

# Aircuity Ventilation Savings Analysis for Sample Non Lab Building 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 Non Lab, Building Optimization Project - Budget Estimate

Aircuity is pleased to provide this Budget Estimate for your building. Aircuity's enabling technology, OptiNet™, will enhance Indoor environmental quality (IEQ) while providing your organization significant carbon and energy reduction to help achieve mission critical objectives.

#### This Budget Estimate is based upon:

- > Assumption of a capable existing BMS control system that can control outside air
- > Energy costs of \$ 0.11/kWh & \$ 1.00/Therm
- > 40 sensed areas and a total approximate demand controlled area of 60,000 square feet
- Base approach of Dry Bulb w/ an Occ. OA flow of 30,000 CFM & an Unocc flow of 19,200 CFM
- > Proposed approach of DCV & DB w/ a day OA flow of 12,000 CFM & a night flow of 9,600 CFM
- > "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:	\$140,000
Capital Savings from Downsizing HVAC if applicable:	

Utility Rebate Incentive if applicable:

Net Capital Cost: \$140,000

Projected Annual Energy Savings: \$26,079
Simple Energy Payback: 5.1 years
CO2 Reduction in Metric tons of CO2: 136
CO2 Reduction in equivalent avg. cars: 26
Reduction from Baseline HVAC Energy: 26%

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!



Customer Name	Sample Non Lab
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

Project Capital Costs	\$140,000
Diversity Savings & Dpt Sensors	\$0
Utility Incentive/Rebate	\$0
Net Capital Cost (Savings)	\$140,000

1st Year Savings	\$26,079
Simple Energy Payback	5.1 years

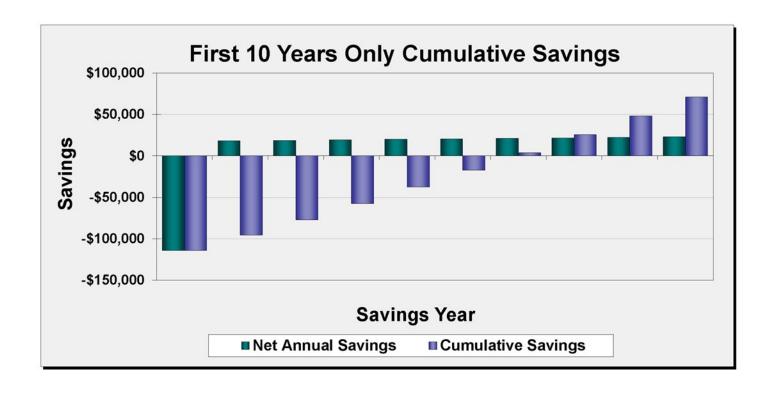
Energy	Units	Saved:	
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45,504 kWh Electricity saved annually 21,073 Therms Heating saved annually 73 kW peak reduction via Max Bin Method

