$ 39,360	5.6
Lighting System Upgrades	$ 12,465	$ 118,175	9.5
Envelope - Air Sealing	$ 1,407	$ 9,173	6.5
Envelope - Window Tinting	$ 1,320	$ 23,270	17.6
Plug Load Devices	$ 1,720	$ 3,356	2.0
Tillis and Contini Hall combined			
Mechanical Upgrades -Tillis	$ 13,791	$ 519,172	37.6
Mechanical Upgrades - Heat Exchanger At Davidow	$ -	$ 165,208	
Mechanical Upgrades - Tillis New Cooling for IT Room	$ 2,430	$ 63,269	26.0
BAS Upgrades - Tillis Hall	$ 8,588	$ 142,703	16.6
BAS Upgrades - Contini Hall	$ 14,483	$ 165,339	11.4
Lighting System Upgrades	$ 17,570	$ 186,202	10.6
Plug Load Devices	$ 2,189	$ 5,967	2.7
Nursing Center			
No Mech - Only BAS	$ 2,495	$ 38,915	15.6
Lighting System Upgrades	$ 1,939	$ 17,985	9.3
Envelope - Air Sealing	$ 1,530	$ 6,371	4.2
Plug Load Devices	$ 192	$ 559	2.9
Davidow Hall			
Microturbine Addtion w/ Continuous Power to Tillis	$ 18,455	$ 567,298	30.7
BAS Brainswap	$ 15,867	$ 374,063	23.6
Lighting System Upgrades	$ 6,955	$ 130,365	18.7
Envelope - Air Sealing	$ 1,532	$ 16,679	10.9
Salem Center			
Mechanical Upgrades - HPs, ERV	$ 9,008	$ 183,850	20.4
BAS Upgrades	$ 1,110	$ 78,454	70.7
Lighting System Upgrades	$ 6,203	$ 51,404	8.3
Envelope - Air Sealing	$ 302	$ 1,573	5.2
Plug Load Devices	$ 1,052	$ 2,517	2.4
Glass Education Center			
Lighting Upgrades	$ 4,680	$ 41,677	8.9
Envelope - Window Tinting	$ 164	$ 2,025	12.4
Plug Load Devices	$ 231	$ 746	3.2
Site ECMs			
Site Lighting	$ 5,811	$ 61,585	10.6
Occupancy Based Control Integration - Scheduled software	$ -	$ 39,806	
Water Conservation Measures	$ 12,383	$ 61,839	5.0
Natural Gas Procurement	$ 27,989	$ 1	0.0
PC Virtualization(Ncomputing)	$ 36,135	$ 176,164	4.9
Add Alternate 23inch Monitors w/ Keyboards and Mice	$ 1,484	$ 75,185	50.7
PPA	$ 34,106	$ 1	0.0
Total Hard Costs	**$ 272,638**	**$ 3,370,257**	**12.4**

3.2 Cash Flow Analysis

The following cash flow analysis is provided for illustration purposes for the proposed ESIP scope:

Year	Annual Energy Savings	Annual Operational Savings	Energy Rebates / Incentives	Total Annual Savings	Annual Financing Payment	Annual Service Costs	Net Cash Flow to Client	Cumulative Cash Flow
Install			$ 323,753					$ -
1	$ 223,040	$ 64,885		$ 287,925	$ 287,924		$ 1	$ 1
2	$ 227,980	$ 66,313		$ 294,292	$ 294,291		$ 1	$ 2
3	$ 202,319	$ 67,771		$ 270,091	$ 270,090		$ 1	$ 3
4	$ 206,855	$ 65,289		$ 272,144	$ 272,143		$ 1	$ 4
5	$ 211,378	$ 66,726		$ 278,104	$ 278,103		$ 1	$ 5
6	$ 216,001	$ 68,194		$ 284,194	$ 284,193		$ 1	$ 6
7	$ 220,843	$ 65,453		$ 286,296	$ 286,295		$ 1	$ 7
8	$ 225,672	$ 66,893		$ 292,565	$ 292,564		$ 1	$ 8
9	$ 230,483	$ 72,794		$ 303,277	$ 303,276		$ 1	$ 9
10	$ 235,523	$ 74,396		$ 309,918	$ 309,917		$ 1	$ 10
11	$ 240,810	$ 71,118		$ 311,928	$ 311,927		$ 1	$ 11
12	$ 245,944	$ 77,411		$ 323,355	$ 323,354		$ 1	$ 12
13	$ 251,457	$ 74,281		$ 325,738	$ 325,737		$ 1	$ 13
14	$ 256,955	$ 75,916		$ 332,871	$ 332,870		$ 1	$ 14
15	$ 262,291	$ 87,681		$ 349,972	$ 349,971		$ 1	$ 15
16	$ 266,170	$ 79,293		$ 345,463	$ 345,462		$ 1	$ 16
17	$ 271,990	$ 81,037		$ 353,027	$ 353,026		$ 1	$ 17
18	$ 277,785	$ 88,208		$ 365,994	$ 365,993		$ 1	$ 18
19	$ 284,013	$ 84,642		$ 368,655	$ 368,654		$ 1	$ 19
20	$ 290,065	$ 92,132		$ 382,197	$ 338,758		$ 43,439	$ 43,458
	$ 4,847,571	**$ 1,490,433**	**$ 323,753**	**$ 6,338,004**	**$ 6,294,546**		**$ 43,458**	

1. Final Interest Rate is TBD (current model is 4% interest rate)
2. Incentives are subject to approval by TRC, the market manager for the Pay for Performance program. These figures will change slightly.

4.0 Post Project Support

Overview

One goal for Salem CC is to initiate a public-private partnership with Schneider Electric for the long-term success of this project. The success of this plan includes effective energy management, risk reduction, and a quality maintenance plan. The following components are part of this Plan. The following pages describe the M&V Options that have been offered to the College through a separate contract from the ESIP.

Sustained Savings Plan		
Performance Assurance Support Services (PASS)	**Energy Supply Services**	**Ongoing Maintenance**
Measurement & Verification of Energy Savings Savings Sustainability Services Support Services Financial Guarantee Resource Advisor Reporting	Electric & Natural Gas Procurement Utility Bill Verification	Davidow CHP Plant Mechanical Building Management Systems Solar
Provided separately through the optional guarantee contract	*Included in energy procurement contract*	*Must be procured separately, per ESIP law*

4.1 Performance Assurance Support Services (PASS)

Measurement & Verification (M&V)

The International Performance Measurement & Verification Protocol (IPMVP) was created to determine standards and best practices in the measurement & verification of energy efficiency investments. The following is a table highlighting the 4 IPMVP "options" for M&V:

Low Value and Accuracy
» High Client Risk
» Low Schneider Electric Risk

High Value and Accuracy
» Low Client Risk
» High Schneider Electric Risk

Typical Cost

IPMVP Option D - Calibrated Simulation » Stand-alone envelope measures. » HVAC and/or control system replacement/refurbishment, either stand-alone or in combination with lighting and/or envelope measures. » Stand-alone HVAC or central plant equipment replacement.	**IPMVP Option C - Whole Meter** » HVAC and/or control system replacement/refurbishment, either stand-alone or in combination with lighting and/or envelope measures. » Central Plant replacement/ refurbishment measures. » Peak demand shift or shaving measures. » Rate change measures.
IPMVP Option A - Partial Retrofit Isolation » Stand-alone lighting measures. » Stand-alone water conservation measures. » Stand-alone HVAC or central plant equipment replacement.	**IPMVP Option B - Retrofit Isolation** » HVAC and/or control system replacement/refurbishment, either stand-alone or in combination with lighting and/or envelope measures. » Central plant measures.

Facility / Campus Boundary

» It is impractical to create a boundary for measuring savings at system and/or equipment level because of interactivity between systems.

» It is economically unfeasible to measure savings at system and/or equipment level.

» Utility end-uses not effected by measures (i.e. plug loads), static in nature or dynamic and economically feasible to measure.

System / Equipment Boundary

» It is practical and economically feasible to create a boundary for measuring performance/savings at system and/or equipment level.

» A defendable baseline can be measured or calculated at a boundary that is identical to that which savings will be measured.

» Utility end-uses not effected by measures (i.e. plug loads), dynamic in nature and economically unfeasible to measure.

Calculated Performance / Savings

» Stipulated calculation parameters/variables are defendable (i.e. information obtained from industry standard literature or statistical analysis).

» Measured calculation parameters/variable are static in nature and can be obtained with instantaneous or short-term measurements.

» Simple metrics can be easily established for dynamic calculation parameters/variables and it is economically feasible to measure them throughout length of performance period.

Measured Performance / Savings

» Savings > 20% Baseline.
» A strong correlation (i.e. linear regression $R^2 > 0.9$) exists between baseline and independent variables(s) (i.e. weather), enabling simple methods to adjust for deviations in each variable. Independent variable(s) are quantifiable and measurable throughout the length of the period.

» Simple metrics are easily established for key operating strategies and/or calculation parameters/variables. Metrics are measured throughout the performance period.

Schneider Electric has presented 3 different scenarios for measurement and verification of the ESIP post-project. All 3 scenarios are optional to the College, per ESIP law.

M&V Scenario #1 - Option A lighting Only.

(Cost, Year 1 Only - $9,205)

This option provides a low cost method of having a guarantee by measuring the key parameters of lighting fixtures. Lighting for this project makes up roughly 30% of the total savings. Since lighting is a static ECM and most of the savings are based off the change in wattage of the fixture, pre-retrofit measurements will be taken before the fixture replacement, and post-retrofit measurements will be taken during the performance period to report on how savings being achieved. Additional parameters would be estimated to calculate total savings for the lighting ECM. This would be a low-cost option for Salem Community College to obtain a guarantee on a large portion of the savings associated with the project. Savings from all other ECMs would be non-measured with no additional activities performed.

M&V Scenario #2 – Option A with Commission and Verify Activities.

(Cost, Year 1 – $28,112, Year 2 onward - $11,870)

This scenario includes the lighting savings as calculated in Scenario #1 as well as verification that the capacity to save exists for the non-lighting ECMs. Reporting on the performance of key performance metrics associated with the ECMs would be provided. This option provides Salem Community College with an added assurance on identifying any issues with how ECMs are performing during the performance period, but without the cost of additional measurements and savings calculations. Training will also be included to show the staff how to look for key performance criteria to understand any excess energy use when not required. Schneider Electric would provide the following support services to ensure ongoing savings performance:

- Remote monitoring and reporting of trend data and observed operations
- Monthly feedback of performance variables and observations
- Site visits 2x per year (heating and cooling season) to inspect effectiveness of implemented ECMs
- On-site training 2x per year

M&V Scenario #3 - Option D Calibrated Simulation (Yr1) to Option C (Yr2 and beyond) .

(Cost, Setup - $57,418, Year 1 - $32,296, Year 2 - $27,537, Year 3 onward - $11,870)

If SCC is interested in a full guarantee with M&V for all ECMs, the option that Schneider Electric suggests would be an Option D approach that will transition to an Option C after Yr1. This method consists of using a calibrated energy model in Yr1 to verify that the savings have been achieved. Since there is significant interactivity with the HVAC, BAS, Lighting and Building Envelope ECMs and the requirement for adjustments due to the lack of Outdoor Air, calibrated models would provide the most accurate account of achieved energy savings in each building. This method has a much higher cost due to the amount of data that would need to be collected, processed, and then input into the savings calculations. Additional utility submeters would be installed and monitored throughout the performance period. A detailed report of all data collected, computer simulations and modeled baselines would be provided at the end of the Yr1. Adjustments for changes to the facility outside the project as well as known changes such as outside air, and energy savings performance by meter/building, with preliminary updates and feedback throughout the year, will be provided in both Yr1 and Yr2. Both Yr1 and Yr2 will include all activities included in the Commission and Verify option to include periodic remote and on-site activities, training and support to ensure optimization of the conservation measures implemented. The cost, starting in Yr3, reflects a reduced level of savings reporting and engagement with SCC having the option each year to select what additional services meet their needs.

4.2 Energy Supply Services

On August 25, 2014, Salem Community College executed a contract with Constellation Energy for 3rd party supply of natural gas. This new contract was a result of SCC's partnership with SE, and will save the College over $18,000 annually. Schneider Electric will continue to act as the energy sourcing partner for Salem Community College into the future, at the College's choosing. Our aim is to minimize energy rates, reduce risk, and take advantage of market opportunities.

Electric & Natural Gas Procurement

Schneider Electric will:

- Identify third-party supply opportunities for natural gas and electric
- Aggregate facilities supply information for procurement as appropriate
- Generate and distribute Requests for Proposals (RFPs), perform due diligence on responses to such RFPs, recommend the provider(s), and negotiate appropriate industry standard contracts on behalf of Salem CC. Schneider will not execute energy supply contracts on behalf of Salem CC.
- Monitor and manage compliance with the negotiated contracts
- Provide timely market updates for electric power, natural gas, and other pertinent information

4.3 Ongoing Maintenance

Under the NJ ESIP legislation, all maintenance contracts are required to be procured separately from the ESIP. By request of the College, Schneider Electric will aid in the development of the maintenance plan with the College, and will issue an RFP to qualified providers of maintenance services. Schneider Electric proposes to be the central point of contact that aids in the creation of a comprehensive maintenance plan and coordinates various contractors as necessary.

Once a piece of equipment has been commissioned and before turning over to the client, training will be provided on the piece of equipment. In addition, all manufactured maintenance will be reviewed and an owner's manual will be turned over to the client, with the acceptance letter.

5.0 Educational Impact

Through partnership with Schneider Electric, Salem CC will free up dollars to be reinvested in SCC's core mission: to provide "affordable, quality higher education for college transfer and workforce development." However, there are additional ways that this Program can have a positive impact on the learning environment.

Building Automation System Learning Lab

The goal is to create a live learning lab for students to experience the College's building automation system (BAS). This may include a digital user interface to the DDC control system (view only), as well as physical building automation system products that student can use in a lab setting. This would complement the existing course offerings in energy auditing, weatherization, and sustainable energy.

Due to budgetary constraints and changes with the College, this scope is not currently included within the project. Both SCC and SE are committed to this opportunity, and will continue its development outside of the ESIP scope.

Energy University

All Salem CC community members would have access to Schneider Electric Energy University. Energy University is a free, online, educational resource, offering more than 200 vendor-neutral courses on energy efficiency and to help individuals identify, implement, and monitor efficiency improvements. This web portal provides technical training that could be used to train facilities staff or as supplemental education students.

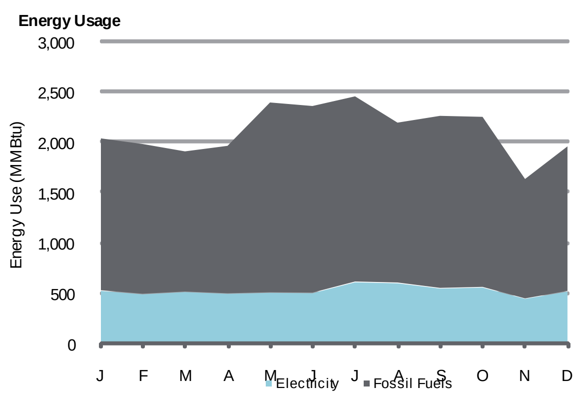
Energy University™ by Schneider Electric

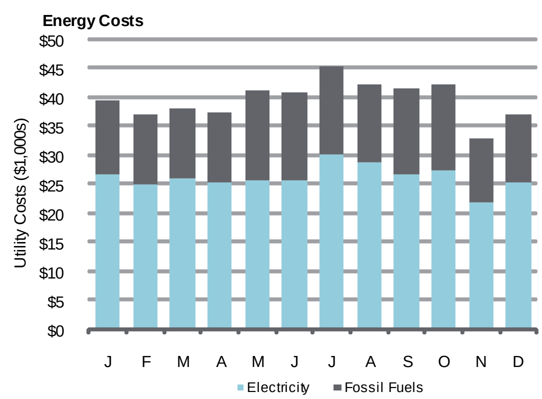
6.0 Energy Savings

6.1 Baseline Energy Use

Below is the baseline weather usage. This was created by taking several years of utility data and weather normalizing it to yield the average energy consumption of the College as a whole.

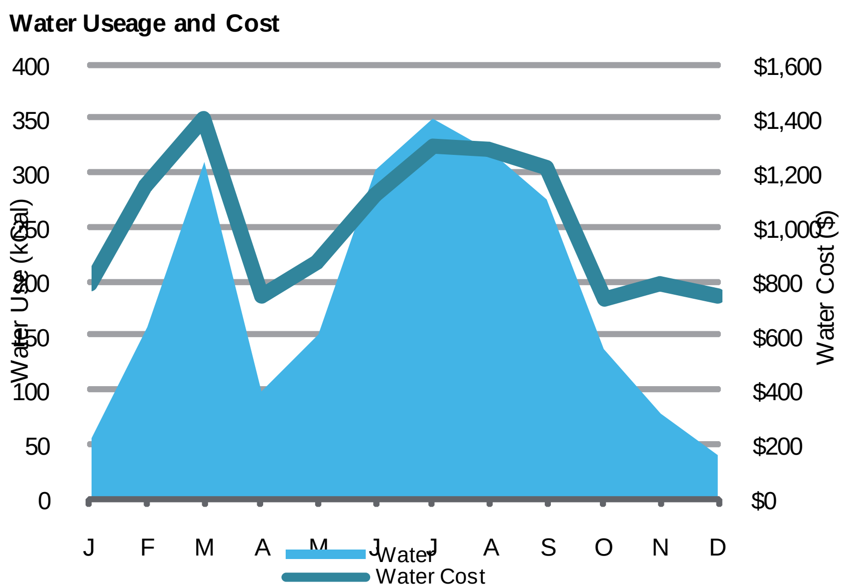
	Electricity			Fossil Fuels			Energy Total		
	Energy	Billed		Energy	Billed		Energy	Billed	
Month	Use	Demand	Cost	Use	Demand	Cost	Use	Demand	Cost
mmm	*kWh*	*kW*	*$*	*Mbtu*	*kBtu/hr*	*$*	*Mbtu*	*kBtu/hr*	*$*
Jan	154,139	541	$26,655	1,514	5,500	$12,626	2,040	7,345	$39,281
Feb	143,704	577	$25,075	1,492	5,500	$11,930	1,982	7,471	$37,005
Mar	150,193	557	$26,060	1,396	5,500	$11,837	1,908	7,400	$37,897
Apr	145,176	580	$25,287	1,468	5,500	$12,148	1,963	7,479	$37,435
May	147,915	515	$25,592	1,891	5,500	$15,659	2,396	7,259	$41,250
Jun	146,797	670	$25,569	1,860	5,500	$15,237	2,361	7,788	$40,806
Jul	179,298	611	$30,008	1,844	5,500	$15,147	2,456	7,586	$45,155
Aug	176,636	534	$28,763	1,592	5,500	$13,569	2,195	7,322	$42,332
Sep	160,676	465	$26,767	1,714	5,500	$14,714	2,263	7,089	$41,481
Oct	163,606	452	$27,209	1,695	5,500	$15,012	2,253	7,041	$42,221
Nov	130,004	419	$21,924	1,190	5,500	$10,927	1,634	6,931	$32,851
Dec	151,972	459	$25,449	1,440	5,500	$11,432	1,958	7,068	$36,881
Year	**1,850,116**	**6,381**	**$314,357**	**19,095**	**66,000**	**$160,237**	**25,409**	**87,777**	**$474,594**





The following table shows baseline water usage.

Month	Water Use	Water Cost
mmm	*kGal*	*$*
Jan	53	$787
Feb	158	$1,151
Mar	311	$1,398
Apr	98	$745
May	151	$866
Jun	303	$1,118
Jul	351	$1,295
Aug	321	$1,288
Sep	276	$1,219
Oct	138	$728
Nov	78	$787
Dec	39	$742
Year	**2,277**	**$12,125**



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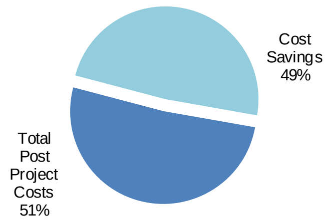
6.2 Energy Savings Calculations

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

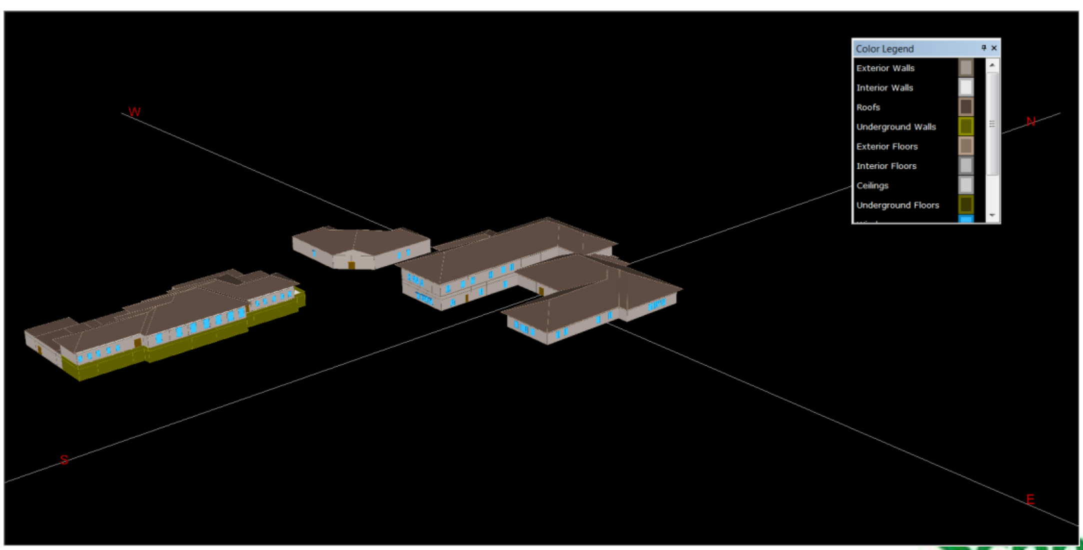


Energy and Water Indices	Energy	Water	Cost
	kBtu/ft2	Gal/ft2	$/ft2
Baseline	85.8	7.7	$1.48
Post Project	82.8	5.5	$0.76
% Savings	**3.6%**	**28.0%**	**48.7%**

Utility Project Summary	Electricity		Fossil Fuels	Water	Total Cost Savings
	kWh	kW	MMBtu	kGal	$
Baseline	1,850,116	6,381	19,095	2,277	$438,983
Post Project	997,004	5,559	21,092	1,640	$225,373
Projected Savings, Units	**853,112**	**822**	**-1,997**	**637**	**$213,610**
Projected Savings, %	**46.1%**	**12.9%**	**-10.5%**	**28.0%**	**48.7%**

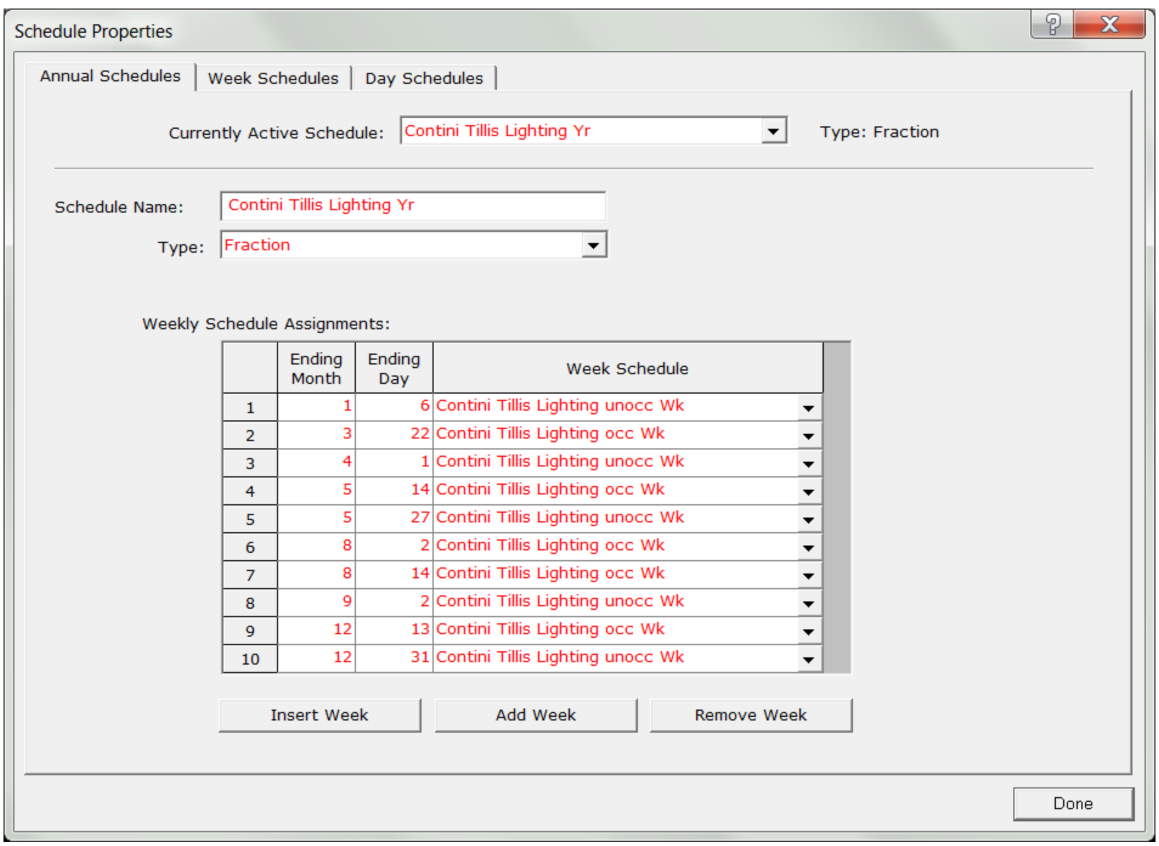
To estimate savings from the proposed HVAC project, Schneider Electric modeled energy use of Buildings using eQuest. eQuest was developed through funding by the United States Department of Energy (USDOE) and is used as the preferred tool for energy modeling in the industry. Using this modeling tool allows for the unique ability to model existing conditions, including combined heat and power, and proposed retrofits to assess energy savings.

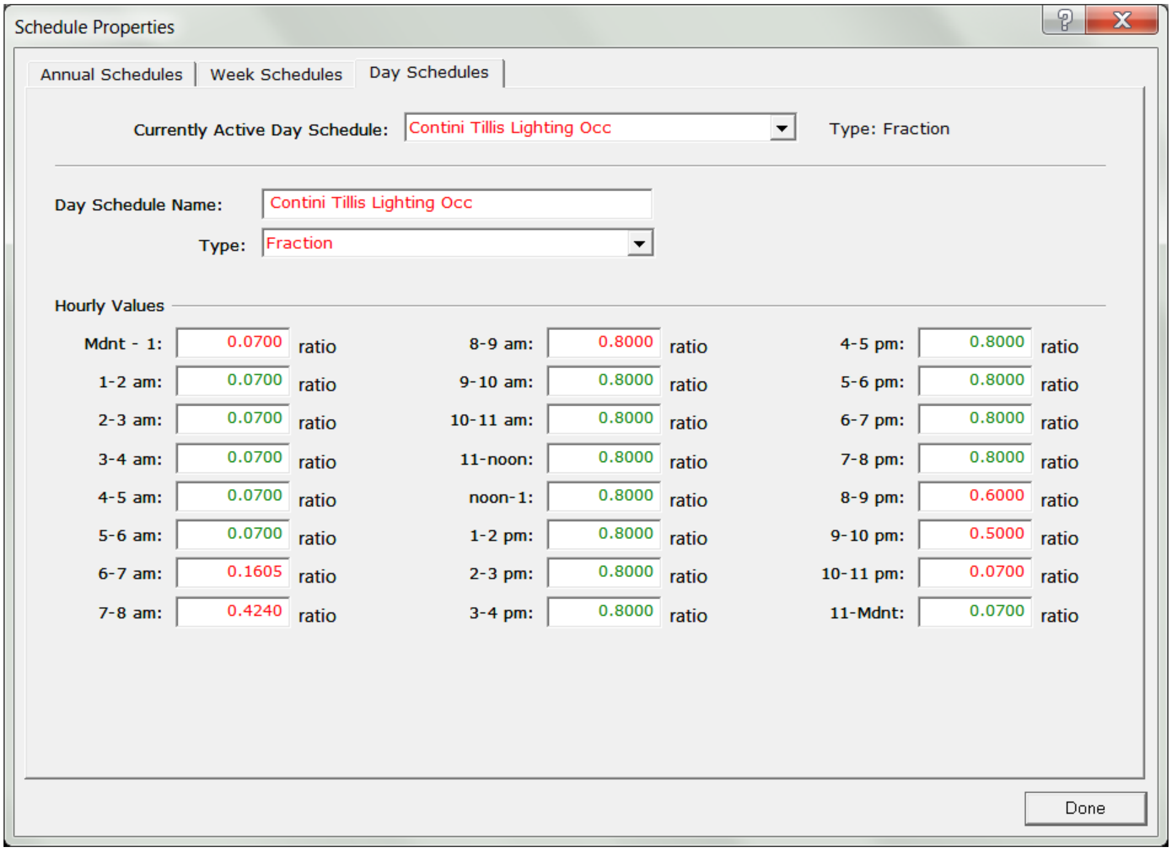
Spaces are defined by their construction to determine thermal conductivity and mass for heat loss/gain calculations. Also included are the ventilation rates, lighting, equipment and occupant loads and schedules. Individual spaces or groups of spaces are assigned to thermal zones that are served by an 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 devices 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. Several buildings may be included in a single project. Below is a screen shot of Contini, Tillis, and Nursing.

