

SIEMENS



Lansing Community College

Lansing, Michigan

Guaranteed Savings & Facility Improvement Contract

Annual Savings Report

Contract Year 5: January 1st, 2010 - December 31st, 2010

Siemens Industry, Inc.

Building Technologies Division

45470 Commerce Center Drive

Plymouth Township, MI 48170

Project Overview - Year 5
Energy / Cost Savings Summary

FIM	Guaranteed Energy Savings	Actual Energy Savings	Units	Guaranteed Cost Savings	Actual Contract Savings
Lighting Retrofit	404,774	435,447	<i>kWh</i>	\$24,381	\$35,586
Water Retrofit	5,983	7,579	<i>kgal</i>	\$47,875	\$77,598
Chiller Retrofit	338,360	398,805	<i>kWh</i>	\$20,564	\$32,041
Dry Bulb Economizer	32,074	36,013	<i>kWh</i>	\$1,949	\$2,893
Temp. Setpoint Reduc.	490,590	490,590	<i>kWh</i>	\$44,103	\$39,700
	1,486	1,486	<i>MLB</i>		\$19,243
CO2 Ventilation Reduc.	1,663	1,527	<i>MMBTU</i>	\$19,189	\$22,947
Unocc. Ventilation Reduc.	2,797	4,048	<i>MMBTU</i>	\$32,268	\$79,045
Operational Savings	-	-		\$26,776	\$26,776
Totals				\$217,105	\$335,830

