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Laboratory Ventilation Savings Analysis

for

Sample Lab Energy Analysis
Lab Optimization Project

City Location is Project City
(Using weather data from Boston, Massachusetts)

Submitted by
Aircuity

June 27, 2019

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Aircuity Energy Savings and ROI Budget Estimate

Re: Sample Lab Energy Analysis, Lab Optimization Project – Budget Estimate

Aircuity is pleased to provide this Budget Estimate for your critical environment. Aircuity's enabling technology, OptiNet™, will increase lab safety while providing your organization significant carbon and energy reduction to help achieve mission critical objectives.

This Budget Estimate is based upon:

- Assumption of an existing or separately installed VAV lab control system
- Energy costs of $ 0.11/kWh & $ 1.00/Therm
- 30 lab spaces and a total approximate demand controlled area of 19,500 square feet
- Current or Baseline Minimum Air change rate of 8.00 ACH Occupied & 6.00 ACH Unocc periods.
- Proposed minimum air change rate of 4.00 ACH Day and 2.00 ACH Night periods.
- "Rule of thumb" installation pricing
- Conservative estimate for air change rate reduction

This budgetary estimate does not include:

- Utility rebate incentives
- Localized installation pricing variations
- Further potential air change rate reduction

The goal of this budgetary estimate is to provide you with an approximate cost and payback analysis for a typical project given the provided parameters. Should you wish to proceed with a more detailed conceptual and/or investment grade analysis, please contact Aircuity at (617) 641-8800 to have a local representative contact you.

Budget Estimate Financial Overview

Project Cost:	**$167,700**
Capital Savings from Downsizing HVAC if applicable:	
Utility Rebate Incentive if applicable:	
Net Capital Cost:	**$167,700**
Projected Annual Energy Savings:	**$71,733**
Simple Energy Payback:	**2.3 years**
CO2 Reduction in Metric tons of CO2:	**369**
CO2 Reduction in equivalent avg. cars:	**71**
Reduction from Baseline HVAC Energy:	**54%**

Note: Aircuity's Budgetary Analysis has proven to reasonably accurate based on the quality of the assumptions used, and is an approved incentive tool by some utilities, but it should be utilized at this stage to simply gauge interest and confirm desire to proceed with more detailed analysis.

Thank You!

Thank you for your interest in Aircuity's Safe, Smart and Efficient Airside Solutions!

Proposed Laboratory System Cashflow Savings Analysis

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June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
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Submitted by	**Enter Your Name and Your Company Name Here**

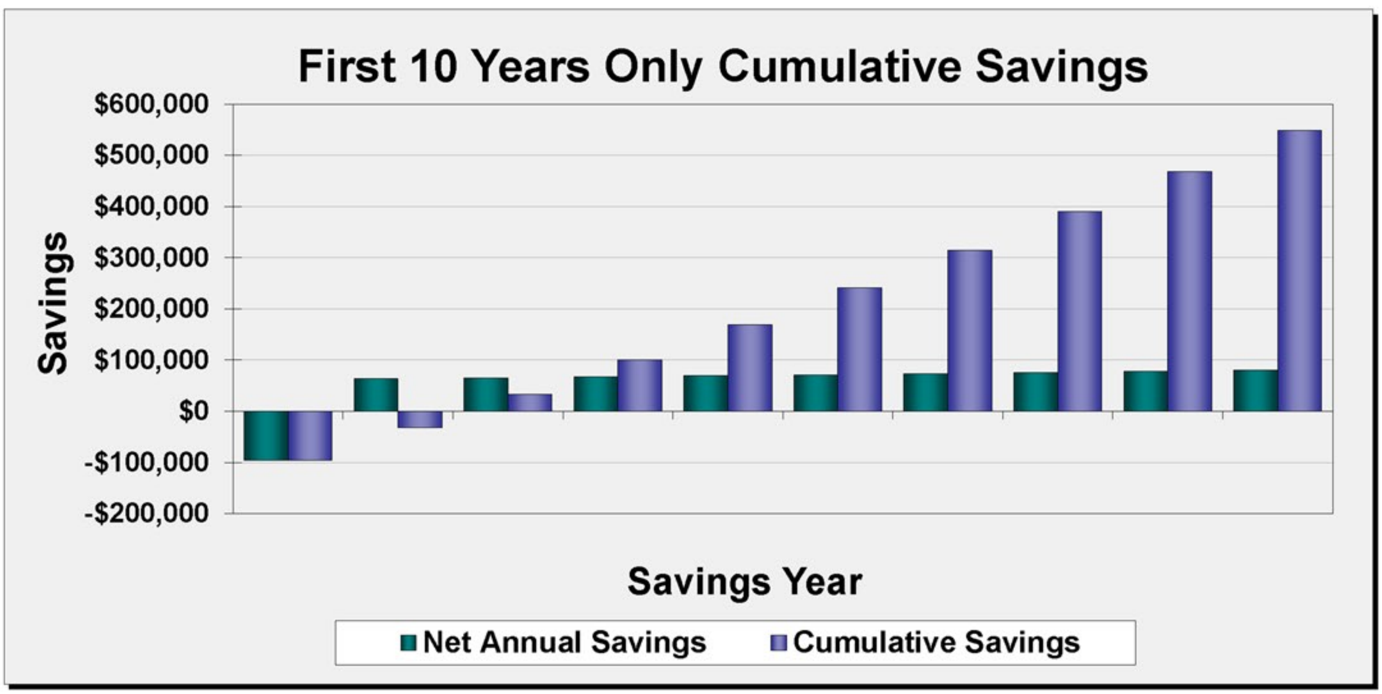
Project Capital Costs	$167,700
Diversity Savings & Dpt Sensors	$0
Utility Incentive/Rebate	$0
Net Capital Cost (Savings)	**$167,700**

1st Year Savings	**$71,733**
Simple Energy Payback	**2.3 years**

Energy Units Saved:
286,652 kWh Electricity saved annually
40,201 Therms Heating saved annually
105 kW peak reduction via Max Bin Method

10 Years of Cashflow Analysis

Year	Energy Savings	Net Recurring Costs	Annual Savings	Net Capital Costs	Net Annual Savings	Cumulative Savings
2020	$71,733	$0	$71,733	($167,700)	($95,967)	($95,967)
2021	$73,885	($10,364)	$63,521		$63,521	($32,446)
2022	$76,101	($10,675)	$65,427		$65,427	$32,981
2023	$78,385	($10,995)	$67,390		$67,390	$100,370
2024	$80,736	($11,325)	$69,411		$69,411	$169,782
2025	$83,158	($11,665)	$71,494		$71,494	$241,275
2026	$85,653	($12,015)	$73,638		$73,638	$314,913
2027	$88,222	($12,375)	$75,848		$75,848	$390,761
2028	$90,869	($12,746)	$78,123		$78,123	$468,884
2029	$93,595	($13,129)	$80,467		$80,467	$549,350
Totals	**$822,338**	**($105,288)**	**$717,050**	**($167,700)**	**$549,350**	**$549,350**
1st year energy savings represents a 54% reduction from base case.					**10 Yrs NPV =**	**$307,241**
					10 Yrs IRR =	**39.6%**
					10 Yrs Cum. Savings	**$549,350**



Environmental Impact

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Customer	**Sample Lab Energy Analysis**
Project	**Enter Project Name Here**
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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	627,823	2,143	2,142,759	756,931	378	343	206,436	103	94
Total Therms	64,435	6,444	6,443,545	749,964	375	340	204,536	102	93
Total Units		8,586	8,586,304	1,506,895	753	683	410,971	205	186