Defining accurate schedules is imperative to creating a proper model. Schedules are used to describe when and to what capacity the building is operated and loaded. Lighting, electrical equipment, people, ventilation, fans, and temperature set-points are all controlled 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 at a reasonable level 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 key is getting all parameters, including electric energy, electric demand, and gas use, to align simultaneously. These adjustments typically involve adjusting operating schedules, internal loads, equipment efficiencies, and temperature set-points. The calibration process typically requires between fifteen and twenty iterations (and 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 the Salem center.

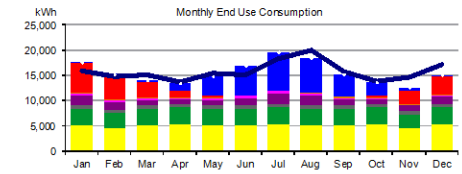
Electric Consumption (kWh)

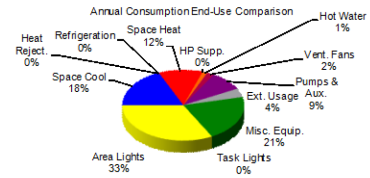
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	49	70	432	1,471	3,944	5,826	7,589	6,956	4,535	2,541	783	170	34,364
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	6,000	4,874	2,949	1,333	185	0	0	0	3	449	2,443	3,745	21,982
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	224	211	234	238	213	194	187	171	169	184	167	217	2,409
Vent. Fans	384	310	193	157	253	386	477	438	297	182	182	224	3,483
Pumps & Aux.	1,928	1,575	1,155	914	1,168	1,537	2,018	1,855	1,245	902	1,103	1,361	16,759
Ext. Usage	629	569	629	609	629	609	629	629	609	629	609	629	7,411
Misc. Equip.	3,272	2,967	3,293	3,395	3,288	3,263	3,407	3,288	3,263	3,405	2,873	3,407	39,120
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	5,119	4,636	5,134	5,347	5,129	5,115	5,352	5,129	5,115	5,350	4,426	5,352	61,204
Total	17,605	15,211	14,018	13,464	14,808	16,931	19,659	18,466	15,236	13,643	12,586	15,104	186,731
Utility Baseline	15,863	14,779	15,070	13,763	15,397	15,179	18,287	20,078	15,693	13,844	14,650	17,174	189,779
Error	11%	3%	-7%	-2%	-4%	12%	7%	-8%	-3%	-1%	-14%	-12%	-2%

8.76% Coefficient of Variation of the Root Squared Mean Error
1.75% Normalized Mean Bias Error

kWh Model Checks

1	Avg Hours	Max Hours	Load Factor
Space Cool	2,449	1,527	17.4%
Heat Reject.	0	0	0.0%
Refrigeration	0	0	0.0%
Space Heat	3,309	1,042	11.9%
HP Supp.	0	0	0.0%
Hot Water	4,992	4,310	49.2%
Vent. Fans	1,814	1,519	17.3%
Pumps & Aux.	4,233	4,197	47.9%
Ext. Usage	0	0	0.0%
Misc. Equip.	5,306	5,306	60.6%
Task Lights	0	0	0.0%
Area Lights	4,504	4,504	51.4%
Total Model	3,890	3,727	42.9%
Utility Baseline	4,124	3,527	40.3%
	-6%	6%	6%





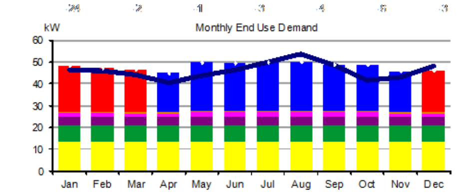
Electric Demand (kW)

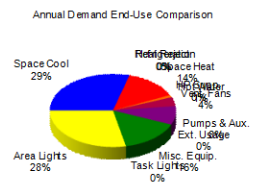
1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0	0	0	18	22	22	22	23	21	21	19	0	168
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	21	20	20	0	0	0	0	0	0	0	0	19	80
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	1	1	1	1	1	0	0	0	0	0	0	0	6
Vent. Fans	2	2	2	2	2	2	2	2	2	2	2	2	23
Pumps & Aux.	4	4	4	4	4	4	4	4	4	4	4	4	48
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	7	7	7	7	7	7	7	7	7	7	7	7	88
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	14	14	14	14	14	14	14	14	14	14	14	14	163
Total	48	47	47	45	50	49	50	50	49	49	46	45	576
Utility Baseline	46	46	44	41	44	46	50	54	49	42	43	48	552
Error	5%	3%	6%	11%	14%	7%	0%	-7%	0%	17%	6%	-4%	4%

8.07% Root Squared Mean Error
-4.30% Mean Bias Error

kW Model Checks

1	Average	Max
Space Cool	14.0	22.5
Heat Reject.	0.0	0.0
Refrigeration	0.0	0.0
Space Heat	6.6	21.1
HP Supp.	0.0	0.0
Hot Water	0.5	0.6
Vent. Fans	1.9	2.3
Pumps & Aux.	4.0	4.0
Ext. Usage	0.0	0.0
Misc. Equip.	7.4	7.4
Task Lights	0.0	0.0
Area Lights	13.6	13.6
Total Model	48.0	50.1
Utility Baseline	46.0	53.8
	4%	-7%





Modeling the EWCMs

After the model has been calibrated, changes are made to the model, which represent implementation of the proposed scope of the energy and water conservation measure. EWCMs are implemented and run one at a time to assess the energy savings of each EWCM individually. The following EWCMs were modeled using eQuest.

- Lighting Upgrades
- Controls Upgrades
- Retro-Commissioning
- Mechanical Upgrades
- Baseline Adjustments for Code Required Ventilation
- Window Film

Outdoor Air Adjustments were done to the baseline, since during the field audit, it was discovered that proper ventilation was not being brought into the space. Our method of calculating this ventilation was to use the similar efficiencies and equipment type as the existing equipment to provide the ventilation air. Doing this in the modeling software allowed us to predict what the usage would be if proper ventilation was being brought in. The difference between the two final use numbers would be the baseline adjustment performed on the project.

Spreadsheet Analysis EWCMs

Savings projections of some EWCMs are more accurately calculated using spreadsheets outside of the energy models. These EWCMS typically have a small amount of interaction with other energy consuming devices in the building or are not able to be modeled due to limitations of the software. The savings for the following EWCMs were calculated using spreadsheets.

- Plug Load Upgrades
- Envelope Upgrades
- Water Conservation Upgrades
- Rate Changes
- Cogeneration

Plug Load Upgrades

Savings from plug load upgrades accounts for a small amount of savings in comparison to the total building energy consumption. For this reason, Schneider Electric used a spreadsheet to calculate the savings for this EWCM. Schneider Electric used logger data to aid in the calculations of this EWCM. The following graphic is an example of a spreadsheet calculation conducted by Schneider Electric.

Salem Community College -Bert Energy Saving Audit

Davidow Hall

1	2	3	4	5	6	7	8	9	10	11	12	13
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year	Monthly kWh w/ Out Bert	Yearly kWh w/ Out Bert	Monthly kWh With Bert	Yearly kWh With Bert	Annual kWh Savings
Soda Machines	2	2	168	12	24	205	12	299	3,594	107	1,284	2,310
Snack Machines	2	2	168	12	24	70	12	102	1,227	37	438	789
TV (LCD)	1	1	168	12	24	27	12	20	237	7	85	152
Hot\Cold Water Coolers	2	2	168	12	24	105	12	153	1,841	55	657	1,183
TOTAL	7	7					12	575	6,899	205	2,464	4,435

Nursing Center

1	2	3	4	5	6	7	8	9	10	11	12	13
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year	Monthly kWh w/ Out Bert	Yearly kWh w/ Out Bert	Monthly kWh With Bert	Yearly kWh With Bert	Annual kWh Savings
Desktop Projector	1	1	168	12	24	12	12	9	105	3	38	68
Hot\Cold Water Coolers	2	2	168	12	24	105	12	153	1,841	55	657	1,183
Water Fountains	3	3	168	12	24	5	12	11	131	4	47	85
TOTAL	6	6					12	162	1,946	58	695	1,251

Building Envelope Upgrades

Calculating savings from envelope upgrades inside a spreadsheet is desirable due to more control of the inputs used in the calculations. 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 envelopes. Schneider Electric uses the ASHRAE Fundamentals 16.23-48 to calculate the flow rate or Crack Method for all envelope calculations.

Water conversation Upgrades

Water conservation upgrades are calculated using spreadsheets. Schneider Electric used occupancy data provided by Salem CC, building type information, and water fixture flow rates to estimate water savings. Energy savings that may occur from less hot water being used were not calculated, due to uncertainty about the transient occupancy profiles that exist in the buildings.

Rate Change

Rate change savings were calculated using the post project expected usage. The post project expected usage was multiplied by the current rates of the college to get a cost value that the college would expect to see if they did not change their rates. A concurrent calculation was also performed with the new lower rates. The difference is the expected savings for this measure.

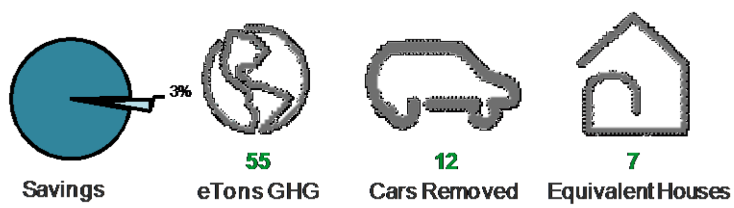
Cogeneration

Due to certain limitations of the energy modeling software used to model the Contini, Tillis, and Nursing buildings, the micro turbine savings were calculated using both eQuest and spreadsheets. Three main factors contributed to the need to use spreadsheet calculations in conjunction with eQuest. First, the mechanical system at Nursing is connected to Tillis through the geothermal well field. Second, Contini and Tillis share the same electric meter. Because of the first and second reasons, Contini, Tillis and Nursing were modeled together in one energy model. A sub meter was used inside the eQuest energy model to ensure accurate predictions of energy consumption for the Nursing and Contini/Tillis electric meters. Third, due to the inability of eQuest to model a micro turbine tracking a sub meter, a micro turbine was created tracking the whole energy model which subsequently included Contini, Tillis, and Nursing. A spreadsheet was then used to remove Nursing's electrical usage from the micro turbine to ensure the micro turbine savings were only for Contini/Tillis. The last step taken in the spreadsheet was to discount the monthly electrical savings and gas penalty by 10%. This was done because the expected up time of the micro turbine is greater than 90%.

6.3 Environmental Impact

Environmental Benefits

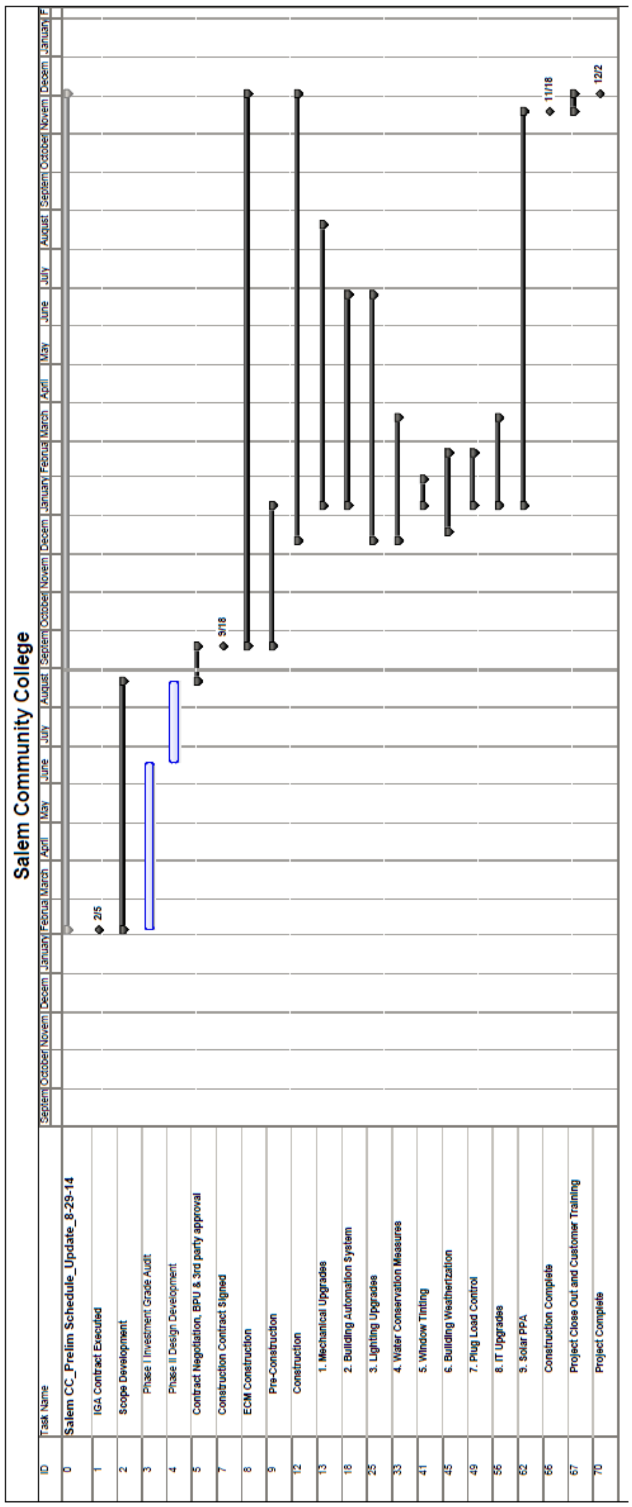
	Baseline Use	Post Project Performance
Total Energy (MMBTU)	25,409	24,494
Total Emission (Tons CO_2e)	1,525	1,470
Total Savings (Tons CO_2e)	-	55



*Emissions factors are derived from EPA eGrids database and represent the National average.
Totals include 5 Project Sites and a total of 20 EWCMs

7.0 Implementation

7.1 Preliminary Project Schedule



7.2 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 for all our employees and subcontractors. SE will comply with all the required safety codes and protocols to ensure that a successful project will be implemented.

7.3 Assessment of Risks

This assessment of risks to meant to provide the customer an idea of the potential risks that would 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.

- Standard Terminal equipment (Heat Pumps, DOAS units) – These items require routine maintenance to sustain efficient operation. Failure to do so would cause risk of savings not being achieved.
- Plant Type Equipment (CHP Plant) – These items require routine and annual maintenance to maintain operating parameters and efficient operation. In addition, since these pieces of equipment are providing electricity and heat, there may be a failure point if the piece of equipment goes down. Schneider designed this system in conjunction with the existing CHP plant to reduce the risk of this situation occurring.
- Controls – The risk of savings not being achieved with this measure would occur if the normal operations of the buildings change. For example, if a space is only used as a traditional classroom and then converted to a high end graphics studio, or if spaces are occupied longer than during the analysis of the ESIP, then this would affect the amount of energy used by the College. Thus, these scenarios would affect savings being realized.
- Solar PV (PPA) – Since the PV field will be owned by a 3rd party entity, no risks would be on Salem CC to maintain the equipment and ensure that it is producing as designed. All risk for maintaining the equipment will be on the 3rd party owner to make sure equipment is operational for the full term of the scope. The only risk that would be incurred would be if there was significant damage to the system (such as a storm or severe weather event), and it was not producing power. In this event, the College would secure electricity from the grid, if it was operational. Since Nautilus Solar gathers the SREC revenue produced from this system, they have a significant incentive to ensure the system is producing optimally.

8.0 Technical

8.1 ECM Descriptions

ECM 1: Mechanical Upgrades

Overview

This ECM is to replace GSHPs and upgrade to hybrid water/ground source heat pump system using existing underground distribution system. New plate and frame heat exchangers, located at Davidow Hall's central plant, will utilize the existing absorption chiller and associated existing cooling tower to provide heat rejection in the summer months. Existing geothermal wells will be used to supplement cooling needs. A new boiler will be installed and provide auxiliary heat to supplement primary heating from the Microturbine central plant waste heat into the new secondary loop in winter months.

Observations

Contini Hall, Tillis Hall, the Nursing Center on the main campus utilize a GSHP system. According to existing information, this system is at least 20 years old and nearing the end of its useful life. Evidence of this has been noticed with some wells no longer operational and difficulties with equipment being able to maintain set points in individual spaces.

Scope of Work

Tillis Hall

Replace the existing heat pumps with new, more efficient heat pumps. This also involves the installation of a boiler to help offset the heating load during extreme winter conditions.

- **Div 22 – Plumbing**
    - Provide new underground uninsulated piping from Caddy Shack and connect to central heat pump loop. Approx 350' of 4" underground pipe.

- **Div 23 - Mechanical**
    - Demolish one (1) abandoned steam boiler
    - Demolish ten (10) existing above ceiling GSHPs
    - Demolish seven (7) existing floor mounted GSHPs
    - Demolish one (1) floor-mounted water to water GSHP
    - Demolish three (3) existing vertical FCUs
    - Provide ten (10) new above ceiling WSHPs
    - Provide seven (7) vertical floor mounted WSHPs
    - Provide one (1) new water to water WSHP
    - Provide three (3) new vertical 2-pipe FCUs
    - Provide three (3) new DOAS units

- Provide two (2) new frame mtd. End suction Pumps
- Provide new 300 MBH condensing boiler
- Provide approx. 150' of 2" piping and circ pump to tie boiler into existing heat pump loop.
- Provide 300 feet of insulated supply air ductwork. Assume average duct side is 14"x12".
- Provide three (3) 14"x12" motorized dampers.
- Provide three (3) exterior 24"x12" outside air louvers and assoc. MODs
- Provide new insulated supply and return piping from existing heat pump mains to the three (3) new DOAS units. Approx. 460' of 1-1/2" piping, 120' of 2" piping, and 80' of 2-1/2" piping.
-

- **Div 25 – Integrated Automation**
  - Automation for this EWCM is included in ECM 02.

- **Div 26 Electrical**
  - Re-use existing electrical feeders serving GSHP's (18) and FCU's (3). Remove existing whip back to existing disconnects. Provide new electrical whip from existing disconnects to new units.
  - Provide new 20A/3P breakers in existing main distribution panelboard and provide 50' feeder (3-#12, 1-#12Gd in 3/4" C.) to new DOAS units. Typical 3.
  - Provide new 20A/1P breaker in existing distribution panelboard and provide 50' feeder (2-#12, 1-#12Gd in 3/4" C.) to new Condensing Boiler and fractional hp pump..
  - Provide new 20A/3P breakers in existing main distribution panelboard and provide 50' feeder (3-#12, 1-#12Gd in 3/4" C.) to new end suction pumps (via combination motor starters). Typical 2.

Key Assumptions

- ✓ Existing heat pump capacities are adequate.
- ✓ Existing heat pump electrical feeders are adequate.
- ✓ Existing maximum peak demand on the combined Contini/Tillis 1000A service is 182KW (257A at .85pf). Assume existing 400A service capacity at the Tillis building is adequate for new loads.
- ✓ Existing Baltimore Aircoil tower is model 3482C as found in CAD file of owner provided documents. Based on these documents, the BAC catalogs suggest the unit is a single cell unit with a nominal cooling capacity of 482 tons. Per Addendum #1 of Cogen CHP HVAC Upgrades Project, the existing absorption chiller is model GJ20D CX-S produces 195 tons of cooling sized for 85F entering cooling water and 94.5F existing cooling water (from tower) at 869 gpm.
- ✓ Existing condenser water source pumps (P-10, 11) are each capable of 1,718 gpm at 50 ft. hd. per nameplate data.
- ✓ Existing secondary water source pumps (P-8, 9) are each capable of 770 gpm at 90 ft. hd. per nameplate data.

Davidow Hall

Three existing natural gas-fired, 65KW microturbine electric generators with hydronic heat recovery currently serve the Central Plant. The intent of this ECM is to expand the plant by the addition of one (1) - Capstone 65KW microturbine to provide additional power and heating/cooling capacity (via an absorption chiller).

- **Div 22 – Plumbing**
  - Provide necessary piping, valves, fittings, and inline pump to connect and circulate heating water from the cogeneration unit's heat exchanger to the existing hot water supply and return taps. (Approx. 20' of 2" piping)

- **Div 23 - Mechanical**
  - Extend the existing concrete housekeeping pad (Appox. 6'x8')
  - Provide new cogeneration unit
  - Provide necessary piping to extend natural gas piping from existing branch tee to new cogeneration unit. (Approx. 15' of 1-1/4" piping)
  - Provide necessary piping, valves, fittings, and inline pump to connect and circulate heating water from the cogeneration unit's heat exchanger to the existing hot water supply and return taps. (Approx. 20' of 2" piping)
  - Provide new gas venting from the cogeneration unit, up through roof and terminate with rain cap.
  - Provide two (2) plate and frame heat exchangers (in Davidow Hall) for interconnection between existing primary condenser loop and existing secondary piping loops. Pipe sizes in accordance to M-501. Assume maximum 40' piping length on source and load side of each heat exchanger (80' combined).
  - Provide new 15A/3P breaker in existing distribution panelboard and provide 150' feeder (3-#12, 1-#12Gd in 3/4" C.) to new in-line pump.

- **Div 25 – Integrated Automation**
  - Automation for this EWCM is included in ECM 02.

- **Div 26 Electrical**
  - Provide new feeder (3-#250KCMIL, 1-#4 GD. In Existing 4" C.)
  - Provide New Feeder (3-#250KCMIL, 1-#4 GD. In Existing 3" C.) Trenched from existing pull box to Tillis storage room. ('LB' up exterior wall into room).
  - Provide New Feeder (4-#1/0, 1-#4 GD. In 2-1/2"C)
  - Provide New Feeder (4-#1/0, 1-#6 GD. In 2" C)
  - Provide 10kA Rated Circuit breakers in existing square D I-line Panelboard.
  - Provide 400A circuit breaker (24VDC shunt trip, 120V motor operator) Intercept existing 400A feeder from existing 112.5 kVA installed adjacent to panel DP240 and reconnect to panel.

Key Assumptions

✓ Existing Baltimore Aircoil tower (Davidow Hall) is model 3482C as found in CAD file of owner provided documents. Based on these documents, the BAC catalogs suggest the unit is a single cell unit with a nominal cooling capacity of 482 tons. Per Addendum #1 of Cogen CHP HVAC Upgrades Project, the existing absorption chiller is model GJ20D CX-S produces 195 tons of cooling sized for 85F entering cooling water and 94.5F existing cooling water (from tower) at 869 gpm.

- ✓ Existing condenser water source pumps (P-10, 11) are each capable of 1,718 gpm at 50 ft. hd. per nameplate data.
- ✓ Existing secondary water source pumps (P-8, 9) are each capable of 770 gpm at 90 ft. hd. per nameplate data.

Salem Center Heat Pump Upgrade

Replacing the existing ground source heat pump units with new higher efficiency units will result in decreased electric energy consumption. The existing heat pumps are 1998-99 vintage and are approaching their estimated service life.

- **Div 23 - Mechanical**
  - Demolish sixteen (16) existing above ceiling GSHPs
  - Demolish existing Roof mounted ERV
  - Provide sixteen (16) new ceiling mounted GSHPs and new hose kits for connecting unit to existing supply and return piping.
  - Provide new roof mounted energy recovery ventilator (ERV) with curb adapter and mount on existing roof curb.
  - Provide new ductwork flex connections at supply and return openings of new heat pump.
  - Provide ductwork transitions and modifications as necessary to connect unit to existing ductwork. Provide and/or repair ductwork insulation as required.
  - Provide piping specialties (isolation valves, strainer, balancing valve, etc.) at heat pumps not having isolation valves refer to detail. (Assume 4 locations)
  - Provide required non-toxic antifreeze. Environal or approved equal.

- **Div 25 – Integrated Automation**
  - Replacing the stand-alone thermostatic controls with a comprehensive, solid state control and direct digital control (DDC) system for each of the existing systems provides a unique opportunity to achieve energy savings while improving occupant comfort and the ability of facility staff to monitor and maintain their building.
  - On-site training for the Building Automation System will be provided. Included in the training will be system architecture, controller and operator panel operation, control drawings, device replacement, product overview and demonstration, logging on and off, system passwords, screen layout, software toolbars and menus, graphic page navigation and use, scheduling (regular, temporary, and special), and basic troubleshooting.

- **Div 26 Electrical**
  - Re-use existing electrical feeders serving heat pumps and ERV. Remove existing whip back to existing disconnects. Provide new electrical whip from existing disconnects to new heat pumps and ERV.

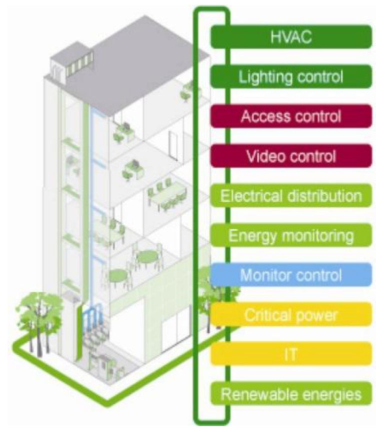
Key Assumptions

- ✓ Existing heat pump capacities are adequate.

- ✓ Existing energy recovery unit capacity is adequate.
- ✓ Existing ERV roof curb is in good condition and can be reused.
- ✓ Existing heat pump and ERV electrical feeders are adequate.
- ✓ Existing pumps, well field, and exterior earth loop piping are adequately sized.
- ✓ Assume condensate drain piping, pumps, etc. are adequate and can be reused.

ECM 2: BAS Upgrades

Overview



A Building Automation System will allow individuals to control equipment from a central location. Individuals will have the ability to identify and diagnose equipment issues without ever having to leave the office. In addition to these key abilities, reporting features allow for managers to better control their energy use and consumption.

Control Strategies That Could Be Implemented With Direct Digital Control System (DDC)

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.

An additional feature, Optimal Stop, is used to save energy at the end of the day. This feature takes advantage of a building's "flywheel" effect. In mild weather, equipment can be stopped earlier than usual without adversely effecting indoor temperatures.

Night Setback/Setup

Utilizing optimal start/stop will allow for a more aggressive night setback/setup schedule. Most of the buildings in this preliminary assessment are currently utilizing a night setback/setup schedule in which cooling season setup temperatures are set to 80º F and the heating season setback temperatures are set to 60º F. Implementing a more aggressive setback and setup schedule will reduce energy consumption for each building.

Heating/Cooling Mode Selection

By utilizing computer technology to accumulate large amounts of data instantaneously and the constant vigilance of digital processing, a BAS can make up-to-the-minute decisions about the heating and cooling needs of a facility. The heating/cooling mode selection feature uses this process to decide whether heating, cooling or both are needed to condition a building. This results in a more comfortable building since the plant is always in the proper mode, and it saves energy by keeping systems from running which are not needed.