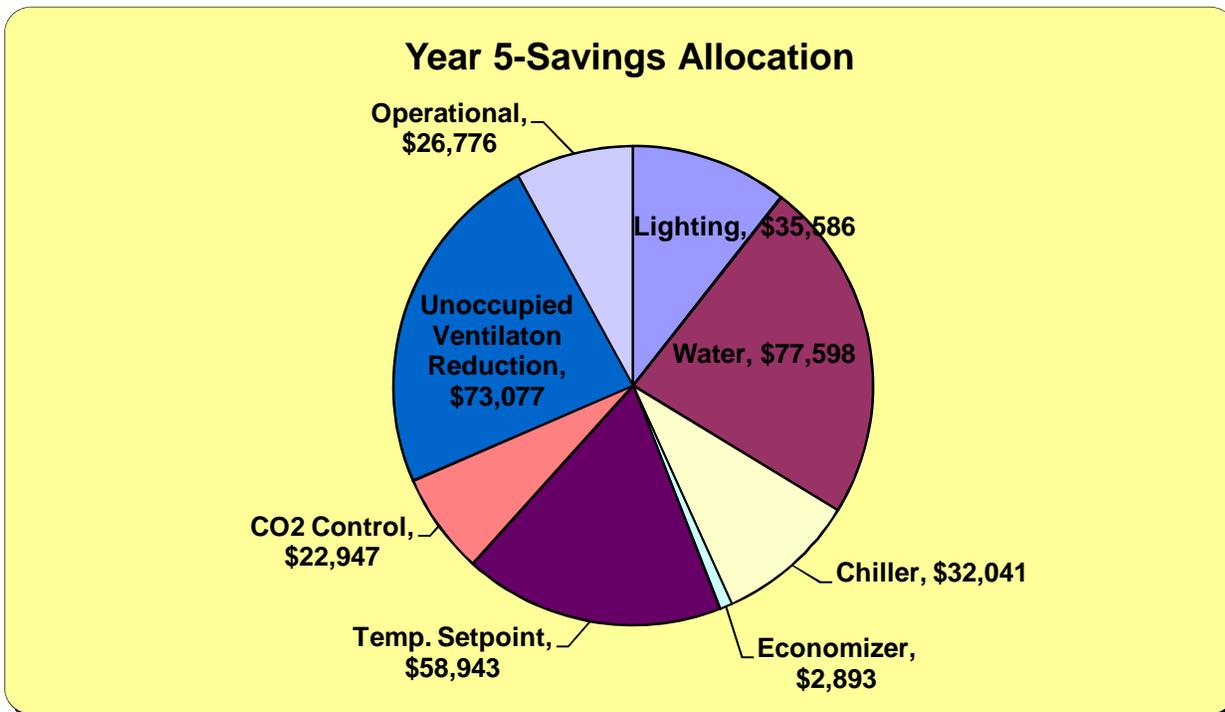
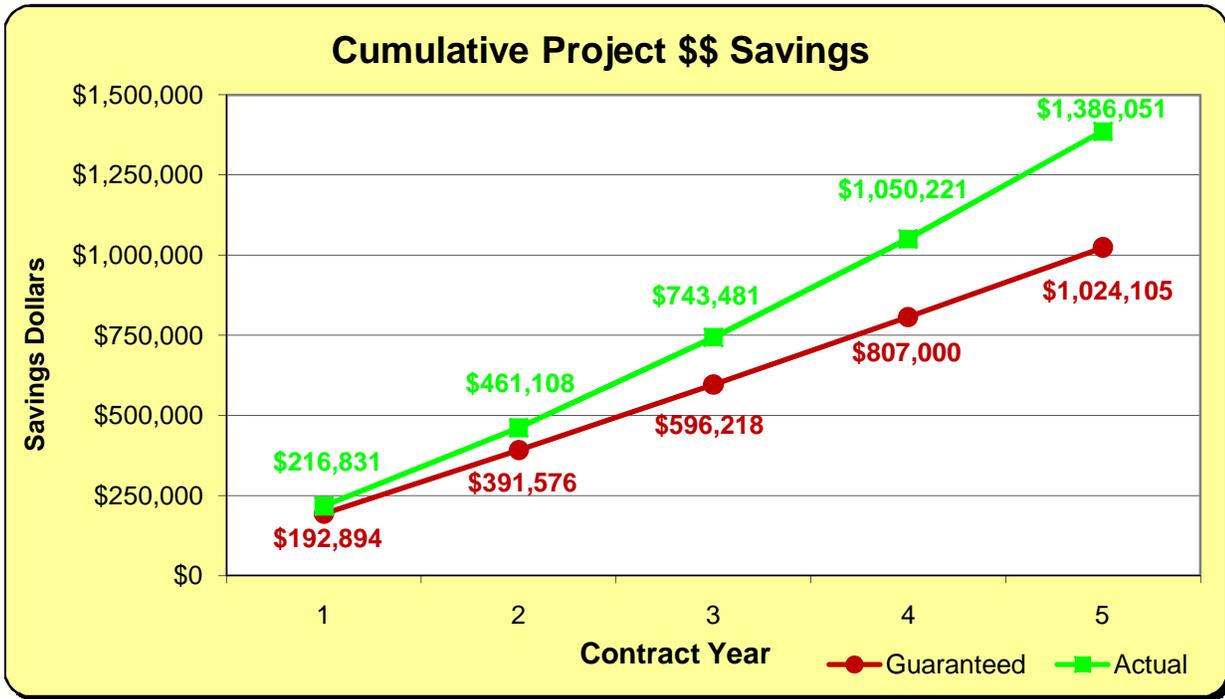
The 'Actual Energy Savings' above directly correspond with the Facility Improvement Measures (FIMS) associated with the energy contract established between Siemens Industry, Inc. - Building Technologies and Lansing Community College.

