AIRCUITY®

Laboratory Ventilation Savings Analysis

for

Anywhere State University

New Laboratory Building

Boston, Ma (Using weather data from Boston, Massachusetts)

Submitted by
Your Aircuity Rep

Copyright 2010

Confidentiality Note: This document, and the software program that created it, is copyrighted and intended for use only by the individual or entity to which it is addressed and may contain information that is privileged, confidential, and exempt from disclosure under applicable law. If the reader is not the intended recipient or the employee or agent responsible for delivering the document to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please contact the sender immediately and destroy the material in its entirety, whether electronic or hard copy.

Aircuity Lab DCV Cashflow Savings Analysis

AIRCUITY

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Project Capital Costs	$240,000
Diversity Savings & Dpt Sensors	$0
Utility Incentive/Rebate	$0
Net Capital Cost (Savings)	**$240,000**

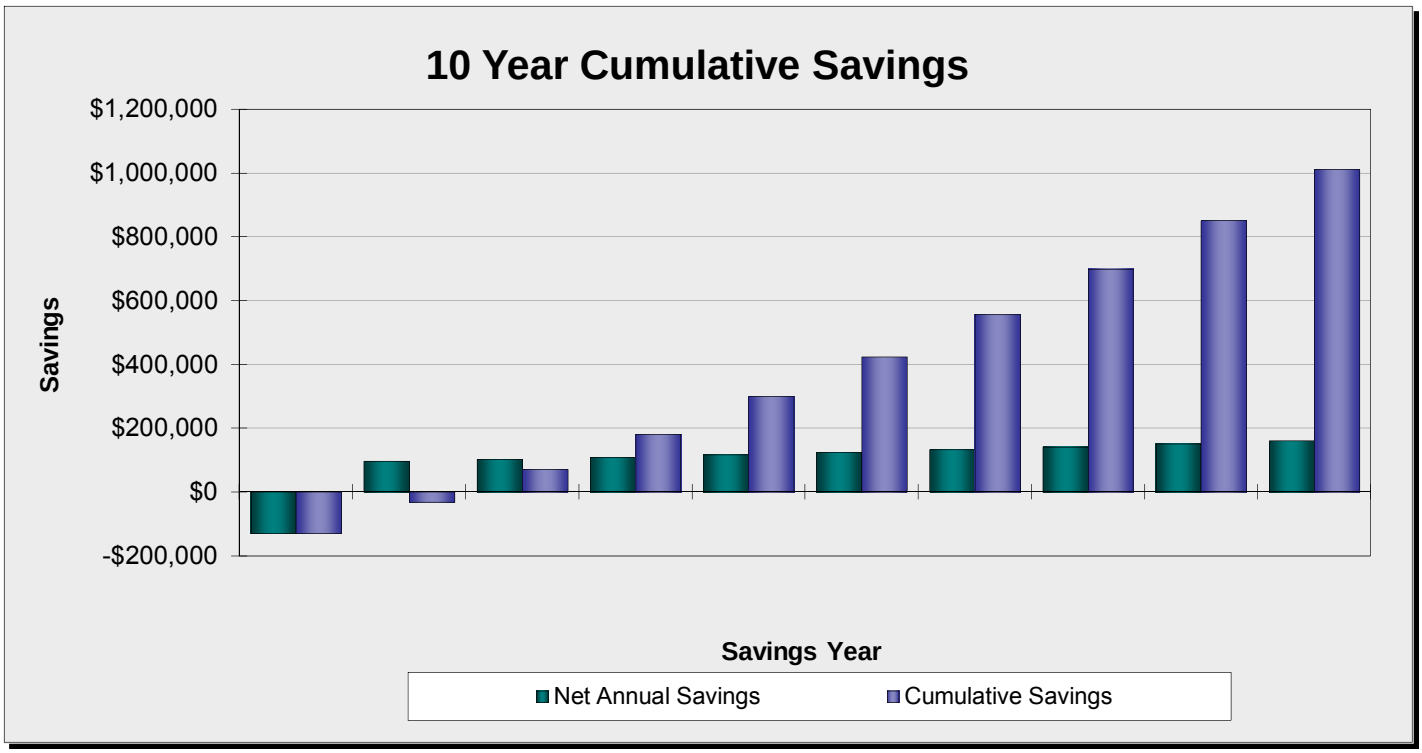
1st Year Savings	**$111,179**
Simple Energy Payback	**2.1 years**

Energy Units Saved:

523,233 kWh saved annually
53,624 Therms saved annually
182 kW peak reduction via Max Bin Method

Cashflow Analysis

Year	Energy Savings	Net Recurring Costs	Annual Savings	Net Capital Costs	Net Annual Savings	Cumulative Savings
2011	$111,179	$0	$111,179	($240,000)	($128,821)	($128,821)
2012	$117,850	($21,012)	$96,838		$96,838	($31,982)
2013	$124,921	($21,642)	$103,279		$103,279	$71,296
2014	$132,416	($22,292)	$110,125		$110,125	$181,421
2015	$140,361	($22,960)	$117,401		$117,401	$298,822
2016	$148,783	($23,649)	$125,134		$125,134	$423,956
2017	$157,710	($24,359)	$133,351		$133,351	$557,308
2018	$167,173	($25,089)	$142,083		$142,083	$699,391
2019	$177,203	($25,842)	$151,361		$151,361	$850,752
2020	$187,835	($26,617)	$161,218		$161,218	$1,011,970
Totals	**$1,465,433**	**($213,463)**	**$1,251,970**	**($240,000)**	**$1,011,970**	**$1,011,970**
First year energy savings represent a 61% reduction from the base option.					**NPV =**	**$530,204**
					IRR =	**44.9%**



Aircuity Environmental Impact

AIRCUITY

October 29, 2010

Customer	**Anywhere State University**
Project	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Annual CO2 Emission Rates for Power Generation in Massachusetts		US National Average
CO_2 (lb/MWh)	1,205.6	1345.1

Fossil Fuel Used	lb CO_2 / MMBtu
Heating: Gas	116.39
Reheat: SameAsHeating	116.39
Other Fuel Type:	

Base Design Annual Emissions

Annual Energy Units		Equivalent MMBTUs	Equivalent MBTUs	CO_2 Lbs	CO_2 Short Tons	CO_2 Metric Tons	Carbon Lbs	Carbon Short Tons	Carbon Metric Tons
Total kWh	1,059,730	3,617	3,616,857	1,277,657	639	579	348,452	174	158
Total Therms	66,077	6,608	6,607,656	769,065	385	349	209,745	105	95
Total Units		10,225	10,224,513	2,046,722	1,023	928	558,197	279	253

Proposed Design Annual Emissions

Annual Energy Units		Equivalent MMBTUs	Equivalent MBTUs	CO_2 Lbs	CO_2 Short Tons	CO_2 Metric Tons	Carbon Lbs	Carbon Short Tons	Carbon Metric Tons
Total kWh	536,497	1,831	1,831,063	646,824	323	293	176,407	88	80
Total Therms	12,453	1,245	1,245,277	144,938	72	66	39,528	20	18
Total Units		3,076	3,076,340	791,762	396	359	215,935	108	98