Set Point Optimization

Optimum comfort is usually best obtained by maintaining uniform temperatures throughout a facility. This reduces the occurrence of adjacent hot and cold spots that exaggerate sensations of discomfort. It also reduces the energy wasted when adjacent systems "fight each other" because they are in different operating modes (heating and cooling).

Temperature uniformity is achieved by calibrating all thermostats to the same set point. Realizing that differences in rooms, systems and personal preference may not make this practical, some variation in set points is desirable. Our recommendation is to establish a minimum summer set point (75F) and a maximum winter set point (70F) with a 1 or 2 degree deviation up in the summer and down in the winter.

Demand Controlled Ventilation

Demand controlled ventilation is a means of reducing the outdoor/ventilation air being delivered to the buildings to meet the actual occupancy density. The carbon dioxide levels are measured in the building and outside air and the ventilation rate is 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.

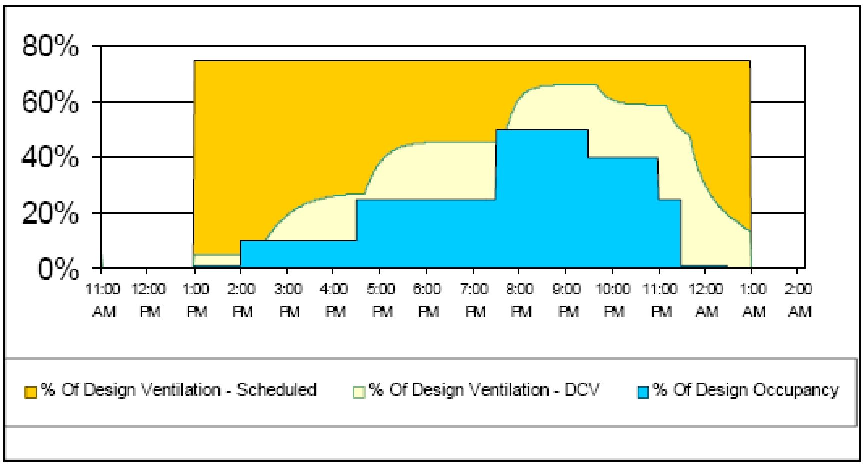


Figure 1 - Comparison of ventilation rates for different system designs

As seen in 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.

Retro Commissioning

As buildings and Building Automation Systems age they tend to get out of calibration and loose some of their original functionality. Retro-commissioning applies a systematic investigation process for improving and optimizing a building's operation and maintenance (O&M).

Retro-commissioning ensures system functionality. It is an inclusive and systematic process intended not only to optimize how equipment and systems operate, but also to optimize how the systems function together. O&M tune-up activities and diagnostic testing are primarily used to optimize the building systems. The goals and objectives for applying this process, as well as the level of rigor, may vary, depending on the current condition of the equipment. The Retro-commissioning process most often focuses on the dynamic energy-using systems with the goal of reducing energy waste, obtaining energy cost savings for the owner, and identifying existing problems.

Observations

Davidow and Donaghay Halls are the only two buildings that have an existing Building Automation System installed on the HVAC equipment.

At Davidow, the existing system is a Honeywell system at the building level that is tied into the Optimum Program that manages the Combined Heat and Power plant. This system seems to be handling the building HVAC equipment fairly well and while generic, does contain schedules and unoccupied set points. The CHP plant was not optimized and there are areas where proper sequencing of the plant could provide additional energy savings.

The Donaghay building contains a newly installed JCI Metasys System. This system is tied to the VAV system, and based upon field investigation, may not have been commissioned properly. There are areas that can be optimized to provide additional energy savings while maintaining comfort.

The rest of the buildings at Salem Community College operate on a standalone or sometimes programmable level thermostat. During the field investigation, it was noticed that many of the programmable thermostats were not programmed properly or had been by-passed and left in the on position. At the Contini building specifically, the thermostats were not mounted in the space they were serving, rather they were found laying above the ceilings, next to the units.

Scope

Donaghay Hall Retro-Commissioning

Since the BAS system is brand new, it does not make fiscal sense to remove this system and install another brand of controls. Instead, we intend to work with the original design of the system and Retro-commission it to identify any detrimental issues, while adjusting settings to achieve the most efficient operation. Any hardware required repairs will be identified and Equipment Deficiency Reports (EDR) created to provide SCC, so that Salem can have the proper information to bring it back to the intended state of operation.

Tillis Hall, Contini Hall, Nursing Center DDC Conversion

The BAS scope for these set of buildings is very similar, since there is no central DDC system currently in place. Replacing the stand-alone thermostatic controls with a comprehensive, solid state control and direct digital control (DDC) system for each of the existing systems provides a unique opportunity to achieve energy savings while improving occupant comfort and the ability of facility staff to monitor and maintain their building.

On-site training for the Building Automation System will be provided. Included in the training will be system architecture, controller and operator panel operation, control drawings, device replacement, product overview and demonstration, logging on and off, system passwords, screen layout, software toolbars and menus, graphic page navigation and use, scheduling (regular, temporary, and special), and basic troubleshooting.

Key Assumption

- ✓ Contini Hall BAS is based on Salem Community College implementing the Contini Mechanical Scope as identified in Section : ECMs evaluated but not included.

Davidow CHP Optimization

Schneider Electric's ability to optimize the CHP would be based on designing a new computer based Direct Digital Control (DDC) system similar to a Building Automation System (BAS). This new DDC system would integrate major equipment within the plant such as Capstone Micro-Turbines, Thermax vapor absorption chiller the associated variable frequency drives, pumps, cooling tower and the domestic hot water supply with tank storage.

Since portions of the CHP plant equipment vary greatly in there communication design characteristics a central integrator (black box translator) will need to be created to bring all operational information and data to a central control terminal.

Once communications between the CHP and building(s) BAS system has been established a data base of operational conditions can be assembled using trending and totalization logging of data for equipment run time hours, temperatures and scheduling. This database will become general screening parameters for an hour by hour optimization of the CHP plant.

The optimizing process or path would follow a simple four (4) step logic shown below:

1. Meet the building's required heat load in all occupant spaces and rooms
2. Provide for the absorption chiller heat load
3. Satisfy the domestic hot water heat load
4. Reject heat to the atmosphere via cooling tower when necessary

ECM 3: Lighting Upgrades

Overview

Fixtures

Fixtures offer a direct method of reducing energy consumption while maintaining adequate lighting for the required tasks. It was noted during the walkthrough that while fixtures may have been utilizing T8 technology, it was of the first generation type with higher powered lamps and ballasts. In addition to this, light levels were noticed to be in a wide range and above the recommended ranges by the Illuminating Engineering Society (IES). Light Levels are measured in Foot Candles (FC).

Sensors

Nothing is more wasteful than using resources when they are not needed. A common example of this is leaving lights on when spaces are unoccupied. During the facility walkthroughs it was noted that many of the rooms did not have occupancy sensors installed, with only few exceptions. Despite this, it was noted that many of the classrooms do have multi-level switching, often times 2, 3, or 4 different lighting circuits. Without being able to measure typical lighting usage on the holiday walkthrough, it is assumed that there is a need for better lighting operation through lighting controls.

Schneider Electric proposes the use of occupancy sensors in classrooms, offices, and common areas such as corridors and hallways which currently do not have lighting occupancy sensor control. Also, locations such as gymnasiums, cafeterias and multipurpose rooms which currently do not have any occupancy sensor controls would benefit from this measure after the lighting upgrade measure is complete.

By increasing control of usage hours of the interior lighting fixtures, electric energy consumption will be reduced. This is will be accomplished using the right technology for the application in order to reduce nuisance switching, which is a common complaint of lighting controls. Schneider Electric will use one of the following technologies detailed below:

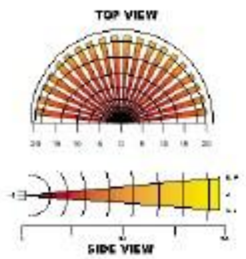
Passive Infrared (PIR) Occupancy Detection

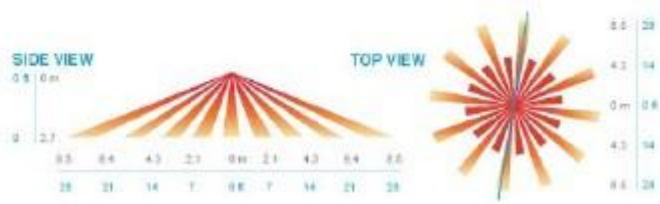
- When people move they enter and exit the beams
- The PIR detector then senses changes in energy
- Body heat in “motion” turns on the sensor
- Lights switch off if no occupancy is detected for duration of time delay

Dual Technology Detection

- Passive infrared initially detects the occupant and turns lights on
- A microphone then engages and listens for occupant sounds indicating continued occupancy
- A 10 second grace period begins after occupancy is no longer recognized. Lights then turn off and voice re-activate upon continued occupancy
- This technology is completed passive sensing
- Works without transmission or interface issues

Shown below is the coverage pattern of a Sensor Switch sensor, which is currently proposed for use in the spaces.





Observations and Scope

The lighting measure shows a summary of the types of lighting fixtures and technology observed in the field. For a detailed scope please reference the Line by Line attached in the Appendices.

Donaghay

- Classrooms consist of 2 and 4 lamp 2x4 32W T8 troffers installed in lay-in ceilings. Foot candles range from 29-95, and provide an opportunity for proper lighting controls. A re-lamp and re-ballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Hallways consisted of three different types of fixtures, 4 lamp 32W T8 2x4 troffers, 2 lamp 32W T8 2x4 troffers, and 4' 2 lamp 32W T8 surface mount wraps. Foot candles range from 15-71. A relamp and reballast of these areas are currently specified.
- Library fixtures were 2 lamp 2x4 volumetric troffers installed in lay-in ceilings. Foot candles range from 8-43 and these should be improved. A relamp and reballast of these areas are currently specified.
- Open Spaces have lay-in ceilings throughout and hold a variety of fixtures ranging from vanity style 2 lamp 32W T8 strips, vaportite 8' 4 lamp 32W T8's, to 3 lamp 2x4 32W T8 troffers being the most prevalent. Foot candles were between 30-99. A relamp and reballast of these areas are currently specified.
- Private Offices were fairly consistent with either 2 or 3 lamp 2x4 32W T8 troffers installed in lay-in ceilings. Foot candles were in the 95-50 range for the most part, as others were as low as 22-40. A relamp and reballast of these areas are currently specified.
- Restrooms mainly consisted of 3 lamp 2x4 32W T8 troffers mounted in lay-in ceilings. A relamp and reballast of these areas are currently specified. Foot candles range from 90-50 on average, but were recorded as low as 28.
- Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Tillis

- Classrooms consisted of 2, 3, and 4 lamps 2x4 32W T8 troffers mounted in lay-in ceilings, with the 2 and 4 lamps fixtures becoming the majority. One classroom 102, the hair salon, had abnormal light levels for a classroom situation, but the 121-50 foot candle levels have to remain for the purpose of the room. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.

- Hallways were either 2 or 4 lamp 32W T8 troffers installed in lay-in ceilings. A relamp and reballast of these areas are currently specified Light levels were not as consistent, ranging from 91-99.
- Meeting rooms consisted of 2, 3, or 4 lamp 2x4 32W T8 troffers. The lay-in ceilings allow for easy installation of ceiling sensors. Foot candles range from 96-28, but were fairly consistent between 60-40. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamp with a reflector is specified.
- Open Space fixtures are 4 lamp 2x4 32W T8 troffers, with a few 2 lamp fixtures noticed as well. Light levels range as high as 150 to as low as 11. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Private Offices were typically small, with fixture counts noticed between 2 and 6. The 4 lamp 2x4 32W T8 troffer was the fixture of choice as this is noticed in all but a few offices (2 lamps 2x4 32W T8 in two areas, and a 3 lamp 2x4 32W T8 in another). A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified. Foot candles ranged from 170-27.
- Restrooms have a wide variety of fixtures with no concrete type noticed. Foot candles seemed fairly high, ranging from 132-28. The higher light levels were noticed in restrooms where 4 L 2x4 32W T8 troffers were installed. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Contini Hall

- Classrooms consisted primarily of 2 or 4 lamp 32 watt T8 2' x 4' recessed troffer fixtures with prismatic lenses and electronic ballasts. Some of the 2 lamp fixtures have previously been retrofitted and contain a silver reflector. Current light levels range from 20 to 200 FC's. A relamp and reballast of these areas are currently specified. In areas where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Hallways consisted primarily of 2 lamps 32 watt T8 2' x 4' recessed troffer fixtures with electronic ballasts and prismatic lenses, some of which have been previously converted and contain a silver reflector. Current light levels range from 25 to 100 FC's. A relamp and reballast of these areas are currently specified.
- Offices were like the classes and consisted primarily of 2 or 4 lamp 32 watt T8 2' x 4' recessed troffer fixtures with prismatic lenses and electronic ballasts. Some of the 2 lamp fixtures have previously been retrofitted and contain a silver reflector. Current light levels range from 10 to 120 FC's. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Restrooms consisted primarily of 2 lamp 32 watt T8 2' x 4' recessed troffer fixtures with electronic ballasts and prismatic lenses. Some of the 2 lamp fixtures have previously been retrofitted and contain a silver reflector. A relamp and reballast of these areas is currently specified. Current light levels range from 15 to 85 FC's.
- Exterior – Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Nursing Center

- This is a small building with only a few distinct areas, and has an open floor plan as soon as you enter it. The entry mezzanine area is basically a lobby that looks down to the open practice area and classrooms. It has 2'x2' recessed troffer fixtures with (2) 6" 32w T8 U lamps, a normal power electronic ballast and parabolic louver. A kit changing the lamps to (3) 2' straight lamps and a reflector is currently specified for the area. Light levels ranged from 32 to 54 foot candles.
- Classrooms are open as with the rest of the building. The main luminaire in the actual classes is an 8' chain hung industrial hood fixture with (4) 4' 32w T8 lamps and normal power electronic ballast. The main luminaire in the practice lab / class is a 4' 2 lamp 32w T8 1'x4' box fixture that is chain hung. These fixtures have normal power electronic ballasts and a parabolic louver. A relamp and reballast of the areas is currently specified. Fixtures will be tandem wired where applicable. Light levels ranged from 30 to 50 foot candles.
- Restrooms consisted of 2-Lamp 32 watt T8 6" U lamps in a 2'x2' recessed troffer with normal power electronic ballast and prismatic lenses. A kit changing the lamps to (3) 2' straight lamps is currently specified for the areas. Current light levels range from 20 to 60 FC's.
- Exterior – Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Davidow Hall

- Classrooms are primarily 2'x4' 4-Lamp 32 watt T8, normal power electronic ballast recessed troffer fixtures with prismatic lenses. Current light levels range from 25 to 125 FC's. Delamping to 3 lamps and a reflector is currently specified. Except for four rooms that did have occupancy controls, no other occupancy or daylight harvesting controls were seen.
- Hallways are primarily 2 or 4-Lamp 32 watt T8, normal power electronic ballast 2'x4' recessed troffer fixtures with prismatic lenses. Current light levels range from 20 to 60 FC's. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Offices are a mix of 2 or 3-lamp 32 watt T8 lamps and electronic ballast 2'x4' recessed troffer fixtures with prismatic lenses. Light levels ranged from 10 to 90 FC's. A relamp and reballast of the areas are currently specified.
- Restrooms contained a wide variety of fixture types, depending on the exact layout, but most components stayed the same. Whether it was of 1'x4' or 2'x4' recessed troffer or a 4' strip fixture, most were a 2-Lamp 32 watt T8 with normal power electronic ballast and prismatic lenses. Current light levels range from 10 to 70 FC's. A relamp and reballast of the areas are currently specified.
- The Field House Gym was illuminated with 1 lamp 400w Metal Halide up lights with a wire guard hung on pendants. New 4 lamp T5 HO fixtures are currently specified for the area. Current light levels range from 15 to 30 foot candles.
- Exterior – Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Salem Center

- Classrooms consisted primarily of 3 or 4 lamp 32 watt T8 2' x 4' recessed troffer fixtures. The 3 lamp fixtures had parabolic louvers and the 4 lamp fixtures were prismatic lenses. Current light levels range from 25 to 90 FC's. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Hallways consisted primarily of 4-lamp 32 watt T8 2'x 4' recessed troffer fixtures with prismatic lenses and electronic ballast. Current light levels range from 10 to 85 FC's. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Offices were like the classes and consisted primarily of 3 or 4-lamp 32 watt T8 2' x 4' recessed troffer fixtures. The 3 lamp fixtures had parabolic louvers and the 4 lamp fixtures were prismatic lenses. Current light levels range from 80 to 110 FC's. A relamp and reballast of the 3 lamp fixtures in these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified.
- Restrooms consisted primarily of 4-lamp 32 watt T8 2' x 4' recessed troffer fixtures with prismatic lenses and electronic ballast. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified. Current light levels range from 30 to 90 FC's.
- Exterior – Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

Glass Center

- Classrooms are scarce with the size of the facility. Lay-in ceilings hold the 4 lamp 2x4 32W T8 fixtures. Foot candle levels range from 150-135. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamp with a reflector is specified.
- Private Offices were small with foot candles ranging from 130 to 85. With only two fixtures present, the 4 lamp 2x4 32W T8's deliver more light than needed. Where 4L fixtures exist, delamping to 3 lamp with a reflector is specified.
- Storage closets also add to the uniformity of the fixture specification with their 4 lamp 2x4 32W T8 troffers illuminating the space with 60 foot candles.4L fixtures exist, delamping to 3 lamp with a reflector is specified.
- Restrooms also have 4 lamp 2x4 32W T8 troffers installed in their lay-n ceilings. A relamp and reballast of these areas are currently specified. Where 4L fixtures exist, delamping to 3 lamps with a reflector is specified. Foot candles in these spaces range from 113-63.
- Exterior fixtures have been designed to be replaced with New LED wall packs, LED flood, LED parking/walkway pole flood fixtures or LED canopy style fixtures. LED technology has a much longer lamp life which equates to a significant decrease in maintenance replacement and repair time. In addition, the new fixture optics are extremely efficient allowing for better distribution of light thereby maximizing energy savings while also increasing the quality of light.

ECM 4: Water Conservation Measures

Observations and Scope

Schneider Electric proposes to bring an engineered solution for reduction of water consumption by recommissioning the existing plumbing systems. We will conduct a thorough assessment of each and every fixture to analyze their unique "fingerprint" of how they require water to be delivered for optimal performance. Typically there is a wide variety of existing flow rates within the same make and model of fixtures. In some cases, fixtures rated at 1.6 gallons per flush (gpf) will actually use more water than a 3.5 gpf fixture right next to it. It is normal to witness many fixtures that will not function properly, requiring multiple flushes and showing signs of debris being left behind. This is common with "off the shelf" products (fixtures, flush valves, diaphragm assemblies), new or old. The tolerance of the products accompanied by variables on site (water pressure, venting and drain systems) can cause most plumbing systems to have a +/-30% variance across the same building. Simply replacing older style fixtures will not eliminate this inconsistency of flow rates and the improper performance of fixtures. "Recommissioning of Existing Plumbing Systems" is specifically designed to eliminate these system variances by tuning each fixture individually to its needs.

The scope of work to be detailed will emphasize **increasing the operational performance** of the systems with the **minimum water required** to create sustainable savings. Our **Variable Flow Technology** will tune each fixture to the **right** amount of water. This system upgrade has many benefits including:

- Increased consistency and performance of the systems – our first objective is to ensure each and every fixture operates properly.
- Reduction of maintenance costs and plumbing infrastructure upgrades – new flush valve assembly kits and wear parts in all flushometers will create a new "zero baseline" for maintenance.
- Standardization of valves and maintenance parts for all flushometers throughout all the
- buildings. No need to stock multiple items in inventory.
- Significant reduction in water consumption – savings across the campus could be expected to range from 20% to 40% of current water costs.

Other critical points of consideration when comparing this engineered solution to a simple change out of fixtures (product solution) are:

- The savings potential exists for buildings that already have "low-flow" fixtures. Rather than abandon savings potential, and not address the performance issues of buildings already having "low-flow" fixtures, our approach will deliver results. Savings in excess of 20% in buildings with low flow fixtures can be expected.
- Sustainable savings that can be measured and verified – as opposed to using stipulated flows from nameplate data. We will provide accurate pre and post flows to ensure the savings are real - this approach, coupled with our training of their staff, will ensure the savings are sustainable.
- Project implementation is simplified. By not removing fixtures from the floor or wall, the risk of the unknown is greatly reduced. Likewise, implementation is not disruptive to the normal activities and function of building – bathrooms are typically shut down for about the same amount of time as a typical cleaning schedule.

Salem Community College

Scope of Work by Building

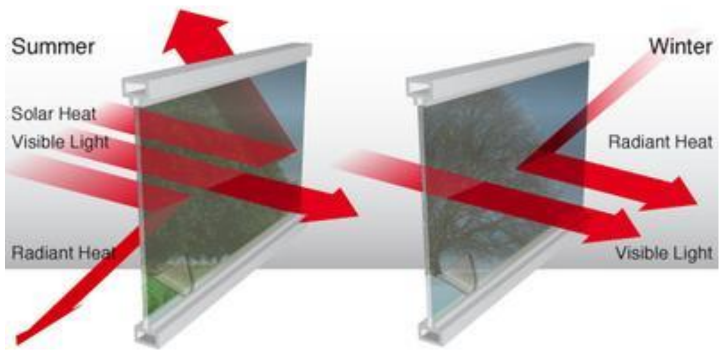
Site Information		Quantities on Site								Scope of Work Option #3																						
										Flushometers Recommissioning										Tank Toilets				Sinks			Showers					
Building or Meter	In Scope of Work	Lavatory Sinks	General Use Sinks	Multipurpose Lav Sinks	Tank Toilets	Pressure Assist Toilet	Flushometer Toilets	Urinals	Wall Showers	Valve Recommissioning	Valve Rebuilding	New Valve X-Body	New Piston Valve Body	Spud Replacement	Flushtube Replacement	Control Stop Rebuilding	Control Stop Adapt/Replace	Handle-Mount Hands-Free	Piston Valve Hands-Free	System Tuning	Retrofit Upgrade	Angle Stop "Adder Valve"	Fill Valve & Tank Gasket	Vandal-Resistant Flow Ctrl	Manual Faucet	Hands-Free Sink Faucet	Wall Showerhead	Handheld Showerhead	Shower Diverter	**Flushometer Toilet Replacements**	**Tank Toilet Replacements**	**Urinal Replacements**
Donaghay Hall	x	16	3		1		15	5				20		7	7					1				18								
Tillis Hall	x	14	2		4		9	4				13		5	5						1			14								
Nursing Center	x	2					2	1				3		1	1									2								
Contini Hall	x	15	18				17	5				22		22	22									15								
Davidow Hall	x	26	2				42	12	14			54		19	19									27								
Sustainable Energy Center	x	5	1		1		4	1		5											1			6								
Glass Education Center	x	7	1		6			2		2											6	1		7								
Salem Center	x	6					6	2				8		5	5									6								
Total	x	**91**	**27**	**0**	**12**	**0**	**95**	**32**	**14**	**7**	**0**	**120**	**0**	**59**	**59**	**0**	**0**	**0**	**0**	**1**	**8**	**1**	**0**	**95**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Figure 1: Water Conservation Scope Building/Fixture Type.

ECM 5: Window Tinting

Observations

Window Film has been used for many years to improve the overall look of a building's façade and to eliminate glare created by the sun. With improved film technologies, today's film also acts as an insulation and reflecting surface that keeps heat in during the winter time and out during the summer time.



*Courtesy of Solutia Films

This ECM will help increase the overall envelope efficiency of all applicable buildings. Most of the buildings have large clear windows that do not aid in increasing the overall building envelopes' R-value. Others have had window film applied before, but it has failed in many locations. By installing a high grade window film, a buildings' overall R-value can increase, allowing the facility to better maintain desired temperature set points and increase personal comfort.

Scope

Install Vista Enerlogic VEP 35 Window Film at the following locations.

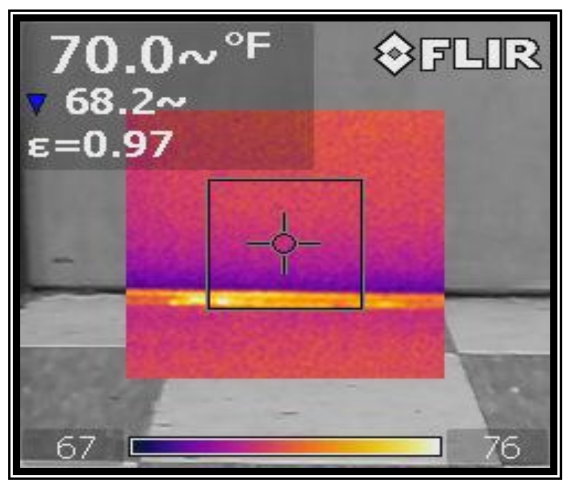
- Remove any existing film and prepare window for Window Film.
- Furnish and install Vista Enerlogic VEP 35 on
  - 1,664 sqft of glass at Donaghay Hall
  - 147 sqft of glass at the Nursing Center
  - 158 sqft of glass at the Glass Education Center

ECM 6: Building Weatherization

Observations

This ECM comprises of the shell of the building and how well it is keeping the conditioned air in, while keeping 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 rid the possibility of "hot" or "cold" spots brought on by unconditioned air infiltrating the conditioned spaces.
- Decreased Energy Consumption - Less conditioned air will be lost through the building envelope and the Heating and Cooling equipment will not have to work as hard to maintain the set point of the conditioned space, which will decrease the energy consumed and save on energy costs.
- Increase Air Quality – Decreasing infiltration of contaminated air promotes less humidity and greater air quality. This allows for the existing electronic air cleaning systems to run at peak performance and maintain the highest level of air quality for the end users. A significant decrease in maintenance costs for heating and cooling systems is also a benefit.
- Maintenance Costs – Reducing the "runtime" will increase the life of the heating and cooling equipment and increase the performance of new equipment.



These images show different areas of air sealing or insulation needs. (Left to Right) the first pictures shows the lack of insulation above the ceiling in Tillis Hall. The middle picture shows the air gap between the doors. The last picture shows a thermal image of the lack of weather-stripping underneath a door.

Scope

The scope of work for Salem Community College includes installing weather-stripping and bottom door sweeps to exterior and interior doors, sealing penetrations/openings, applying Polyurethane Foam to roof/wall seams and uninsulated roofs. Below are specific descriptions and scope that is applicable to each building.

Donaghay Hall

CRITICAL AIR LEAKAGE

Above the acoustic tile, along the 1-story portion of the building, we found suspended tape and "mudded" dry-wall; except for the portion around the perimeter of the exterior wall. It was evident that this perimeter crack was allowing for the unconditioned air to infiltrate when smoke tested.

Air leakage was detected around all the Entry/Exit doors due to the "lack-of" or deteriorated weather-stripping. Since the weather-stripping is starting to show signs of deterioration, SE recommends that all the doors receive new weather-stripping and retrofit each door's seal as if they were new.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Exterior Doors and Sweeps	7num	OEM weather-stripping or Brush Pile - Plus, use Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
DGC Automatic Doors. Center Strip Only	192lf	OEM weather-stripping or Brush Pile
Wall/Ceiling Seam – 1 Story Section Only	332lf	1-Part SPF Sealant or Siliconized Acrylic Caulk

Nursing Center

CRITICAL AIR LEAKAGE

In the storage portion of the building behind the classrooms, a multitude of supports/beams penetrating the building envelope were located exposed. When smoke tested, it was noticed that these various penetrations were allowing air to infiltrate the building.