The 'Actual Contract Savings' are the product of (1) X (2):

(1) Contract Escalated Rates or Actual Utility Rates (from LCC Utility Bills)

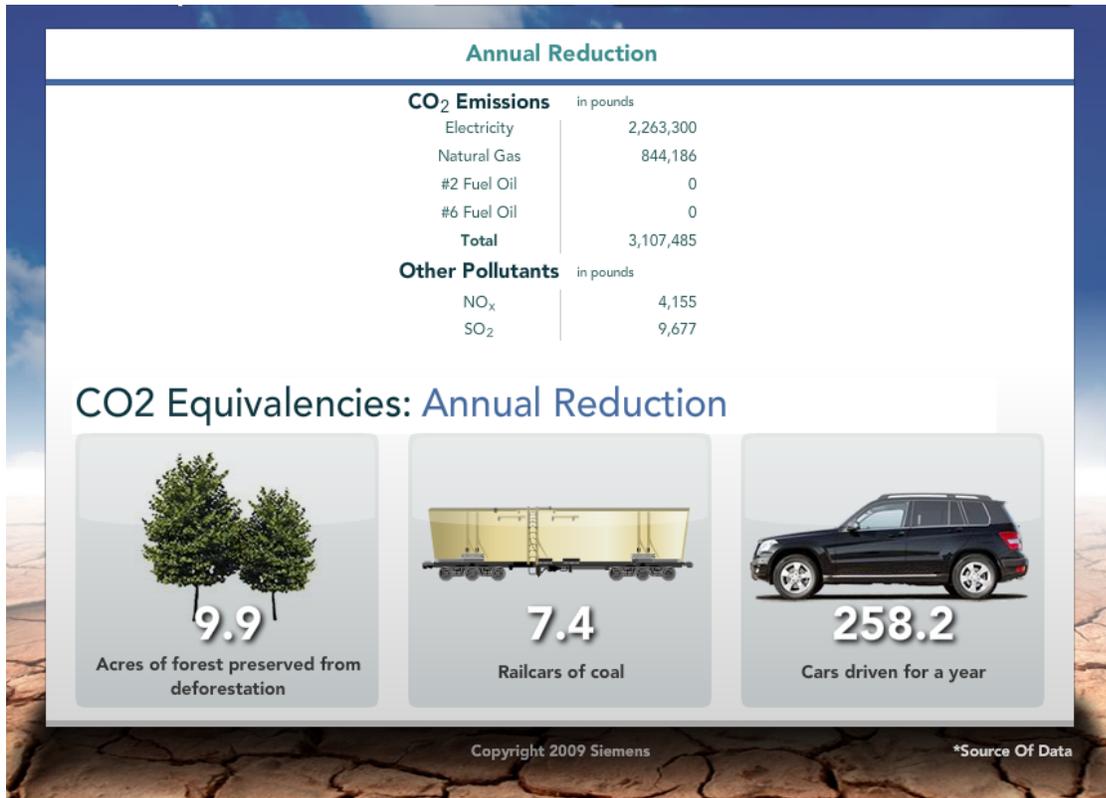
(2) 'Actual Energy Savings' (Combination of Trended and Calculated Utility Savings based on the M&V Plan)

Project Overview - Year 5
Guarantee Savings Comparisons Graphs



Lansing Community College – Greenhouse Gas Emissions Reductions

Year 5 Energy Savings, January 1st 2010 to December 31st 2010, resulted in the following reductions in greenhouse gas emissions. These reductions are a result of 1,360,855 kWh and 72,091 Therms of energy savings.



Lansing Community College – Greenhouse Gas Emissions Reductions

Cumulative Energy Savings, Years 1 through 5, resulted in the following reductions in greenhouse gas emissions. These reductions are a result of 6,681,537 kWh and 343,955 Therms of cumulative energy savings since project completion.



Project Overview - Year 5
Utility Bill Savings Analysis

While Siemens' guarantee is reported based upon engineering calculations and trend data, it is also helpful to analyze utility bills in order to determine the project's impact on energy consumption. Therefore, the following table summarizes the consumption for all buildings included as part of Siemens' project.