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	341,170	1,164	1,164,414	411,330	206	187	112,181	56	51
Total Therms	24,234	2,423	2,423,425	282,062	141	128	76,926	38	35
Total Units		3,588	3,587,840	693,392	347	314	189,107	95	86

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	**286,652**	**978**	**978,345**	**345,601**	**173**	**157**	**94,255**	**47**	**43**
Total Therms	**40,201**	**4,020**	**4,020,120**	**467,902**	**234**	**212**	**127,610**	**64**	**58**
Total Units		**4,998**	**4,998,464**	**813,502**	**407**	**369**	**221,864**	**111**	**101**

Saving 369 metric tons of CO2 emissions is equivalent to:

- ✓ **45,000 gallons of gasoline burned (71 average cars).**
- ✓ **101 metric tons of carbon.**
- ✓ **The annual CO2 emissions from 31 average American households.**

Base and Proposed System Energy Cost Savings Summary

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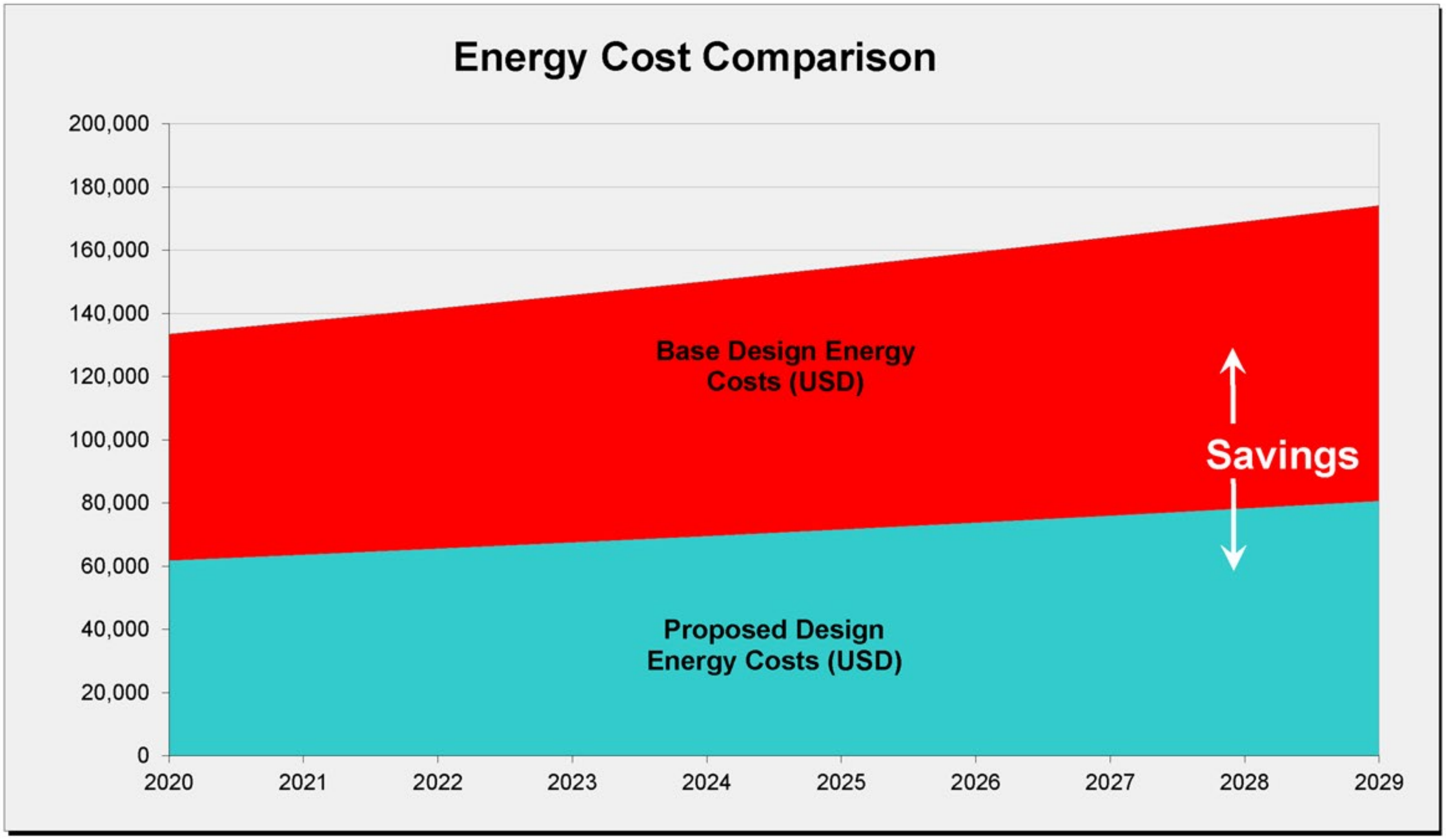
	Base Design in CFM	Proposed Design in CFM	CFM Flow Savings
Average Day Airflow	29,355.6	18,031.4	11,324.2
Average Night Airflow	22,548.9	10,709.6	11,839.4
Average Airflow	24,979.9	13,324.5	11,655.4
Average Annual $/CFM	$ 5.34	$ 4.64	$ 6.15
Energy Inflation Rate	3.0%		

Year	Base Design Energy Costs (USD)	Proposed Design Energy Costs (USD)	Energy Savings (USD)	Cumulative Savings (USD)
2020	133,496	61,763	71,733	71,733
2021	137,501	63,616	73,885	145,618
2022	141,626	65,524	76,101	221,719
2023	145,875	67,490	78,385	300,104
2024	150,251	69,515	80,736	380,840
2025	154,758	71,600	83,158	463,998
2026	159,401	73,748	85,653	549,651
2027	164,183	75,961	88,222	637,874
2028	169,109	78,240	90,869	728,743
2029	174,182	80,587	93,595	822,338
10 Yr Savings	$ 1,530,381	$ 708,043	$ 822,338	$ 822,338



Energy Savings & Capital Cost Analysis Basic Assumptions

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Customer Name	**Sample Lab Energy Analysis**		For US Weather Stations, Actual Airport Location:
Project Name	**Enter Project Name Here**		Boston Logan International Airport
City	**Project City**	Weather Station:	**Massachusetts, Boston**
Submitted by	**Enter Your Name and Your Company Name Here**		**Budget Estimate**

Building & Financial Assumptions

Number of Zones	30	
Avg Zone Area (sq. ft.)	650	
Total sq. ft (calculated)	19,500	
Avg Ceiling Height	10.00	
Total # of Fume Hoods	20	
Avg FH Max CFM	800	
Avg FH Min CFM	160	
Avg Day FH Sash Opening	60%	Open
Avg Nite FH Sash Opening	25%	Open
Annual Inflation Rate	3%	
Energy Inflation Rate	3%	
Hurdle Rate	8%	
Financial Analysis Period	10 Yrs	
Incentive/Rebate $/kWh	$ -	
Incentive/Rebate $/Therm	$ -	
Incentive/Rebate $/kW	$ -	

Baseline & Proposed Design Data

	Thermal Loads by Zone Type		
	Normal Activity, Low Load	**Moderate Activity, Medium Load**	**High Activity, High Load**
% of Zones	**80%**	**10%**	**10%**
Number of Zones	**24**	**3**	**3**
Room Peak W/ft^2 (Day)	6.00	10.00	12.00
Avg Peak W/ft^2 (Day)	4.00	8.00	12.00
Avg W/ft^2 (Day)	3.00	6.00	9.00
Avg Peak W/ft^2 Nite	2.00	4.00	9.00
Avg Watts/ft^2 Nite	1.50	3.00	6.00
Base Day Supply ACH	8.00	8.00	8.00
Base Night Supply ACH	6.00	6.00	6.00
Proposed Normal Day Sup. ACH	4.00	4.00	4.00
Proposed Normal Night Sup. ACH	2.00	2.00	2.00
High Vent Max/Purge Sup. ACH	12.00	12.00	12.00

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 *(Triggers Wet Bulb Recalc)*	None	
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
Base SA Temp	55	°F
Proposed SA Temp	55	°F
COP of Refrigeration System	3.3	
Heating Efficiency	75%	
Heat Recovery System Type	None	
Heat Recovery Efficiency	75%	
Heat Recovery Installed Price	$ -	
Annual Heat Recovery Costs	$ -	
Extra Static from Heat Recovery	0.75	in.