Annual Lab DCV Emissions Savings

Annual Energy Units Saved		Equivalent MMBTUs	Equivalent MBTUs	CO_2 Lbs	CO_2 Short Tons	CO_2 Metric Tons	Carbon Lbs	Carbon Short Tons	Carbon Metric Tons
Total kWh	**523,233**	**1,786**	**1,785,794**	**630,833**	**315**	**286**	**172,045**	**86**	**78**
Total Therms	**53,624**	**5,362**	**5,362,379**	**624,127**	**312**	**283**	**170,217**	**85**	**77**
Total Units		**7,148**	**7,148,173**	**1,254,960**	**627**	**569**	**342,262**	**171**	**155**

Saving 569 metric tons of CO2 emissions is equivalent to:

- ✓ **69,420 gallons of gasoline burned (110 average cars).**
- ✓ **155 metric tons of carbon.**
- ✓ **the annual CO2 emissions from 48 average American households.**

Aircuity Energy Cost Savings Summary

AIRCUITY

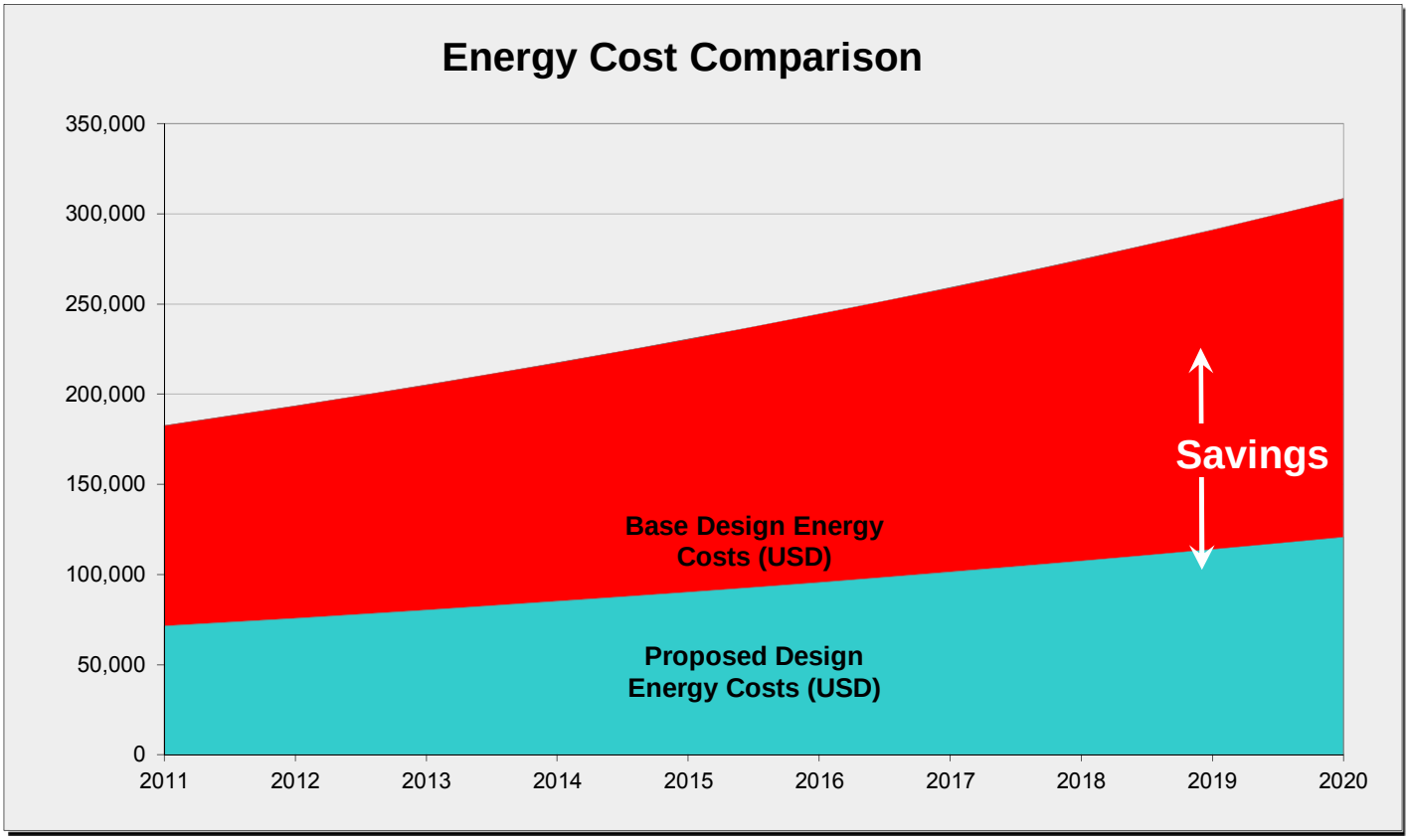
October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

	Base Design in CFM	Proposed Design in CFM	CFM Flow Savings
Average Day Airflow	46,667	25,494	21,173
Average Night Airflow	35,000	12,153	22,847
Average Airflow	39,167	16,917	22,249

Average Annual $/CFM	$ 4.66	$ 4.22
Energy Inflation Rate	6.0%	

Year	Base Design Energy Costs (USD)	Proposed Design Energy Costs (USD)	Energy Savings (USD)	Cumulative Savings (USD)
2011	182,647	71,467	111,179	111,179
2012	193,606	75,755	117,850	229,030
2013	205,222	80,301	124,921	353,951
2014	217,535	85,119	132,416	486,367
2015	230,587	90,226	140,361	626,729
2016	244,423	95,639	148,783	775,512
2017	259,088	101,378	157,710	933,222
2018	274,633	107,461	167,173	1,100,395
2019	291,111	113,908	177,203	1,277,598
2020	308,578	120,743	187,835	1,465,433
10 Yr Savings	$ 2,407,430	$ 941,997	$ 1,465,433	$ 1,465,433



Aircuity Savings Analysis Base Data & Assumptions

AIRCUITY®

October 29, 2010

Customer Name	**Anywhere State University**		
Project Name	**New Laboratory Building**		
City	**Boston, Ma**	Weather Station:	**Massachusetts, Boston**
Submitted by	**Your Aircuity Rep**		

Building & Financial Assumptions

Number of Zones	50	
Avg Zone Area (sq. ft.)	700	
Total sq. ft (calculated)	35,000	
Avg Ceiling Height	10	
Total # of Fume Hoods	10	
Avg FH Max CFM	800	
Avg FH Min CFM	160	
Avg Day FH Sash Opening	60%	Open
Avg Nite FH Sash Opening	30%	Open
Annual Inflation Rate	3%	
Energy Inflation Rate	6%	
Hurdle Rate	8%	
Incentive/Rebate $/kWh	$ -	
Incentive/Rebate $/Therm	$ -	
Incentive/Rebate $/kW	$ -	