	Baseline Year 2002-2003	Report Year 2010	Energy Savings	Cost Savings	% Savings
Electricity - kWh	13,959,367	11,197,940	2,761,427	\$223,465	19.78%
Natural Gas - CCF	28,339	30,852	-2,513	-\$2,357	8.87%
Steam - MIb	34,265	22,895	11,370	\$147,237	33.18%
Water - CCF	27,967	19,426	8,541	\$65,406	30.54%
Totals				2010 LCC Utility Bill Savings: \$433,751	

The list below summarizes all buildings that are used to calculate the above utility data:

- 1) ARTS & SCIENCES
- 2) DART AUDITORIUM
- 3) GANNON PHYS.ED.
- 4) GANNON VOC.TECH.
- 5) S.P.S.
- 6) AVIATION CENTER
- 7) DAZY FLIGHT CNTR.
- 8) SYKES TECH.CNTR.

Notes:

This spreadsheet is used for comparison purposes only. It demonstrates that the energy savings initiatives have had a significant impact on the LCC Campus Utility Consumptions.

Savings realized by the SBT Energy Project are represented on the Project Overview Year 5 - Energy / Cost Savings Summary page.

Lighting Retrofit

Savings Type: Electric (kWh)

Verification Type: Measured Capacity

	Baseline kWh Consumption	Guaranteed kWh Savings	Actual kWh Savings ¹	Rate	Actual Contract Savings
Arts & Sciences	1,063,601	166,212	178,807	0.0803/kWh	\$14,366
Aviation Center	96,853	14,405	15,497	0.1132/kWh	\$1,755
Dart Auditorium	16,259	5,853	6,296	0.0803/kWh	\$506
Dazy Flight Center	19,322	2,717	2,923	0.112/kWh	\$327
Gannon	961,126	209,185	225,037	0.0803/kWh	\$18,080
Student Personnel Serv.	17,783	6,402	6,887	0.0803/kWh	\$553
Totals	2,174,944	404,774	435,447		\$35,586

Notes:

¹Actual savings have been verified with post-retrofit power readings. Savings are based on a comparison between the calculated kWh reduction and the kWh reduction of a measured sample of fixtures.

	Calculated	Guaranteed	Measured	% Difference
Sample kWh Reduction Sample Size: ~100 Fixtures	10,393	9,354	10,062	7.57%
	Calculated	Guaranteed	Actual	% Difference
Total kWh Reduction	449,749	404,774	435,447	7.58%

Water Retrofit

Savings Type: Water (kgal)

Verification Type: Measured Capacity

The table below is an extract from the sample of measured fixtures. In total, 25 fixtures were measured. These three (3) items were located on the 1st Floor of the Gannon Building

Pre-Retrofit Fixture		Upgraded Fixture	
Fixture	Flow	Fixture	Flow
Sloan Flush Valve/Water Closet	3.8 gpf	American Standard 1.6 WC/Retro	1.5 gpf
Sloan Flush Valve Urinal	2.1 gpf	Zurn Urinal Retro	1.0 gpf
Lavatory	2.5 gpm	Vandal Proof Aerator	0.5 gpm

	Calculated	Guaranteed	Actual ¹	% Diff.
Total kgal Reduction	5,383	4,845	7,579	56.44%
			\$/kgal ²	\$10.24
			Actual Contract \$ Saved	<u>\$77,598</u>

Notes:

¹Actual contract savings have been verified with post-retrofit water flow readings.

Savings are based on a comparison between the calculated kgal reduction and the kgal reduction of a measured sample of fixtures.

²\$/kgal average was taken from the main buildings where water retrofits were completed.