	Baseline	Proposed
Control Sys.	Dry Bulb	DCV & DB

## 10 Years of Cashflow Analysis

Energy Savings	Net Recurring Costs	Annual Savings	Net Capital Costs	Net Annual Savings	Cumulative Savings
\$26,079	\$0	\$26,079	(\$140,000)	(\$113,921)	(\$113,921)
\$26,861	(\$8,652)	\$18,209		\$18,209	(\$95,712)
\$27,667	(\$8,912)	\$18,755		\$18,755	(\$76,957)
\$28,497	(\$9,179)	\$19,318		\$19,318	(\$57,639)
\$29,352	(\$9,454)	\$19,897		\$19,897	(\$37,742)
\$30,232	(\$9,738)	\$20,494		\$20,494	(\$17,248)
\$31,139	(\$10,030)	\$21,109		\$21,109	\$3,862
\$32,073	(\$10,331)	\$21,742		\$21,742	\$25,604
\$33,036	(\$10,641)	\$22,395		\$22,395	\$47,999
\$34,027	(\$10,960)	\$23,067		\$23,067	\$71,065
\$298,962	(\$87,897)	\$211,065	(\$140,000)	\$71,065	\$71,065
avings represents	s a 26% reducti	on from base	case.	10 Yrs NPV =	\$1,254
942300 TELEVIS				10 Yrs IRR =	8.2%
				10 Yrs Cum.	\$71,065
				Savings	φ <i>1</i> 1,005
	\$26,079 \$26,861 \$27,667 \$28,497 \$29,352 \$30,232 \$31,139 \$32,073 \$33,036 \$34,027	Savings         Costs           \$26,079         \$0           \$26,861         (\$8,652)           \$27,667         (\$8,912)           \$28,497         (\$9,179)           \$29,352         (\$9,454)           \$30,232         (\$9,738)           \$31,139         (\$10,030)           \$32,073         (\$10,331)           \$33,036         (\$10,641)           \$34,027         (\$10,960)           \$298,962         (\$87,897)	Savings         Costs         Savings           \$26,079         \$0         \$26,079           \$26,861         (\$8,652)         \$18,209           \$27,667         (\$8,912)         \$18,755           \$28,497         (\$9,179)         \$19,318           \$29,352         (\$9,454)         \$19,897           \$30,232         (\$9,738)         \$20,494           \$31,139         (\$10,030)         \$21,109           \$32,073         (\$10,331)         \$21,742           \$33,036         (\$10,641)         \$22,395           \$34,027         (\$10,960)         \$23,067           \$298,962         (\$87,897)         \$211,065	Savings         Costs         Savings         Costs           \$26,079         \$0         \$26,079         (\$140,000)           \$26,861         (\$8,652)         \$18,209           \$27,667         (\$8,912)         \$18,755           \$28,497         (\$9,179)         \$19,318           \$29,352         (\$9,454)         \$19,897           \$30,232         (\$9,738)         \$20,494           \$31,139         (\$10,030)         \$21,109           \$32,073         (\$10,331)         \$21,742           \$33,036         (\$10,641)         \$22,395           \$34,027         (\$10,960)         \$23,067	Savings         Costs         Savings         Costs         Savings           \$26,079         \$0         \$26,079         (\$140,000)         (\$113,921)           \$26,861         (\$8,652)         \$18,209         \$18,209           \$27,667         (\$8,912)         \$18,755         \$18,755           \$28,497         (\$9,179)         \$19,318         \$19,318           \$29,352         (\$9,454)         \$19,897         \$19,897           \$30,232         (\$9,738)         \$20,494         \$20,494           \$31,139         (\$10,030)         \$21,109         \$21,109           \$32,073         (\$10,331)         \$21,742         \$21,742           \$33,036         (\$10,641)         \$22,395         \$22,395           \$34,027         (\$10,960)         \$23,067         \$23,067           \$298,962         (\$87,897)         \$211,065         (\$140,000)         \$71,065           avings represents a 26% reduction from base case.         10 Yrs NPV =





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

Annual CO2 Emission Rates for Powe in Massachusetts	US National Average	
CO <sub>2</sub> (lb/MWh)	1,205.6	1345.1

Fossil Fuel Used	Ib CO <sub>2</sub> / MMBtu
Heating: Gas	116.39
Reheat: SameAsHeating	116.39
Other Fuel Type:	

### **Base Design Annual Emissions**

		···		CO <sub>2</sub>			Carbon		
Annual E	nergy Units	Equivalent MMBTUs	Equivalent MBTUs	Lbs	Short Tons	Metric Tons	Lbs	Short Tons	Metric Tons
Total kWh	717,307	2,448	2,448,169	864,817	432	392	235,859	118	107
Total Therms	21,651	2,165	2,165,065	251,992	126	114	68,725	34	31
Total Units		4,613	4,613,234	1,116,809	558	506	304,584	152	138

## **Proposed Design Annual Emissions**

					CO <sub>2</sub> Carbon				
Annual E	nergy Units	Equivalent MMBTUs	Equivalent MBTUs	Lbs	Short Tons	Metric Tons	Lbs	Short Tons	Metric Tons
Total kWh	671,803	2,293	2,292,864	809,956	405	367	220,897	110	100
Total Therms	577	58	57,748	6,721	3	3	1,833	1	1
Total Units		2,351	2,350,613	816,677	408	370	222,730	111	101

# **Annual Lab DCV Emissions Savings**

				CO <sub>2</sub>						Carbon	
	l Energy Saved	Equivalent MMBTUs	Equivalent MBTUs	Lbs	Short Tons	Metric Tons	Lbs	Short Tons	Metric Tons		
Total kWh	45,504	155	155,305	54,862	27	25	14,962	7	7		
<b>Total Therms</b>	21,073	2,107	2,107,316	245,271	123	111	66,892	33	30		
Total Units		2,263	2,262,621	300,132	150	136	81,854	41	37		

Saving 136 metric tons of CO2 emissions is equivalent to:

- √ 16,602 gallons of gasoline burned (26 average cars).
- √ 37 metric tons of carbon.
- ✓ The annual CO2 emissions from 12 average American households.