In addition, the roof-decking and exterior wall seam also allowed for air infiltration when smoke tested. Lastly, we found that the Exit/Entry doors had deteriorated or just lacked weather-stripping and bottom sweeps.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Exterior Doors	5num	OEM or Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Roof/Wall Joints	279lf	2-Part Polyurethane Foam Insulation sprayed
Exterior Wall Penetrations (Beams/Supports & Mech Duct Work)	27num	Apply 1-Part Polyurethane Sealant and/or Caulk

Davidow Hall & DuPont Field House

CRITICAL AIR LEAKAGE

In classrooms 101-107 and from classroom 108 along the handicap ramp to the Main entrance, above the acoustic ceiling tiles, a roof-wall seam was smoke tested and proved to show air infiltration. Since the original weather-stripping is starting to show signs of deterioration, it is my recommendation that all the doors receive new weather-stripping and retrofit each door's seal as if they were new.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Roof/Wall Intersection	424lf	2-Part or 1-Part Polyurethane Foam Insulation/Sealant (depending on size of gap/crack
Exterior Exit/Entry Doors – Full Weather Stripping + Sweeps	35num	OEM or comparable. Compression foam or brush-pile for double doors without astragals. Bottoms: Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Exterior Penetration	1num	Rigid Foam Board Insulation + 1-Part Polyurethane Foam Sealant will be recessed up into cavity.
Large Roll Up Door	40lf	Special Ordered 45 degree weather-stripping installed from exterior

Salem Center

CRITICAL AIR and THERMAL LEAKAGE

Exit/Entry doors throughout the complex were noted to have deteriorated or "lack-of" weather-stripping and bottom sweeps. In addition, the North stairwell interior wood doors were allowing the infiltration/exfiltration of air due to the Exit doors opening and closing; recommend installing weather-stripping to cut off this effect at these locations as well.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Exterior Exit/Entry Doors	4	OEM weather-stripping or Brush Pile - Plus, use Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Interior Stairwell Doors	2	OEM – or see above.

ECM 7: Plug Load Control

Observations

The purpose of our audit was to target plug load equipment that can be controlled via a time of day on/off schedules via the Bert plugs within each facility to gain direct energy savings by automatically turning off equipment during unoccupied times. The target equipment to be control via Bert included Copiers, Water Fountains, Projectors, Laptop Charging Carts, Printers/Monitors, Vending Machines, Coffee Makers and Window A/C units.

Scope

Below is the proposed plug load controllers that will be needed based on the types of equipment present during the field investigation.

Donaghay Hall							
Equipment	**Number of Berts**	**Total Number of Devices**	**Typical Use, Hours/Week**	**Off Time Hours (Weekdays)**	**Off Time Hours (Weekends)**	**Watts**	**Months/ Year**
Soda Machines	5	5	168	12	24	205	12
Snack Machines	1	1	168	12	24	70	12
Printer\Monitor Combo (3 devices per bert)	3	18	168	12	24	20	12
SmartBoard\Projector	7	7	168	12	24	12	12
Medium Printer	4	4	168	12	24	21	12
Hot\Cold Water Coolers	2	2	168	12	24	105	12
TV(LCD)	1	1	168	12	24	27	12
Copier	7	7	168	12	24	60	12
Commercial Coffe Maker	2	2	168	12	24	60	12
Laptop Charging Cart	1	1	168	12	24	35	12
Water Fountains	3	3	168	12	24	5	12
TOTAL	36	51					12

Tillis Hall							
Equipment	**Number of Berts**	**Total Number of Devices**	**Typical Use, Hours/Week**	**Off Time Hours (Weekdays)**	**Off Time Hours (Weekends)**	**Watts**	**Months/ Year**
Copiers	3	3	168	12	24	60	12
Printer\Monitor Combo	6	18	168	12	24	20	12
Medium Printer	1	1	168	12	24	21	12
SmartBoards\Projectors	4	4	168	12	24	12	12
Hot\Cold Water Coolers	7	7	168	12	24	105	12
Water Fountain\Coolers	3	3	168	12	24	5	12
TV (LCD)	4	4	168	12	24	27	12
Monitors	8	32	168	12	24	20	12
TOTAL	36	72					12

Nursing Center							
Equipment	**Number of Berts**	**Total Number of Devices**	**Typical Use, Hours/Week**	**Off Time Hours (Weekdays)**	**Off Time Hours (Weekends)**	**Watts**	**Months/ Year**
Desktop Projector	1	1	168	12	24	12	12
Hot\Cold Water Coolers	2	2	168	12	24	105	12
Water Fountains	3	3	168	12	24	5	12
TOTAL	6	6					12

Contini Hall							
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year
Soda Machine	2	2	168	12	24	205	12
Snack Machine	2	2	168	12	24	70	12
SmartBoards\Projectors	8	8	168	12	24	12	12
Medium Printer	1	1	168	12	24	21	12
Copier	2	2	168	12	24	60	12
Cold\Hot Water coolers	2	2	168	12	24	105	12
Monitors	8	30	168	12	24	15	12
Water Fountains	3	3	168	12	24	5	12
TOTAL	28	50					12

Davidow Hall							
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year
Soda Machines	2	2	168	12	24	205	12
Snack Machines	2	2	168	12	24	70	12
TV (LCD)	1	1	168	12	24	27	12
Copiers	2	2	168	12	24	60	12
SmartBoards/Projectors	5	5	168	12	24	12	12
Hot\Cold Water Coolers	2	2	168	12	24	105	12
Water Fountains	3	3	168	12	24	5	12
TOTAL	17	17					12

Salem Community Center							
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year
Copiers	4	4	168	13	24	60	12
Printer\Monitor Combo	7	14	168	13	24	20	12
Medium Printer	6	6	168	13	24	21	12
SmartBoards\Projectors	2	2	168	13	24	12	12
Hot\Cold Water Coolers	3	3	168	13	24	105	12
Water Fountain\Coolers	2	2	168	13	24	5	12
TV (LCD)	1	1	168	13	24	27	12
Snack Machine	1	1	168	13	24	70	12
Soda Machine	1	1	168	13	24	205	12
TOTAL	27	34					12

Glass Center							
Equipment	Number of Berts	Total Number of Devices	Typical Use, Hours/Week	Off Time Hours (Weekdays)	Off Time Hours (Weekends)	Watts	Months/ Year
Copiers	1	1	168	13	24	60	12
Printer\Monitor Combo	2	6	168	13	24	20	12
Medium Printer	1	1	168	13	24	21	12
SmartBoards\Projectors	2	2	168	13	24	12	12
Hot\Cold Water Coolers	1	1	168	13	24	105	12
Water Fountain\Coolers	1	1	168	13	24	5	12
TOTAL	8	12					12

ECM 8: IT Upgrades

Based on conversations with Larry Mckee, IT Manager, this scope was developed with his input and an NComputing Distributor "Firefly" to incorporate PC virtualization into the scope. This ECM not only provides energy savings, but reduces the number of PCs that Salem Community College (SCC) will have to purchase. In typical college environments, most computing applications are either web-based or traditional MS Office type of platforms. These platforms are not power hungry applications that require full resources from a traditional PC. By virtualizing PC/Servers, multiple users can have independent use with a monitor, keyboard and mouse without the need for PC, thus reducing hardware costs.

The scope for this measure is to provide the following items for a comprehensive solution on the main campus of SCC. The computer counts were provided by the college.

- Seven (14) FireFly 3200 Series Server with the following specifications:
  - Pedestal Chassis with Lockable Bezel
  - Intel® Xeon® Processor, 4C, HT @3.5GHz
  - 32GB Memory, ECC, 1600 MHz
  - 200GB Auto-Redundant Solid State Drive
  - Dual-Port Gigabit Ethernet NIC
  - Remote Management Module
  - 450W 80 Plus Gold Efficient Power Supply
  - Optical Drive, 24x DVD-RW
  - Logitech® USB Keyboard, Mouse, and Headset
  - Server 2008®R2 Preinstalled – License Required
  - FireFly Computers Optimization Suite for vSpace™
  - NComputing vSpace Server™ 6 Preloaded
  - 3 Year On-Site Warranty with Advance Exchange

- (383) NComputing L300 Desktop Virtualization Device - Mfr #: L300
- 3 year Unlimited Technical Support with FireFly Computer Engineers
- Access to All FireFly Computers created vSpace Server Enhancements
- 383 Monitors, Keyboards and Mice

Items not included in Scope:

- ✓ Microsoft WS CAL'S
- ✓ Headphones
- ✓ Kensington lock for L300's

ECM 9: Solar PPA

Observations

Installing a solar photovoltaic system on College owned land and facilities will allow Salem CC to produce on-site, clean electricity. This will be provided at College facilities at no upfront cost through a power purchase agreement (PPA). A PPA will provide a rate change, and these savings will be utilized inside the ESIP to help fund other scope items. This system will also be on the main campus, and visible to the Community.

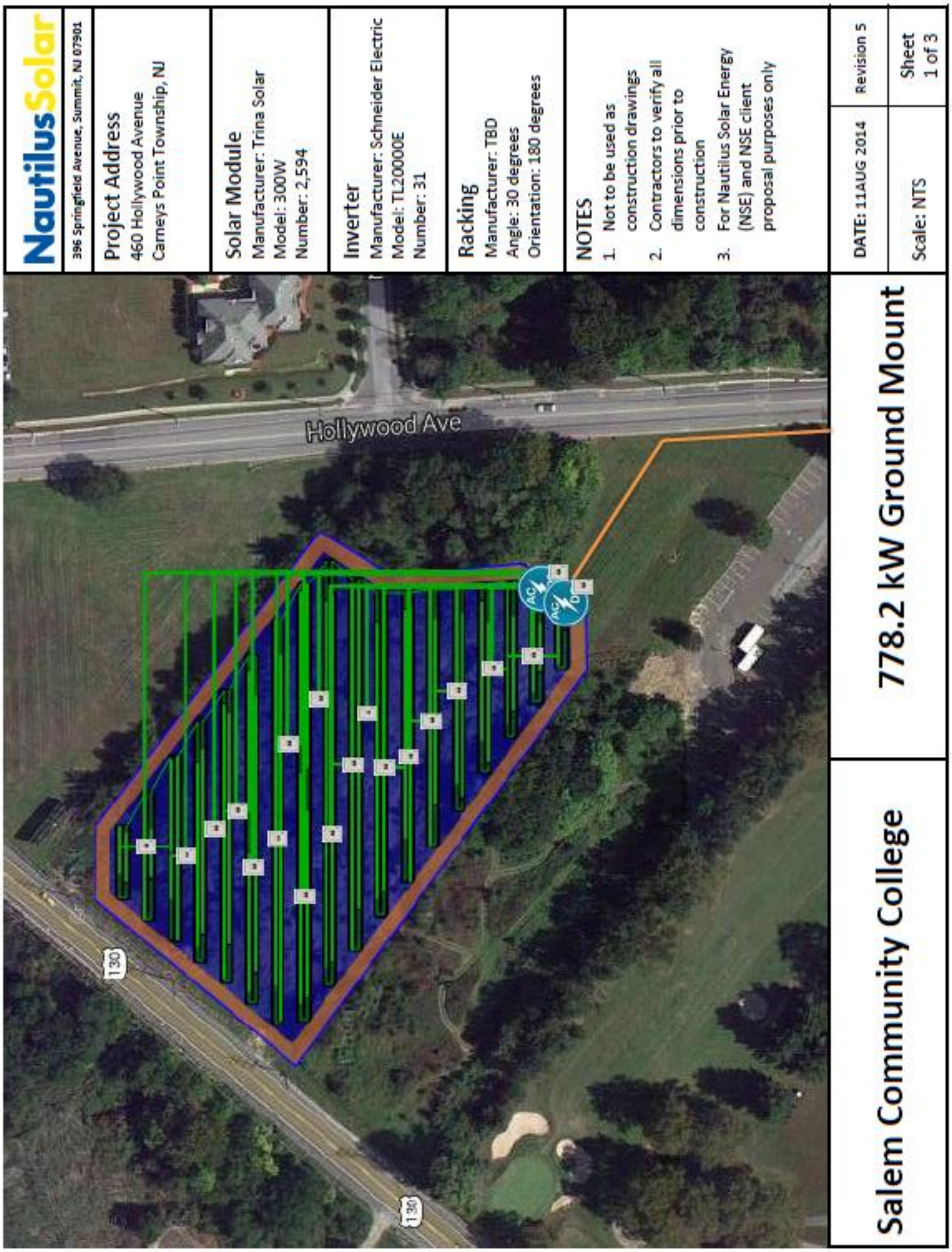
Scope

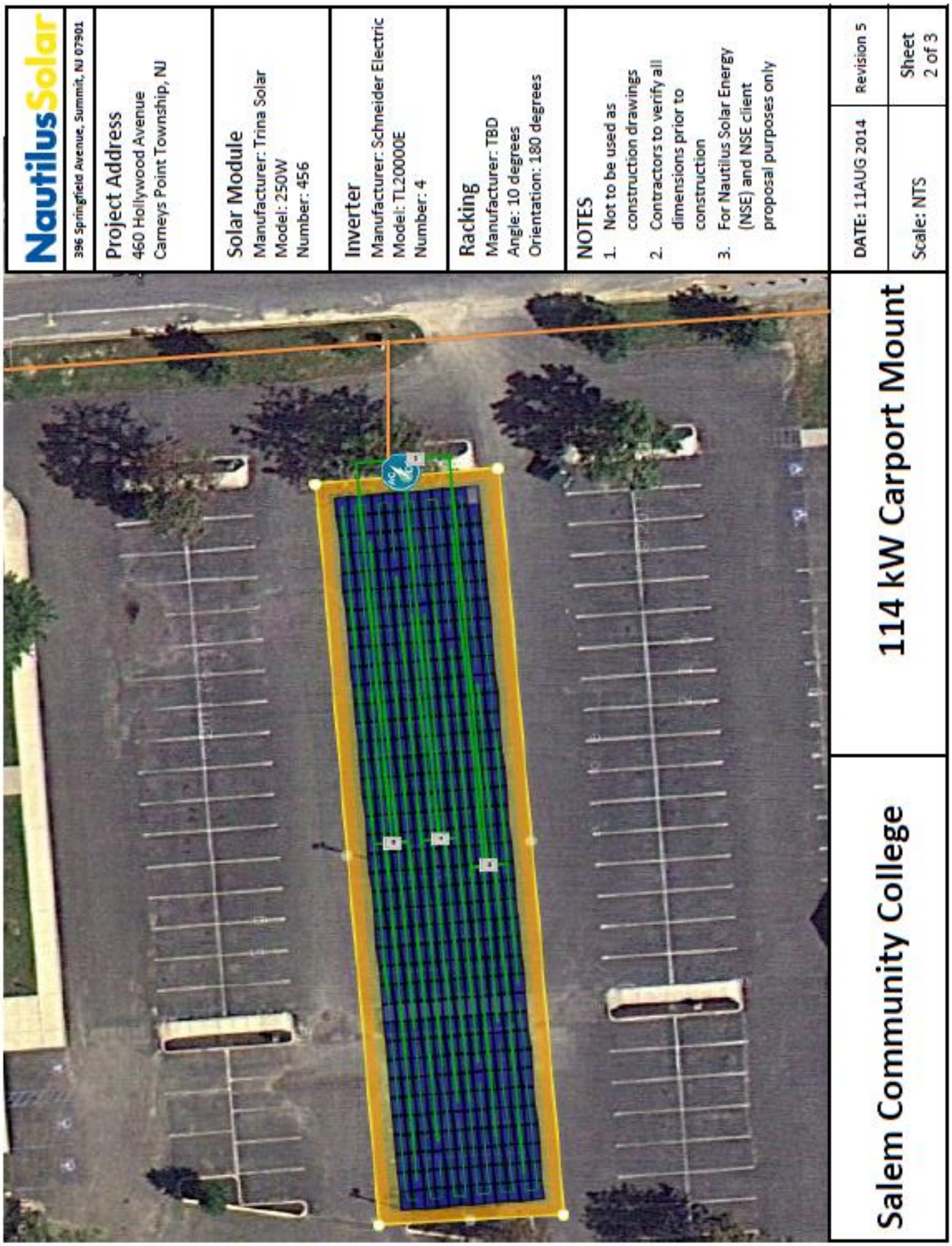
On August 21, the Salem Community College approved and executed the PPA contract with Nautilus Solar, a Schneider Electric partner. The system is described on the following pages. The scope includes:

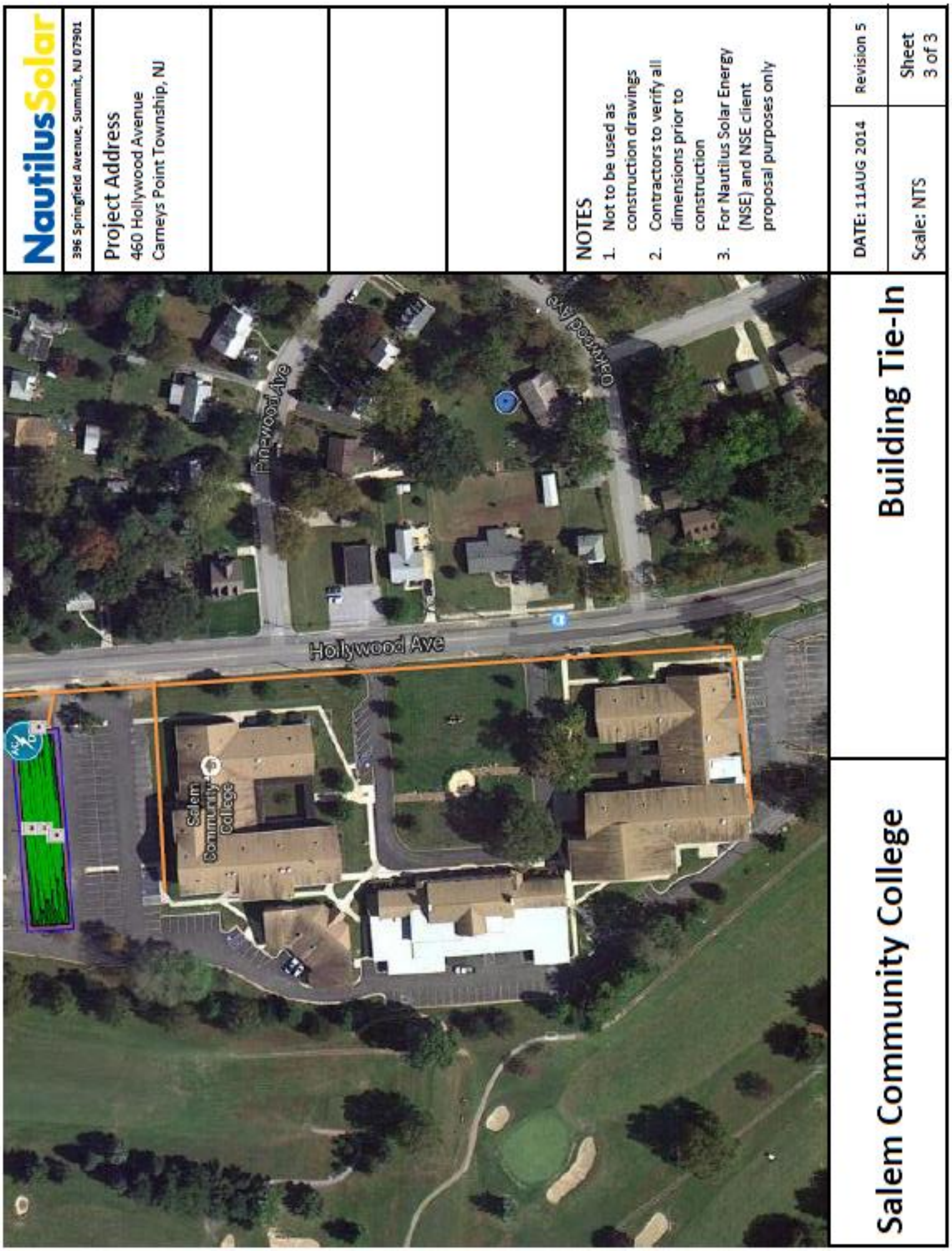
- A nominal 114 kW carport system in the Davidow parking lot on the northern two rows of parking
- A nominal 778 kW ground mounted system at the northern field

In total, this will be an 892kW system. Schneider Electric will optimize the College's energy mix of solar power, CHP power, and grid power to provide the best financial results. The PPA rate will be $0.12/kWh, with an annual escalation rate of 2%, as described in the table here.

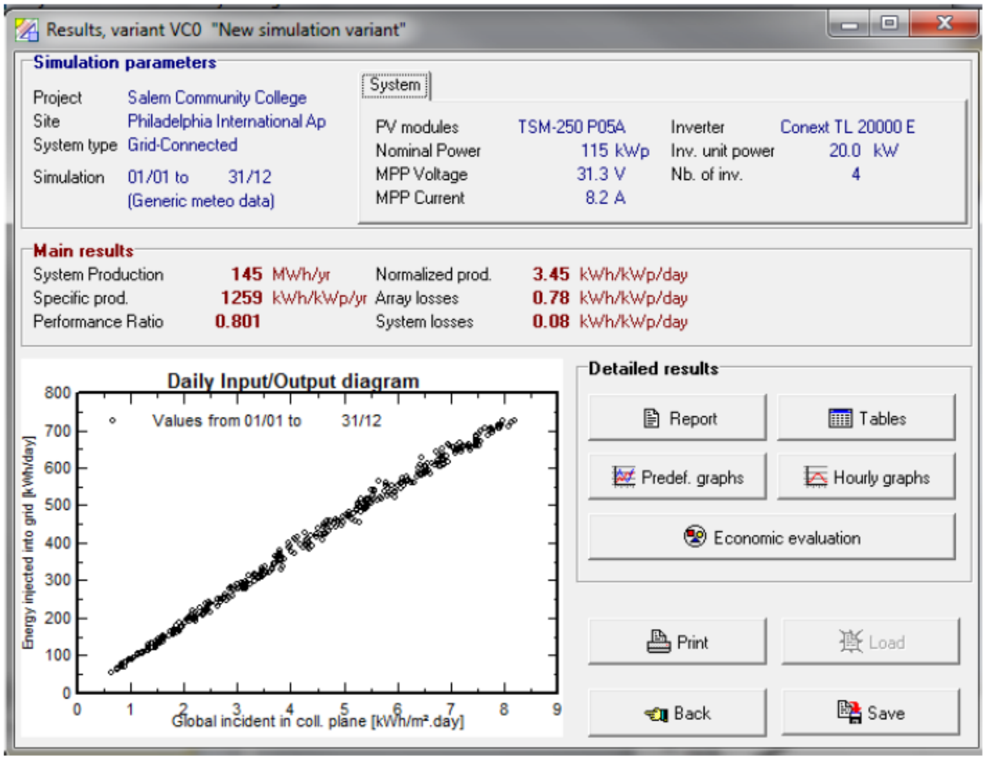
Contract Year	PPA Rate $/kWh
1	$0.1200
2	$0.1224
3	$0.1248
4	$0.1273
5	$0.1299
6	$0.1325
7	$0.1351
8	$0.1378
9	$0.1406
10	$0.1434
11	$0.1463
12	$0.1492
13	$0.1522
14	$0.1552
15	$0.1583


NautilusSolar
396 Springfield Avenue, Summit, NJ 07901
Project Address
460 Hollywood Avenue
Carneys Point Township, NJ
Solar Module
Manufacturer: Trina Solar
Model: 300W
Number: 2,594
Inverter
Manufacturer: Schneider Electric
Model: TL20000E
Number: 31
Racking
Manufacturer: TBD
Angle: 30 degrees
Orientation: 180 degrees
NOTES
1. Not to be used as construction drawings
2. Contractors to verify all dimensions prior to construction
3. For Nautilus Solar Energy (NSE) and NSE client proposal purposes only
DATE: 11AUG 2014
Revision 5
Scale: NTS
Sheet 1 of 3
Hollywood Ave
130
778.2 kW Ground Mount
Salem Community College

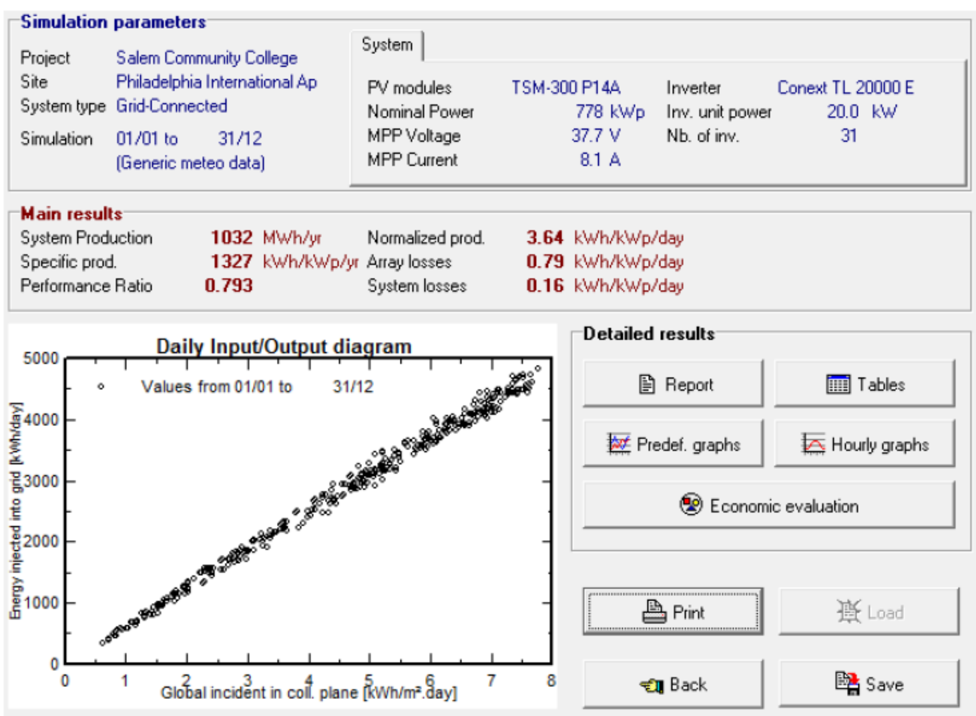

NautilusSolar
396 Springfield Avenue, Summit, NJ 07901
Project Address
460 Hollywood Avenue
Carneys Point Township, NJ
Solar Module
Manufacturer: Trina Solar
Model: 250W
Number: 456
Inverter
Manufacturer: Schneider Electric
Model: TL20000E
Number: 4
Racking
Manufacturer: TBD
Angle: 10 degrees
Orientation: 180 degrees
NOTES
1. Not to be used as construction drawings
2. Contractors to verify all dimensions prior to construction
3. For Nautilus Solar Energy (NSE) and NSE client proposal purposes only
DATE: 11AUG 2014
Revision 5
Scale: NTS
Sheet 2 of 3
114 kW Carport Mount
Salem Community College


NautilusSolar
396 Springfield Avenue, Summit, NJ 07901
Project Address
460 Hollywood Avenue
Carneys Point Township, NJ
NOTES
1. Not to be used as construction drawings
2. Contractors to verify all dimensions prior to construction
3. For Nautilus Solar Energy (NSE) and NSE client proposal purposes only
DATE: 11AUG 2014
Revision 5
Scale: NTS
Sheet 3 of 3
Salem Community College
Building Tie-In
Hollywood Ave
Pinewood Ave
Oakwood Ave
Salem Community College

778.2 kW Ground Mount System Analysis



114 kW Carport System Analysis



ECM 10: Energy Procurement

Observations

Salem CC currently purchases electricity with the Community College Consortium, through Middlesex Community College. For natural gas, Salem CC currently purchases from directly from the utility, South Jersey Gas, for its smaller accounts, and the College is under contract with South Jersey Energy for the Davidow Power Plant. Both the electric and natural gas accounts currently under contract and the accounts not under contract represent a significant savings opportunity by working with Schneider Electric.

Scope

On July 28, 2014, Schneider Electric ran an RFP for 3rd party Natural Gas supply for all of Salem Community College's facilities. Multiple suppliers responded, with Constellation Energy Gas Choice, LLC being the winning supplier. The rate that has been secured is $0.4979/therm for two years (24 months).

Schneider Electric will also be evaluating electric procurement to begin when the College finishes its arrangement through the Community College Consortium. On an ongoing basis, SE will continue to provide the following services throughout the lifetime of our partnership.