A & S Building - Chiller Retrofit

Savings Type: Electric (kWh)

Verification Type: Measured Capacity

	Baseline kWh Consumption	Guaranteed kWh Savings	Projected kWh Savings ¹	Rate	Projected Cost Savings
Arts & Sciences	553,480	338,360	398,805	\$0.0803/kWh	\$32,041
Totals	553,480	338,360	398,805		\$32,041

TONS (T)	BASELINE PERFORMANCE				PROJECTED PERFORMANCE				BASELINE (BL)		PROJECTED CONSUMPTION		PROJECTED ENERGY SAVINGS	
	Output %	Hours (H)	Ton-Hrs T x H = TH	kW/TON Eff-B	kW/TON Eff-P	Ton-Hrs T x H = TH	Hours (H)	Output %	kWh TH x Eff-B	\$	kWh TH x Eff-P	\$	kWh BL-PR	\$
50	0-9	62	3,090	1.0613	0.488	3,491	69.8	0-9	3,279	\$194	1,704	\$137	1,576	\$127
100	10-19	262	26,160	1.0613	0.411	29,554	295.5	10-19	27,763	\$1,638	12,147	\$976	15,616	\$1,255
150	20-29	214	32,040	1.0613	0.297	36,197	241.3	20-29	34,003	\$2,006	10,751	\$864	23,252	\$1,868
200	30-39	496	99,200	1.0613	0.280	112,071	560.4	30-39	105,277	\$6,212	31,380	\$2,521	73,897	\$5,937
250	40-49	595	148,675	1.0613	0.312	167,966	671.9	40-49	157,783	\$9,310	52,405	\$4,210	105,378	\$8,466
300	50-59	387	116,070	1.0613	0.353	131,130	437.1	50-59	123,181	\$7,269	46,289	\$3,719	76,892	\$6,178
350	60-69	188	65,625	1.0613	0.402				69,645	\$4,110			69,645	\$5,595
400	70-79	56	22,520	1.0613	0.443				23,900	\$1,410			23,900	\$1,920
450	80-89	13	5,850	1.0613	0.502				6,208	\$366			6,208	\$499
500	90-100	5	2,300	1.0613	0.574				2,441	\$144			2,441	\$196
		2,276	521,530			480,410	2,276		553,480	\$32,659	154,675	\$12,427	398,805	\$32,041

Notes:

¹ kW/TON ratings are based on manufacturer certified replacement efficiencies.



The chiller has been modified to limit the Maximum Output to 60% of capacity. This change was implemented by LCC Maintenance Specialist, Al Edgeworth. The post-retrofit chiller size was designed based on a 10-Year chilled water supply average. Siemens can monitor the status of the chiller (ON/OFF), but all actual chiller control is done by the Chiller itself. Mike Brosnan, SBT service technician is scheduled to investigate the communication problem that will not allow the Apogee system to monitor all parameters of the chiller. It may be possible that the switch from Siemens controls to Carrier controls disrupted any data transferring that existed. If we can establish a gateway between the devices, SBT will be able to track and trend chiller operation and performance.

Dry Bulb Economizer

Savings Type: Electric (kWh)