## **Base and Proposed System Energy Cost Savings Summary**



Customer Name Sample Non Lab

Project Name Enter Project Name Here

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

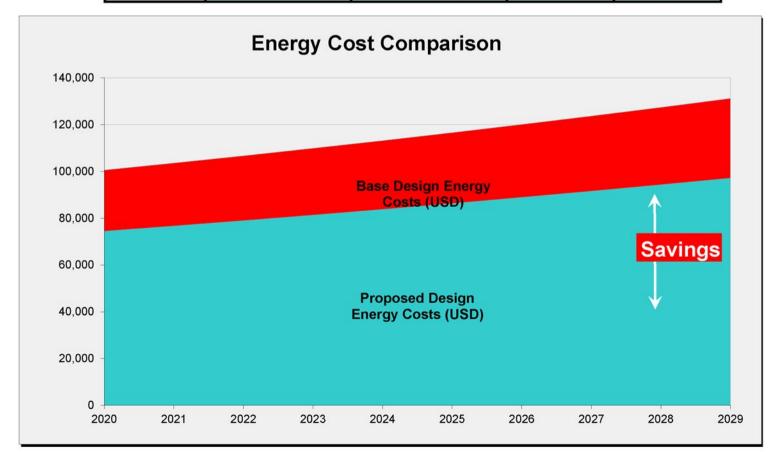
Submitted by Enter Your Name and Your Company Name Here

	Base Design in CFM	Proposed Design in CFM	CFM Flow Savings
Average Day Airflow	38,906.2	38,756.0	150.2
Average Night Airflow	24,303.7	20,868.6	3,435.1
Average Airflow	29,518.9	27,257.0	2,261.9

Average Annual \$/CFM \$ 3.41 \$ 2.73 \$ 11.53

Energy Inflation Rate 3.0%

Year	Base Design Energy	Proposed Design	Energy	Cumulative
Tear	Costs (USD)	Energy Costs (USD)	Savings (USD)	Savings (USD)
2020	100,554	74,476	26,079	26,079
2021	103,571	76,710	26,861	52,940
2022	106,678	79,011	27,667	80,606
2023	109,879	81,382	28,497	109,103
2024	113,175	83,823	29,352	138,455
2025	116,570	86,338	30,232	168,687
2026	120,067	88,928	31,139	199,826
2027	123,669	91,596	32,073	231,900
2028	127,379	94,344	33,036	264,935
2029	131,201	97,174	34,027	298,962
10 Yr Savings	\$ 1,152,744	\$ 853,782	\$ 298,962	\$ 298,962