Strategic Planning, Market Analysis, and Risk Management Services:

- **A.** SE and Salem CC will jointly develop a Strategic Energy Plan (SEP) that incorporates tactical and strategic processes for evaluating energy supply alternatives. Plans will address ongoing purchasing and risk management strategies, planning, implementation, and comparative cost information. Salem CC and SE will jointly develop energy objectives, goals, and key performance indicators that will be incorporated into the SEP.
- **B.** SE will obtain appropriate data and information from Salem CC to assist in the development of a risk management strategy and execute on that strategy as directed by Salem CC.
- **C.** SE will provide timely market updates and insights on gas transportation and basis, regional power market indices, spot market energy prices, and other pertinent market data.
- **D.** SE will monitor, and report on, various regulatory developments to Salem CC.
- **E.** SE will provide email alerts and appropriate updates for time-sensitive information.

Procurement and Management Services:

- **A.** SE will identity Salem CC sites which have the opportunity to purchase third-party supply.
- **B.** SE will aggregate Salem CC facilities supply information for procurement purposes as appropriate.
- **C.** SE will generate and distribute Requests for Proposals (RFPs), perform due diligence on responses to such RFPs, recommend the provider(s), and negotiate appropriate industry standard contracts on behalf of Salem CC. SE will not execute energy contracts on behalf of Salem CC.
- **D.** SE will monitor and manage compliance with the negotiated contracts.
- **E.** SE will implement strategies as outlined in the Strategic Energy Plan (SEP).

ECMs Evaluated but not included in Plan

Contini Hall Heat Pump Upgrades

Replace GSHPs and upgrade to hybrid water/ground source heat pump system using existing underground distribution system. New plate and frame heat exchangers, located at Davidow Hall's central plant, will utilize the existing absorption chiller and associated existing cooling tower to provide heat rejection in the summer months. Existing geothermal wells will be used to supplement cooling needs of Contini Hall. A new boiler installed at Contini will be provided as auxiliary heat to supplement primary heating from the Microturbine central plant waste heat into the new secondary loop in winter months.

- **Div 22 – Plumbing**
    - Provide new uninsulated underground piping from Mechanical Room and connect to existing condenser water loop valve box location adjacent to golf course. Approx 450' of 6" underground pipe.
    - Provide new insulated supply and return piping from existing heat pump mains to the five (5) new DOAS units. Approx. 1100' of 2" piping, 200' of 2-1/2" piping, and 50' of 3" piping.

- **Div 23 - Mechanical**
    - Demolish thirty-six (36) existing above ceiling GSHPs
    - Demolish four (4) abv. ceiling OA units and electric duct coil
    - Demolish two (2) existing base mtd. Circulating Pumps
    - Demolish one (1) existing electric boiler
    - Provide nineteen (19) abv. ceiling GSHPs
    - Provide (1)one exterior 24"x24" outside air louver for one of the new DOAS units.
    - Provide 500 feet of insulated supply air ductwork. Assume average duct side is 20"x14".
    - Provide five (5) 20"x14" motorized dampers.
    - Provide new 300 MBH condensing boiler
    - Provide piping and circ pump to tie boiler into existing heat pump loop.
    - Provide five (5) abv. ceiling DOAS Heat Pump units
    - Provide two (2) new frame mtd. End suction Pumps
    - Provide 50 feet of 1 1/2" gas piping new gas company provided meter to new boiler location.
    - Provide two (2) new closets approx. 8'x8'.

- **Div 25 – Integrated Automation**
    - Automation for this EWCM is included in ECM 02.

- **Div 26 Electrical**
    - Re-use existing electrical feeders serving GSHP's (18) and pumps (2). Remove existing whip back to existing disconnects. Provide new electrical whip from existing disconnects to new units.
    - Provide new 20A/1P breaker in existing distribution panelboard and provide 50' feeder (2-#12, 1-#12Gd in 3/4" C.) to new Condensing Boiler and fractional hp pump.
    - Provide new 30A/3P breakers in existing main distribution panelboard and provide 50' feeder (3-#10, 1-#10Gd in 3/4" C.) to new DOAS units. Typical 5.

Key Assumptions

- Existing heat pump capacities are adequate.
- Existing heat pump electrical feeders are adequate.
- Existing Make-Up Air unit capacity is adequate
- End Suction Pump approx. 260 gpm @ 85 ft. hd.
- Existing heat pump electrical feeders are adequate.
- Existing maximum peak demand on the combined Contini/Tillis meter is 182KW (257A at .85pf). Assume existing 400A service capacity at the Tillis building is adequate for new loads.
- Assume 2psi gas pressure is available at street.
- Existing MAU serving Lab Hoods is suitable for reuse. Minor repair work is required.

Window Tinting: Davidow, Contini, Tillis Halls

Install Vista Enerlogic VEP 35 Window Film at the following locations.

- Remove any existing film and prepare window for Window Film.
- Furnish and install Vista Enerlogic VEP 35 on
  - 970 sqft of French Panes at Tillis Hall
  - 1,148 sqft of glass at Contini Hall
  - 4,288 sqft of glass at Davidow Hall
  - 408 sqft of glass and French panes at the Salem Center

Air Sealing/Insulation

Tillis Hall

CRITICAL AIR and THERMAL LEAKAGE

Before the college, Tillis Hall was the clubhouse that served the adjacent golf-course. The top floor was used as a banquet hall; it had tall ceilings and windows. When SCC installed the drop ceilings to hide the plumbing pipes and mechanical unit, they didn't install any insulation; it lacks a proper thermal and air barrier protection. Spraying the underside of the both roof lines, see drawing and satellite photo, will give the building proper thermal, vapor and moisture barriers – increase the energy efficiency and life cycle of the mechanical equipment.

The Double Steel Commercial Exit/Entry door between Room 101 and 103 did have their OEM seals, but due to age and usage the weather-stripping was displaying deterioration on all sides.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Exterior Exit/Entry Doors	2num	OEM weather-stripping or Brush Pile - Plus, use Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Main Roof Line	14,718 bsqft	Once the old mechanical system is removed, AESS will prep, clean and apply 2.5" of Polyurethane Closed Cell Foam Insulation to existing roof line
Secondary Roof Line	9,590 bsqft	Prep, Clean and Apply to existing roof line - Polyurethane Closed Cell Foam Insulation

Contini

CRITICAL AIR LEAKAGE

Similar to Donaghay, above the one story wing, there was a drywall ceiling above the acoustic tiles; all seams were taped and mudded except for the perimeter. This was allowing for unconditioned attic air to infiltrate the space below.

Unlike the Donaghay, we also found an exterior wall/roof seam above the acoustic tiles on the 2nd story wing; resulting in unwanted airflow into the plenum above the drop ceiling.

Air leakage was detected around all the Entry/Exit Doors due to the deterioration or "lack-of" of OEM weather-stripping. Replacing these strips will help maintain a more consistent internal temperature, reduce the amount of unwanted drafts at the various entrances and cut down on the pest infestation during inclement weather.

In addition, (4) 42x82" doors leading to separate unconditioned stairwell were demonstrating airflow into the hallways when smoke tested.

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Exterior Exit/Entry Doors	7num	Replace OEM Weather Stripping if available or Use Brush Pile and Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Interior Wood Stairwell Doors	4num	41”x82” Handicap Doors - Compression Foam Tape and Extruded Aluminum Carrier with Soft Cell urethane foam insert
Exterior Exit/Entry Automatic Doors W/S	32lf	OEM or comparable felt inserts, 2 per door, 8’ ea,
Wall Ceiling Seam, (1-Story Wing)	314lf	1-Part Polyurethane Sealing or Siliconized Acrylic Caulk
Wall Ceiling Seam, (2-Story Wing)	412lf	1 or 2 Part Polyurethane Sealant or Insulation

Glass Education Center

CRITICAL AIR LEAKAGE

Since the SHJ Education Center is fully conditioned and the PJS Studio and Lab contains kilns that generate tremendous heat; the two buildings need to be compartmentalized from each other.

- In the SHJ, above the drop ceiling, air leakage was detected at the wall/ceiling seam above the drop ceiling. (See Mock-Up).
- In addition, a set of interior doors leading into the workshop needs full weather-stripping. (See Mock-Up)

All exterior Exit/Entry doors of the classroom/office portion of the Fine Arts Center need to be fully weather-stripped. (See Mock-Ups and Satellite Photo)

SCOPE OF WORK

Areas of Concern	Quantity	Material/Solution
Wall/Ceiling Seam	85	1-Part SPF Polyurethane Sealant or Acrylic Siliconized Caulk
Exterior Doors 36" DGC, 36x84	4num	Compression Foam in Door Frame & Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover
Interior Doors	2num	- Replace OEM Weather Stripping if available or Use Brush Pile and Extruded aluminum carrier with slotted holes and matching self-tapping screws, and UL Classified, Q-Lon soft cell urethane foam insert with polyethylene clad thermoplastic cover

8.3 Existing Conditions

Salem Community Collage - Donaghay Hall

Address: 460 Hollywood Avenue Carney's Point, NJ
Size (ft²): 48,000
Built: 1978; addition 1998
Use: Student Services
Floors: 2

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
2	Aaon VAV DX Gas-Pack AHUs w/ ERV	RN-070-3-0-EA09-3C9	70 Tons	540 in / 432 out					<2	
	Zone Level VAV boxes									

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes
3	Lochinvar - Knight XL HW Boilers			800 in / 746.4 out		93%		

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM	Notes
2	HW Pumps	Taco FI2009E2FAJ1L0A	7.5	136.0	75	1750	Balancing valves 50% closed, VFDs at 82%

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls

Brand JCI - Metasys
Type DDC
Age <2 years
Condition Good

Setpoints

Domestic Hot Water

HW Fuel Electric
Htg Size 4500
Htg Volume 80 Gallons

Envelope

Type	Description	Condition
Exterior	Face brick with concrete masonry block	Good
Glazing	Wood frame, fixed, installed in 1978	Fair
Roof	Pitched, wood deck, brown built-up Approx. 10 yrs old	Fair

Other Resource Consuming Systems

- Computers
- TVs
- Water Fountains
- Kitchen

Comments and Observations

- Client has indicated that systems are not operating the way they should be. This is evident by the amount of energy increase on the u

Recent/planned work

-

Salem Community Collage - Tillis Hall

Address: 460 Hollywood Avenue Carney's Point, NJ
Size (ft²): 27,200
Built: 1927
Use: Classrooms/Academic Affairs/Administrative Services
Floors: 2

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
17	Water Furnance Ground Source Heat Pumps	ATH045A300CLE	1 to 8 tons		800-2200				?	

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes
1	HW Boiler	Weil-Mclain/ MN - P-888-W		665		79%	20?	No longer in use.

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM	Notes
2	Pumps - GSHP Loop	Baldor	7.5	?	?	?	

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary	Exterior MH Wallpacks	

Primary Controls

Setpoints

Brand Various
Type Local T-stat (non prog in most cases)
Age 15+
Condition Good

Domestic Hot Water

HW Fuel Electric
Htg Size 12500
Htg Volume 132 Gals

Envelope

Type	Description	Condition
Exterior	Brick with concrete masonry block	Good
Glazing	Mainly Double Pane approximately 7 years old	Fair/Good
Roof	Pitched, wood deck, built-up, brown, rubber roof; asphalt shingles approximately 15 years old	Good

Other Resource Consuming Systems

- Computers
- TVs
- Copiers/Printers/Fax
- Projectors
- Mini-refrigerators
- Water Coolers

Comments and Observations

- Building contains multiple usage types including Campus Safety, Administration, classrooms, student group (robitics) work space, computer labs
- GSHP systems utilize local t-stat controls. These are non-programmable and setpoints vary.
- No outside air was observed during site visits or on building drawings.

Recent/planned work

-

Salem Community Collage - Contini Hall

Address: 460 Hollywood Avenue Carney's Point, NJ
Size (ft²): 39,000
Built: 1982
Use: Classrooms/Labs
Floors: 2

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
18	Water Furnace GSHP	ATH045A300CLE or sir	3-5 tons							
1	Trane	CBDB10A0JBER0								

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes
1	HW Boiler			1904/2396		79%	20	Abandoned in place

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM	Notes
2	GSHP Loop	Bell & Gossett 1510	7.5	240.0	80	1800	Only one pump in operation during site vis

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls

Setpoints

Brand JCI - Metasys
Type DDC
Age 5 yrs
Condition good

Domestic Hot Water

HW Fuel Electric
Htg Size 4500 Watts
Htg Volume 80 Gallons

Envelope

Type	Description	Condition
Exterior	Face brick with CMU Walls	Good
Glazing	Mainly Double Pane, except in few areas	Fair
Roof	EPDM single ply/Shingle and metal roof	Good

Other Resource Consuming Systems

- Computers
- TVs
- Water Fountains
- Vending machines
- Projectors
- Science lab equipment

Comments and Observations

- One of the pumps seemed to have a bearing missing or operating incorrectly.
- 3-way valves noticed on distribution system. Need to know if HW Reset is being applied.
- VFDs on pumps and fans

Recent/planned work

-

Salem Community Collage - Nursing Center

Address: 460 Hollywood Avenue Carney's Point, NJ
Size (ft²): 5,700
Built: 1999
Use: Nursing Education
Floors: 1

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
2	Trane GSHP	GEHE09041D2AB0LRD	7.5 each						<2	

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM
2	Pumps	Bell & Gossett 80 BF 7	3	72.0	50	1810

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls

Setpoints

Brand Honeywell
Type Local T-stat
Age <2 years
Condition Good

Domestic Hot Water

HW Fuel Electric
Htg Size 1610 Watts
Htg Volume 10 Gallons

Envelope

Type	Description	Condition
Exterior	Brick	Good
Glazing	Mainly Double Pane, except in few areas	Fair
Roof	EPDM single ply/Shingle and metal roof	Good

Other Resource Consuming Systems

- Computers
- TVs
- Projector
- Nursing Lab equipment
- Water Fountains

Comments and Observations

- Pump balancing valves are 50% closed.
- Programmable T-stats set to 70F/72F occupied. Units were not maintaining, space temperature read 64 F.

Recent/planned work

-

Energy Savings Improvement Program (ESIP)
Energy Savings Plan

Salem Community Collage - Davidow Hall

Address: 460 Hollywood Avenue Carney's Point, NJ
Size (ft²): 65,650

Built: 1991
Use: Classrooms/Offices
Floors: 1

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	Min OA	Age (yrs)	Notes
1	AHU 1 - Academic	Climate Changer Size	38	247	11,745	10HP / 3HF	2.50	2,600	24	Htg Calculated from GPM and delta T on dra
1	AHU 2 - Theater	Climate Changer Size	54	470	16,700	10HP / 5HF	1.75	5,500	24	Htg Calculated from GPM and delta T on dra
1	AHU 3 - Theater Lobb	Climate Changer Size	62	490	20,700	20HP / 5HF	0.03	5,200	24	Htg Calculated from GPM and delta T on dra
1	AHU 4 - Gym AHU	Climate Changer Size	106?	880 total	26,090	20 HP	0.02	8,745	24	Htg Calculated from GPM and delta T on dra
1	AHU 5 - Gym AHU	Climate Changer Size	106?	880 total	26,090	20 HP	0.02	8,745	24	Htg Calculated from GPM and delta T on dra
1	AHU 6 - Office w/ DX				450.0	1/8 HP		50	24?	
1	AHU 7 - Office w/ DX									

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes
2	A/C Chiller	Trane RTAC 2004 UQ0N UAFN L1	200					Not in use
10	HW Boiler	Weil-Mclain						
1	Absorption Chiller	Thermax CJ20DCX-S						

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM	
2	CHWP	Bell & Gossett	30	900.0	86	1800	Tag P-1/P-2
2	HWP	Bell & Gossett	15	?	?	?	Tag: P-3/P-4
2	CHWP?	Armstrong	25	770.0	90	1800	Tag: P-7/P-8
2	CHWP?	Armstrong	40	1718.0	50	1200	Tag: P-9/P-10
10	Boiler Pumps	Emerson	1/8	?	?	?	
3	Turbine Heat Recover	Armstrong	1.5	40.0	60	1800	Tag: P-16

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls

Setpoints

Brand Honeywell
Type DDC
Age ?
Condition Good

Domestic Hot Water

HW Fuel Natural Gas
Htg Size 199 MBH Input
Htg Volume 100 Gallons

Envelope

Type	Description	Condition
Exterior	Brick with concrete masonry block	Good
Glazing	Metal, operable, double glazed, 10 yrs	Good
Roof	Pitched, aluminum metal deck, built-up, ballasted	Good
	Brown, 2008, 40 yr warranty	

Other Resource Consuming Systems

- Computers
- TVs
- Water Fountains
- Projectors
- Theater A/V and lighting
- (3) Capstone C-65 Microturbines

Comments and Observations

- One of the pumps seemed to have a bearing missing or operating incorrectly.
- AHU 1 is a VAV AHU with HW Reheat in each box
- AHUs 2-5 have been converted to VAV with SF VFDs
- AHUs 1-3 utilize CO2 RA DCV

Recent/planned work

Salem Community Collage - Salem Center

Address: 174 East Broadway Salem, NJ
Size (ft²): 12,600
Built: 1998
Use: Career Center
Floors: 2

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
14	Water Furnance Ground Source Heat Pumps	ATH045A300CLE	3 to 5 tons		800-2200				?	
1	Greenheck Rooftop Ventilation ERV Unit	ERV-522S-B				7.5 / 3.0			?	Appears to be abandoned in place, not run

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM
2	Pumps (GSHP Loop)	Gould's Pumps Model: NPE Type: 1 1/2 x 2-6 Cat No. 3ST1J	5	?	?	3560

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls — Setpoints

Brand Various (primary Honeywell Digital)
Type Local T-stat (primarily non-programable)
Age 5 yrs?
Condition Good

Domestic Hot Water

HW Fuel Electric
Htg Size 1500
Htg Volume 20 Gals

Envelope

Type	Description	Condition
Exterior	Brick façade with concrete masonry black, painted.	Good
Glazing	Wood frame; 10 years old	Good
Roof	Flat, wood deck, rubber roof; 10 years old	Good

Other Resource Consuming Systems

- Computers
- TVs
- Copiers
- Water Coolers

Comments and Observations

- Local t-stat control, vast majority are non-programmable digital thermostats wall-mounted in the spaces.
- Primarily office spaces and carrer advice/advising spaces. Some areas provide computer access to clients.

Recent/planned work

-

Salem Community Collage - Glass Education Center

Address: 286 Welchville Road Alloway, NJ
Size (ft²): 14,000
Built: 2009
Use: Classrooms/Administration
Floors: 1

Building Schedule:
Weekday: 7:30am-3:30pm
Weekend/Holiday: Closed

Operating Schedule:
Weekday: 6am-10pm
Weekend/Holiday: Saturday 7am-4pm

HVAC Systems

Air-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Fan Volume (CFM)	Fan Size (SF HP / RF HP)	SP (in.)	OA	Age (yrs)	Notes
2	DX Split System - Cooling with furnace or e	OU Trane 2TTA3060A3	5							

Water-side equipment

Quantity	Type	Nameplate Data [Manuf/Model#]	Cooling (Tons)	Heating (MBH)	Cooling Efficiency	Heating Efficiency	Age (yrs)	Notes
1	HW Boiler	Weil-Mclain					?	Propane Burner

Quantity	Type	Nameplate Data [Manuf/Model#]	HP	GPM	Head (ft)	RPM
5	Radiant Floor Circulation Pumps	Taco 0 7-ZF5-9	1/25	?	?	3250
1	Ceiling mounted fan	Trane	?	?	?	?

Lighting Systems

		Location
Primary	T8/ 32watt	Everywhere
Secondary		

Primary Controls (Setpoints)

Brand Various
Type Local T-stat
Age ?
Condition Fair

Domestic Hot Water

HW Fuel Electric
Htg Size 4500
Htg Volume 40 Gals

Envelope

Type	Description	Condition
Exterior	Concrete and fabricated stone front; steel building attached to rear	Good
Glazing	Vinyl clad operable casement windows	New
Roof	Pitched asphalt shingle in front; flat membrane above steel building	Good

Other Resource Consuming Systems

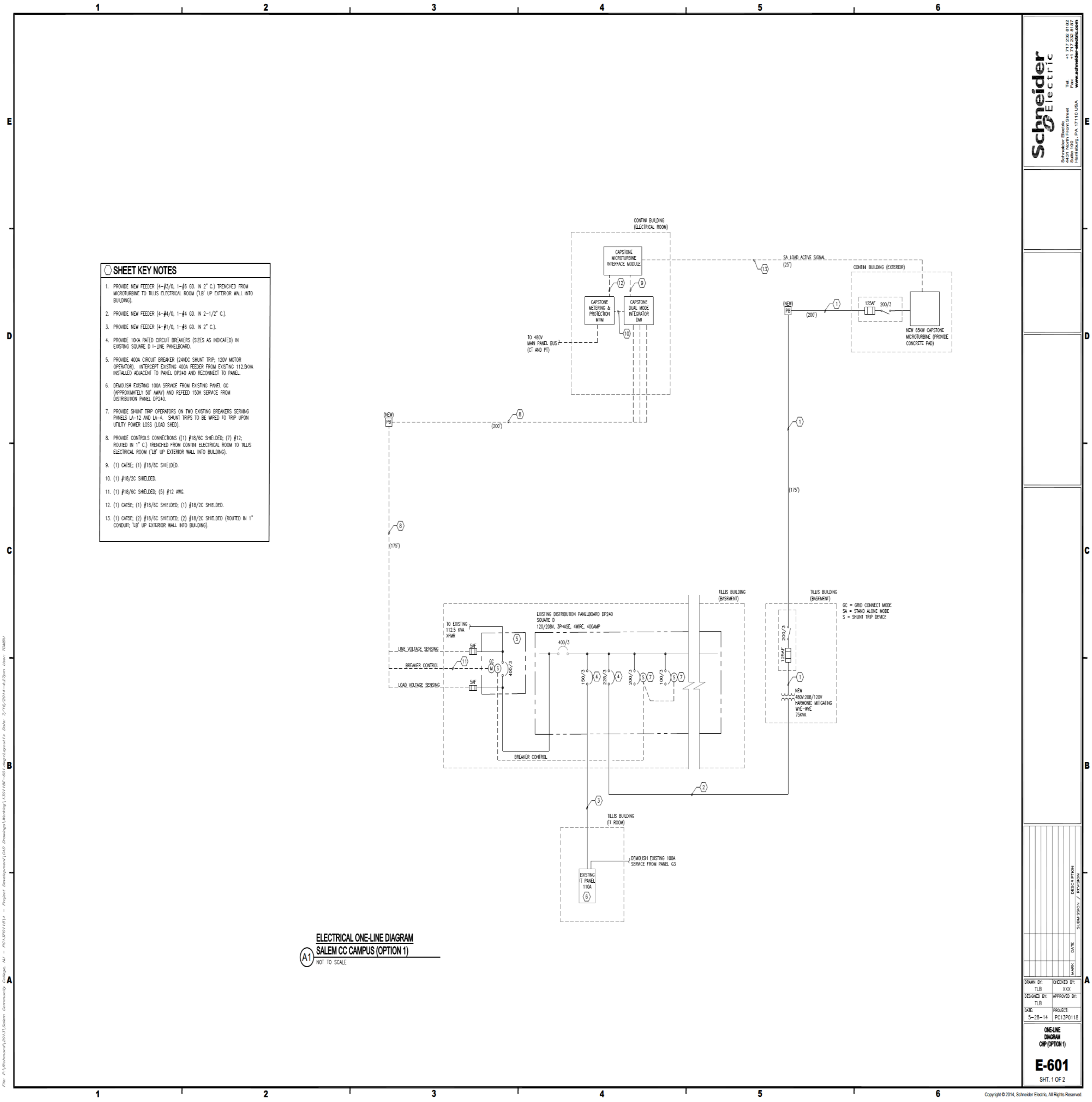
- Computers
- TVs
- Water Fountains
- Glass forming burners
- Glass ovens/furnaces

Comments and Observations

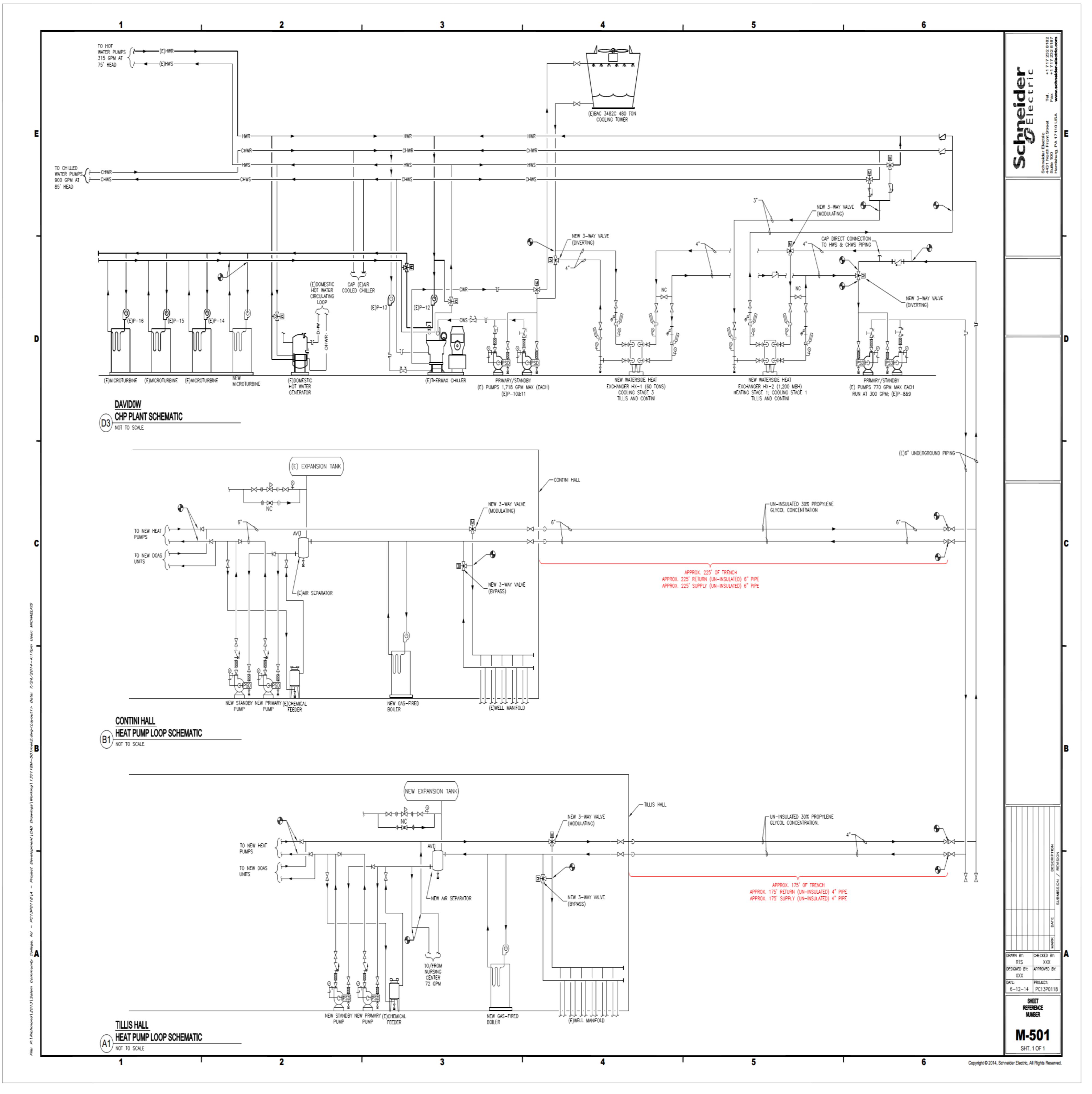
- HW Boiler displayed error code 'E 02' during site visit
- SS 1 Set to 73F in HOLD mode (offices and meeting room 110)
- SS 2 Set to 63F in HOLD mode
- Both filters on both split system units were extremely dirty and deflecting due to high static, unit performance is highly compromised.

Recent/planned work

8.4 Drawings and Specifications



Preliminary Electrical Connection Design from New Capstone Microturbine Unit



Preliminary Mechanical Connections of New Microturbine Unit.

8.5 Independent Energy Audit

Schneider Electric will attach an electronic copy of the Local Government Energy Audit completed by Dome-Tech in 2010.