Fan System Assumptions & Data

Supply Fan Total Static - (No HR)	5.00	in w.c.
Supply Fan Efficiency	70%	
Exhaust Fan Total 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	177	
$/Ton: Cooling System	$ 1,750	
$/Watt Cost for Hydronic Room Cooling	$ 1.00	
$/MBH: Heating System	$ 40	
Subtract Cost of Dewpoint Sensors	**No**	
*Dewpoint Sensor Cost Installed	$ 1,500	
Proposed Installed System Price	$ 167,700	(from ONE)
Annual Costs for Proposed System	$ 10,062	(from ONE)
Years of Annual Services in System Price	1.0	Years

Baseline $/CFM		Diversity %
$9.88	Cooling System	100%
$1.74	Heating System	100%
$0.43	Reheat System	100%
$6.00	Exhaust Fan	100%
$4.50	Supply AHU	100%
$0.15	AHU VFDs	100%
$0.00	Heat Recovery	100%
$0.45	Ductwork	100%
$23.15	Total Base HVAC	

Occupancy Schedule

June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

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%**

Lab Airflow Analysis & Flow Drivers Summary

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June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
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Supply CFM Comparisons

	Base Calculated CFM	Proposed Calculated CFM	CFM Differences	% Differences
Total Fume Hood Maximum CFM	16,000	16,000	0	0%
Total Fume Hood Minimum CFM	3,200	3,200	0	0%
Estimated Total Peak FH CFM	12,000	12,000	0	0%
Estimated Total FH Avg CFM - Day	9,600	9,600	0	0%
Estimated Total FH Avg CFM - Night	4,000	4,000	0	0%
Avg Peak Cooling CFM - Day	18,086	19,567	1,480	8%
Avg Cooling CFM - Day	13,565	13,565	0	0%
Avg Peak Cooling CFM - Night	10,658	11,646	988	9%
Avg Cooling CFM - Night	7,105	7,105	0	0%
Day Average ACH CFM	29,049	15,854	(13,195)	-45%
Night Average ACH CFM	22,549	9,124	(13,425)	-60%
Avg Peak CFM - Day	30,325	21,548	(8,777)	-29%
Average CFM - Day	29,356	18,031	**(11,324)**	**-39%**
Avg Peak CFM - Night	23,506	17,158	(6,348)	-27%
Average CFM - Night	22,549	10,710	**(11,839)**	**-53%**

Average and Peak Supply Flow Breakdown by Room Type

Room Type	Base Peak Occ CFM	Base Peak UnOcc CFM	Proposed Peak Occ CFM	Proposed Peak UnOcc CFM
Low Load, Non-High Hood Density	20,800	15,600	12,480	10,320
Low Load, High Hood Density	-	-	-	-
Medium Load, Non-High Hood Density	2,600	1,950	2,671	1,379
Medium Load, High Hood Density	-	-	-	-
High Load, Non-High Hood Density	3,876	2,907	3,877	2,940
High Load, High Hood Density	-	-	-	-
Other Areas (Non-Lab, CV Lab, etc.)	-	-	-	-
Lab Corridors and Associated Areas	3,049	3,049	2,519	2,519
Total Peak Supply Flows	30,325	23,506	21,548	17,158

Room Type	Base Average Occ CFM	Base Average UnOcc CFM	Proposed Average Occ CFM	Proposed Average UnOcc CFM
Low Load, Non-High Hood Density	20,800	15,600	10,668	5,284
Low Load, High Hood Density	-	-	-	-
Medium Load, Non-High Hood Density	2,600	1,950	1,938	969
Medium Load, High Hood Density	-	-	-	-
High Load, Non-High Hood Density	2,907	1,950	2,907	1,938
High Load, High Hood Density	-	-	-	-
Other Areas (Non-Lab, CV Lab, etc.)	-	-	-	-
Lab Corridors and Associated Areas	3,049	3,049	2,519	2,519
Total Average Supply Flows	29,356	22,549	18,031	10,710

Color Key for Controlling or Max Flow:	Fume Hood Driven	Cooling Driven	ACH Driven