# Energy Savings & Capital Cost Analysis Basic Assumptions



June 27, 2019

Customer Name	Sample Non Lab			For US Weather Stations, Actual Airport Location:		
Project Name	Enter Project Name Here			Boston Logan International Airport		
City	Project City Weather Station:			Massachuset		
Submitted by	Enter Your Nan	ne and Your Con	npany Name Here		Budget Estima	te
Building & Finan	icial Assumptio	ns		Baseli	ne & Proposed De	esign Data
Number of Zones Avg Zone Area (sq. ft.)	40 1,500				rmal Loads by Zone	Туре
Total sq. ft (calculated)	60,000			Normal Activity,	Moderate Activity,	High Activity,
Avg Ceiling Height	10.00			Low Load	Medium Load	High Load
Total # of Fume Hoods	-		% of Zones	80%	10%	10%
Avg FH Max CFM	-		Number of Zones	32	4	4
Avg FH Min CFM	-	F	Room Peak W/ft <sup>2</sup> (Day)	6.00	10.00	12.00
Avg Day FH Sash Opening	60%	Open	Avg Peak W/ft <sup>2</sup> (Day)		8.00	12.00
Avg Nite FH Sash Opening	25%	Open	Avg W/ft² (Day)	3.00	6.00	9.00
			Avg Peak W/ft <sup>2</sup> Nite	2.00	4.00	9.00
Annual Inflation Rate	3%		Avg Watts/ft <sup>2</sup> Nite	1.50	3.00	6.00
Energy Inflation Rate	3%	,				7
Hurdle Rate	8%		Base Day Supply ACH	0.00	0.00	0.00
Financial Analysis Period	10 Yrs	B	ase Night Supply ACH	0.00	0.00	0.00
In a sufficient of the sufficient	0	D	Narmal Day Over ACU	0.00	0.00	0.00
Incentive/Rebate \$/kWh			Normal Day Sup. ACH ormal Night Sup. ACH	0.00	0.00 0.00	0.00
Incentive/Rebate \$/Therm			Max/Purge Sup. ACH			
Incentive/Rebate \$/kW	ъ -	nigh vent	wax/Purge Sup. ACH	0.00	0.00	0.00
		Energy Cost 9 I	HVAC System Assur	mntions		
Gas/Oil/Ot Evi (Trigge Proposed Roon Base Design Roon ( Humidifica	Cooling Method Heating Method ReHeat Method ReHeat Method Electric \$/kWh Nater \$/Ton-Hour her Fuel \$/Therm Steam \$/1,000 lb.  aporative Cooling rs Wet Bulb Recalc) in Cooling Method in Cooling Method DA Humidification tion RH Set Point	\$ 0.1817 \$ 1.0000 \$ 12.4000 None  VAV Air Systen SameAsProposed  None  459	(Not used) (Not used)	Occ Heatin  UnOcc Heatin  COP of R  Heat Reco Heat Reco Annual Heat Recor	cc Cooling Set Point and Reheat Set Point and Recovery System Type and Recovery Efficiency and Recovery Costs from Heat Recovery and Recovery Costs from Heat Recovery and	\$ - 0.75 in.
	ply Fan Efficiency	709			Staged Fans w/ B	The state of the s
Exhaust Fan Tota			in w.c.			71
	ust Fan Efficiency	60%		Numb	er of Exhaust Fans	2
	Conital Cast	Covince 9 Divers	ity Aggress (5	livoroit	oludod)	
	Capital Cost	Savings & Divers	sity Assumptions (D	iversity not in	iciuded)	
Baseline CF \$/Ton \$/Watt Cost for Hydror \$/MBH Subtract Cost of D *Dewpoint Sen	: Heating System Dewpoint Sensors sor Cost Installed Illed System Price Proposed System	\$ 1.00 \$ 40 No \$ 1,500	(from ONE) (from ONE)	Baseline \$/CFM \$7.65 \$0.00 \$0.05 \$6.00 \$4.50 \$0.15 \$0.00 \$18.80	Cooling System Heating System Reheat System Exhaust Fan Supply AHU AHU VFDs Heat Recovery Ductwork Total Base HVAC	Diversity % 100% 100% 100% 100% 100% 100% 100% 10

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# **Occupancy Schedule**



Customer Name Sample Non Lab Project Name **Enter Project Name Here** 

Project City (Using weather data from Boston, Massachusetts)
Enter Your Name and Your Company Name Here City

Submitted by

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



June 27, 2019

Customer Name Sample Non Lab

Project Name Here

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

Submitted by Enter Your Name and Your Company Name Here

## **Supply CFM Comparisons**

	Base Calculated CFM	Proposed Calculated CFM	CFM Differences	% Differences
Total Fume Hood Maximum CFM	0	0	0	N/A
Total Fume Hood Minimum CFM	0	0	0	N/A
Estimated Total Peak FH CFM	0	0	0	N/A
Estimated Total FH Avg CFM - Day	0	0	0	N/A
Estimated Total FH Avg CFM - Night	0	0	0	N/A
Avg Peak Cooling CFM - Day	51,675	51,675	0	0%
Avg Cooling CFM - Day	38,756	38,756	0	0%
Avg Peak Cooling CFM - Night	28,819	28,819	0	0%
Avg Cooling CFM - Night	20,869	20,869	0	0%
Day Average ACH CFM	30,000	12,000	(18,000)	-60%
Night Average ACH CFM	19,200	9,600	(9,600)	-50%
Outside Air (People) CFM - Day	30,000	12,000	(18,000)	-60%
Outside Air (People) CFM - Night	19,200	9,600	(9,600)	-50%
Avg Peak CFM - Day	51,675	51,675	0	0%
Average CFM - Day	38,906	38,756	(150)	0%
Avg Peak CFM - Night	28,819	28,819	0	0%
Average CFM - Night	24,304	20,869	(3,435)	-14%