Find Utility Rebates and Tax Incentives

Baseline & Proposed Design Data

	Zone Types		
	Normal Activity, Low Load	Moderate Activity, Medium Load	High Activity, High Load
% of Zones	**80%**	**15%**	**5%**
Number of Zones	**39**	**8**	**3**
Avg Peak Watts/ft² (Day)	4.0	6.0	10.0
Avg Watts/ft² (Day)	3.0	4.5	7.5
Avg Peak W/ft² Nite	2.0	3.0	5.0
Avg Watts/ft² Nite	1.2	1.8	3.0
Day ACH	8	8	8
Night ACH	6	6	6

	Proposed Variable Ventilation Rates		
Normal Day ACH	4	4	4
Normal Night ACH	2	2	2
High Vent Max ACH	12	12	12

Energy Cost & HVAC System Assumptions

Cooling Method	Electric		
Heating Method	Gas		
ReHeat Method	SameAsHeating		
Electric $/kWh	$ 0.1100		
Chilled Water $/Ton-Hour	$ 0.1817	*(Not used)*	
Gas/Oil/Other Fuel $/Therm	$ 1.0000		
Steam $/1,000 lb.	$ 12.4000	*(Not used)*	
Evaporative Cooling	None		
(Triggers Wet Bulb Recalc)			
Proposed Room Cooling Method	VAV Air System		
Base Design Room Cooling Method	SameAsProposed		
OA Humidification	None		
Humidification RH Set Point	45%		

Occ Cooling Set Point	74	°F
Occ Heating/Reheat Set Point	74	°F
UnOcc Cooling Set Point	74	°F
UnOcc Heating/Reheat Set Point	74	°F
SA Temp	55	°F
COP of Refrigeration System	3.0	
Heating Efficiency	80%	
Heat Recovery System Type	Sensible Only	
Heat Recovery Efficiency	50%	
Heat Recovery Installed Price	$ 165,710	
Annual Heat Recovery Costs	$ 3,300	
Extra Static from Heat Recovery	0.75	in.

Fan System Assumptions & Data

Supply Fan Discharge Static - no HR	5.00	in w.c.
Supply Fan Efficiency	70%	
Exhaust Fan Inlet Static - no HR	4.50	in w.c.
Exhaust Fan Efficiency	60%	

Exhaust Fan Control Strategy:
Staged Fans w/ Bypass Damper

Number of Exhaust Fans: 4

Capital Cost Savings & Diversity Assumptions (Diversity not included)

Include Diversity Savings	**No**	
Design %	99.90%	
Baseline CFM/Ton of Cooling	205	
$/Ton: Cooling System	$ 1,800	
Subtract Cost of Dewpoint Sensors	**No**	
*Dewpoint Sensor Cost Installed	$ 1,500	
Aircuity Installed System Price	$ 240,000	(from ONE)
Annual Aircuity Costs	$ 20,400	(from ONE)
Years of Annual Services in System Price	1.0	Years

Baseline $/CFM		Diversity %
$8.77	Cooling System	100%
$2.50	Heating System	100%
$1.00	Reheat System	100%
$1.25	Exhaust Fan	100%
$4.50	Supply AHU	100%
$0.15	AHU VFDs	100%
$0.45	Ductwork	100%
$18.62	Total Base HVAC	

Release Version: 1.99T6 Beta Vers. Release Date: October, 2010

Occupancy Schedule

AIRCUITY

September 15, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat
12 to 1 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
1 to 2 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
2 to 3 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
3 to 4 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
4 to 5 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
5 to 6 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
6 to 7 AM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
7 to 8 AM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
8 to 9 AM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
9 to 10 AM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
10 to 11 AM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
11 to Noon	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
12 to 1 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
1 to 2 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
2 to 3 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
3 to 4 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
4 to 5 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
5 to 6 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
6 to 7 PM	UnOcc	Occ	Occ	Occ	Occ	Occ	UnOcc
7 to 8 PM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
8 to 9 PM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
9 to 10 PM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
10 to 11 PM	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc
11 to Midnight	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc	UnOcc

	Occ Hours	UnOcc Hours	Off Hours	Occ Hours Percent	UnOcc Hours Percent
0-6	0	42	0	0%	100%
7-12	25	17	0	60%	40%
13-18	30	12	0	71%	29%
19-24	5	37	0	12%	88%
Total	60	108	0	**36%**	**64%**

Aircuity CFM Savings Summary

AIRCUITY®

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

CFM Comparisons

	Base Calculated CFM	Proposed Calculated CFM	CFM Differences	% Differences
Total Fume Hood Maximum CFM	8,000	8,000	0	0%
Total Fume Hood Minimum CFM	1,600	1,600	0	0%
Estimated Total FH Avg CFM - Day	4,800	4,800	0	0%
Estimated Total FH Avg CFM - Night	2,400	2,400	0	0%
Avg Peak Cooling CFM - Day	27,137	29,709	2,572	9%
Avg Cooling CFM - Day	20,353	20,353	0	0%
Avg Peak Cooling CFM - Night	13,569	14,697	1,129	8%
Avg Cooling CFM - Night	8,141	8,141	0	0%
Day Average ACH CFM	46,667	23,987	(22,680)	-49%
Night Average ACH CFM	35,000	11,818	(23,182)	-66%
Avg Peak CFM - Day	47,346	30,539	(16,807)	-35%
Average CFM - Day	46,667	25,494	**(21,173)**	**-45%**
Avg Peak CFM - Night	35,000	15,660	(19,340)	-55%
Average CFM - Night	35,000	12,153	**(22,847)**	**-65%**