Verification Type: Measured Consumption - Verification of Efficient Operation

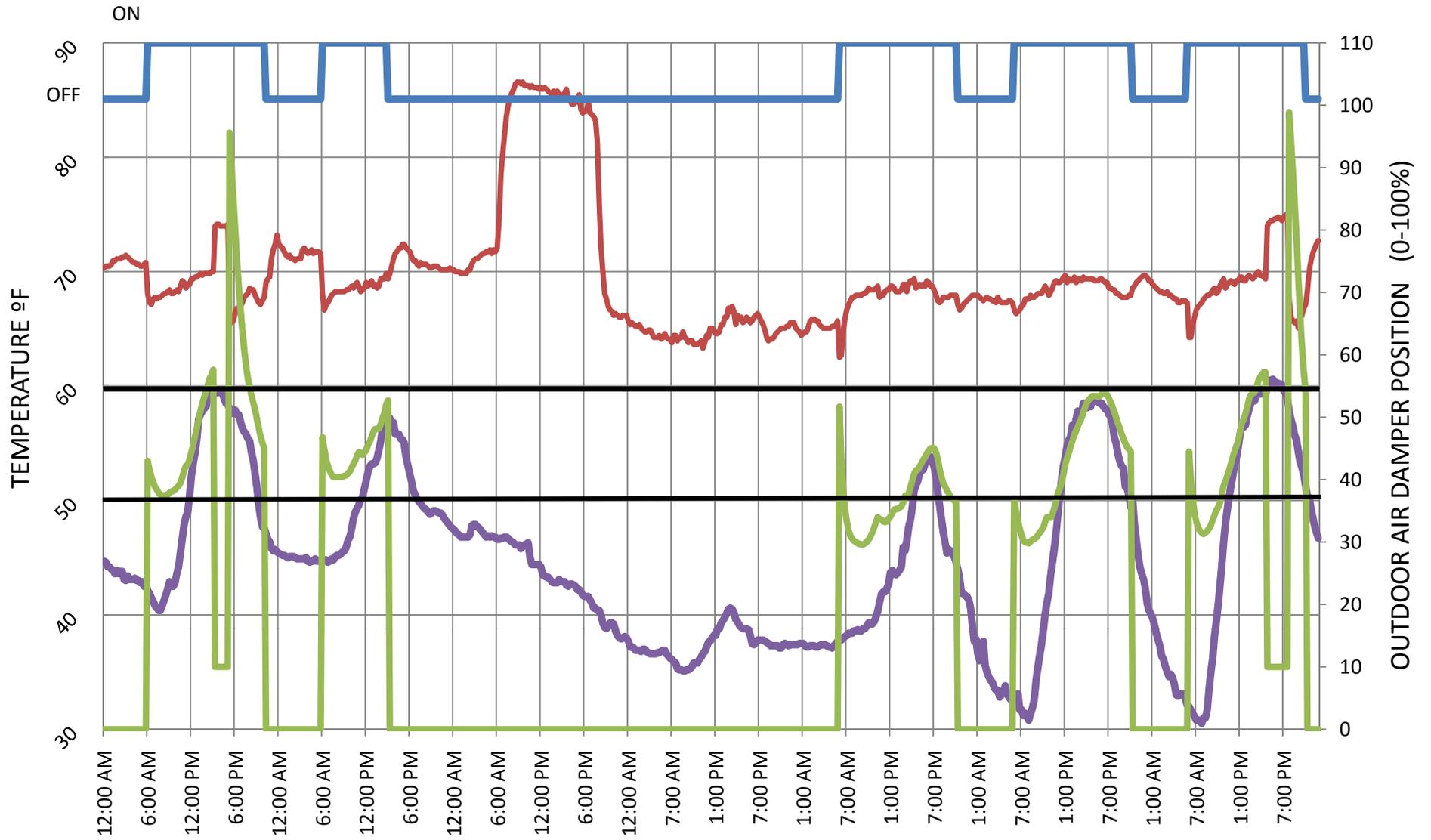
	Baseline kWh Consumption	Guaranteed kWh Savings	Actual kWh Savings	Rate	Actual Contract Savings
Dry Bulb Economizer	63,397	32,074	36,013	0.0803/kWh	\$2,893
Totals	63,397	32,074	36,013		\$2,893

Notes:

The following page shows an air handling unit from the SPS Building in Economizer Mode.

If the temperature outside is between 50°F and 60°F, the mixed air damper closes to utilize 'Free Cooling' in the building by bringing in the cooler outdoor air.

SPS - AHU #4 ECONOMIZER MODE EXAMPLE



March 11TH, 2010 - March 17TH, 2010

MIXED AIR TEMP OUTDOOR AIR TEMP SUPPLY FAN STATUS OUTDOOR AIR DAMPER

CO₂ Ventilation Reduction

Savings Type: Electric (kWh) and Steam (MLB)