## 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	31,800	15,900	31,800	15,900
Low Load, High Hood Density		•	-	
Medium Load, Non-High Hood Density	7,950	3,975	7,950	3,975
Medium Load, High Hood Density	-	-	-	-
High Load, Non-High Hood Density	11,925	8,944	11,925	8,944
High Load, High Hood Density	-			
Other Areas (Non-Lab, CV Lab, etc.)	-		12	
Lab Corridors and Associated Areas	-	-	-	-
Total Peak Supply Flows	51,675	28,819	51,675	28,819

Room Type	Base Average Occ	Base Average UnOcc	Proposed Average	Proposed Average
DANGORAN BARRISTON - BARRISTON	CFM	CFM	Occ CFM	UnOcc CFM
Low Load, Non-High Hood Density	24,000	15,360	23,850	11,925
Low Load, High Hood Density				-
Medium Load, Non-High Hood Density	5,962	2,981	5,962	2,981
Medium Load, High Hood Density	-	-	-	-
High Load, Non-High Hood Density	8,944	5,962	8,944	5,962
High Load, High Hood Density	-		-	-
Other Areas (Non-Lab, CV Lab, etc.)	-	-	-	-
Lab Corridors and Associated Areas	-	-		-
Total Average Supply Flows	38,906	24,304	38,756	20,869

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

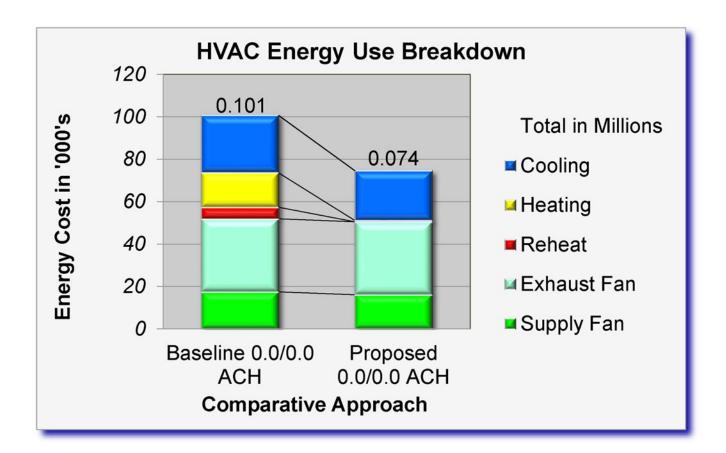


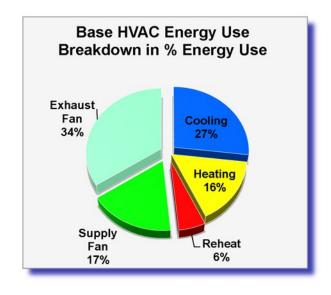
Customer Name Sample Non Lab

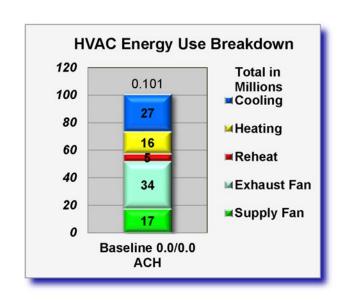
Project Name Here

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

Submitted by Enter Your Name and Your Company Name Here









Customer Name

Sample Non Lab Enter Project Name Here Project Name

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

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

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

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

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

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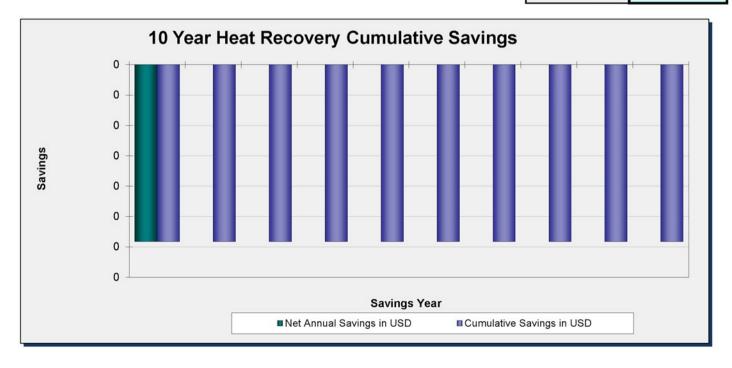
- 0 kWh Electricity saved annually
- 0 Therms heating energy saved annually
- 0 kW peak reduction calculation via Max Bin Method