Base & Proposed HVAC Energy Cost Breakdown

June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
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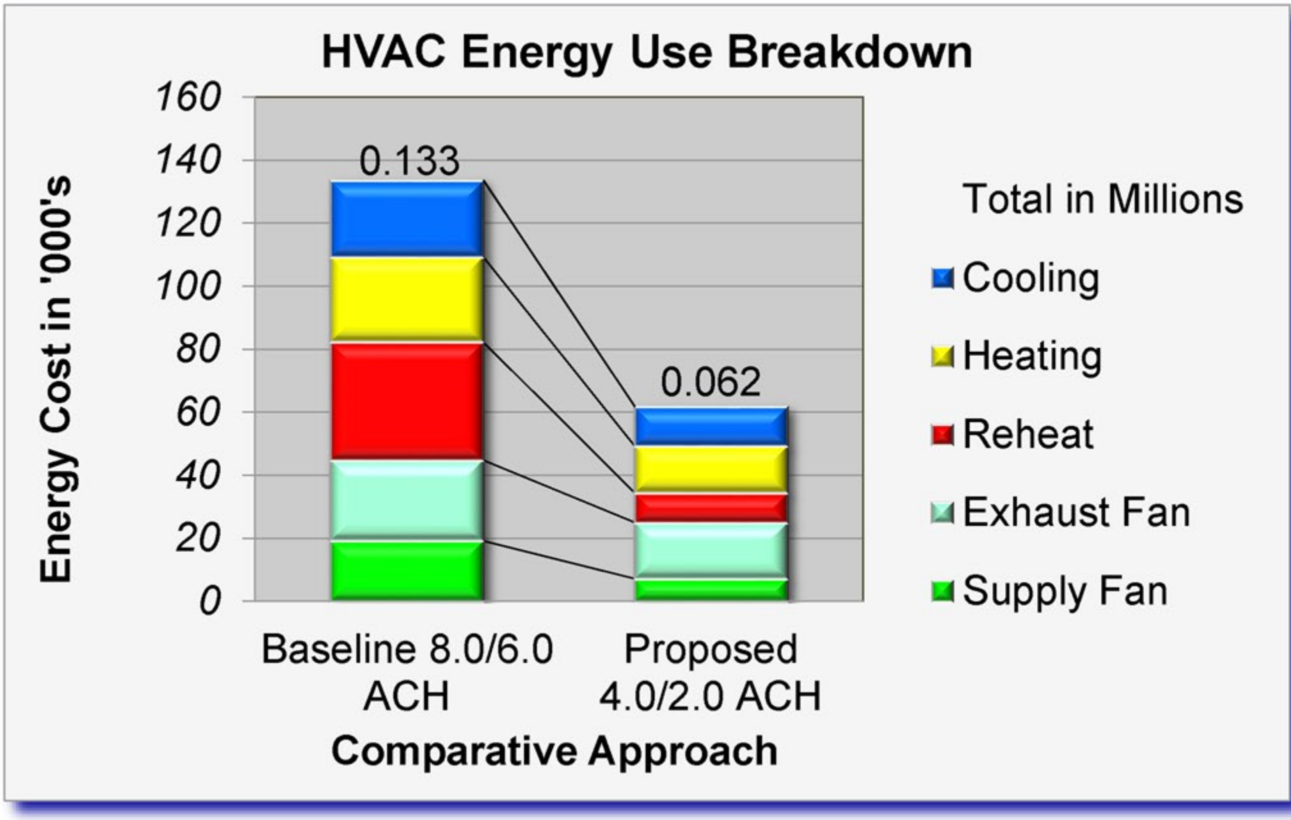
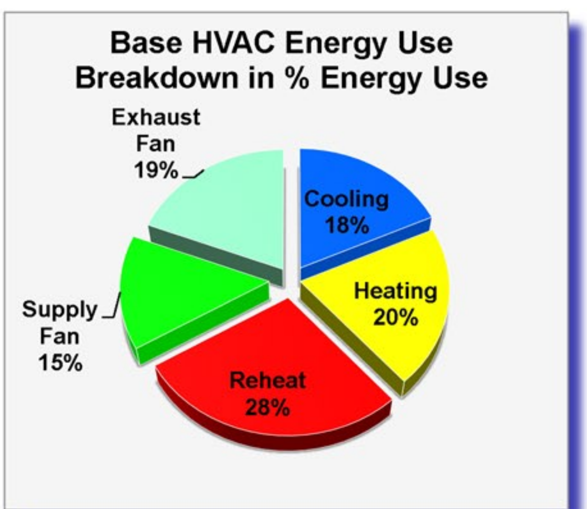
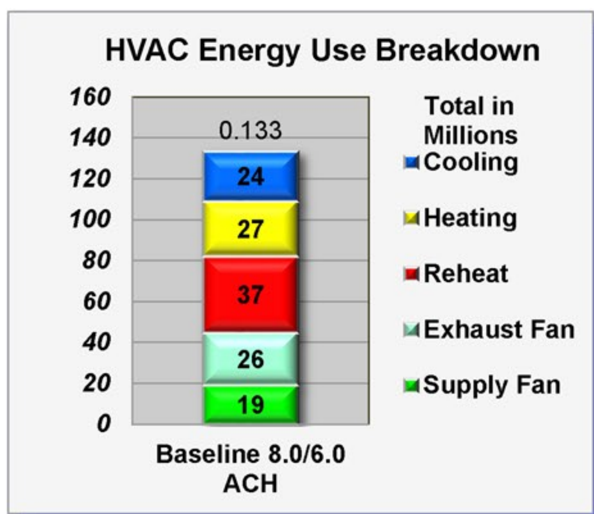
Submitted by	**Enter Your Name and Your Company Name Here**







Heat Recovery & Lab DCV Cashflow Savings Analysis

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June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
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Heat Recovery Capital Costs in $	0
Relative Lab DCV Costs in $	0
Utility Incentive/Rebate in $	0
Net Cost Impact on HVAC Capacity	0
HR Impact on Hydronic Clg 1st Cost	0
Net Capital Cost over Baseline in $	0

Energy Units Saved:
0 kWh Electricity saved annually
0 Therms heating energy saved annually
0 kW peak reduction calculation via Max Bin Method

System	**Energy Costs:**	**HVAC 1st Cost:**
HR Baseline	**$ 61,763**	**$ 699,671**
HR Proposed	**$ 61,763**	**$ 699,671**

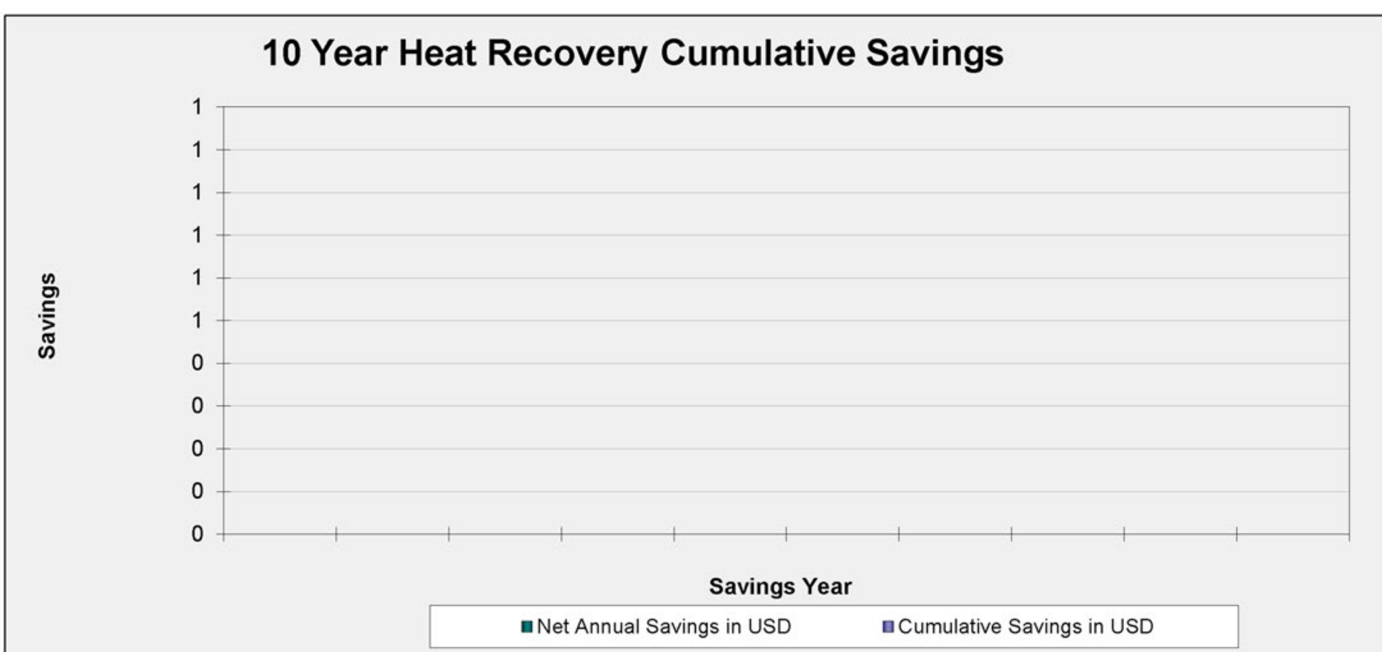
HR Baseline System:	**LabDCV Only**
HR Proposed System:	**HR & LabDCV**
Include Impacts on HVAC 1st Cost	**Yes**

	Primary HR	Secondary HR
HR Equipment:	None	None
HR Efficiency		

1st Yr Savings over Baseline	**$ 0,000**
Simple Energy Payback	**0.0 months**

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
2020	0	0	0	0	0	0
2021	0	0	0		0	0
2022	0	0	0		0	0
2023	0	0	0		0	0
2024	0	0	0		0	0
2025	0	0	0		0	0
2026	0	0	0		0	0
2027	0	0	0		0	0
2028	0	0	0		0	0
2029	0	0	0		0	0
Totals	**$ 0,000**	**$ 0,000**	**$ 0,000**	**$ 0,000**	**$ 0,000**	**$ 0,000**
First year energy savings represent a 0% reduction from the base option.					NPV =	$ 0,000
					IRR =	N/A