SALEM COMMUNITY COLLEGE
Energy Audit

<u>Prepared For:</u>
SALEM COMMUNITY COLLEGE

Contact
Raymond Constantine
Exec. Director of Special Projects

<u>Prepared By:</u>
Dome – Tech, Inc.

Prepared Under the Guidelines of the State of NJ Local Government Energy Audit Program

May 2010

Dome-Tech, Inc.

510 Thornall Street, Suite 170
Edison, NJ 08837
Phone: 732-590-0122
Fax: 732-590-0129

FINAL

New Jersey's Clean Energy Program
Your Power to Save
njcleanenergy.com

May 18, 2010

Erik J. Miller
Dome-Tech Group
510 Thornall Street, Suite 170
Edison, NJ 08837

Dear Mr. Miller,

This letter is to inform you that the energy audit report submitted, as outlined below, has been approved. You may now send the final audit report to the participating local government. Thank you for your contribution to the Local Government Energy Audit Program.

Very truly yours,

John Malanga

Applicant Entity:	Salem Community College
Project Number:	Salem Community College 1001
Auditing Firm Awarded:	Dome-Tech Group
Expiration Date:	May 18, 2011

Application Number	Facility Name	Approved Audit Report Name/Review/ Number
01796MA	Donaghay Hall	Salem Community College
01799MA	Tillis Hall	
01800MA	Contini Hall	
01797MA	Nursing Center	
01795MA	Davidow Hall	
01798MA	Salem Center	
01794MA	Glass Education Center	

CC: Raymond Constantine
Executive Director of Special Projects
Salem Community College
460 Hollywood Avenue
Carneys Point, NJ 08069

Commercial & Industrial Market Manager
New Jersey's **Clean Energy** Program
c/o TRC Energy Services
900 Route 9 North, Suite 104, Woodbridge, NJ 07095
Toll Free – 866-433-4479 • Phone – 732-855-0033 • Fax – 732-855-0422

Dome-Tech, Inc.
510 Thornall Street, Suite 170
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Fax: 732.590.0129

SALEM COMMUNITY COLLEGE
ENERGY AUDIT REPORT
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Dome-Tech, Inc.

510 Thornall Street, Suite 170
Edison, NJ 08837

Tel: 732.590.0122
Fax: 732.590.0129

May 27, 2010

Mr. Raymond Constantine
Executive Director of Special Projects
Salem Community College
460 Hollywood Ave
Carneys Point, NJ 08069

**Re: EXECUTIVE SUMMARY FOR SALEM COMMUNITY COLLEGE
STATE OF NEW JERSEY LOCAL GOVERNMENT ENERGY AUDIT –REVISED REPORT**

Dear Mr. Constantine:

Dome-Tech was retained by Salem Community College, as a pre-qualified participant in the Local Government Energy Audit Program, to perform an energy audit. The objective of the energy audit was to evaluate the school's energy consumption, establish baselines for energy efficiency and identify opportunities to reduce the amount of energy used and/or its cost.

The scope of the audit is standardized under the Program, and consisted of the following:

- Benchmarking historic energy consumption utilizing EPA Energy Star's Portfolio Manager
- Characterizing building use, occupancy, size, and construction
- Providing a detailed equipment list including estimated service life and efficiency
- Identifying and quantifying energy conservation measures (ECMs)
- Evaluating the economic viability of various renewable/distributed energy technologies
- Performing a utility tariff analysis and assessing savings potential from energy procurement strategies
- Providing the method of analyses

Based upon data received for the period May 2008 – May 2009, the College had an annual expenditure of:

- Electricity: 2,344,080 kWh at a total cost of $368,440
- Natural Gas: 28,130 therms at a total cost of $38,280
- Propane 17,010 gallons at a total cost of $40,380

Please refer to Section 2 of this report for a detailed list of identified Energy Conservation Measures (ECMs), along with a summary of their preliminary economics (estimated project cost, estimated annual energy savings, applicable rebate(s), etc.) In this report, all identified ECMs are ranked and presented according to their simple payback; however, please note that the master ECM table can also be sorted by building, by measure type, etc.

If all identified ECMs were to be implemented, they would provide the following estimated benefits to Salem Community College:

- Total annual electrical savings: 999,810 kilowatt-hours; 43%
- Total annual natural gas savings: 22,485 therms of natural gas usage; 80%
    - A portion of this savings is offset by additional Landfill gas purchase but the rates/costs are less with landfill gas.
- Total annual cost savings: $212,035; 47%
- Total annual CO_2 emissions reduction: 553 tons
- Total estimated implementation cost: $3,176,500
- Total average simple payback: 14.8 years

The projects that are recommended for implementation (at all facilities) include: installing a Building Management System (BMS), upgrading the lighting, installing programmable thermostats, installing vending machine power management devices, and implementing energy awareness programs.

The Salem Community College data was entered into the US EPA ENERGY STAR's Portfolio Manager database program. The scores ranged from a low of 6 to a high of 30. Buildings with scores of 75 or higher may qualify for the ENERGY STAR Building Label. Please see report for individual facility scores.

Distributed/Renewable Energy Systems were reviewed with the following conclusions:

- Dome-Tech considered three different types of wind turbine technologies that consisted of both building-mounted and traditional ground-mounted variety. Due to attractive payback and high potential for energy reduction, the 50 kilowatt ground mounted wind turbine project appears to be the most attractive option. Should Salem Community College decide to pursue a wind turbine project, Dome-Tech recommends commissioning a more detailed study.
- A roof-mounted 88 kw dc and ground mounted 371 kw dc photovoltaic system that could provide 33% of the school's annual energy usage was assessed for implementation.
- CHP, Fuel Cells, and Micro-turbines were also researched, but are not recommended due to the lack of thermal requirements in the summertime.

Regarding the procurement of utilities, Dome-Tech understands that Salem Community Colleges facilities are served by six electric accounts behind Atlantic City Electric, under various rate classes. Dome-Tech understands that Salem Community College has Annual and Monthly General Service Fixed Price accounts that are currently not contracted with a retail energy supplier. The College is also served by two natural gas accounts behind South Jersey Gas Company. Now is an ideal time to seek longer-term rate stability through a fixed price arrangement through a retail supplier.

During the development of this audit, Dome-Tech was assisted by facility personnel, who were both knowledgeable and very helpful to our efforts. We would like to acknowledge and thank those individuals.

Sincerely,

Bang Duong
Energy Engineer

SALEM COMMUNITY COLLEGE
ECO/ECM Summary

SALEM COMMUNITY COLLEGE
ECO/ECM Summary

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Energy Audit Purpose & Scope

Purpose:

- The objectives of the energy audit are to evaluate the site's energy consumption, establish baselines for energy consumption and identify opportunities to reduce the amount of energy used and/or its cost.

Scope:

I. Historic Energy Consumption: Benchmark energy use using Energy Star Portfolio Manager

II. Facility Description: Characterize building usage, occupancy, size and construction.

III. Equipment Inventory: Detailed equipment list including useful life and efficiency.

IV. Energy Conservation Measures: Identify and evaluate opportunities for cost savings and economic returns.

V. Renewable/Distributed Energy Measures: Evaluate economic viability of various renewable/distributed energy technologies.

VI. Energy Purchasing and Procurement Strategies: Perform utility tariff analysis and assess potential for savings from energy procurement strategies.

VII. Method of Analysis: Appendices

Historic Energy Consumption

Dome-Tech, Inc.

Utility Usage and Costs Summary   Time-period: May 2008 – May 2009

Buildings	Electric				Natural Gas			
	Account Number	Annual Consumption (kWh)	Annual Cost	$ / kWh	Account Number	Annual Consumption (therms)	Annual Cost	$ / Therm
Davidow Hall	1017 7369 992	744,000	$ 112,236.12	$0.151	meter#337545 21240007407	27,808	$ 37,362.80	$1.344
	No Additional Electrical Service				meter#249259 212403054-05	329	$ 917.30	$2.788
	No Additional Electrical Service				212400290-05	*Natural Gas*	*Not Used*	*Not Used*
Contini Hall & Tillis Hall	2490 2299 999	768,960	$ 121,824.41	$0.158	*No Natural Gas Service*			
Donaghay Hall	0249 0229 9957	452,560	$ 70,565.75	$0.156	*No Natural Gas Service*			
Glass Education Center *	0249 0239 9971	52,721	$ 8,940.16	$0.170	Modern Gas- 01-7401-5645	17,013	$ 40,382.61	$2.374
					PROPANE in Gallons			
Salem Center	1348 1409 9997	235,760	$ 39,748.34	$0.169	*No Natural Gas Service*			
Nursing Center	0249 0229 9957	90,080	$ 15,127.11	$0.168	*No Natural Gas Service*			
TOTAL / AVERAGE		**2,344,081**	**$ 368,441.89**	**$0.157**		**28,137**	**$ 38,280.10**	**$1.360**

**Glass Education Center Building has an incomplete year of utility billing so pricing is assumed from portion of year provided*

Please see Appendix for full utility data and consumption profiles for all Buildings.

Historic Energy Consumption

ENERGY STAR SCORES

- Energy Star Score is calculated to establish a facility-specific energy intensity baseline.
- Energy Star can be used to compare energy consumption to other similar facilities and to gauge the success of energy conservation and cost containment efforts.
- Buildings with an Energy Star rating/score of 75, or above, are eligible to apply for an official Energy Star Building label.
- Energy Star scores are only applicable to certain types of buildings (i.e.: schools K-12, offices or dormitory buildings). Energy Star Score can not be determined for the college classroom building type.

Facility Name	Total Floor Area	Energy Star Score	Eligible to Apply for ENERGY STAR	Current Site Energy Intensity (kBtu/SF)	Current Source Energy Intensity (kBtu/SF)
Donaghay Hall	48,000	NA	NA	29.6	98.8
Contini Hall (science & tech) & Tillis	66,200	NA	NA	40.6	135.5
Nursing Center -formerly Glass	5,700	NA	NA	55.3	184.5
Davidow Hall	65,650	NA	NA	82.4	175
Salem Center	12,600	NA	NA	64.1	214
Glass Education Center	14,000	NA	NA	*-One Year Data*	*-One Year Data*

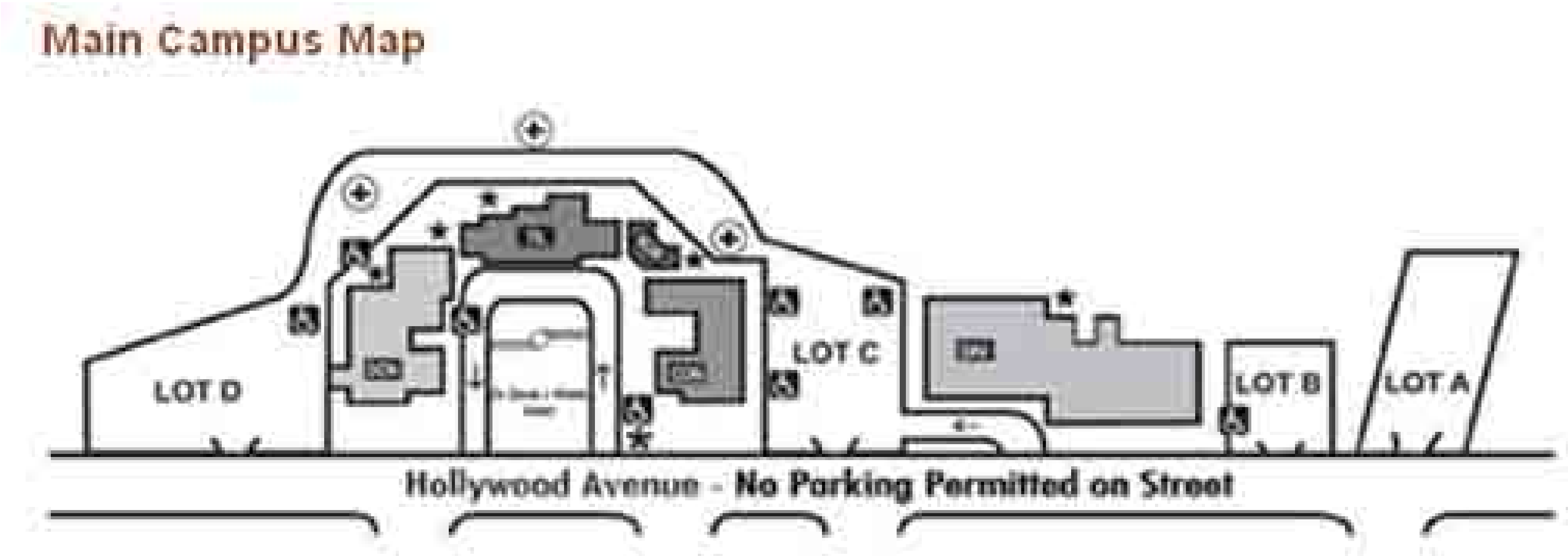
Historic Energy Consumption (continued)

Portfolio Manager Sign - In

- An account has been created for Salem Community College in Portfolio Manager. You will have received an email to notify you of the generation of this account and shared access with Dome-Tech. Please use the login information to view your facility data. Please feel free to alter this information when the report is finalized. We would ask that you leave the sign-in information alone until then. Your college's information is currently shared as read only.
- When the report is finalized the shared access will be changed so that you can use / edit the information and change as you wish.
- Website link to sign-in: https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.Login

  - Username: ***SalemCC***
  - Password: ***DTSalemCC***
  - Email for account: ***constant@salemcc.edu***

Facility Information



CON- CONTINI HALL DAV- DAVIDOW HALL DON- DONAGHAY HALL NUR- NURSING CENTER
TIL – TILLIS HALL GLASS CTR & SALEM CENTER ARE OFF THE MAIN CARNEYS POINT CAMPUS

Facility Information

➢ **Building Name:** **Donaghay Hall**

Address:	460 Hollywood Avenue Carney's Point, New Jersey
Gross Floor Area:	48,000 sf
Year Built:	1978; addition in 1998
# Occupants:	250 students/ 23 staff members plus 5 Staff Librarians and 15 faculty and kitchen staff
Use:	This two story building houses a Student Services unit, bookstore, testing center, library, café, student union, and student activities office. It is operated from 7 AM to 11 PM, 5 days per week, 12 months per year

➢ **Construction Features:**

Facade:	Brick and stucco façade with concrete masonry block. The stucco in certain area's are in poor condition and cracking.
Roof Type:	Pitched, wood deck, brown built-up, approximately 10 + years old, in fair condition.
Windows:	Wood frame, fixed, installed in 1978, in fair condition.
Exterior Doors:	Metal, installed in 1978, in fair condition.

Facility Information (continued)

- **Building Name:** **Donaghay Hall**
- **Major Mechanical Systems**

  - **Ground Source Heat Pumps**
    - Seven (7) Water Furnace Ground Source Heat Pumps that range in capacity from 2 to 25 tons.
    - The fans on these units range from approximately 800 to 2,200 CFM.
    - Three (3) Baldor pumps (3 & 5 HP) that circulate ground source loop water.

  - **Boilers / Heating Systems**
    - COGEN plant in Davidow Hall supplies heating hot water to the ground source heat pumps
    - One (1) State Select 82 gallon electric Domestic Hot Water Tank with a capacity of 4.5 kW.
    - Seven (7) Water Furnace Ground Source Heat Pumps with supplemental electric resistance heat that range in capacity from 2 to 25 tons.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

- **Building Name:** **Tillis Hall**

Address:	460 Hollywood Avenue Carney's Point, New Jersey
Gross Floor Area:	27,200 sf
Year Built:	1927
# Occupants:	125 students; 45 staff
Use:	This two story building houses the Academic Affairs, Administrative Services, Campus Operations, Cultural Events, Foundation, President's, Institutional Research, Planning and Development, and Public Relations Offices; as well as classrooms, and a Robotics Lab; operation is from 7 am until 11 pm. This Building is connected to Contini Hall.

- **Construction Features:**

Facade:	Brick with concrete masonry block.
Roof Type:	Pitched, wood deck, built-up, brown, rubber roof is in good condition, asphalt shingles are in fair condition; approximately 15+ years old.
Windows:	Cover approximately 20% of façade, wood frame, and metal, fixed, double hung, with glazing, approximately 7 years old, in fair/good condition.
Exterior Doors:	Approximately three (3) metal doors, approximately 7 years old, in good condition.

Facility Information (continued)

- **<u>Building Name</u>:** **Tillis Hall**
- **<u>Major Mechanical Systems</u>**

  - **Ground Source Heat Pumps**
    - Seventeen (17) Water Furnace Ground Source Heat Pumps that range in capacity from 1 to 8 tons.
    - The fans on these units range from approximately 800 to 2,200 CFM.
    - Two (2) Baldor pumps (7.5 HP) that circulate ground source loop water.

  - **Boilers / Heating Systems**
    - Seventeen (17) Water Furnace Ground Source Heat Pumps with supplemental electric resistance heat that range in capacity from 1 to 8 tons.
    - One (1) Weil-McLain fire-tube boiler with a capacity of 665 MBH that supplies heating hot water to the ground source heat pumps. (This unit is no longer in use.)
    - Two (2) State Select 40 gallon electric Hot Water Storage Tanks with a capacity of 3.5kW and 4.5 kW.
    - One (1) Ruud 52 gallon electric Hot Water Storage Tank with a capacity of 4.5 kW.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

- **Building Name:** **Contini Hall**

Address:	460 Hollywood Avenue Carney's Point, New Jersey
Gross Floor Area:	39,000 sf
Year Built:	1982
# Occupants:	350 students; 18 staff
Use:	This two story building houses classrooms, computer graphics, nursing, science and math laboratories. It operates from 7 AM to 11 PM, 5 days per week, 12 months per year. This Building is connected to Tillis Hall.

- **Construction Features:**

Facade:	Brick with concrete masonry block.
Roof Type:	Pitched, wood deck, built-up, truss has asphalt shingles, approximately 15+ years old, in fair/good condition.
Windows:	Cover approximately 20% of façade, approximately 10+ years old, in fair/good condition.
Exterior Doors:	Approximately five (5) metal doors, approximately 10+ years old, in fair/good condition.

Facility Information (continued)

- **<u>Building Name</u>: Contini Hall**
- **<u>Major Mechanical Systems</u>**

  - **Ground Source Heat Pumps**
    - Eighteen (18) Water Furnace Ground Source Heat Pumps that range in capacity from 2 to 6 tons.
    - The fans on these units range from approximately 800 to 2,200 CFM.
    - Two (2) US Electric pumps (7.5 HP) that circulate ground source loop water.

  - **Boilers / Heating Systems**
    - Eighteen (18) Water Furnace Ground Source Heat Pumps with supplemental electric resistance heat that range in capacity from 2 to 6 tons.
    - One (1) Precision electric boiler with a capacity of 90 kW that supplies heating hot water to the ground source heat pumps.
    - One (1) Vanguard 80 gallon electric Hot Water Storage Tank with a capacity of 4.5 kW.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

- **Building Name:** **Nursing Center**

Address:	460 Hollywood Avenue Carney's Point, New Jersey
Gross Floor Area:	5,700 sf
Year Built:	1999
# Occupants:	90 students; 9 staff
Use:	This single story nursing center was formerly the glass/art labs and is now used for nursing education. It operates from 7 AM to 11 PM, 5 days per week, 12 months per year.

Construction Features:

Facade:	Brick with concrete masonry block.
Roof Type:	Pitched, wood deck, built-up, brown, approximately 15+ years old, in fair condition.
Windows:	Covering approximately 10% of façade, metal frame, fixed, glazed, approximately 10+ years old, in fair condition.
Exterior Doors:	Approximately two (2) doors, metal frame, approximately 10+ years old, in fair condition.

Facility Information (continued)

- **Building Name:** **Nursing Center**
- **Major Mechanical Systems**

  - **Ground Source Heat Pumps**
    - Two (2) Water Furnace Ground Source Heat Pumps that have a capacity of 5 tons each.
    - One(1) Marathon pump (1/2 HP) that circulates ground source loop water.
  - **Air Handling Units**
    - Two (2) Greenheck Air Handling Units.
    - The fans on these units are approximately 2,000 CFM.
    - These units were formerly equipped with heat recovery wheels. Due to a recent change in use, the heat wheels have been removed.
  - **Boilers / Heating Systems**
    - Two (2) Water Furnace Ground Source Heat Pumps with supplemental electric resistance heat that have a capacity of 5 tons each.
    - Four (4) State Select 40 gallon electric Hot Water Storage Tanks with a capacity of 4.5 kW.
    - One (1) State Select 10 gallon electric Hot Water Storage Tank with a capacity of 4.5 kW.
    - One (1) PEX Radiant floor heating system – Non operational.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

➢ **Building Name:** **Davidow Hall**

Address:	460 Hollywood Avenue Carney's Point, New Jersey
Gross Floor Area:	65,650 sf
Year Built:	1991
# Occupants:	250 students; 12 staff
Use:	This single story building houses a theatre, field house and athletics offices, business and education offices, classrooms, lecture hall, gallery, and Community Outreach office. It operates from 7 AM to 11 PM, 5 days per week, 12 months per year.

➢ **Construction Features:**

Facade:	Brick with concrete masonry block.
Roof Type:	Pitched, aluminum metal deck, built-up, ballasted, brown, installed in 2008 (in new condition); 40 year warranty.
Windows:	Covering 20% of façade, metal, operable, double glazed, shades/blinds, approximately 10 years old, in good condition.
Exterior Doors:	Approximately fifteen (15) doors, approximately 10+ years old.

Facility Information (continued)

- **Building Name:** **Davidow Hall**
- **Major Mechanical Systems**

  - **Chillers**
    - One (1) Thermax Absorption Chiller.
      - Two (2) US Electric Chilled Water Pumps 30 HP each.
      - One(1) Recirculation Pump ¾ HP.
      - Two (2) Loop Water Pumps 30 HP each.
      - Two (2) Absorption Chiller Pump 3 & 7.5 HP.
    - One (1) Trane Packaged Air Cooled Chiller.

  - **Air Handlers**
    - Six (6) McQuay Air Handlers equipped with chilled water cooling and hot water coils.
    - Fans are equipped with variable frequency drives (VFDs).
    - The fans range in size from 11,000 CFM to 21,000 CFM.
    - Three (3) Fan Coil Units equipped with chilled water cooling and hot water coils.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information (continued)

- **Building Name:** **Davidow Hall**
- **Major Mechanical Systems**

  - **Cooling Tower**
    - One (1) Baltimore Aircoil (BAC).
    - The Cooling tower fans are equipped with a 30 HP fan with a variable frequency drive.
      - Two (2) Condenser Water Pumps 40 HP each.

  - **Package Heat Pumps**
    - Two (2) McQuay – Air Cooled Heat Pumps.

  - **Micro-turbine based Co-Generation Plant**
    - Three (3) Capstone 65 kW Micro-turbines.
    - Two (2) Marathon Electric Heating Hot water pumps 10 HP each.
    - One (1) Turbine Heat Recovery Pump 1.5 HP.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information (continued)

- **Building Name:** **Davidow Hall**
- **Major Mechanical Systems**

  - **Boilers / Heating Systems**
    - COGEN plant in Davidow Hall supplies heating hot water to Air Handlers and Variable Volume Boxes.
    - Eight (8) – Weil-McLain Fire-tube boilers that are emergency heating source.
    - One (1) AO Smith 100 gallon natural gas Domestic Hot Water Tank.
    - One (1) AO Smith 250 gallon natural gas Domestic Hot Water Tank.
      - One (1) Domestic Hot Water Recirculation Pump ¼ HP.

  - **Terminal Air Units**
    - Nineteen (19) – variable volume boxes and fan power boxes equipped with hot water coils.

  - **Controls**
    - Optimum Control System – Manages HVAC in Davidow Building.
    - Luma Lighting Control System – Manages Landscape Lighting.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

➢ Building Name: Salem Center

Address:	174 East Broadway Salem, New Jersey
Gross Floor Area:	12,600 sf
Year Built:	1998
# Occupants:	120 students; 15 staff
Use:	This two story building serves as the Career Center. This building is off the Main Carney's Point Campus.

➢ Construction Features:

Facade:	Brick façade with Concrete masonry block, painted.
Roof Type:	Flat, wood deck, rubber roof, approximately 10+ years old, in good condition.
Windows:	Wood frame, approximately 10+ years old, in good condition.
Exterior Doors:	Wood frame, approximately 10+ years old, in good condition.

Facility Information (continued)

- **<u>Building Name</u>: Salem Center**
- **<u>Major Mechanical Systems</u>**

  - **Ground Source Heat Pumps**
    - Fifteen (15) Water Furnace Ground Source Heat Pumps that range in capacity from 3 to 5 tons.
    - The fans on these units range from approximately 800 to 2,200 CFM.
    - Two (2) Goulds Manufacturing pumps (7.5 HP) that circulate ground source loop water.

  - **Boilers / Heating Systems**
    - Fifteen (15) Water Furnace Ground Source Heat Pumps with supplemental electric resistance. heat that range in capacity from 3 to 5 tons.
    - One (1) Vanguard 20 gallon electric Hot Water Storage Tank with a capacity of 1.5 kW.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Facility Information

- **Building Name:** **Glass Education Center**

Address:	286 Welchville Road, Alloway, NJ
Gross Floor Area:	14,000 sf
Year Built:	2009
# Occupants:	150 students; 8 staff
Use:	This single story facilty is approximately 4,000 sf is used for classrooms and administration; the remaining 10,000 sf is the workshop area. The building is operated from 7 a.m. until 11 p.m., 6 days per week, 12 months per year. This building is off the Main Carney's Point Campus.

- **Construction Features:**

Facade:	Concrete and fabricated stone front; pre-fabricated steel building attached to the rear.
Roof Type:	Pitched asphalt shingle in front; flat membrane above steel building in rear.
Windows:	Vinyl clad operable casement windows, in new condition.
Exterior Doors:	Metal, mostly glass in front; six (6) garage doors on building in rear.

Facility Information

- **Building Name: Glass Education Center**
- **Major Mechanical Systems**

  - **Air Cooled Heat Pumps**
    - Two (2) Trane Air Cooled Heat Pumps equipped with DX cooling coils.
    - The fans on these are rated at 2000 CFM.

  - **Boilers / Heating Systems**
    - One (1) Weil- McLain propane boiler that supplies heating hot water to the radiant floor heating system.
      - Five (5) Taco Recirculation Pumps 1/25 HP each.
    - One (1) Trane Ceiling Mounted fan assisted propane fired furnace.
    - One (1) Bradford –White 40 gallon electric Hot Water Storage Tank with a capacity of 4.5 kW.

Please see Appendix for detailed equipment and lighting inventory for the buildings.

Greenhouse Gas Emission Reduction

Implementation of all the identified ECMs will yield:

- 999,810 kilowatt-hours of annual avoided electric usage.
- 22,485 therms of annual avoided natural gas usage.
- 17,850 gallons of annual avoided Propane usage.
- 16,000 therms of annual *additional* Landfill gas usage.
- This equates to the following ***annual*** reductions:

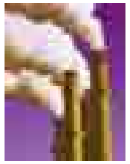
  - 553 tons of CO2;

    -OR-

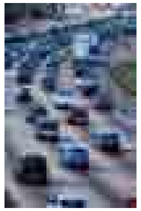
  - 96 Cars removed from road;

    -OR-

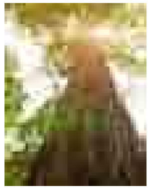
  - 151 Acres of trees planted annually



The Energy Information Administration (EIA) estimates that power plants in the state of New Jersey emit s 0.66lbs CO2 per kWh generated.



The Environmental Protection Agency (EPA) estimates that one car emits 11,560 lbs CO2 per year.



The EPA estimates that reducing CO2 emissions by 7,333 pounds is equivalent to planting an acre of trees.

Notes and Assumptions

- Project cost estimates were based upon industry accepted published cost data, rough order of magnitude cost estimates from contractors, and regional prevailing wage rates. The cost estimates presented in this report should be used to select projects for investment grade development. The cost estimates presented in this report should not be used for budget development or acquisition requests.