System	Energy Costs:	HVAC 1st Cost:
HR Baseline	\$ 74,476	\$ 873,382
HR Proposed	\$ 74,476	\$ 873,382

	Primary HR	Secondary HR
HR Equipment:	None	None
HR Efficiency		

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

	Energy	Net Recurring	Annual	Net Capital	Net Annual	Cumulative
Year	Savings in USD	Costs in USD	Savings in USD	Costs in USD	Savings in USD	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
t year energy	/ savings represent a 0°	NPV =	\$ 0,000			
					IRR =	N/A



## **DBC Diversity Savings and Peak Lab Airflow Overview**



June 27, 2019

Customer Name Sample Non Lab

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 Design

The base design has a peak cooling requirement of 51,674.7 CFM (with a peak average of 5.2 watts per sq foot); A base occupied minimum ventilation level requirement of 30,000. CFM (3.0 ACH); And a base unoccupied minimum ventilation level requirement of 19,200. CFM (1.92 ACH).

#### **Proposed Design**

The peak cooling and estimated maximum fume hood flows are the same as in the base design. With 40 zones, 99.9% of the time there will be 0 or fewer zones at the proposed max .0 ACH, and 99.9% of the time there will be 40 or more zones at the proposed avg. normal .0 ACH. The proposed occupied minimum ventilation rate is 12,000. CFM (.0 ACH);

The proposed unoccupied minimum ventilation rate is 9.600. CFM (.0 ACH).

	Base Design	Proposed
Total number of Zones	40	40
99.9000th percentile of zones at normal Occ ACH	N/A	40
Number of zones at max ACH (Occ.)	N/A	0
	er.	
Occupied Average Normal Zone ACH	0 ACH	0 ACH
Unoccupied Average Normal Zone ACH	0 ACH	0 ACH
Proposed Average Max Zone ACH	N/A	0 ACH
	225	
Occupied Normal Zone ACH in CFM	750.0	300.0
Unoccupied Normal Zone ACH in CFM	480.0	240.0
Proposed Max Zone ACH in CFM	N/A	0.0
O store OFM Doe To a of Oooling		000
System CFM Per Ton of Cooling	229	302
Cooling System Capacity Requirements in Tons	226	171
HVAC Capital Cost per CFM in Units of \$/CFM	18.80	16.90
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	31,799.8	31,799.8	0.0
Avg Max Flow for Moderate Activity Zones	7,949.9	7,949.9	0.0
Avg Max Flow for High Activity Zones	11,924.9	11,924.9	0.0
Avg Max Flow for Other Area Zones	0.0	0.0	0.0
Avg Max Flow for Corridor & Assoc. Zones	0.0	0.0	0.0
EXPECTED PEAK CFM	51,674.7	51,674.7	0.0

Zone diversity on this project results in a 0% peak airflow savings with up to \$ 98,000 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.