DBC Diversity Savings and Peak Lab Airflow Overview

June 27, 2019

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Submitted by	**Enter Your Name and Your Company Name Here**

Base Design

The base design has a peak cooling requirement of 18,086.1 CFM (with a peak average of 5.2 watts per sq foot);
A base occupied minimum ventilation level requirement of 29,048.9 CFM (8.0 ACH);
And a base unoccupied minimum ventilation level requirement of 22,548.9 CFM (6.0 ACH).
An estimated maximum fume hood flow rate of 9,600. 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 30 zones, 99.9% of the time there will be 3 or fewer zones at the proposed max 12.0 ACH,
and 99.9% of the time there will be 27 or more zones at the proposed avg. normal 4.0 ACH.
The proposed occupied minimum ventilation rate is 15,853.9 CFM (4.0 ACH);
The proposed unoccupied minimum ventilation rate is 9,123.8 CFM (2.0 ACH).

	Base Design	Proposed
Total number of Zones	30	30
99.9000th percentile of zones at normal Occ ACH	N/A	27
Number of zones at max ACH (Occ.)	N/A	3
Occupied Average Normal Zone ACH	8 ACH	4 ACH
Unoccupied Average Normal Zone ACH	6 ACH	2 ACH
Proposed Average Max Zone ACH	N/A	12 ACH
Occupied Normal Zone ACH in CFM	867.0	433.0
Unoccupied Normal Zone ACH in CFM	650.0	217.0
Proposed Max Zone ACH in CFM	N/A	1,300.0
System CFM Per Ton of Cooling	177	177
Cooling System Capacity Requirements in Tons	171	122
HVAC Capital Cost per CFM in Units of $/CFM	23.15	23.07
Hydronic Room Cooling System Cost	$	$
Hydronic Room Cooling System Peak Capacity in Tons	0.0	0.0

Proposed Design Diversity Flow in CFM

	Base Design	Proposed	Peak CFM Saved
Avg Max Flow for Normal Activity Zones	**20,800.0**	**12,480.0**	**8,320.0**
Avg Max Flow for Moderate Activity Zones	**2,600.0**	**2,671.5**	**-71.5**
Avg Max Flow for High Activity Zones	**3,875.6**	**3,877.2**	**-1.6**
Avg Max Flow for Other Area Zones	**0.0**	**0.0**	**0.0**
Avg Max Flow for Corridor & Assoc. Zones	**3,048.9**	**2,519.1**	**529.8**
EXPECTED PEAK CFM	**30,324.5**	**21,547.9**	**8,776.7**

Zone diversity on this project results in a 29% peak airflow savings with up to $ 205,000 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.

Detailed Lab Air Systems Capital Cost & DBC Diversity Analysis

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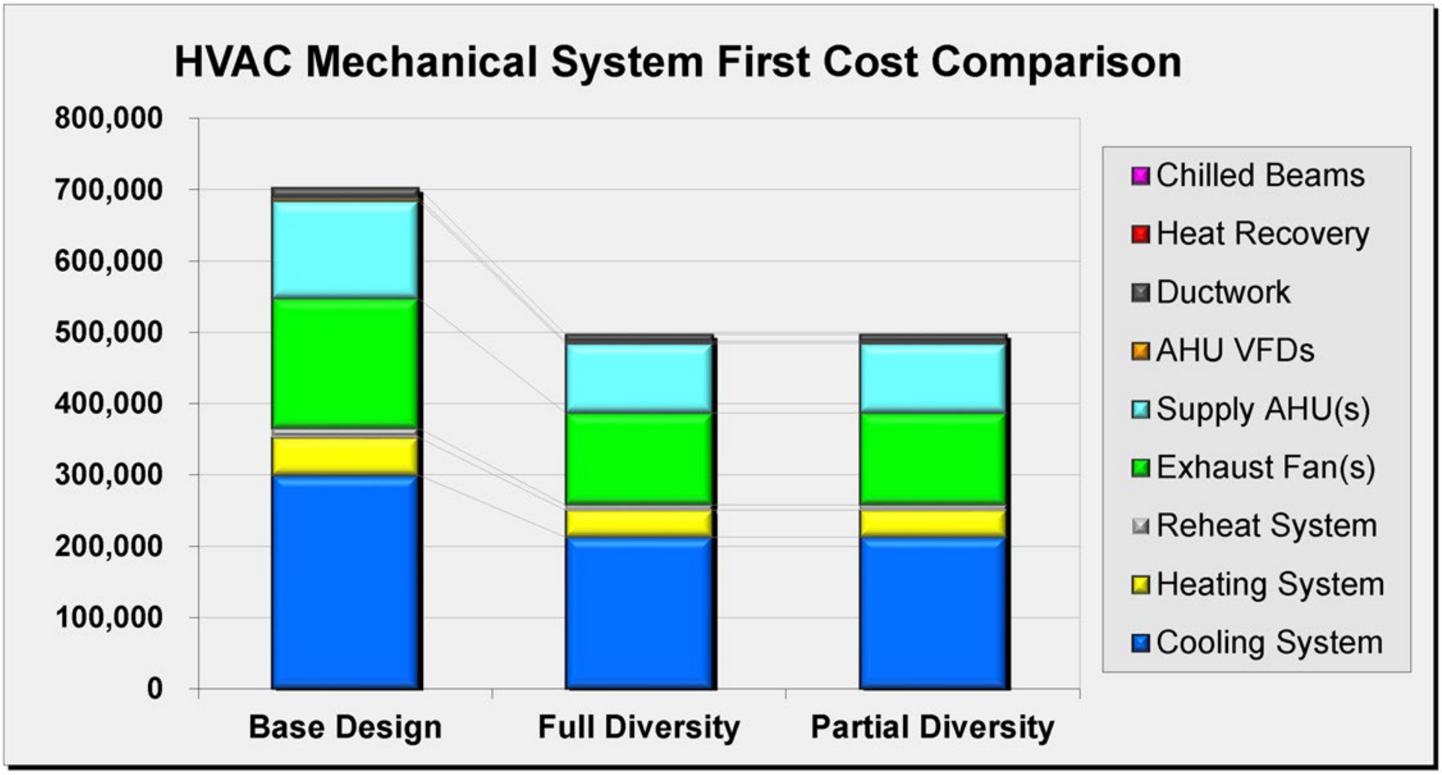
	Base Design			Proposed Design with Full (100%) Diversity Taken			
HVAC System Component	USD/CFM	Based on Max CFM Flow of:	System Cost in USD	USD/CFM	Based on Max CFM Flow of:	System Cost in USD	First Cost Savings over Base Design
Cooling System	$ 9.88	30,324.5	299,564	$ 9.88	21,547.9	212,863	86,701
Heating System	$ 1.74	30,324.5	52,857	$ 1.75	21,547.9	37,741	15,116
Reheat System	$ 0.43	30,324.5	13,012	$ 0.34	21,547.9	7,385	5,628
Exhaust Fan(s)	$ 6.00	30,324.5	181,947	$ 6.00	21,547.9	129,287	52,660
Supply AHU(s)	$ 4.50	30,324.5	136,460	$ 4.50	21,547.9	96,965	39,495
Heat Recovery	$ 0.00	30,324.5	0	$ 0.00	21,547.9	0	0
AHU VFDs	$ 0.15	30,324.5	4,549	$ 0.15	21,547.9	3,232	1,316
Ductwork	$ 0.45	30,324.5	13,646	$ 0.45	21,547.9	9,697	3,949
Chilled Beams	----	----	0	----	----	0	0
Total HVAC System	**$ 23.15**		**702,035**	**$ 23.07**		**497,169**	**$ 204,865**