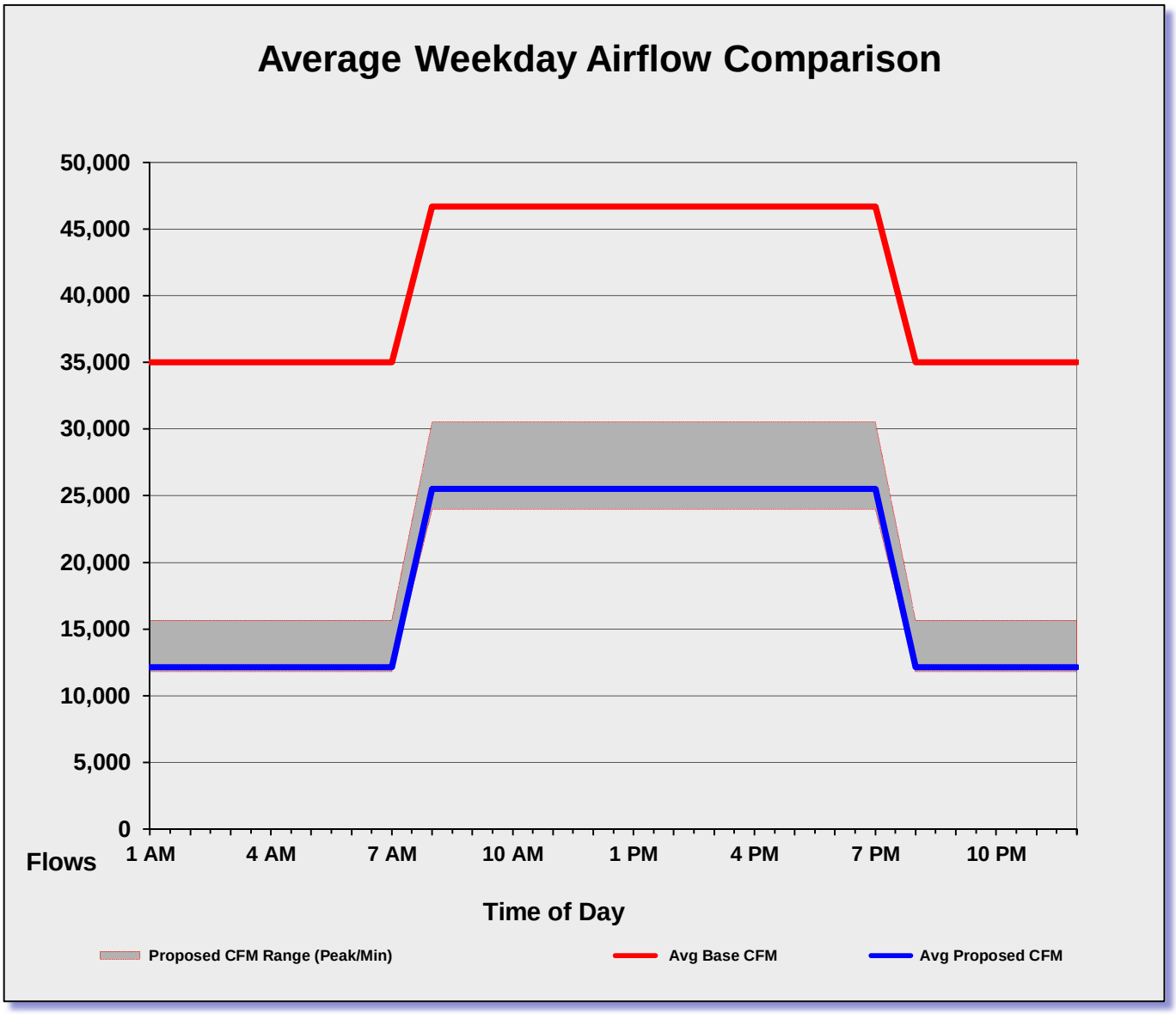
Ventilation CFMs and ACHs

	System CFM	Avg. Zone CFM
2 ACH	11,666	233
3 ACH	17,500	350
4 ACH	23,333	466
5 ACH	29,166	583
6 ACH	35,000	700
7 ACH	40,833	816
8 ACH	46,666	933
9 ACH	52,500	1,050
10 ACH	58,333	1,166
11 ACH	64,166	1,283
12 ACH	70,000	1,400
13 ACH	75,833	1,516
14 ACH	81,666	1,633
15 ACH	87,500	1,750
16 ACH	93,333	1,866

Aircuity Average Airflow Savings Comparison

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**



Heat Recovery & Lab DCV Cashflow Savings Analysis

AIRCUITY

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Heat Recovery Capital Costs in $	106,886
Relative Lab DCV Costs in $	0
Utility Incentive/Rebate in $	0
Net Cost Impact on HVAC Capacity	(14,528)
Net Capital Cost over Baseline in $	**92,358**

Baseline System:	**LabDCV Only**
Proposed System:	**HR & LabDCV**
Include Impacts on HVAC 1st Cost	**Yes**

1st Yr Savings over Baseline	**$ 7,806**
Simple Energy Payback	**9.2 years**

Energy Units Saved:

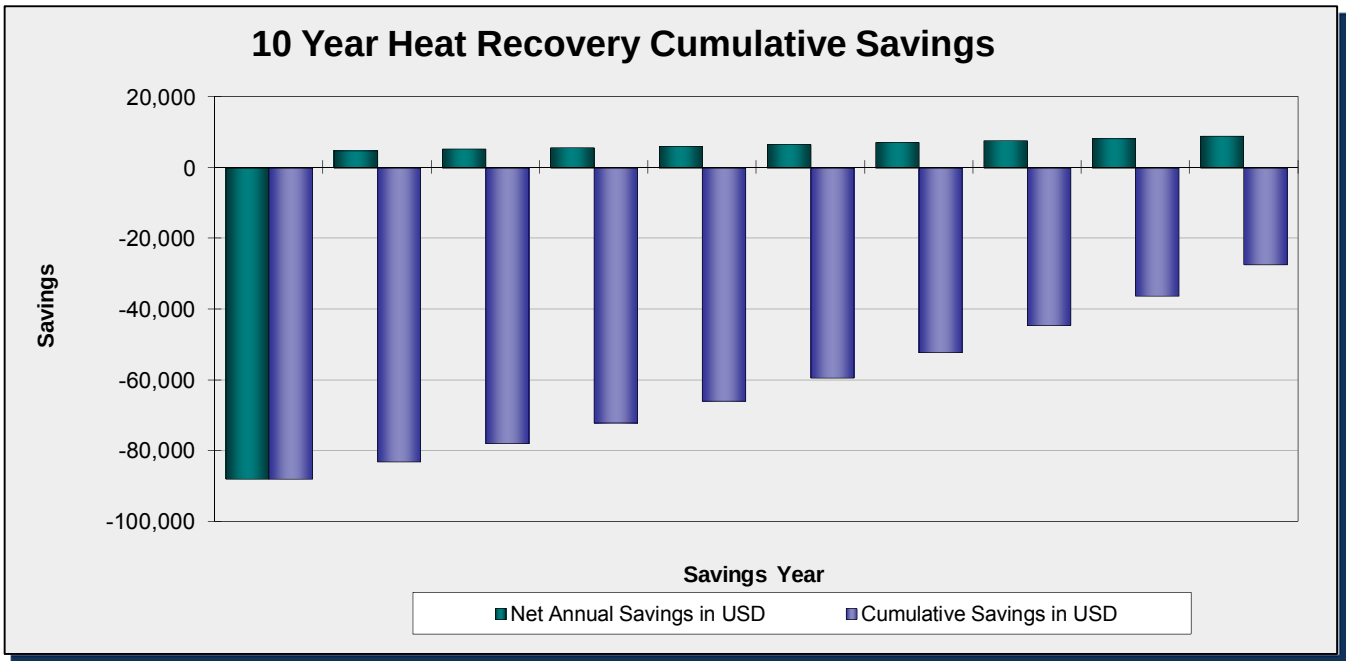
-77,769 kWh saved annually
16,360 Therms or 1,726 GigaJ saved annually
3 kW peak reduction calculation via Max Bin Method

System	Energy Costs:	HVAC 1st Cost:
Baseline	**$ 74,587**	**$ 583,157**
Proposed	**$ 66,781**	**$ 568,629**