- The average CO2 emission rate from power plants serving the facilities within this report was obtained from the Environmental Protection Agency's (EPA) eGRID2007 report. It is stated that power plants within the state of NJ emit 0.66 lbs of CO2 per kWh generated.
  - The EPA estimates that burning one therm of natural gas emits 11.708 lbs CO2.
  - The EPA estimates that one car emits 11,560 lbs CO2 per year.
  - The EPA estimates that reducing CO2 emissions by 7,333 pounds is equivalent to planting an acre of trees.

- The following COGEN utility prices provided were used Davidow Hall within this study:
  - Electricity Cost ($/kWh): $0.034
  - Price of Hot Water ($/therm): $0.939

- The following utility prices provided were used within this study:

Building	$ / kWh	$ / Therms	$/ Propane
Davidow	$0.151	$1.360	NA
Contini & Tillis	$0.158	NA	NA
Donaghay	$0.156	NA	NA
Glass Center	$0.170	NA	$2.374
Salem Center	$0.169	NA	NA
Nursing Center	$0.168	NA	NA

Energy Conservation Measures - ECM #1: Optimize Time of Day Schedules

Dome-Tech, Inc.

Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$22,960
Estimated Gross Implementation Costs:	$3,000
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$3,000
Estimated Simple Payback:	0.1
Annual Avoided CO_2 Emissions (tons):	143.1

	On	Off	Hrs/Day	Days/Yr
Existing	0	24	24	365
Proposed	6	23	17	365

Unit	Area Served	CFM	Estimated Savings
AHU-1	Offices/Classrooms	10,000	$3,857
AHU-2	Theater	12,000	$4,628
AHU-3	Theater Lobby	12,000	$4,628
AHU-4	Gymnasium	12,000	$4,628
AHU-5	Gymnasium	12,000	$4,628
AHU-6	Locker Room	5,000	$1,928
FCU-1	Classroom	1,200	$463
FCU-2	Classroom	1,200	$463
FCU-3	Classroom	1,200	$463

- A review of the schedules in the building management system (BMS) revealed an opportunity to optimize the time of day schedules.
- Optimizing the schedules to better reflect actual building occupancy will reduce heating and cooling costs.
- For example, programming the units to come on at 6 AM and turn off at 11 PM rather than operating the units around the clock, will reduce HVAC cost.

Please see Appendix for Time of Day Schedules

ECM #2: Fuel Switch from propane to LFG

Picture: Showing Landfill Gas Piping

Glass Center	TOTALS
Estimated Annual Energy Cost Savings:	$1,910
Estimated Gross Implementation Costs:	$600
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$600
Estimated Simple Payback:	0.3
Annual Avoided CO_2 Emissions (tons):	0

- Salem Glass Center may have the ability to utilize Landfill Gas (LFG) from the neighboring Landfill. All piping for LFG has been pre-installed. Salem Community College should look into acquiring fuel service from the neighboring LFG provider.
- The average propane cost Salem Community College is paying is $2.374 per gallon. When compared to propane on a BTU basis, the equivalent landfill gas cost is $2.58 per therm. The actual price (recommended by Salem Community College) for LFG is approximately $1.34 per therm which is over 92% less than propane heat. The price of Landfill Gas is generally cheaper than natural gas.
- Replacing the propane with LFG will provide at least $1,900 in annual savings. Internal piping to all the furnaces and glass blowing equipment has been installed and is prepared for the fuel switch. Dome-Tech recommends contacting the local natural gas representative to discuss installing natural gas supply piping to the site and pricing with LFG provider.
- Prior to installing gas-fired equipment , refer to applicable fire codes for proper ventilation requirements.

ECM #3: Cap Existing DX Pipes in AHU 1,2,3 (savings from sealing holes in AHU)

Picture: Davidow AHU -1

Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$930
Estimated Gross Implementation Costs:	$330
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$330
Estimated Simple Payback:	0.4
Annual Avoided CO_2 Emissions (tons):	5.8

- The Air Handlers in Davidow Hall have large holes from the refrigerant piping that was removed. This allows conditioned air into plenum causing an unnecessary increase in the heating, cooling and dehumidification load.
- Dome-Tech recommends capping these holes.
- Energy savings will be realized by the reducing conditioned air and excess fan energy required.

ECM #4: Optimize Setpoints for Server Room

Dome-Tech, Inc.

	Donaghay Hall	Tillis Hall	TOTALS
Estimated Annual Energy Cost Savings:	$100	$210	**$310**
Estimated Gross Implementation Costs:	$50	$140	**$190**
NJ Smart Start Rebate:	$0	$0	**$0**
Net Estimated Implementation Costs:	$50	$140	**$190**
Estimated Simple Payback:	0.5	0.7	**0.6**
Annual Avoided CO_2 Emissions (tons):	0.0	0.0	**0.0**

- The Air Conditioning Units in the Server Rooms in Tillis and Donaghay are set on their lowest temperature. ASHRAE conditions allows a setpoint of 75 °F for server rooms.

- DomeTech recommends raising the setpoint to 75 °F.

Picture: Server Room AC Unit set for 63 °F

ECM #5: Setpoint Optimization – Salem Center

Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$1,500
Estimated Gross Implementation Costs:	$1,100
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$1,100
Estimated Simple Payback:	0.7
Annual Avoided CO_2 Emissions (tons):	0.0

- A review of the facilities showed that the HVAC systems were controlled by programmable thermostats.
- Dome-Tech took sample readings and a review of the programmed setpoints revealed room and supply temperature setpoint inconsistencies. The typical readings were 71 degrees for cooling and 74 degrees for heating.
- Dome-Tech recommends that standard summer/winter setpoints be implemented as follows:
  - *74 °F cooling – 72 °F heating*
  - *Ensure there are no deviations between the zone temperature setpoints* ***(prevents one zone heating, next zone cooling)***

ECM #6: Vending Machine Power Management

	Contini Hall	Tillis Hall	Donaghay Hall	Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$370	$370	$735	$200	**$1,675**
Estimated Gross Implementation Costs:	$360	$360	$720	$180	**$1,620**
NJ Smart Start Rebate:	$0	$0	$0	$0	**$0**
Net Estimated Implementation Costs:	$360	$360	$720	$180	**$2,335**
Estimated Simple Payback:	1.0	1.0	1.0	0.9	**1.4**
Annual Avoided CO_2 Emissions (tons):	0.8	0.8	1.6	0.4	**3.6**

VENDING MACHINE COUNT	QTY
Contini Hall	2
Tillis Hall	2
Donaghay Hall	4
Salem Center	1

- Dome-Tech recommends installing a VendMiser vending machine power management device on all vending machines.
- The device uses a passive infrared sensor to power down the machine when the area surrounding it is vacant. Then it monitors the room's temperature and automatically re-powers the cooling system at one- to three-hour intervals, independent of sales, to ensure that the product stays cold.
- The microcontroller will never power down the machine while the compressor is running, eliminating compressor short-cycling. In addition, when the machine is powered up, the cooling cycle is allowed to finish before again powering down (reduces compressor wear and tear).

ECM #7: Optimize and Standardize the Space Temperature Setpoints

Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$500
Estimated Gross Implementation Costs:	$1,100
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$1,100
Estimated Simple Payback:	2.2
Annual Avoided CO_2 Emissions (tons):	0.0

- A review of the building management systems revealed room and supply temperature setpoint inconsistencies.
- DomeTech recommends that standard summer/winter setpoints be implemented as follows:
  - *74 °F cooling – 70 °F heating*
  - *Ensure there are no deviations between the zone temperature setpoints **(prevents one zone heating, next zone cooling)***

AHU	CFM	Observed Current Average Zone Winter Setpoint	Proposed Zone Winter Setpoint
AHU-1	10,000	74	70
AHU-2	12,000	72	70
AHU-3	12,000	72	70
AHU-6	12,000	72	70
FCU-1	1,200	72	70
FCU-2	1,200	76	70
FCU-3	1,200	72	70
FCU-4	1,200	72	70

ECM #8: Lighting Upgrade

	Contini Hall	Tillis Hall	Donaghay Hall	Salem Center	Nursing Center	Glass Center	Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$10,590	$6,530	$9,870	$5,590	$1,260	$2,640	$3,090	**$39,570**
Estimated Gross Implementation Costs:	$19,250	$16,000	$19,580	$11,340	$3,200	$8,940	$29,900	**$108,210**
NJ Smart Start Rebate:	$1,040	$1,030	$975	$1,030	$135	$1,790	$6,580	**$12,580**
Net Estimated Implementation Costs:	$18,210	$14,970	$18,605	$10,310	$3,065	$7,150	$23,320	**$95,630**
Estimated Simple Payback:	1.7	2.3	1.9	1.8	2.4	2.7	7.5	**2.4**
Annual Avoided CO_2 Emissions (tons):	22.1	13.6	20.9	10.9	2.5	5.1	30.0	**105.2**

- Although most of the current light fixtures have higher efficiency T-8 fluorescent lamps and ballasts, improved light fixture designs will further reduce lighting energy costs by relamping while maintaining the minimum lighting output as per state codes. The Dupont Field house (which is part of Davidow Hall) has older technology HID lighting and should be retrofitted with High Output T5 fixtures.

- Many areas were observed to have lights on regardless of occupancy. Installing occupancy sensors in these areas will automatically turn lights on/off according to actual occupancy by sensing the presence of people in the room. Occupancy sensors will reduce lighting energy costs by approximately 30%*.
- See Appendix for detailed , room by room upgrades.

*Source: Turner, Wayne, Energy Management Handbook, 1999.

ECM #9: Install Timers on Hot Water Heaters

	Donaghay Hall	Nursing Center	Contini Hall	Glass Center	Tillis Hall	Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$100	$260	$50	$50	$100	$40	**$600**
Estimated Gross Implementation Costs:	$160	$800	$160	$160	$320	$160	**$1,760**
NJ Smart Start Rebate:	$0	$0	$0	$0	$0	$0	**$0**
Net Estimated Implementation Costs:	$160	$970	$190	$190	$390	$190	**$1,760**
Estimated Simple Payback:	1.6	3.1	3.2	3.2	3.2	4.0	**3.0**
Annual Avoided CO_2 Emissions (tons):	0.2	0.5	0.1	0.1	0.2	0.1	**1.2**

*Equipment cost only. Assumes install by staff.

- These buildings generate domestic hot water from electric hot water heaters. The hot water heaters range from 10-100 gallons and 1.5 – 4.5 kilowatts of heating.
- Although hot water heaters/storage tanks are insulated, there is significant standby heat loss during off hours. The heating elements turn on throughout unoccupied hours to maintain the desired set point temperature.
- Placing timers on the units will turn the units off during unoccupied hours and turn them back on two hours prior to occupation. This setback schedule eliminates energy used to make up the standby heat loss.

ECM#10: Office AHU Static Pressure Reset

Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$460
Estimated Gross Implementation Costs:	$1,740
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$1,740
Estimated Simple Payback:	3.8
Annual Avoided CO_2 Emissions (tons):	4.4

- The discharge air static pressure set points for Air Handling Unit #1, which serves the office area's with variable volume boxes, are currently set manually by the operators.

- Under a static pressure reset strategy, the BMS will periodically (every 15 minutes) poll VAV box damper positions and adjust the static pressure set point to maintain the box that is most open at 95% damper position.

- A static pressure reset strategy will reduce fan power consumption and yield energy savings by reducing the static pressure to the lowest required limit without affecting desired space conditions.

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ECM #11: Install Heat Recovery from Glass Blowing Furnace

Picture: Salem Glass Center Furnaces

Glass Center	TOTALS
Estimated Annual Energy Cost Savings:	$1,990
Estimated Gross Implementation Costs:	$9,730
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$9,730
Estimated Simple Payback:	4.9
Annual Avoided CO_2 Emissions (tons):	0.0

- These furnaces run 24/7. Reclaiming wasted heat from the glass blowing furnaces exhaust system and integrating it into the radiant floor system, will reduce the facility's propane use.
- Installing a waste heat energy recovery system will provide about $2,000 in annual savings.

ECM #12: Heat Pump Replacement

	Donaghay Hall	Nursing Center	Contini Hall	Tillis Hall	Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$3,600	$800	$7,200	$6,300	$6,300	**$24,200**
Estimated Gross Implementation Costs:	$171,650	$15,600	$177,495	$175,430	$157,230	**$697,405**
NJ Smart Start Rebate:	$5,180	$810	$5,910	$5,310	$4,860	**$22,070**
Net Estimated Implementation Costs:	$166,470	$14,790	$171,585	$170,120	$152,370	**$675,335**
Estimated Simple Payback:	46.2	18.5	23.8	27.0	24.2	**27.9**
Annual Avoided CO_2 Emissions (tons):	7.7	1.7	15.1	13.2	12.4	**50.1**

- The existing heat pump units (HP's) are between 15-30 years old and are at the end of their estimated equipment service life (EESL) per ASHRAE standards. (The EESL for package heat pump units is 15 years.)
- Replacing these HP's with new, higher efficiency units will significantly reduce annual energy and maintenance costs.
- The well fields are beginning to fail; an alternative cooling option is to replace the failing ground source heat pumps with high efficiency air conditioning units. Refer to ECM #18 to see heating option replacement.
- New Jersey SmartStart offers rebates that usually pay for the incremental cost to upgrade to higher efficiency units.

Ton Ranges	(QTY)	Standard SEER	Hi Efficiency SEER
1	1	13	17
2	5	13	17
3	13	13	17
4	22	13	17
5	13	13	17
6	1	13	17
7.5	1	13	17
25	2	13	17

*Savings do not include maintenance savings.

Picture: Tillis Hall Heat Pump

*Energy Efficiency Ratios: EER is the rating of heating /cooling output (Btu) divided by the electrical energy input (watts). The higher the EER, the more efficient the unit.

ECM #13: Replace Kitchen Equipment with Energy Star Rated Equipment

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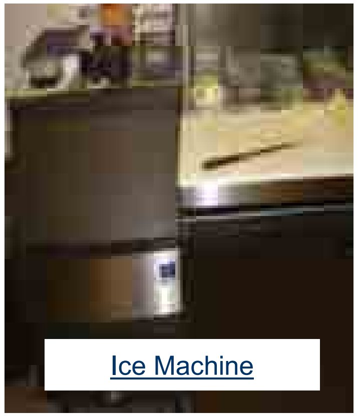
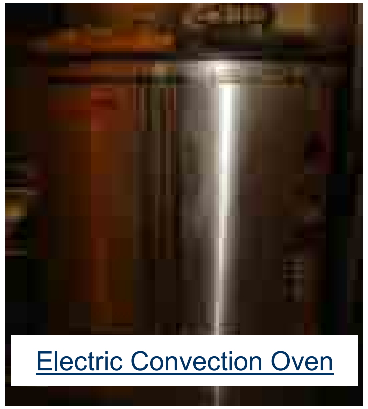
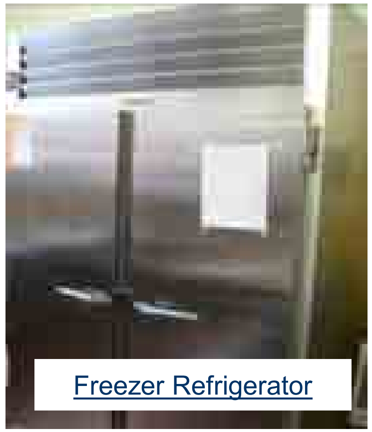
Donaghay Hall	TOTALS
Estimated Annual Energy Cost Savings:	$1,550
Estimated Gross Implementation Costs:	$14,660
NJ Smart Start Rebate:	$0
Net Estimated Implementation Costs:	$14,660
Estimated Simple Payback:	9.5
Annual Avoided CO_2 Emissions (tons):	3.3


Food Warmer


Ice Machine

- Most of the kitchen equipment (reach-in coolers/freezers, food warmers, dishwashers) in Donaghay Hall is older and less efficient than newer higher efficiency equipment.
- Replacing the electric equipment with higher efficiency Energy Star labeled equipment will provide at least $1,550 in annual savings.
- Improvements in kitchen equipment include lower idle rates, better insulation which reduces the amount of standby losses through sides and top, and premium efficiency fan motors.

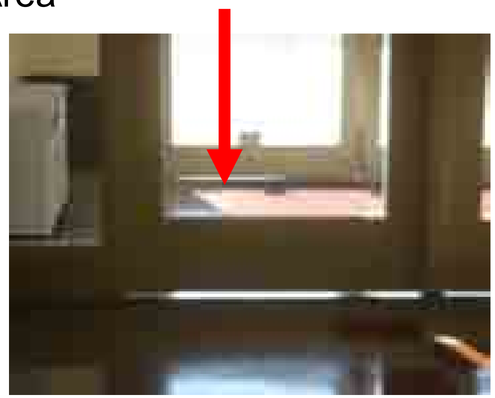

Electric Convection Oven


Freezer Refrigerator

ECM #14: Weather-stripping Exterior Doors

	Contini Hall	Tillis Hall	Davidow Hall	TOTALS
Estimated Annual Energy Cost Savings:	$150	$110	$100	**$360**
Estimated Gross Implementation Costs:	$1,400	$1,050	$1,050	**$3,500**
NJ Smart Start Rebate:	$0	$0	$0	**$0**
Net Estimated Implementation Costs:	$1,400	$1,050	$1,050	**$3,500**
Estimated Simple Payback:	9.3	9.5	10.5	**9.7**
Annual Avoided CO_2 Emissions (tons):	0.9	0.7	0.7	**2.3**

Infiltration Area



Picture: Davidow Exterior Door

- Many of the perimeter doors have poor weather stripping that allow infiltration to enter conditioned areas causing an unnecessary increase in the heating, cooling and dehumidification load.
- Dome-Tech recommends replacing all old weather stripping on perimeter doors that do not have vestibules.
- Energy savings will be realized by the reduction of hot and cold outside air that the building's HVAC equipment must condition to room temperature.

ECM #15: Install Building Management System

	Contini Hall	Tillis Hall	Donaghay Hall	Salem Center	Glass Center	Nursing Center	TOTALS
Estimated Annual Energy Cost Savings:	$15,040	$13,460	$13,590	$12,990	$3,148	$3,622	**$61,850**
Estimated Gross Implementation Costs:	$214,235	$203,170	$92,514	$181,040	$37,186	$59,317	**$787,462**
NJ Smart Start Rebate:	$0	$0	$0	$0	$0	$0	**$0**
Net Estimated Implementation Costs:	$214,235	$203,170	$92,514	$181,040	$37,186	$59,317	**$787,462**
Estimated Simple Payback:	14.2	15.1	6.8	13.9	11.8	16.4	**12.7**
Annual Avoided CO_2 Emissions (tons):	31.4	28.1	28.7	25.4	6.3	7.1	**127.1**

- A Building Management System (BMS) is a computer system designed specifically for the automated control and monitoring of the heating, ventilation, lighting, and needs of a single facility or group of buildings such as university campuses, office buildings or factories. The system can also be used for data collection and used to produce trend analysis and annual consumption forecasts.

- These buildings are not equipped with a centralized building management system, and much of the HVAC is operated manually. Salem Community College should consider a campus wide control system. Davidow Hall has a computer based BMS that should be able to control the centralized system. Additional data lines and sensors installation will be incurred. Further analysis will be required to get cost estimates for the centralized system.

ECM #15: Building Management System (Continued)

- Dome-Tech recommends installing a Building Management System with the following capabilities (the following ECMs below are included under the Building Management System energy savings and are detailed in the following pages). Implementing a building management system could produce estimated annual energy savings of $61,000.

  - **Setpoint Optimization**
  - **Time of Day Optimization**

- Optimize and Standardize the Space Temperature Set points - Optimizing the space temperature setpoints to industry standards will reduce heating and cooling loads which will increase energy savings. A review of existing thermostat setpoints revealed inconsistencies and an opportunity to reduce HVAC costs.

- Optimize Time of Day Schedules - Optimizing the schedules to better reflect actual building occupancy will reduce heating and cooling costs. Implementing a time of day schedule would normally incur energy savings.

ECM #15: BMS Option 2: Programmable Thermostats

	Contini Hall	Tillis Hall	TOTALS
Estimated Annual Energy Cost Savings:	$15,040	$13,460	**$28,500**
Estimated Gross Implementation Costs:	$2,820	$2,660	**$5,480**
NJ Smart Start Rebate:	$0	$0	**$0**
Net Estimated Implementation Costs:	$2,820	$2,660	**$5,480**
Estimated Simple Payback:	0.2	0.2	**0.2**
Annual Avoided CO_2 Emissions (tons):	10.3	9.1	**19.4**

- An alternative option to a centralize BMS system is to install programmable thermostats. Although this is an alternative option to the campus wide BMS system, Dome-Tech highly recommends installing a centralized BMS system due to better control and optimization of the HVAC systems.
- A review of the facilities showed that the HVAC systems were controlled by non-programmable thermostats.
- Dome-Tech recommends replacing the non-programmable thermostats with programmable thermostats.
- Installing programmable thermostats will provide scheduled temperature control to prevent overheating and cooling when the building is unoccupied.

ECM #16: Premium Efficiency Motors

	Donaghay Hall	Davidow Hall	Contini Hall	Tillis Hall	Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$350	$60	$250	$250	$260	**$1,170**
Estimated Gross Implementation Costs:	$4,210	$4,230	$3,800	$3,800	$2,750	**$18,790**
NJ Smart Start Rebate:	$110	$90	$80	$80	$110	**$470**
Net Estimated Implementation Costs:	$4,100	$4,140	$3,720	$3,720	$2,640	**$18,320**
Estimated Simple Payback:	11.7	69.0	15.0	14.9	10.2	**15.6**
Annual Avoided CO_2 Emissions (tons):	0.7	0.6	0.5	0.5	0.5	**2.8**

- Most of the existing motors serving the AHU's and pumps are standard efficiency motors. See the appendix for a detailed list of motors surveyed for this ECM.

Typical Efficiencies for Standard & Premium Motors (1800 RPM Open Drip-Proof Motors)			
HP	**QTY**	**STANDARD EFFICIENCY**	**PREMIUM EFFICIENCY**
3	1	82.5%	89.5%
5	3	82.5%	89.5%
7.5	2	85.5%	91.0%
10	1	86.5%	91.7%

- Dome-Tech recommends replacing select regularly operated standard efficiency motors (pumps and large AHU's) with new premium efficiency motors. For all other motors, when the motor starts to fail it is recommended that they are replaced with new premium efficiency motors. The new motors would reduce electrical consumption.

ECM #17: Elevator Motor Efficiency Controller

- The Department of Energy estimates that 44% of the motors in U.S. industry are lightly loaded and operating inefficiently. Electric motors become highly inefficient when they are lightly loaded – when performing less work than they are designed to handle.

- There are several ways to manage motor loading to optimize efficiency. Variable speed drives conserves energy by varying the motor speed in response to the system load. However, many applications with varying motor loads require constant speed. These systems include escalator and elevator motors.

- Another device designed to manage motor energy is a motor power efficiency controller or PEC. PEC's are designed to manage motor efficiency in constant speed systems by varying the power to motor while maintaining a fixed speed.

- A PEC is essentially a soft start with proprietary technology (voltage/amperage control algorithms). The technology senses a lightly loaded motor's inefficiency and reduces the power to the electric motor while maintaining the motor at full operating speed. In numerous tests by independent third parties, the PEC typically saves 20-40% of the electricity used by motors in appropriate applications.

ECM #17: Elevator Motor Efficiency Controller – (continued)

	Contini Hall	Tillis Hall	Donaghay Hall	Salem Center	TOTALS
Estimated Annual Energy Cost Savings:	$1,470	$680	$1,150	$580	**$3,880**
Estimated Gross Implementation Costs:	$15,585	$15,585	$15,585	$15,585	**$62,340**
NJ Smart Start Rebate:	$0	$0	$0	$0	**$0**
Net Estimated Implementation Costs:	$15,585	$15,585	$15,585	$15,585	**$62,340**
Estimated Simple Payback:	10.6	22.9	13.6	26.9	**16.1**
Annual Avoided CO_2 Emissions (tons):	3.1	1.4	2.4	1.1	**8.0**

- Each facility has 1 elevator each equipped with 15 HP motors. Since this is a ***newly emerging technology***, Dome-Tech recommends performing a pilot study on one elevator. If effective, this initiative should be implemented on all four systems. The presented savings and costs assume a single installation.

- The manufacturer of the PEC claims testing has been done by a group of utilities in New Jersey. Dome-Tech recommends reviewing the technology with Atlantic City Electric for potential incentives.

ECM #18: High Efficiency Boilers, COGEN Waste Heat

- The existing 195 kW micro-turbine co-generation plant provides electricity, heating hot water and chilled water to Davidow Hall. Due to a failing geothermal well field, Donaghay Hall's water loop was also interconnected to the co-generation plant. Site personnel inquired about the potential to interconnect the remaining buildings to the plant in order to receive heating hot water.
- The ground source heat pumps are nearing the end of the ASHRAE recommend service life. Some of the ground source heat pump loops are starting to fail. A ***comparison*** of high efficiency condensing boilers to standard fire-tube boilers has been calculated and is shown below. Note that gas lines would have to be piped to the remaining buildings.
- The co-gen plant's current heating capacity is 843 MBtu-h. The combined connected heating load in Davidow and Donaghay Halls exceeds the current heating capacity of the three microturbines. Although the College is considering adding a fourth micro-turbine to the plant, which would provide an additional 280 MBtu-h, the connected heating loads of Davidow and Donaghay exceeds the peak heating output of the plant. The total connected load in the remaining buildings is 1,585 MBtu-h.
- Adding the remaining buildings to the existing loop would not be advisable.
- An alternative option to the ground-source wells and existing auxiliary electric reheat is to install modular high efficiency condensing boilers for the remaining buildings. A central heating plant (via modular condensing boilers) could be installed and piped from the CO-Gen mechanical room.
- To account for the cooling side, a cooling tower can be installed to replace the ground source water loops. Condenser water can be piped from a central location to all buildings.

ECM #18: High Efficiency Boilers, COGEN Waste Heat (continued)

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	Contini Hall	Tillis Hall	Donaghay Hall	TOTALS
Estimated Annual Energy Cost Savings:	$5,630	$5,070	$5,140	**$15,840**
Estimated Gross Implementation Costs:	$137,340	$137,340	$108,230	**$382,910**
NJ Smart Start Rebate:	$1,000	$1,000	$1,000	**$3,000**
Net Estimated Implementation Costs:	$136,340	$136,340	$107,230	**$379,910**
Estimated Simple Payback:	24.2	26.9	20.9	**24.0**
Annual Avoided CO_2 Emissions (tons):	24.5	22.1	22.4	**69.0**

- In Tillis, Contini and Donaghay Hall, the high first cost of a new boiler system preclude this ECM from being justified by economics alone. However, reliability issues warrant consideration of this project as part of a long-term capital improvement plan. Installation of a new boiler would allow boiler runtimes to be equally distributed and would allow for reliable backup capacity should one boiler fail or require repairs.
- High efficiency boilers should be considered for theses facilities when the ground source heat pump loop fails. Salem County Community College may consider installing a central heating plant to meet the thermal loads of the campus.
- If the fire-tube boiler in Tillis were replaced with high efficiency condensing boilers, savings will be incurred because condensing boilers extract more heat from the input fuel thus allowing efficiencies of 90% and above. Furthermore, Contini and Donaghay Halls have electric supplemental heat, which is very costly compared to gas fired heating systems.

ECM #19: Window Replacement

	Donaghay Hall	Contini Hall	TOTALS
Estimated Annual Energy Cost Savings:	$630	$1,650	**$2,280**
Estimated Gross Implementation Costs:	$520,350	$554,215	**$1,074,565**
NJ Smart Start Rebate:	$0	$0	**$0**
Net Estimated Implementation Costs:	$520,350	$554,215	**$1,074,565**
Estimated Simple Payback:	826.0	335.9	**471.3**
Annual Avoided CO_2 Emissions (tons):	0.0	0.0	**0.0**

NOTE: The presented economics should be used for planning purposes only. If the client decides to proceed with the window replacement project, these economics should be refined with an investment grade analysis.

- A survey of the facility revealed a mixture of types and sizes of windows, and window functionality and condition varied throughout the buildings.
- A window replacement project would result in a measurable improvement in heat retention. In addition, increased aesthetic value and occupant comfort would accompany a window project. It should be noted however, that even an optimized window project can rarely be justified solely on economic payback.
- Because the economics alone are not sufficient to justify implementation, occupant comfort and aesthetics should be the overriding considerations in moving forward with this project.