	Proposed Design w/Partial (Selected) Diversity Taken				
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	$ 9.88	100%	21,547.9	212,863	86,701
Heating System	$ 1.75	100%	21,547.9	37,741	15,116
Reheat System	$ 0.34	100%	21,547.9	7,385	5,628
Exhaust Fan(s)	$ 6.00	100%	21,547.9	129,287	52,660
Supply AHU(s)	$ 4.50	100%	21,547.9	96,965	39,495
Heat Recovery	$ 0.00	100%	21,547.9	0	0
AHU VFDs	$ 0.15	100%	21,547.9	3,232	1,316
Ductwork	$ 0.45	100%	21,547.9	9,697	3,949
Chilled Beams	----	----	----	0	0
Total HVAC System	**$ 23.07**			**497,169**	**$ 204,865**



Energy Conservation & Photovoltaics (Solar Energy)Technology Comparison

June 27, 2019

Customer	**Sample Lab Energy Analysis**
Project	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

The Proposed system has about the same carbon impact as a 516 kW solar panel.
The Proposed system will save about the same electrical energy generated by a 220 kW solar panel.
The Proposed system will cost approximately 6.5% of a solar panel with the same carbon impact.
The Proposed system payback is about 7.8 times better than solar panels, even w/ incentives & credits.

Figures of Merit	Solar Panels (516 kW)	OptiNet	OptiNet to Solar Factor
Metric tons of CO_2 saved	369	369	1.0
kWH Power Generated/ Saved	674,745	286,652	0.4
Heating Savings in Therms	0	40,201	N/A
Total equivalent MMBtu saved	2,303	4,998	2.2
Total equivalent Therms saved	23,029	49,985	2.2
Annual Savings in USD	74,222	71,733	0.97
Installed Cost in USD	2,581,867	167,700	15.4
Simple payback in years	34.8	2.3	14.9
Simple payback yrs w/ incentive for Public, Gov, Edu	24.4	1.7	14.0
Simple payback w/ Ren. Fed & State Credits - Bus.	13.6	1.7	7.8
Area of Installation in square feet	51,637	10.0	5,164
Equipment weight in pounds	881,953	300	2,940

Assumptions:	Value	
Electric Power Costs USD/kWh (from Assumptions)	0.110	USD/kWh
Heating Costs per Therms (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 Therms Equivalent (Gas)	11.639	
Installed Cost per W: Large Installation (>10 kW) (1)	5.0	USD/W
Solar Array Equipment-only USD/W	2.0	USD/W
OptiNet Installed Cost	167,700	USD
OptiNet Equipment weight (lb/system)	300.0	
OptiNet Equipment space used in sq feet	10.00	
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)	1.0%	
Watts per square foot - Solar Array	10.00	
OptiNet kWh savings	286,652	
OptiNet Heating Savings in Therms	40,201	
Solar Array Size with Same Carbon Impact Savings as OptiNet	516	kW
Solar Array Size w/ Same Electrical Savings as OptiNet System	220	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

Proposed System 5 Year Life Cycle Cost Analysis

AIRCUITY

June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

	Base System Design	Proposed System Design	Proposed System (Aircuity) Savings
Aircuity First Cost	**$0**	**$167,700**	**($167,700)**
Diversity Savings	$0	$0	**$0**
Rebate & Incentives	$0	$0	**$0**
Adjustments to First Cost	$0	$0	**$0**
Net First Cost	**$0**	**$167,700**	**($167,700)**
Year 1 Energy Cost	$133,496	$61,763	**$71,733**
Year 2 Energy Cost	$137,501	$63,616	**$73,885**
Year 3 Energy Cost	$141,626	$65,524	**$76,101**
Year 4 Energy Cost	$145,875	$67,490	**$78,385**
Year 5 Energy Cost	$150,251	$69,515	**$80,736**
Total 5 Year Energy Cost	**$708,748**	**$327,908**	**$380,840**
Year 1 Maintenance Cost		$0	**$0**
Year 2 Maintenance Cost		$10,364	**($10,364)**
Year 3 Maintenance Cost		$10,675	**($10,675)**
Year 4 Maintenance Cost		$10,995	**($10,995)**
Year 5 Maintenance Cost		$11,325	**($11,325)**
5 Year Maintenance Cost	**$0**	**$43,359**	**($43,359)**
Total 5 Year Operation Cost	**$708,748**	**$371,267**	**$337,482**
5 Year Cost of Ownership	**$708,748**	**$538,967**	**$169,782**
Avg. Cost of ownership per year	**$141,749.63**	**$107,793.32**	**$33,956**

Proposed System 10 Year Life Cycle Cost Analysis

June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

	Base System Design	Proposed System Design	Proposed System (Aircuity) Savings
Aircuity First Cost	**$0**	**$167,700**	**($167,700)**
Diversity Savings	$0	$0	**$0**
Rebate & Incentives	$0	$0	**$0**
Adjustments to First Cost	$0	$0	**$0**
Net First Cost	**$0**	**$167,700**	**($167,700)**
Year 1 Energy Cost	$133,496	$61,763	**$71,733**
Year 2 Energy Cost	$137,501	$63,616	**$73,885**
Year 3 Energy Cost	$141,626	$65,524	**$76,101**
Year 4 Energy Cost	$145,875	$67,490	**$78,385**
Year 5 Energy Cost	$150,251	$69,515	**$80,736**
Year 6 Energy Cost	$154,758	$71,600	**$83,158**
Year 7 Energy Cost	$159,401	$73,748	**$85,653**
Year 8 Energy Cost	$164,183	$75,961	**$88,222**
Year 9 Energy Cost	$169,109	$78,240	**$90,869**
Year 10 Energy Cost	$174,182	$80,587	**$93,595**
Total 10 Year Energy Cost	**$1,530,381**	**$708,043**	**$822,338**
Year 1 Maintenance Cost		$0	**$0**
Year 2 Maintenance Cost		$10,364	**($10,364)**
Year 3 Maintenance Cost		$10,675	**($10,675)**
Year 4 Maintenance Cost		$10,995	**($10,995)**
Year 5 Maintenance Cost		$11,325	**($11,325)**
Year 6 Maintenance Cost		$11,665	**($11,665)**
Year 7 Maintenance Cost		$12,015	**($12,015)**
Year 8 Maintenance Cost		$12,375	**($12,375)**
Year 9 Maintenance Cost		$12,746	**($12,746)**
Year 10 Maintenance Cost		$13,129	**($13,129)**
10 Year Maintenance Cost	**$0**	**$105,288**	**($105,288)**
Total 10 Year Operation Cost	**$1,530,381**	**$813,331**	**$717,050**
10 Year Cost of Ownership	**$1,530,381**	**$981,031**	**$549,350**
Avg. Cost of ownership per year	**$153,038**	**$98,103**	**$54,935**

Energy Units and Energy Dollar Savings Detailed Comparison

AIRCUITY®
June 27, 2019

Customer	**Sample Lab Energy Analysis**
Project	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