	Primary HR	Secondary HR
HR Equipment:	Glycol Coils	None
HR Efficiency	0.5	

Cashflow Analysis of Using Heat Recovery & Lab DCV vs. a Baseline of Lab DCV Only in USD

Year	Energy Savings in USD	Net Recurring Costs in USD	Annual Savings in USD	Net Capital Costs in USD	Net Annual Savings in USD	Cumulative Savings in USD
2011	7,806	(3,300)	4,506	(92,358)	(87,853)	(87,853)
2012	8,274	(3,399)	4,875		4,875	(82,978)
2013	8,771	(3,501)	5,270		5,270	(77,708)
2014	9,297	(3,606)	5,691		5,691	(72,017)
2015	9,855	(3,714)	6,140		6,140	(65,877)
2016	10,446	(3,826)	6,620		6,620	(59,256)
2017	11,073	(3,940)	7,132		7,132	(52,124)
2018	11,737	(4,059)	7,678		7,678	(44,446)
2019	12,441	(4,180)	8,261		8,261	(36,185)
2020	13,188	(4,306)	8,882		8,882	(27,303)
Totals	**$ 102,886**	**$ -37,831**	**$ 65,055**	**$ -92,358**	**$ -27,303**	**-27,303**
First year energy savings represent a 4% reduction from the base option.					**NPV =**	**$ -46,975**
					IRR =	**-5.4%**



Aircuity Diversity Savings Analysis

AIRCUITY®

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Base Design

The base design has a peak cooling requirement of 27,100 CFM (with a peak average of 4.7 watts per sq foot);
A base occupied minimum ventilation level requirement of 46,700 CFM (8 ACH);
And a base unoccupied minimum ventilation level requirement of 35,000 CFM (6 ACH).
An estimated maximum fume hood flow rate of 4,800 CFM (with 60% fume hood diversity factor);

Proposed Design

The peak cooling and estimated maximum fume hood flows are the same as in the base design.
With 50 zones, 99.9000% of the time there will be 4 or fewer zones at the proposed max 12 ACH,
and 99.9000% of the time there will be 46 or more zones at the proposed normal 4 ACH.
The proposed occupied minimum ventilation rate is 24,000 CFM (4 ACH);
The proposed unoccupied minimum ventilation rate is 11,800 CFM (2 ACH).

	Base Design	Proposed
Total number of Zones	50	50
99.9000th percentile of zones at normal Occ ACH	N/A	46
Number of zones at max ACH (Occ.)	N/A	4
Occupied Normal Zone ACH	8 ACH	4 ACH
Unoccupied Normal Zone ACH	6 ACH	2 ACH
Proposed Max Zone ACH	N/A	12 ACH
Occupied Normal Zone ACH in CFM	933	467
Unoccupied Normal Zone ACH in CFM	700	233
Proposed Max Zone ACH in CFM	N/A	1,400
System CFM Per Ton of Cooling	205	205
HVAC Capital Cost per CFM in Units of $/CFM	18.62	18.62
Cooling System Capacity Requirements in Tons	231	149

Proposed Design Diversity Flow in CFM

	Base Design	Proposed	Peak CFM Saved
Avg Max Flow for Normal Activity Zones	**36,400**	**21,112**	**15,288**
Avg Max Flow for Moderate Activity Zones	**7,467**	**5,905**	**1,562**
Avg Max Flow for High Activity Zones	**3,479**	**3,522**	**-43**
EXPECTED PEAK CFM	**47,346**	**30,539**	**16,807**

Zone diversity on this project results in a 35% peak airflow savings with up to $ 313,000 of project first cost savings due to the reduction in size of the HVAC mechanical system.

The payback in this analysis does not include the diversity described above.