ECM # 20: Creation of an Energy Awareness & Education Program

Estimated Annual Savings:	\$10,000 - \$15,000*
Gross Estimated Implementation Cost:	\$1500
Expected Rebate / Energy Efficiency Credit:	None
Net Estimated Implementation Costs:	\$1500
Simple Payback (yrs):	Varies
Annual Avoided CO_2 Emissions (tons):	Varies
Cost per Ton CO_2 Reduction (\$/ton):	Varies

- Salem Community College currently has no observed program in place.

- Educational institutions are where our nation's youth spend a significant portion of their time. As such, educators can have a potentially large impact on promoting an energy conscious and conservation-minded society that starts at their school, leading to energy cost reductions, environmental benefits, and national energy independence.

- In addition, schools can receive recognition for their efforts and possible media coverage, which can contribute to enhanced school spirit, and individual feelings of accomplishment and connection.

Renewable/Distributed Energy Measures

Distributed Generation & Renewable Energy

- Distributed Generation (on-site generation) generates electricity from many small energy sources. These sources can be renewable (solar/wind/geothermal) or can be small scale power generation technologies (CHP, fuel cells, microturbines). Davidow Hall has three (3) 65 kW microturbines that produce electricity and hot water for the building.

- Renewable energy is energy generated from natural resources (sunlight, wind, and underground geothermal heat) which are naturally replenished

- Photovoltaic (solar) are particularly popular in Germany and Spain and growing in popularity in the U.S.

- Wind power is growing as well, mostly in Europe and the U.S.

Renewable Energy Technologies: Wind

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Wind turbines generate electricity by harnessing a wind stream's kinetic energy as it spins the turbine airfoils. As with most renewable energy sources, wind energy is subject to intermittent performance due to the unpredictability of wind resources.

Carney's Point Wind Speed

As previously stated, wind speed is critical to the successful wind turbine installation. According to average wind data from NASA's Surface Meteorology and Solar Energy records, the average annual wind speed for Carney's Point area is 4.6 meters per second. Ideal wind speeds for a successful project should average over 6 meters per second.

For Salem Community College, Dome-Tech considered three (3) types of wind turbine technologies; building integrated wind turbines (1 kW each) and traditional ground mounted wind turbines (5 kW & 50 kW).

Building Integrated Wind Turbines
Model: AeroVironment AVX1000
Height: 8.5'
Rotor Diameter: 6'
Weight: 130 lbs.
Cut-In Wind Speed: 2.2 m/s
Maximum Generating Capacity: 1 kW

5 kW Ground Mount
Model: WES5 Tulipo
Height: 40'
Rotor Diameter: 16'
Weight: 1,900 lbs.
Cut-In Wind Speed: 3.0 m/s
Maximum Generating Capacity: 5.2 kW

50 kW Ground Mount
Model: Entegrity EW50
Height: 102'
Rotor Diameter: 50'
Weight: 21,000 lbs.
Cut-In Wind Speed: 4.0 m/s
Maximum Generating Capacity: 50 kW

Renewable Energy Technologies: Wind

The project economics and wind turbine pros and cons are presented in the following tables:

Wind Turbine Economics

	Building Integrated	Ground Mount 5 kW	Ground Mount 50 kW
Gross Installation Cost Estimate	$130,000	$62,400	$250,000
NJJ SSB Rebate	$45,278	$35,994	$95,720
Net Installation Cost Estimate	$84,722	$26,406	$154,280
Annual Energy Savings	$2,137	$1,698	$15,861
Simple Payback	39.7 yrs.	15.5 yrs.	9.7 yrs.
System Capacity	20 kW	10 kW	50 kW
Annual Avoided Energy Use	14,149 kWh	11,248 kWh	105,041 kWh
Annual CO2 Emissions, Therms	5	4	37
% of Annual Electric Use*	0.7%	0.5%	5.1%

Salem Community College: 2055600 kWh/Year.

Wind Turbine Pros & Cons

Pros	Cons
➢Annual reduction in energy spend and use can be potentially reduced by almost $16,000 (5 % reduction). ➢Typical equipment life span is 15-30 years. ➢Reduction of annual greenhouse gas emissions by 126 tons per year. ➢A wind turbine project could be incorporated into science and other curriculums to raise student awareness of energy alternatives. ➢High visible "green" project.	➢Payback period is significant (over 10 years). ➢Average area wind speed is not ideal and impacts performance. ➢Prone to lighting strikes. ➢Bird collisions are likely, but may be reduced with avian guard (building integrate only). ➢Zoning may be an issue. Check with local zoning regulations. ➢Wind turbines do create noise, although below 50 dB (a typical car ride is over 80 dB).

Due to a reasonable payback and high potential for energy reduction, the 50 kilowatt ground mounted wind turbine project appears to be the most attractive option. Should Salem Community College decide to pursue a wind turbine project, Dome-Tech recommends commissioning a more detailed study.

Renewable Energy Technologies: Solar Photovoltaic

Solar Photovoltaic

- Sunlight can be converted into electricity using photovoltaic's (PV).
- A solar cell or photovoltaic cell is a device that converts sunlight directly into electricity.
- Photons in sunlight hit the solar panel and are absorbed by semiconducting materials, such as silicon. Electrons are knocked loose from their atoms, allowing them to flow through the material to produce electricity.
- Solar cells are often electrically connected and encapsulated as a module, in series, creating an additive voltage. The modules are connected in an array. The power output of an array is measured in watts or kilowatts, and typical energy needs are measured in kilowatt-hours.
- Can be recommended in this application for placement on additional buildings / areas (such as fields or parking areas).

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Renewable Energy Technologies: Solar Photovoltaic – Roof Mounted System

Solar Photovoltaic Systems for Davidow Hall, Contini Hall, Nursing Center, Tillis Hall and Donaghay Hall.

	Roof Mount
System Capacity, kw-dc (maximum utilization of roof space)	88 kw dc
Annual Electric Generation, kwhrs of AC electricity produced	98,246 kwh
Total Annual Facility Electric Use, kwhrs	2,055,600 kwh
% of Total Annual Usage	5%
All-In Cost of Electric Year 1	$0.157 / kwh
Annual Electric Cost Savings	$15,425
Estimated SREC Value (Year 1):	$589 / SREC
Estimated Year 1 SREC Revenue:	$57,912
Equivalent Annual CO2 Emission Reduction (tons per year)[1]	62 tons/yr
Equivalent Cars Removed From Road Annually[2]	11
Equivalent Acres of Trees Planted Annually[3]	17
System Installed Cost (does not include value of tax credits)	$528,678
Simple Payback (includes tax incentives)	8.4
IRR (25 Years)	9%
Net Present Value (25 yrs, 10% discount rate)	($29,043)

1. Estimated CO2 Emissions Rate: 1.268 lbs/kWh
2. EPA Estimate: 11,560 lbs CO2 per car
3. EPA Estimate: 7,333 lbs CO2 per acre of trees planted

	Roof Mount
System Capacity (kW)	**88**
No. of Panels	**383**
Annual Output (kWh)	**98,246**

Dome-Tech recommends replacing the roofs before installation of PV system.

Renewable Energy Technologies: Solar Photovoltaic – Ground Mounted System

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Solar Photovoltaic Systems

	Ground Mount
System Capacity, kw-dc (maximum utilization of Ground space)	371 kw dc
Annual Electric Generation, kwhrs of AC electricity produced	561,825 kwh
Total Annual Facility Electric Use, kwhrs	2,055,600 kwh
% of Total Annual Usage	27%
All-In Cost of Electric Year 1	$0.157 / kwh
Annual Electric Cost Savings	$88,206
Estimated SREC Value (Year 1):	$589 / SREC
Estimated Year 1 SREC Revenue:	$331,174
Equivalent Annual CO2 Emission Reduction (tons per year)[1]	356 tons/yr
Equivalent Cars Removed From Road Annually[2]	62
Equivalent Acres of Trees Planted Annually[3]	97
System Installed Cost (does not include value of tax credits)	$2,225,048
Simple Payback (includes tax incentives)	5.9
IRR (25 Years)	14%
Net Present Value (25 yrs, 10% discount rate)	$523,912

1. Estimated CO2 Emissions Rate: 1.268 lbs/kWh

2. EPA Estimate: 11,560 lbs CO2 per car

3. EPA Estimate: 7,333 lbs CO2 per acre of trees planted

	Ground Mount
System Capacity (kW)	**371**
No. of Panels	**1,216**
Annual Output (kWh)	**561,825**

Renewable Energy Technologies: Solar Photovoltaic

➢ Non-Financial Benefits of Solar PV

- The implementation of solar PV projects at Salem Community College would place your facilities at the forefront of renewable energy utilization. This allows the college the opportunity to not only gain experience with this energy technology, but also to win recognition as an environmentally sensitive, socially conscious institution. Additionally, these projects could be incorporated into science education and additional curriculums to raise awareness of current energy alternatives to the younger generations.

Utility Tariff and Rate Review: Electricity

- **Accounts and Rate Class:** The College has six facilities each with a single electric service. The College's six electric accounts are behind Atlantic City Electric under rate classes Annual General Service and Monthly General Service.

- **Electric Consumption and Cost:** Based on the one-year period studied, the total annual electric expenditure for the College is about $368,000 and the total annual consumption is about 2,344,000 kilowatt-hours (kWh).

- **Average/Effective Rate per kWh:** For the one year period studied, the College's average monthly cost per kilowatt-hour ranged from 13.12 ¢/kWh to 20.01 ¢/kWh, inclusive of utility delivery charges. The College's overall, average cost per kilowatt-hour during this period was 15.70 ¢/kWh.
  - Note that these average electric rates are "all–inclusive"; that is, they include all supply service (generation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.

Utility Tariff and Rate Review: Natural Gas

- **Accounts and Rate Class:** The College's Davidow Hall is served by two natural gas accounts behind South Jersey Gas Company under rate classes Basic Gas Supply Service-General Service Gas (BGSS-GSG). The College's Glass Education Center is served by one Modern Gas account that supplies and delivers Propane.

- **Natural Gas Consumption and Cost:** Based on the one-year period studied, the total annual natural gas expenditure for the College is about $38,000 and the total annual consumption is about 28,000 therms (th). Natural gas is used predominantly throughout the winter period for heating purposes. Total Annual propane expenditure is about $40,000 and total annual consumption is about 17,000 gallons.

- **Average/Effective Rate per Therm:** For the one year period studied, the College's average cost per therm ranged from $0.98 to $2.78 per therm, inclusive of utility delivery charges. The College's overall, average cost per therm during this period was $1.36 per therm. The College's overall, average cost per gallon for propane during this period was $2.37 per gallon.
  - Note that these average natural gas rates are "all–inclusive"; that is, they include all supply service (interstate transportation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.

Utility Deregulation in New Jersey: Background and Retail Energy Purchasing

- In August 2003, per the Electric Discount and Energy Competition Act [N.J.S.A 48:3-49], the State of New Jersey deregulated its electric marketplace thus making it possible for customers to shop for a third-party (someone other than the utility) supplier of retail electricity.
- Per this process, every single electric account for every customer in New Jersey was placed into one of two categories: BGS-FP or BGS-CIEP. BGS-FP stands for Basic Generation Service-Fixed Price; BGS-CIEP stands for Basic Generation Service-Commercial and Industrial Energy Pricing.
- At its first pass, this categorization of accounts was based on rate class. The largest electric accounts in the State (those served under a Primary or a Transmission-level rate class) were moved into BGS-CIEP pricing. All other accounts (the vast majority of accounts in the State of New Jersey, including residential) were placed in the BGS-FP category, receiving default electric supply service from the utility.
- The New Jersey Board of Public Utilities (NJBPU) has continued to move new large energy users from the BGS-FP category into the BGS-CIEP category by lowering the demand (kW) threshold for electric accounts receiving Secondary service. Several years ago, this threshold started at 1,500kW; now, it has come down to 1,000 kW. So, if an account's "peak load share" (as assigned by the utility) is less than 1,000 kW, then that facility/account is in the BGS-FP category. If you are unsure, you may contact Dome-tech for assistance.

Utility Deregulation in New Jersey: Background & Retail Energy Purchasing (continued)

- There are at least 3 important differentiating factors to note about each rate category:
  1. The rate structure for BGS-FP accounts and for BGS-CIEP accounts varies.
  2. The "do-nothing" option (ie, what happens when you don't shop for retail energy) varies.
  3. The decision about whether, and why, to shop for a retail provider varies.

- Secondary (small to medium) Electric Accounts:
  - BGS-FP rate schedules for all utilities are set, and re-set, each year. Per the results of our State's BGS Auction process, held each February, new utility default rates go into effect every year on June 1st. The BGS-FP rates become each customer's default rates, and they dictate a customer's "Price to Compare" (benchmark) for shopping purposes. To learn more about the BGS Auction process, please go to www.bgs-auction.com.
  - A customer's decision about whether to buy energy from a retail energy supplier is, therefore, dependent upon whether a supplier can offer rates that are lower than the utility's (default) Price to Compare. In 2009, and for the first time in several years, many BGS-FP customers have "switched" from the utility to a retail energy supplier because there have been savings.

- Primary (large) Electric Accounts:
  - The BGS-CIEP category is quite different. There are two main features to note about BGS-CIEP accounts that do not switch to a retail supplier for service. The first is that they pay an hourly market rate for energy; the second is that these accounts also pay a "retail margin adder" of $0.0053/kWh. For these large accounts, this retail adder can amount to tens of thousands of dollars. The adder is eliminated when a customer switches to a retail supplier for service.
  - For BGS-CIEP accounts, the retail adder makes a customer's decision about *whether* to switch relatively simple. However, the process of setting forth a buying strategy can be complex, which is why many public entities seek professional assistance when shopping for energy.
  - For more information concerning hourly electric market prices for our region, please refer to www.pjm.com.

Utility Deregulation in New Jersey: Background & Retail Energy Purchasing (continued)

- Natural Gas Accounts:
  - The natural gas market in New Jersey is also deregulated. Unlike the electric market, there are no "penalties", or "adders", for not shopping for natural gas. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. While natural gas is a commodity that is exceptionally volatile and that is traded minute-by-minute during open trading sessions, market rates are "settled" each month, 3 business days prior to the subsequent month (this is called the "prompt month"). Customers that do not shop for a natural gas supplier will typically pay this monthly settlement rate to the utility, plus other costs that are necessary to bring gas from Louisiana up to New Jersey and ultimately to your facility.
  - For additional information about natural gas trading and current market futures rates for various commodities, you can refer to www.nymex.com.
  - A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by enlisting a retail natural gas supplier. Many larger natural gas customers also seek the assistance of a professional consultant to assist in their procurement process.

Retail Energy Purchasing: Recommendations and Resources

- Electric
  - o Based on current and recent market conditions, and actual bid processes run by Dome-Tech for various clients, we have seen customers with BGS-FP accounts save approximately 10-20% in projected energy costs by switching to retail energy supplier. The College could secure this type of agreement with the NJ County College Electric Consortium. This could represent an annual savings of approximately $30,000 for the larger accounts at the College. It is important to note that actual rates and potential savings will be dependent on several factors, including market conditions, account usage characteristics/load profile (load factor), volume, and contract term.
- Natural Gas
  - o Based on current and recent market conditions, and actual bid processes run by Dome-Tech for various clients, we have seen many customers entering into longer-term contracts for fixed natural gas rates. These rates vary substantially based on load type, volume, and term. The College could secure this type of agreement with the South Jersey Power Co-Operative.
- Energy Purchasing Co-Operatives
  - Many public entities participate in various energy aggregation buying groups. Sometimes, an entity will have multiple options to choose from. These might include purchasing through a County co-operative, or purchasing through a trade-type association (for instance, many schools participate in NJASBO's ACES program). Co-operative purchasing may not necessarily get you the lowest rates; however, there is often substantial volume, and it can represent a good alternative for entities with limited energy consumption who can have a difficult time getting energy suppliers to respond to them on a direct, singular basis.
- To determine whether a savings opportunity currently exists for your entity, or for guidance on how to get started, you may contact Dome-Tech to discuss. There is also additional information provided below.

Retail Energy Purchasing: Recommendations and Resources (continued)

- To learn more about energy deregulation, visit the New Jersey Board of Public Utilities website: www.bpu.state.nj.us
- For more information about the retail energy supply companies that are licensed and registered to serve customers in New Jersey, visit the following website for more information: http://www.bpu.state.nj.us/bpu/commercial/shopping.html
- Provided below is a list of NJ BPU-licensed retail energy suppliers:

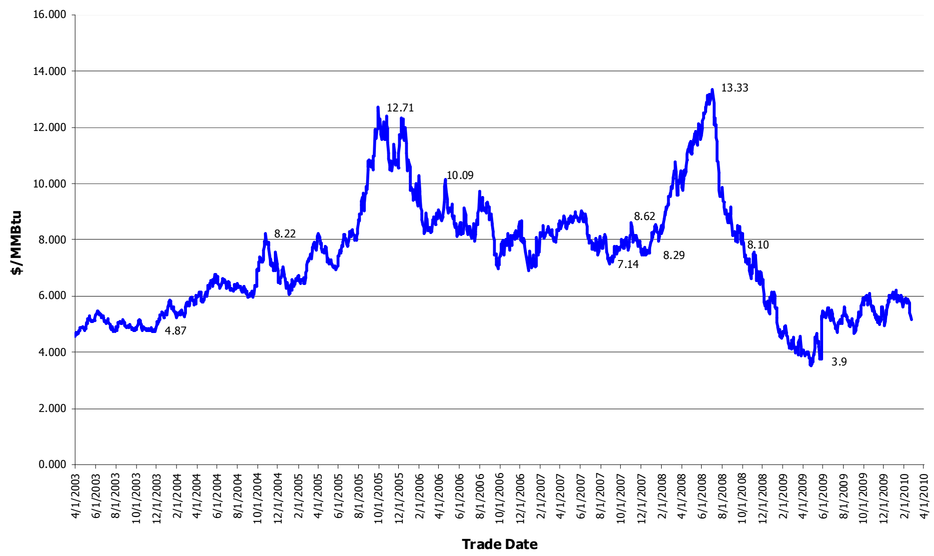
Company	Electricity	Natural Gas	Website
Pepco	X	X	www.pepcoenergy.com
Hess	X	X	www.hess.com
Sprague	X	X	www.spragueenergy.com
UGI	X	X	www.gasmark.com
South Jersey Energy	X	X	www.sjindutries.com
Direct	X	X	www.directenergy.com
Global	X	X	www.globalp.com
Liberty	X		www.libertypowercorp.com
ConEd Solutions	X		www.conedsolutions.com
Constellation	X		www.constellation.com
Glacial	X		www.glacialenergy.com
Integrys	X		www.intergryenergy.com
Suez	X		www.suezenergyna.com
Sempra	X		www.semprasolutions.com
Woodruff		X	www.woodruffenergy.com
Mx Energy		X	www.mxenergy.com
Hudson		X	www.hudsonenergy.net
Great Eastern		X	www.greateasterngas.com

**Note: Not every Supplier serves customers in all utility territories within New Jersey*

Historical Energy Futures Settlement Prices

- Below please find graphs that show the last several years' worth of market settlement prices for both natural gas and electricity. Each of these graphs shows the average closing prices of a rolling 12-month period of energy futures prices. The graphs are representative of the commodity, alone; they do not include any of the additional components (capacity, transmission, ancillary services, etc.) that comprise a retail energy price. They are meant to provide an indication of the level of pricing that a particular customer might expect to see, but the graphs do not account for the specific load profile of any individual energy user.

Henry Hub 12 month strip



PJM West 12 month strip

Operations & Maintenance

Picture: Davidow Hall - AHU – 4

Davidow Hall

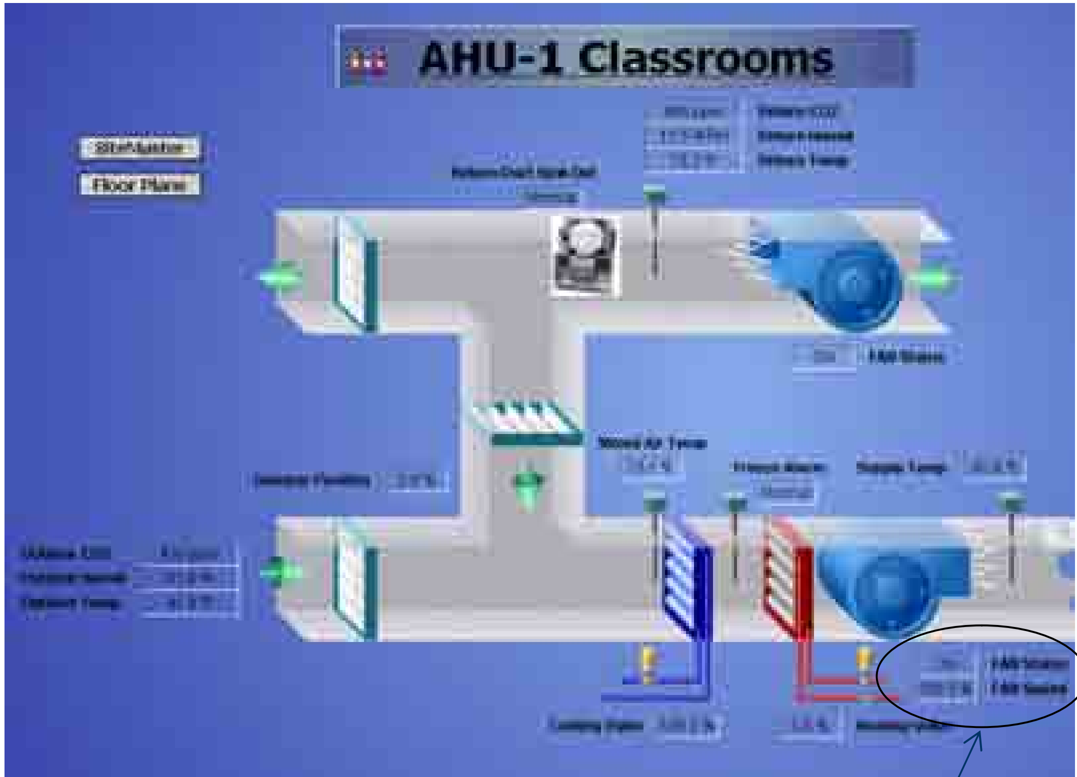
- Issue: Missing Filters
- Impact: Leads to poor air quality, improper pressurization and ventilation and thermal comfort
- Recommendation: Install Filter
  - *There is little or no expected O&M savings from this measure*

Picture: Davidow Hall - Temperature Sensor

Davidow Hall

- Issue: Overheating - Thermostat Calibration RM – C108, Davidow Hall
- Impact: The thermostats when compared to a calibrated thermometer is off by 4 degrees. As a result, the room is overheating which leads to poor thermal comfort.
- Recommendation: Recalibrate Temperature Sensors
  - *There is minimal to no energy savings due to net savings on cooling side*

Operations & Maintenance



Picture: Davidow Hall – Supply Fan Speed at 100%

Picture: Davidow Hall – Static Pressure Setpoint locked at 2.00 in/w.c.

Davidow Hall

- Issue: AHU – 1: Static Sensor out of calibration
- Impact: Static pressure setpoint will never be satisfied. The fans run at full load and never modulates. As a result, there is an increased and excessive fan use.
- Recommendation: Replace or Recalibrate Static Pressure Sensor
  - *There is approximate $50 year for O&M savings from this measure*

Potential Project Funding Sources

Through the NJ Clean Energy program, the New Jersey Board of Public Utilities currently offers a variety of subsidies or rebates for many of the project types outlined in this report. More detailed information can be found at: www.njcleanenergy.com

NJ Smart Start Buildings – Equipment Rebates noted in ECMs where available.
Equipment Rebates - Water Heaters, Lighting, Lighting Controls/Sensors, Chillers, Boilers, Heat pumps, Air conditioners, Energy Mgmt. Systems/Building Controls, Motors, Motor-ASDs/VSDs, Custom/Others http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

Pay for Performance Program – Performance-Based Incentives for installations.
Provides up to 50% of total project costs. ***Based on findings in this study, up to $285,000 in incentives for project implementation could be provided under this program.*** A minimum reduction target of 15% compared to baseline must be achieved. Energy modeling of building and systems and energy reduction plan is required (incentives provided to pay for part of study costs.)

Energy Savings Improvement Program (ESIP) Public entities can contract with energy saving companies in up to 20-year lease purchases enabling public entities to implement energy conservation measures to their facilities and pay for the costs using the value of energy savings that result from the improvements. The Energy saving companies (ESCO) would assist in bypassing large upfront costs to the entity.
www.**nj**.gov/dca/lgs/lfns/09lfns/2009-11.doc

Potential Project Funding Sources (continued)

Clean Energy Solutions Capital Investment Loan/Grant

The EDA offers up to $5 million in interest-free loans and grants to promote the concept of "going green" in New Jersey. Under this program, scoring criteria based on the project's environmental and economic development impact determines the percentage split of loan and grant awarded. Funding can be used to purchase fixed assets, including real estate and equipment, for an end-use energy efficiency project, combined heat and power (CHP or cogen) production facility, or new state-of-the-art efficient electric generation facility, including Class I and Class II renewable Energy.
http://www.njeda.com/web/Aspx_pg/Templates/Npic_Text.aspx?Doc_Id=1078&menuid=1360&topid=722&levelid=6&midid=1357

Clean Renewable Energy Bonds (CREBs) – For Renewable Energy Projects

Federal Loan Program for Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrokinetic Power, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal

http://www.irs.gov/irb/2007-14_IRB/ar17.html

Renewable funding for PV & wind, plus federal credits currently available:
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program/applications-and-e-forms-renewable-ener

Online Energy Profiler from Atlantic City Electric - Atlantic City Electric offers an Online Energy Profiler program for tracking and managing energy costs for multiple facilities.
http://epo.energyinteractive.com/conectivepo/cgi/eponline.exe

Potential Project Funding Sources (continued)

Dome-Tech, Inc.

<u>Small Business Direct Install Program</u> – NJ Clean Energy makes the investment in energy efficiency upgrades by initially covering 80% of the cost to install the recommended energy efficiency measures. If eligible, the entity will pay ONLY 20% of the total cost to install the energy efficiency measures. **http://www.njcleanenergy.com/commercial-industrial/programs/direct-install**

We encourage you to contact the program directly for further information on this particular program for the following buildings: Contini Hall, Tillis Hall, Donaghay Hall, Glass Education Center & Salem Center.

Steps to Participate for Buildings under 200KW / month

1. CONTACT THE PARTICIPATING CONTRACTOR IN YOUR AREA
Identify the contractor assigned and trained to provide Direct Install services in the county where your project is located. Using the contact information provided, call or email the Participating Contractor to discuss your project. The contractor will schedule an Energy Assessment and work with you to complete the Program Application and Participation Agreement. If you're unable to contact the Participating Contractor or have questions, you may contact us at 866-NJSMART or send an e-mail to DirectInstall@trcsolutions.com..

2. REVIEW RESULTS
After the Energy Assessment, the contractor will review results with you, including what measures qualify and your share of the project cost.

3. DECIDE TO MOVE FORWARD
You will sign a Scope of Work document to proceed with implementation of qualifying measures.

4. ARRANGE INSTALLATION
You and the Participating Contractor will set a convenient start date for the installation.

5. CONFIRM INSTALLATION
Once the Participating Contractor completes the installation, you accept the work by signing a Project Completion Form. A program representative will approve the project as complete.

6. COMPLETE TRANSACTION
You pay the Participating Contractor your share of the project cost and the program pays its share.

Next Steps

- **<u>The following projects should be considered for implementation:</u>**

  - Install Building Management System
  - Lighting upgrades
  - Vending machine power management
  - Start Energy Awareness Program
  - Energy Procurement (Electricity & Gas)
  - Heat Pump Replacements
  - High Efficient Condensing Boilers

  Note that additional "Phase 2" engineering may be required to further develop these projects, to bring them to bidding and implementation.

  - **<u>Consider applying for Pay-For-Performance Program</u>**