Customer Name Sample Non Lab

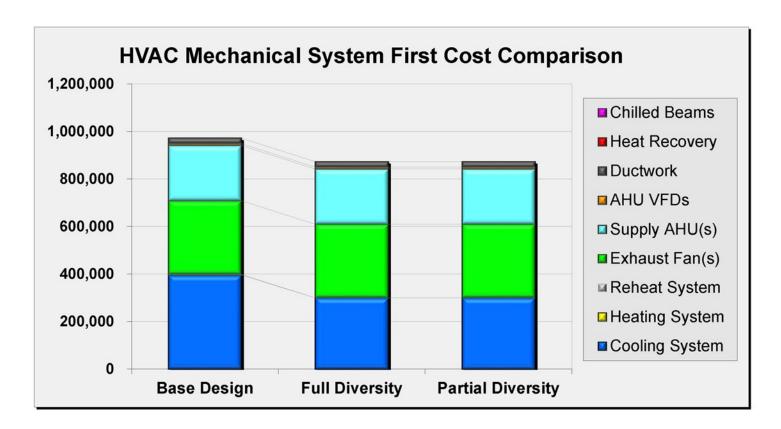
Project Name Here

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

Submitted by Enter Your Name and Your Company Name Here

	Base Design				Propose	ed Design with Full	(100%) Dive	rsity 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 Heating System	NAME OF THE OWNER OWNER OF THE OWNER		N. 200 (100 (100 (100 (100 (100 (100 (100		\$ 5.80 \$ 0.00		Contract Contract	95,507
Reheat System	\$ 0.05	51,674.7	2,831		\$ 0.00	51,674.7	0	2,83
Exhaust Fan(s) Supply AHU(s)	\$1000 TO 100	100000000000000000000000000000000000000	0,000,000		\$ 6.00 \$ 4.50			
Heat Recovery AHU VFDs	(95) (10) (10)		5.0	П	\$ 0.00 \$ 0.15			(
Ductwork Chilled Beams	\$ 0.45	3500,000,000	100000000000000000000000000000000000000		\$ 0.45		23 (A) (A) (A) (A)	
Total HVAC System			971,720		\$ 16.90		873,382	\$ 98,338

		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	\$ 5.80	100%	51,674.7	299,794	95,507			
Heating System	\$ 0.00	100%	51,674.7	0	0			
Reheat System	\$ 0.00	100%	51,674.7	0	2,831			
Exhaust Fan(s)	\$6.00	100%	51,674.7	310,048	0			
Supply AHU(s)	\$ 4.50	100%	51,674.7	232,536	0			
Heat Recovery	\$ 0.00	100%	51,674.7	0	0			
AHU VFDs	\$ 0.15	100%	51,674.7	7,751	0			
Ductwork	\$ 0.45	100%	51,674.7	23,254	0			
Chilled Beams				0	0			
Total HVAC System	\$ 16.90			873,382	\$ 98,338			



## Energy Conservation & Photovoltaics (Solar Energy )Technology Comparison

June 27, 2019

Customer Sample Non Lab
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 191 kW solar panel.

The Proposed system will save about the same electrical energy generated by a 40 kW solar panel.

The Proposed system will cost approximately 14.7% of a solar panel with the same carbon impact.

The Proposed system payback is about 2.5 times better than solar panels, even w/ incentives & credits.

Figures of Merit	Solar Panels (191 kW)	OptiNet	OptiNet to Solar Factor
Metric tons of CO <sub>2</sub> saved	136	136	1.0
kWH Power Generated/ Saved	248,939	45,504	0.2
Heating Savings in Therms	0	21,073	N/A
Total equivalent MMBtu saved	850	2,263	2.7
Total equivalent Therms saved	8,496	22,626	2.7
Annual Savings in USD	27,383	26,079	0.95
Installed Cost in USD	952,549	140,000	6.8
Simple payback in years	34.8	5.4	6.5
Simple payback yrs w/ incentive for Public, Gov, Edu	24.4	5.1	4.8
Simple payback w/ Ren. Fed & State Credits - Bus.	13.0	5.1	2.5
Area of Installation in square feet	19,051	10.0	1,905
Equipment weight in pounds	325,386	300	1,085

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	140,000	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)	2.6%	
Watts per square foot - Solar Array	10.00	
OptiNet kWh savings	45,504	
OptiNet Heating Savings in Therms	21,073	
Solar Array Size with Same Carbon Impact Savings as OptiNet	191	kW
Solar Array Size w/ Same Electrical Savings as OptiNet System		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



June 27, 2019

The second secon	
Customer Name	Sample Non Lab
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

		Proposed System	Proposed System
	Base System Design	Design	(Aircuity) Savings
(a) 11 E) 10 1	00	*440.000	(4440.000)
Aircuity First Cost	\$0	\$140,000	(\$140,000)
Diversity Savings	\$0	\$0	\$0
Rebate & Incentives	\$0	\$0	
Adjustments to First Cost	\$0	\$0	\$0
Net First Cost	\$0	\$140,000	(\$140,000)
		, ,	(*****,****)
Year 1 Energy Cost	\$100,554	\$74,476	\$26,079
Year 2 Energy Cost	\$103,571	\$76,710	\$26,861
Year 3 Energy Cost	\$106,678	\$79,011	\$27,667
Year 4 Energy Cost	\$109,879	\$81,382	\$28,497
Year 5 Energy Cost	\$113,175	\$83,823	\$29,352
Total 5 Year Energy Cost	\$533,857	\$395,402	\$138,455
Variat Maintanana Cart		ФО.	**
Year 1 Maintenance Cost Year 2 Maintenance Cost		\$0	\$0
		\$8,652	(\$8,652
Year 3 Maintenance Cost		\$8,912	(\$8,912
Year 4 Maintenance Cost		\$9,179	(\$9,179
Year 5 Maintenance Cost  5 Year Maintenance Cost	\$0	\$9,454 <b>\$36,197</b>	(\$9,454
5 fear Maintenance Cost	<b>\$</b> 0	\$30,197	(\$36,197)
			<u>-</u>
Total 5 Year Operation Cost	\$533,857	\$431,599	\$102,258
5 Year Cost of Ownership	\$533,857	\$571,599	(\$37,742
Avg. Cost of ownership nor year	\$106,771.43	\$114.210.04	(\$7.EAD
Avg. Cost of ownership per year	\$100,771.43	\$114,319.81	(\$7,548)