Aircuity First Cost (Diversity) Savings Summary

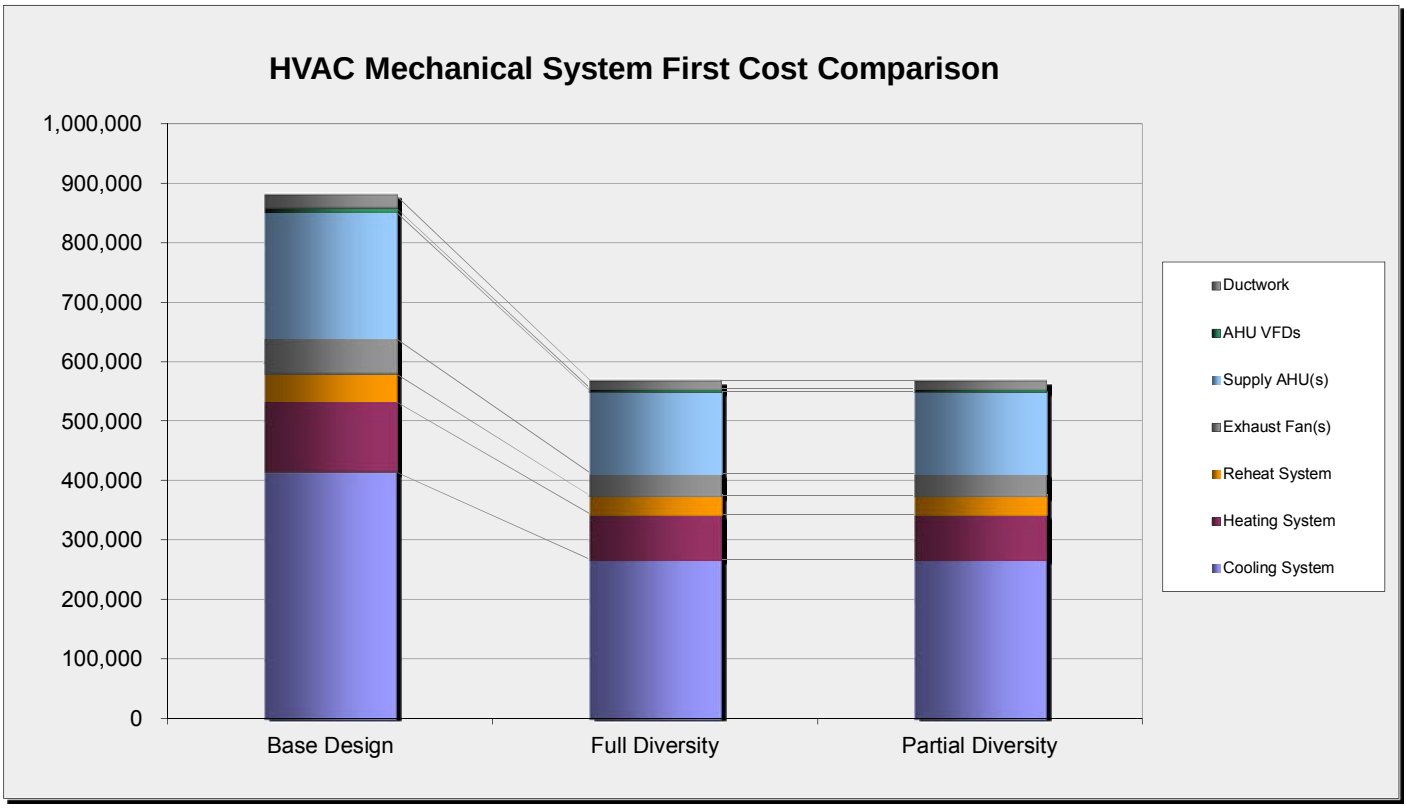
AIRCUITY®

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

	Base Design			Proposed Design with 100% Diversity			
HVAC System Component	USD/CFM	Based on Max CFM Flow of:	System Cost in USD	% of Diversity Savings	Based on Max CFM Flow of:	System Cost in USD	First Cost Savings over Base Design
Cooling System	$ 8.77	47,346	415,212	100%	30,539	267,820	147,392
Heating System	$ 2.50	47,346	118,364	100%	30,539	76,347	42,017
Reheat System	$ 1.00	47,346	47,346	100%	30,539	30,539	16,807
Exhaust Fan(s)	$ 1.25	47,346	59,182	100%	30,539	38,174	21,009
Supply AHU(s)	$ 4.50	47,346	213,056	100%	30,539	137,425	75,631
AHU VFDs	$ 0.15	47,346	7,102	100%	30,539	4,581	2,521
Ductwork	$ 0.45	47,346	21,306	100%	30,539	13,743	7,563
Total HVAC System	**$ 18.62**		**881,568**			**568,629**	**$ 312,939**

	Proposed Design w/Partial (Selected) Diversity				
HVAC System Component	USD/CFM	% of Diversity Savings	Based on Max CFM Flow of:	System Cost in USD	First Cost Savings over Base Design
Cooling System	$ 8.77	100%	30,539	267,820	147,392
Heating System	$ 2.50	100%	30,539	76,347	42,017
Reheat System	$ 1.00	100%	30,539	30,539	16,807
Exhaust Fan(s)	$ 1.25	100%	30,539	38,174	21,009
Supply AHU(s)	$ 4.50	100%	30,539	137,425	75,631
AHU VFDs	$ 0.15	100%	30,539	4,581	2,521
Ductwork	$ 0.45	100%	30,539	13,743	7,563
Total HVAC System	**$ 18.62**			**568,629**	**$ 312,939**



Aircuity & Photovoltaics (Solar Energy)Technology Comparison

October 29, 2010

Customer	**Anywhere State University**
Project	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

The Aircuity system has about the same carbon impact as a 797 kW solar panel.
The Aircuity system will save about the same electrical energy generated by a 410 kW solar panel.
The Aircuity system will cost approximately 4.3% of a solar panel with the same carbon impact.
The Aircuity system payback is about 16.1 times better than solar panels, even w/ incentives & credits.

Figures of Merit	Solar Panels (797 kW)	OptiNet	OptiNet to Solar Factor
Metric tons of CO_2 saved	569	569	1.0
kWH Power Generated/ Saved	1,040,904	523,233	0.5
Gas Savings in therms	0	53,624	N/A
Total equivalent MBTU saved	3,553	7,148	2.0
Annual Savings in USD	114,499	111,179	0.97
Installed Cost in USD	5,576,130	240,000	23.2
Simple payback in years	48.7	2.2	22.6
Simple payback yrs w/ incentive for Public, Gov, Edu	38.3	1.5	26.3
Simple payback w/ Ren. Fed & State Credits - Bus.	23.4	1.5	16.1
Area of Installation in square feet	7,404	15.0	494
Equipment weight in pounds	126,465	450	281

Assumptions:	Value	
Electric Power Costs USD/kWh (from Assumptions)	0.110	USD/kWh
Gas Heating Costs per therm (from Assumptions)	1.000	USD
Annual Solar kWh hours per kW (Massachusetts, Boston)	1,307	
CO2 lb/kWh (Massachusetts, Boston)	1.2056	
Carbon lb to MBTU Equivalent (Gas)	#N/A	
Installed Cost per kWh: Large Installation (>10 kW) (1)	7.0	USD/kWh
Solar Array Equipment-only USD/W	4.8	USD/W
OptiNet Installed Cost	240,000	USD
OptiNet Equipment weight (lb/system)	450.0	
OptiNet Equipment space used in sq feet	15.00	
Utility Energy Efficency Incentive - USD/kWH, ≥ 1 year payback (3)	0.15	USD/kWH
State Renewable Energy incentive - USD/kW of Solar PV capacity(3	1.00	USD/kW
Utility Solar Energy Incentive - USD/kW of Solar PV capacity(3)	0.50	USD/kW
Federal Tax Renewable Credit % off (2)	30%	
State Tax Renewable Credit % up to USD25,000 (3)	0.4%	
Watts per square foot - Solar Array	107.58	
OptiNet kWh savings	523,233	
OptiNet Gas Savings in Therms	53,624	
Solar Array Size with Same Carbon Impact Savings as OptiNet	797	kW
Solar Array Size w/ Same Electrical Savings as OptiNet System	410	kW
Installed weight of Solar Panels in (lbs/ft2)	17.08	

(1) www.srpnet.com/environment/earthwise/solarbiz.aspx
(2) http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US02F&State=federal&currentpageid=1&ee=1&re=1
(3) http://dsireusa.org

Aircuity 5-Year Life Cycle Cost Analysis

AIRCUITY

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

	Base Design	Aircuity	Aircuity Savings
Aircuity First Cost	**$0**	**$240,000**	**($240,000)**
Diversity Savings	$0	$0	**$0**
Rebate & Incentives	$0	$0	**$0**
Adjustments to First Cost	$0	$0	**$0**
Net First Cost	**$0**	**$240,000**	**($240,000)**
Year 1 Energy Cost	$182,647	$71,467	**$111,179**
Year 2 Energy Cost	$193,606	$75,755	**$117,850**
Year 3 Energy Cost	$205,222	$80,301	**$124,921**
Year 4 Energy Cost	$217,535	$85,119	**$132,416**
Year 5 Energy Cost	$230,587	$90,226	**$140,361**
Total 5 Year Energy Cost	**$1,029,597**	**$402,868**	**$626,729**
Year 1 Maintenance Cost		$0	**$0**
Year 2 Maintenance Cost		$21,012	**($21,012)**
Year 3 Maintenance Cost		$21,642	**($21,642)**
Year 4 Maintenance Cost		$22,292	**($22,292)**
Year 5 Maintenance Cost		$22,960	**($22,960)**
5 Year Maintenance Cost	**$0**	**$87,906**	**($87,906)**
Total 5 Year Operation Cost	**$1,029,597**	**$490,775**	**$538,822**
5 Year Cost of Ownership	**$1,029,597**	**$730,775**	**$298,822**
Avg. Cost of ownership per year	**$102,960**	**$73,077**	**$29,882**