Verification Type: Measured Consumption - Verification of Efficient Operation

	Guaranteed MMBTU Savings	Actual MMBTU Savings	Rate \$/MMBTU	Actual Contract Savings
Arts & Sciences				
<i>Heating</i>	715.1	707.7	15.15	\$10,723
<i>Cooling</i>	10.8	13.5	23.54	\$317
Dart Auditorium				
<i>Heating</i>	339.4	251.48	13.77	\$3,463
<i>Cooling</i>	36.9	27.4	23.54	\$644
Gannon				
<i>Heating</i>	193.5	207.6	14.05	\$2,917
<i>Cooling</i>	15.4	16.6	23.54	\$390
TLC				
<i>Heating</i>	321.4	276.6	14.01	\$3,875
<i>Cooling</i>	30.6	26.0	23.77	\$618
Totals	1,663	1,527		\$22,947

Notes:

Savings are based on trended CO₂ levels, equipment runtimes and outside / mixed air damper positions.

Occupied/Unoccupied OA Setpoints = 20/0 %

Unoccupied Ventilation Reduction

Savings Type: Electric (kWh) and Steam (MLB)

Verification Type: Measured Consumption

	Guaranteed MMBTU Savings	Actual MMBTU Savings	Rate \$/MMBTU	Actual Contract Savings
Gannon				
<i>Heating</i>	384.7	451.3	14.05	\$6,340
<i>Cooling</i>	48.8	57.3	23.54	\$1,349
<i>Motors</i>	127.4	149.5	23.54	\$3,519
TLC				
<i>Heating</i>	698.8	1,079.9	14.01	\$15,131
<i>Cooling</i>	66.5	101.5	23.77	\$2,413
<i>Motors</i>	1,185	1,828.4	23.77	\$43,459
Student Personnel Serv.				
<i>Heating</i>	156.7	208.7	13.45	\$2,807
<i>Cooling</i>	19.9	26.5	23.54	\$624
<i>Motors</i>	108.5	144.6	23.54	\$3,403
Totals	2,797	4,048		\$79,045

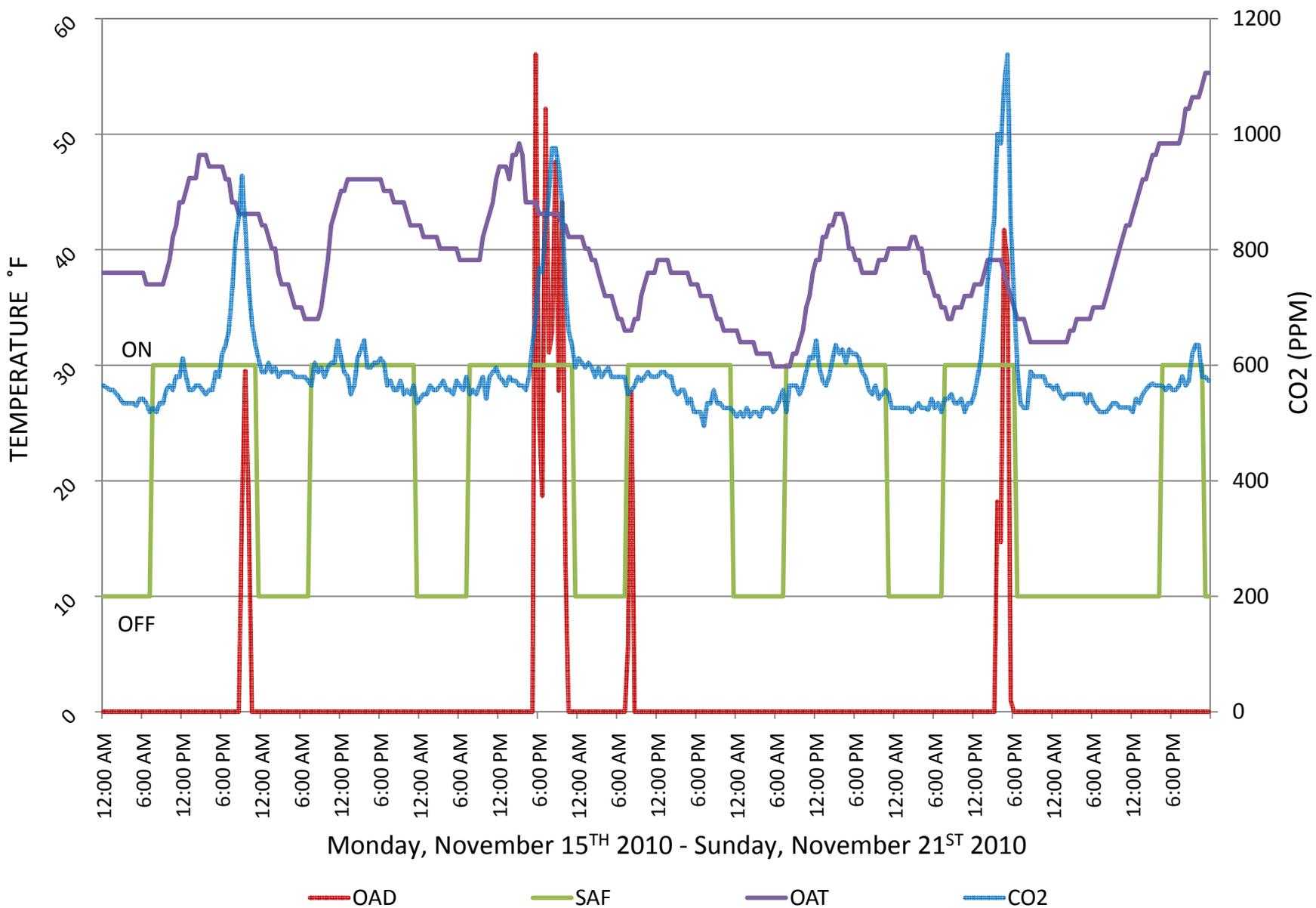
Notes:

The graph on the following page shows the scheduling in the GPE Building over a typical summer week.

The graph also demonstrates CO₂ based Air Handling Unit Control.

As CO₂ levels increase, the outdoor air damper opens, allowing more outdoor air into the building. If CO₂ levels remain low, the outdoor air damper remains closed.

GANNON - LCAC2 CO2 CONTROL (OUTSIDE AIR REDUCTION)



Mandated Temperature Setpoints

Savings Type: Electric (kWh) and Steam (MLB)

Verification Type: Stipulated

Lansing Community College developed a strategy to reduce their energy bills through operational adjustments. These adjustments were as follows:

- 1) Reduce winter heating space temperatures by 3 degrees F. in all buildings.
- 2) Raise summer cooling space temperatures by 3 degrees F. in all buildings.

	Guaranteed kWh Savings	Stipulated kWh Savings	Rate	Stipulated Contract Savings
Electric	490,590	490,590	\$0.0809/kWh	\$39,700
Totals	490,590	490,590		\$39,700

	Guaranteed MLB Savings	Stipulated MLB Savings	Rate	Stipulated Contract Savings
Steam	1,486	1,486	\$12.95/MLB	\$19,243
Totals	1,486	1,486		\$19,243

Notes:

LCC has indicated that the proposed reduction in temperature setpoints caused comfort issues in certain areas on campus. Since the energy savings are stipulated for this report, the cost savings will not change. Siemens will continue to monitor and trend supply, return, mixed air and space temperatures. LCC maintenance personnel will be notified of any abnormalities found in the temperature trends.

Operational Savings

Savings Type: Cost Savings Only

Verification Type: Stipulated

Account/Vendor	Cost Avoidance Description	Contract Savings
LCC Staff	Dart Auditorium HVAC Repairs	\$2,566
LCC Staff	A&S Dual Duct Maintenance	\$3,388
Contracted Mechanical Services	A&S Chiller Maintenance	\$11,255
LCC Staff	Plumbing Fixture Repair	\$9,567
Totals		\$26,776

Notes:

Operational Savings were mutually agreed upon as part of the signed performance contract agreement.