Base Design

Occ

Annual Occ Energy Units		Annual Occ Energy Costs		Total Annual Costs at Occ Average Flow	
Cooling kWh	107,302	Cooling	$ 11,803	$	5.32 per CFM
Heating Therms	10,044	Heating	$ 10,044		
Reheat Therms	13,570	Reheat	$ 13,570		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	85,949	Supply Fan	$ 9,454	Cooling cost / CFM	$ 1.13
Exhaust Fan kWh	98,970	Exhaust Fan	$ 10,887	Heating cost / CFM	$ 0.96
Total kWh	292,222	Total	$ 55,758	Reheat cost / CFM extra	$ 2.41
Total Therms	23,614			Fan cost / CFM	$ 1.94
Peak kW	258				

UnOcc

Annual Unocc Energy Units		Annual Unocc Energy Costs		Total Annual Costs at Unocc Average Flow	
Cooling kWh	113,921	Cooling	$ 12,531	$	5.36 per CFM
Heating Therms	16,933	Heating	$ 16,933		
Reheat Therms	23,889	Reheat	$ 23,889		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	88,005	Supply Fan	$ 9,681	Cooling cost / CFM	$ 0.86
Exhaust Fan kWh	133,675	Exhaust Fan	$ 14,704	Heating cost / CFM	$ 1.17
Total kWh	335,601	Total	$ 77,738	Reheat cost / CFM extra	$ 2.41
Total Therms	40,822			Fan cost / CFM	$ 1.68
Peak kW	189				

Total

Annual Total Energy Units		Annual Total Energy Costs		Total Annual Costs at All Average Flows	
Cooling kWh	221,223	Cooling	$ 24,335	$	5.34 per CFM
Heating Therms	26,977	Heating	$ 26,977		
Reheat Therms	37,459	Reheat	$ 37,459		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	173,955	Supply Fan	$ 19,135	Cooling cost / CFM	$ 0.97
Exhaust Fan kWh	232,645	Exhaust Fan	$ 25,591	Heating cost / CFM	$ 1.08
Glycol Pump kWh	-	Glycol Pump	$ -		
Total kWh	627,823	Total	$ 133,496	Reheat cost / CFM extra	$ 2.41
Total Therms	64,435			Fan cost / CFM	$ 1.79
Peak kW	258				

Proposed Design

Occ

Annual Occ Energy Units		Annual Occ Energy Costs		Total Annual Costs at Occ Average Flow	
Cooling kWh	61,914	Cooling	$ 6,811	$	4.50 per CFM
Heating Therms	6,532	Heating	$ 6,532		
Reheat Therms	3,839	Reheat	$ 3,839		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	33,326	Supply Fan	$ 3,666	Cooling cost / CFM	$ 1.06
Exhaust Fan kWh	73,926	Exhaust Fan	$ 8,132	Heating cost / CFM	$ 1.01
Total kWh	169,166	Total	$ 28,979	Reheat cost / CFM extra	$ 2.41
Total Therms	10,371			Fan cost / CFM	$ 1.83
Peak kW	153				

UnOcc

Annual Unocc Energy Units		Annual Unocc Energy Costs		Total Annual Costs at Unocc Average Flow	
Cooling kWh	51,915	Cooling	$ 5,711	$	4.76 per CFM
Heating Therms	8,288	Heating	$ 8,288		
Reheat Therms	5,575	Reheat	$ 5,575		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	31,588	Supply Fan	$ 3,475	Cooling cost / CFM	$ 0.83
Exhaust Fan kWh	88,502	Exhaust Fan	$ 9,735	Heating cost / CFM	$ 1.20
Total kWh	172,004	Total	$ 32,784	Reheat cost / CFM extra	$ 2.41
Total Therms	13,864			Fan cost / CFM	$ 1.92
Peak kW	91				

Total

Annual HVAC Total Energy Units		Annual Total HVAC Energy Costs		Total Annual Costs at All Average Flows	
Cooling kWh	113,828	Cooling	$ 12,521	$	4.64 per CFM
Heating Therms	14,820	Heating	$ 14,820		
Reheat Therms	9,414	Reheat	$ 9,414		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	64,914	Supply Fan	$ 7,141	Cooling cost / CFM	$ 0.94
Exhaust Fan kWh	162,428	Exhaust Fan	$ 17,867	Heating cost / CFM	$ 1.11
Glycol Pump kWh	-	Glycol Pump	$ -		
Total kWh	341,170	Total	$ 61,763	Reheat cost / CFM extra	$ 2.41
Total Therms	24,234			Fan cost / CFM	$ 1.88
Peak kW	153				

Savings

Occ

Annual Occ Energy Units Saved		Annual Occ Energy Cost Savings	
Cooling kWh	45,388	Cooling	$ 4,993
Heating Therms	3,512	Heating	$ 3,512
Reheat Therms	9,731	Reheat	$ 9,731
Heating kWh	-		
Reheat kWh	-		
Supply Fan kWh	52,623	Supply Fan	$ 5,789
Exhaust Fan kWh	25,044	Exhaust Fan	$ 2,755
Total kWh	123,056	Total	$ 26,779
Total Therms	13,243		
Peak kW	105		

UnOcc

Annual Unocc Energy Units Saved		Annual Unocc Energy Cost Savings	
Cooling kWh	62,006	Cooling	$ 6,821
Heating Therms	8,644	Heating	$ 8,644
Reheat Therms	18,314	Reheat	$ 18,314
Heating kWh	-		
Reheat kWh	-		
Supply Fan kWh	56,418	Supply Fan	$ 6,206
Exhaust Fan kWh	45,173	Exhaust Fan	$ 4,969
Total kWh	163,597	Total	$ 44,954
Total Therms	26,958		
Peak kW	98		

Total

Annual Total Energy Units Saved		Annual Total Energy Cost Savings	
Cooling kWh	107,394	Cooling	$ 11,813
Heating Therms	12,156	Heating	$ 12,156
Reheat Therms	28,045	Reheat	$ 28,045
Heating kWh	-		
Reheat kWh	-		
Supply Fan kWh	109,041	Supply Fan	$ 11,995
Exhaust Fan kWh	70,217	Exhaust Fan	$ 7,724
Glycol Pump kWh	-	Glycol Pump	$ -
Total kWh	286,652	Total	$ 71,733
Total Therms	40,201		54%
Peak kW	105		

Full CV Flow

Annual Energy Units		Annual Energy Costs		Total Annual Costs at Average Flow	
Cooling kWh	273,326	Cooling	$ 30,066	$	5.00 per CFM
Heating Therms	32,112	Heating	$ 32,112		
Reheat Therms	30,390	Reheat	$ 30,390		
Heating kWh	-				
Reheat kWh	-			**Costs per CFM**	
Supply Fan kWh	258,671	Supply Fan	$ 28,454	Cooling cost / CFM	$ 0.99
Exhaust Fan kWh	277,300	Exhaust Fan	$ 30,503	Heating cost / CFM	$ 1.06
Glycol Pump kWh	-	Glycol Pump	$ -	Reheat cost / CFM extra	$ 1.45
Total kWh	809,297	Total	$ 151,525	Fan cost / CFM	$ 1.94
Total Therms	62,503				

Net Lab & Other Areas Electrical Loads (Plugs, Lights, etc.)		Net Lab Electrical Load Energy Costs	
Day Clg Load kWh	237,858	Day Clg Load	$ 26,164
Nite Clg Load kWh	230,540	Nite Clg Load	$ 25,359
Total Clg Load kWh	468,398	Total Load	$ 51,524
Peak Clg Load Kw	101		