Aircuity 10-Year Life Cycle Cost Analysis

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

	Base Design	Aircuity	Aircuity Savings
Aircuity First Cost	**$0**	**$240,000**	**($240,000)**
Diversity Savings	$0	$0	**$0**
Rebate & Incentives	$0	$0	**$0**
Adjustments to First Cost	$0	$0	**$0**
Net First Cost	**$0**	**$240,000**	**($240,000)**
Year 1 Energy Cost	$182,647	$71,467	**$111,179**
Year 2 Energy Cost	$193,606	$75,755	**$117,850**
Year 3 Energy Cost	$205,222	$80,301	**$124,921**
Year 4 Energy Cost	$217,535	$85,119	**$132,416**
Year 5 Energy Cost	$230,587	$90,226	**$140,361**
Year 6 Energy Cost	$244,423	$95,639	**$148,783**
Year 7 Energy Cost	$259,088	$101,378	**$157,710**
Year 8 Energy Cost	$274,633	$107,461	**$167,173**
Year 9 Energy Cost	$291,111	$113,908	**$177,203**
Year 10 Energy Cost	$308,578	$120,743	**$187,835**
Total 10 Year Energy Cost	**$2,407,430**	**$941,997**	**$1,465,433**
Year 1 Maintenance Cost		$0	**$0**
Year 2 Maintenance Cost		$21,012	**($21,012)**
Year 3 Maintenance Cost		$21,642	**($21,642)**
Year 4 Maintenance Cost		$22,292	**($22,292)**
Year 5 Maintenance Cost		$22,960	**($22,960)**
Year 6 Maintenance Cost		$23,649	**($23,649)**
Year 7 Maintenance Cost		$24,359	**($24,359)**
Year 8 Maintenance Cost		$25,089	**($25,089)**
Year 9 Maintenance Cost		$25,842	**($25,842)**
Year 10 Maintenance Cost		$26,617	**($26,617)**
10 Year Maintenance Cost	**$0**	**$213,463**	**($213,463)**
Total 10 Year Operation Cost	**$2,407,430**	**$1,155,460**	**$1,251,970**
10 Year Cost of Ownership	**$2,407,430**	**$1,395,460**	**$1,011,970**
Avg. Cost of ownership per year	**$240,743**	**$139,546**	**$101,197**

Aircuity Energy Units and Energy Dollar Savings Detailed Comparison

AIRCUITY

October 29, 2010

Customer	**Anywhere State University**
Project	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Occ

Base Design

Annual Occ Energy Units	
Cooling kWh	155,361
Heating Therms	2,188
Reheat Therms	21,200
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	160,669
Exhaust Fan kWh	177,474
Total kWh	493,503
Total Therms	23,388
Peak kW	401

Annual Occ Energy Costs	
Cooling	$ 17,090
Heating	$ 2,188
Reheat	$ 21,200
Supply Fan	$ 17,674
Exhaust Fan	$ 19,522
Total	$ 77,673

Total Annual Costs at Occ Average Flow	
$ 4.66 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 1.03
Heating cost / CFM	$ 0.13
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 2.23

Proposed Design

Annual Occ Energy Units	
Cooling kWh	84,873
Heating Therms	1,195
Reheat Therms	4,142
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	51,523
Exhaust Fan kWh	132,317
Total kWh	268,713
Total Therms	5,337
Peak kW	219

Annual Occ Energy Costs	
Cooling	$ 9,336
Heating	$ 1,195
Reheat	$ 4,142
Supply Fan	$ 5,668
Exhaust Fan	$ 14,555
Total	$ 34,896

Total Annual Costs at Occ Average Flow	
$ 3.83 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 1.03
Heating cost / CFM	$ 0.13
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 2.22

Savings

Annual Occ Energy Units Saved	
Cooling kWh	70,488
Heating Therms	993
Reheat Therms	17,058
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	109,146
Exhaust Fan kWh	45,157
Total kWh	224,790
Total Therms	18,050
Peak kW	182

Annual Occ Energy Cost Savings	
Cooling	$ 7,754
Heating	$ 993
Reheat	$ 17,058
Supply Fan	$ 12,006
Exhaust Fan	$ 4,967
Total	$ 42,777

UnOcc

Base Design

Annual Unocc Energy Units	
Cooling kWh	170,302
Heating Therms	3,739
Reheat Therms	38,950
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	156,335
Exhaust Fan kWh	239,590
Total kWh	566,226
Total Therms	42,689
Peak kW	281

Annual Unocc Energy Costs	
Cooling	$ 18,733
Heating	$ 3,739
Reheat	$ 38,950
Supply Fan	$ 17,197
Exhaust Fan	$ 26,355
Total	$ 104,974

Total Annual Costs at Unocc Average Flow	
$ 4.67 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 0.83
Heating cost / CFM	$ 0.17
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 1.94

Proposed Design

Annual Unocc Energy Units	
Cooling kWh	59,132
Heating Therms	1,298
Reheat Therms	5,817
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	50,870
Exhaust Fan kWh	157,781
Total kWh	267,783
Total Therms	7,116
Peak kW	110

Annual Unocc Energy Cost	
Cooling	$ 6,504
Heating	$ 1,298
Reheat	$ 5,817
Supply Fan	$ 5,596
Exhaust Fan	$ 17,356
Total	$ 36,572

Total Annual Costs at Unocc Average Flow	
$ 4.68 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 0.83
Heating cost / CFM	$ 0.17
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 2.94

Savings

Annual Unocc Energy Units Saved	
Cooling kWh	111,170
Heating Therms	2,441
Reheat Therms	33,132
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	105,464
Exhaust Fan kWh	81,808
Total kWh	298,443
Total Therms	35,573
Peak kW	171

Annual Unocc Energy Cost Savings	
Cooling	$ 12,229
Heating	$ 2,441
Reheat	$ 33,132
Supply Fan	$ 11,601
Exhaust Fan	$ 8,999
Total	$ 68,402

Total

Base Design

Annual Total Energy Units	
Cooling kWh	325,663
Heating Therms	5,928
Reheat Therms	60,149
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	317,003
Exhaust Fan kWh	417,064
Total kWh	1,059,730
Total Therms	66,077
Peak kW	401

Annual Total Energy Costs	
Cooling	$ 35,823
Heating	$ 5,928
Reheat	$ 60,149
Supply Fan	$ 34,870
Exhaust Fan	$ 45,877
Total	$ 182,647

Total Annual Costs at All Average Flows	
$ 4.66 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 0.91
Heating cost / CFM	$ 0.15
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 2.06

Proposed Design

Annual HVAC Total Energy Units	
Cooling kWh	144,005
Heating Therms	2,494
Reheat Therms	9,959
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	102,393
Exhaust Fan kWh	290,099
Total kWh	536,497
Total Therms	12,453
Peak kW	219

Annual Total HVAC Energy Costs	
Cooling	$ 15,841
Heating	$ 2,494
Reheat	$ 9,959
Supply Fan	$ 11,263
Exhaust Fan	$ 31,911
Total	$ 71,467

Total Annual Costs at All Average Flows	
$ 4.22 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 0.94
Heating cost / CFM	$ 0.15
Reheat cost / CFM extra	$ 2.26
Fan cost / CFM	$ 2.55

Savings

Annual Total Energy Units Saved	
Cooling kWh	181,658
Heating Therms	3,434
Reheat Therms	50,190
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	214,610
Exhaust Fan kWh	126,965
Total kWh	523,233
Total Therms	53,624
Peak kW	182

Annual Total Energy Cost Savings	
Cooling	$ 19,982
Heating	$ 3,434
Reheat	$ 50,190
Supply Fan	$ 23,607
Exhaust Fan	$ 13,966
Total	$ 111,179
	61%

Full CV Flow

Annual Energy Units	
Cooling kWh	387,995
Heating Therms	7,278
Reheat Therms	47,360
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	464,444
Exhaust Fan kWh	497,061
Total kWh	1,349,500
Total Therms	54,638

Annual Energy Costs	
Cooling	$ 42,679
Heating	$ 7,278
Reheat	$ 47,360
Supply Fan	$ 51,089
Exhaust Fan	$ 54,677
Total	$ 203,083

Total Annual Costs at Average Flow	
$ 4.29 per CFM	
Costs per CFM	
Cooling cost / CFM	$ 0.90
Heating cost / CFM	$ 0.15
Reheat cost / CFM extra	$ 1.36
Fan cost / CFM	$ 2.23

Cooling (Plugs, Lights, etc.) Electrical Load Information	
Day Clg Load kWh	384,345
Nite Clg Load kWh	276,728
Total Clg Load	661,073
Peak Clg Load Kw	164

Cooling Load Energy Costs	
Day Clg Load	$ 42,278
Nite Clg Load	$ 30,440
Total Load	$ 72,718

Aircuity Heat Recovery Energy Units & Energy Dollar Savings Detailed Comparison

AIRCUITY®

October 29, 2010

Customer	**Anywhere State University**
Project	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

Baseline Metrics with Lab DCV Only (No Heat Recovery):

Annual Energy Units	
Cooling kWh	144,785
Heating Therms	18,854
Reheat Therms	9,959
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	108,619
Exhaust Fan kWh	162,721
Glycol Pump kWh	-
Total kWh	416,124
Total Therms	28,813
Peak kW	220

Annual Energy Costs		
Cooling	$	15,926
Heating	$	18,854
Reheat	$	9,959
Supply Fan	$	11,948
Exhaust Fan	$	17,899
Glycol Pump	$	-
Total	$	74,587

Total Annual Costs		
$	1.90	per CFM

Costs per CFM		
Cooling cost / CFM	$	0.41
Heating cost / CFM	$	0.48
Reheat cost / CFM extra	$	0.29
Fan cost / CFM	$	0.76

Proposed Metrics with Heat Recovery & Lab DCV:

Annual Energy Units	
Cooling kWh	144,005
Heating Therms	2,494
Reheat Therms	9,959
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	121,327
Exhaust Fan kWh	189,402
Glycol Pump kWh	39,159
Total kWh	493,893
Total Therms	12,453
Peak kW	217

Annual Energy Costs		
Cooling	$	15,841
Heating	$	2,494
Reheat	$	9,959
Supply Fan	$	13,346
Exhaust Fan	$	20,834
Glycol Pump	$	4,307
Total	$	66,781

Total Annual Costs		
$	3.95	per CFM

Costs per CFM		
Cooling cost / CFM	$	0.94
Heating cost / CFM	$	0.15
Reheat cost / CFM extra	$	0.29
Fan cost / CFM	$	0.72

Annual Energy Units Saved	
Cooling kWh	780
Heating Therms	16,360
Reheat Therms	-
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	(12,709)
Exhaust Fan kWh	(26,682)
Glycol Pump kWh	(39,159)
Total kWh	(77,769)
Total Therms	16,360
Peak kW	3

Annual Energy Savings		
Cooling	$	86
Heating	$	16,360
Reheat	$	-
Supply Fan	$	(1,398)
Exhaust Fan	$	(2,935)
Glycol Pump	$	(4,307)
Total	$	7,806
		10%

Aircuity Savings Analysis Advanced Base Data & Assumptions

AIRCUITY

October 29, 2010

Customer Name	**Anywhere State University**
Project Name	**New Laboratory Building**
City	**Boston, Ma (Using weather data from Boston, Massachusetts)**
Submitted by	**Your Aircuity Rep**

High Hood Density (HHD) Room/Zone Assumptions

% of Hoods in HHD zones	0%
% of Total Zone Number that are HHD	0%
Avg HHD Zone Area as % of Avg Zone	100%

Metrics	All Zones	HHD Zones	Non-HHD Zones
Hoods	10	0	10
Zones	50	0	50
Area	700	700	700
Total sqft	35,000	0	35,000

Secondary Heat Recovery System Assumptions

Secondary HR Wheel/Wrap around Coil	None	
Secondary HR Efficiency	60%	
Secondary HR Pressure Drop in "WC	0.75	in.
Secondary HR Control Approach	Fixed Speed	
Secondary HR Installed Price	$ -	
Secondary Annual HR Costs	$ -	

Advanced Primary Heat Recovery System Assumptions

Dry Bulb Change Over Temp	70	°F
HR Low Range Engage Temp	55	°F
Primary Wheel/Bypass Control Approach	Variable Speed	
Primary "Sensible Only" HR Type	Glycol Coils	
HR Lockout Control Approach	Diff Enthalpy	
Average Exh/Sup Ratio %	90%	

Other HVAC System Assumptions

Direct Evaporative Cooling Efficiency	90%	
Direct Evap. Clg pressure Drop ("WC)	0.5	in.
Direct Evap Clg Outside Air Lockout Temp	60	°F
Other Fuel Type	Unlisted Fuel	
Other Fuel Type lb CO2 / MMBtu Emissions	150.0	
"Unlisted" Fuel lb CO2 / MMBtu Emissions	150	

Return Air Temp Rise	2	°F
Chilled Beam Chilled Water COP Eff %	110%	
Chilled Beam Pressure Drop	0.5	in.
Peak Elec Demand Calculation	Max Bin Method	
CFM/Ton Peak Design Capacity %	99.50%	
Return Air %	0%	
Include Return Air in Base Design	No	

Advanced Fan System Assumptions

Assumptions	Exhaust Fan	Supply Fan
Full Load Motor Efficiency	0.90	0.90
Full Load VFD Efficiency	0.965	0.965
Motor Oversize Factor	10%	10%

Use Design / Measured Data ?	**No**

Design / Measured Data

Motor Nameplate HP			*(Not used)*
Measured Motor KW			*(Not used)*
Peak Base Flow in CFM			*(Not used)*
OccAvgCFM Base Flow			*(Not used)*
UnOccAvgCFM Base Flow			*(Not used)*
Calc. Design Flow's BHP	65.2	61.2	*Hp*

Exhaust Fan Exit Velocity % Min	50%
Minimum Fan Power %	12.5%