NSF Lab & Other Energy	Base	Proposed
HVAC Energy in equiv KBTU	8,586,304	3,587,840
Total energy in equiv. KBTU	10,184,946	5,186,482
Total energy in equiv. BTU/ft2	522,305	265,973
Total energy in equiv. kWh/ft2	153.0	77.9

GSF Building Electrical Loads (Plugs, Lights, etc.)		GSF Building Electrical Load Energy Costs	
Day Clg Load kWh	273,537	Day Clg Load	$ 30,089
Nite Clg Load kWh	265,121	Nite Clg Load	$ 29,163
Total Clg Load kWh	538,658	Total Load	$ 59,252
Peak Clg Load Kw	117		

Building GSF Energy	Base	Proposed
HVAC Energy in equiv KBTU	9,874,250	4,126,016
Total energy in equiv. KBTU	11,712,688	5,964,454
Total energy in equiv. BTU/ft2	390,423	198,815
Total energy in equiv. kWh/ft2	114.4	58.3

Heat Recovery Energy Units & Energy Dollar Savings Detailed Comparison

AIRCUITY®

June 27, 2019

Customer	**Sample Lab Energy Analysis**
Project	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

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

Annual Energy Units	
Cooling kWh	113,828
Heating Therms	14,820
Reheat Therms	9,414
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	64,914
Exhaust Fan kWh	162,428
Glycol Pump kWh	-
Total kWh	341,170
Total Therms	24,234
Peak kW	153

Annual Energy Costs		
Cooling	$	12,521
Heating	$	14,820
Reheat	$	9,414
Supply Fan	$	7,141
Exhaust Fan	$	17,867
Glycol Pump	$	-
Total	$	61,763

Total Annual Costs at Average Flow		
$	2.47	per CFM

Costs per CFM		
Cooling cost / CFM	$	0.50
Heating cost / CFM	$	0.59
Reheat cost / CFM extra	$	0.45
Fan cost / CFM	$	1.00

HR Proposed Metrics with Heat Recovery & Lab DCV:

Annual Energy Units	
Cooling kWh	113,828
Heating Therms	14,820
Reheat Therms	9,414
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	64,914
Exhaust Fan kWh	162,428
Glycol Pump kWh	-
Total kWh	341,170
Total Therms	24,234
Peak kW	153

Annual Energy Costs		
Cooling	$	12,521
Heating	$	14,820
Reheat	$	9,414
Supply Fan	$	7,141
Exhaust Fan	$	17,867
Glycol Pump	$	-
Total	$	61,763

Total Annual Costs at Average Flow		
$	4.64	per CFM

Costs per CFM		
Cooling cost / CFM	$	0.94
Heating cost / CFM	$	1.11
Reheat cost / CFM extra	$	0.45
Fan cost / CFM	$	0.82

Annual Energy Units Saved	
Cooling kWh	-
Heating Therms	-
Reheat Therms	-
Heating kWh	-
Reheat kWh	-
Supply Fan kWh	-
Exhaust Fan kWh	-
Glycol Pump kWh	-
Total kWh	-
Total Therms	-
Peak kW	-

Annual Energy Savings		
Cooling	$	-
Heating	$	-
Reheat	$	-
Supply Fan	$	-
Exhaust Fan	$	-
Glycol Pump	$	-
Total	$	-
		0%

Hydronic Room Cooling System First Cost Comparison

	HR Baseline Case		HR Proposed Case	
Hydronic Room System Cost	**$**	**-**	**$**	**-**
Peak Capacity in Tons		-		-

Energy Savings & Capital Cost Analysis Advanced Assumptions

AIRCUITY®

June 27, 2019

Customer Name	**Sample Lab Energy Analysis**
Project Name	**Enter Project Name Here**
City	**Project City (Using weather data from Boston, Massachusetts)**
Submitted by	**Enter Your Name and Your Company Name Here**

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	20	0	20
Zones	30	0	30
Area	650	650	650
Total sqft	19,500	0	19,500

Other Areas on the Same AHU (Non-lab or Lab areas without Lab DCV Control) Assumptions

Total ft^2 of Other Areas	-	Peak W/ft^2 Day	4.50
Avg Ceiling Height in ft.	10.00	Avg W/ft^2 Day	2.25
Avg Peak Watts/ft^2 (Day)	3.00	Avg W/ft^2 Nite	1.13

Avg ACH Rates	Base Rates	Proposed Rates
Day ACH	4.00	3.00
Night ACH	3.50	2.00

Secondary Heat Recovery System Assumptions

Secondary HR Wheel/Wrap around Coil	None	
Secondary HR Efficiency	65%	
Secondary HR Pressure Drop in "WC	0.75	in.
Secondary Glycol Pump HP/1000 cfm	0.15	Hp
Secondary HR Control Approach	Variable Speed	
Uses Secondary HR Bypass Dampers	No	
Secondary HR Installed Price	$ -	
Secondary Annual HR Costs	$ -	

Advanced Primary Heat Recovery System Assumptions

HR Dry Bulb Change Over Temp	77	°F
HR Low Range Engage Temp	55	°F
Primary Wheel/Bypass Control Approach	Variable Speed	
Uses Primary HR Bypass Dampers	No	
Primary "Sensible Only" HR Type	Glycol Coils	
HR Lockout Control Approach	Diff Enthalpy	
Average Exh/Sup Ratio %	90%	
Primary Glycol Pump motor HP/1000 cfm	0.15	Hp

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	150.0	
"Unlisted" Fuel lb CO2 / MMBtu	150	
Total Building Net to Gross Factor	0.65	

Return Air Temp Rise	3	°F
Chilled Beam Chilled Water COP Eff %	120%	
Chilled Beam Pressure Drop	0.5	in.
Peak Elec Demand Calculation	Max Bin Method	
CFM/Ton Peak Design Capacity %	99.75%	
Heating System Peak Design Capacity %	99.75%	
Supply Fan Energy Transfer to SA %	67.0%	
Avg. Lab Room Flow Tracking Offset %	10.0%	
Avg. Peak FH Opening % for HVAC Sizing	75%	

Advanced Fan System Assumptions

Assumptions	Exhaust Fan	Supply Fan
Full Load Motor Eff.	0.90	0.90
Full Load VFD Effi.	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	35.8	34.1	*Hp*

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

Return/Outside Air System and Occupancy Assumptions for Lab and Non-Lab Projects

Bldg sq ft (From Assumptions - Lab DCV)	19,500	ft^2
Max People/1,000ft^2 (Day)	25.0	
Day Design Occupancy	488	people
Max People/1,000ft^2 (Night)	4.0	
Night Design Occupancy	78	
OA CFM/person	20	CFM
Avg Day % Design Occupancy	40%	
Average Day Occupancy	196	people
Average Day Min DCV OA	3,920	CFM
Avg Night % Design Occupancy	50%	
Average Night Occupancy	39	people
Average Night Min DCV OA	780	CFM

Occ Design Fixed Vent OA (20 CFM/person)	9,760	CFM
Night Design Fixed Vent OA (20 CFM/person)	1,560	CFM
Non-Lab Application (No Lab DCV override)	No	
Dry Bulb Economizer Changeover Temp	67	°F

Control of Return & OA	Baseline	Proposed
Use Return Air	No	No
DCV & Economizer Approach	Fixed OA	DCV Only
Use Occ/Unocc w/ Non-DCV	No	No
Occ Airflow in CFM	9,760	3,920
Unocc Airflow in CFM	9,760	780
Occ Min vent ACH Rate	3.00	1.21
Unocc Min Vent ACH Rate	3.00	0.24