# **Proposed System 10 Year Life Cycle Cost Analysis**



June 27, 2019

Customer Name Sample Non Lab

Project Name Here

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

Submitted by Enter Your Name and Your Company Name Here

		Proposed System	Proposed System
	Base System Design	Design	(Aircuity) Savings
Aircuity First Cost	\$0	\$140,000	(\$140,000)
Diversity Savings	\$0	\$0	\$0
Rebate & Incentives	\$0	\$0	\$0
Adjustments to First Cost	\$0	\$0	\$0
Net First Cost	\$0	\$140,000	(\$140,000)
Year 1 Energy Cost	\$100,554	\$74,476	\$26,079
Year 2 Energy Cost	\$103,571	\$76,710	\$26,861
Year 3 Energy Cost	\$106,678	\$79,011	\$27,667
Year 4 Energy Cost	\$109,879	\$81,382	\$28,497
Year 5 Energy Cost	\$113,175	\$83,823	\$29,352
Year 6 Energy Cost	\$116,570	\$86,338	\$30,232
Year 7 Energy Cost	\$120,067	\$88,928	\$31,139
Year 8 Energy Cost	\$123,669	\$91,596	\$32,073
Year 9 Energy Cost	\$127,379	\$94,344	\$33,036
Year 10 Energy Cost	\$131,201	\$97,174	\$34,027
Total 10 Year Energy Cost	\$1,152,744	\$853,782	\$298,962
Year 1 Maintenance Cost		\$0	\$0
Year 2 Maintenance Cost		\$8,652	(\$8,652)
Year 3 Maintenance Cost		\$8,912	(\$8,912)
Year 4 Maintenance Cost		\$9,179	(\$9,179)
Year 5 Maintenance Cost		\$9,454	(\$9,454)
Year 6 Maintenance Cost		\$9,738	(\$9,738)
Year 7 Maintenance Cost		\$10,030	(\$10,030)
Year 8 Maintenance Cost		\$10,331	(\$10,331)
Year 9 Maintenance Cost		\$10,641	(\$10,641)
Year 10 Maintenance Cost		\$10,960	(\$10,960)
10 Year Maintenance Cost	\$0	\$87,897	(\$87,897)
			<u>-</u>
Total 10 Year Operation Cost	\$1,152,744	\$941,679	\$211,065
10 Year Cost of Ownership	\$1,152,744	\$1,081,679	\$71,065
Avg. Cost of ownership per year	\$115,274	\$108,168	\$7,107



Customer Sample Non Lab
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			Proposed Design			Savings			
					Section Control Contro					
Occ	Annual Occ Energy Units	Annual Occ Energy Costs	Total Annual Costs at Occ Average Flow	Annual Occ Energy Units	Annual Occ Energy Costs	Total Annual Costs at Occ Average Flow	Annual Occ Energy Units Saved	Annual Occ Energy Cost Savings		
	Cooling kWh 130,715	Cooling \$ 14,379	\$ 3.48 per CFM	Cooling kWh 118,534	Cooling \$ 13,039	\$ 2.92 per CFM	Cooling kWh 12,182	Cooling \$ 1,340		
	Heating Therms 6,431	Heating \$ 6,431		Heating Therms 1	Heating \$ 1		Heating Therms 6,430	Heating \$ 6,430		
	Reheat Therms 129	Reheat \$ 129		Reheat Therms -	Reheat \$ -		Reheat Therms 129	Reheat \$ 129		
	Heating kWh -			Heating kWh -			Heating kWh -			
	Reheat kWh -		Costs per CFM	Reheat kWh -		Costs per CFM	Reheat kWh -			
	Supply Fan kWh 85,237	Supply Fan \$ 9,376	Cooling cost / CFM \$ 1.03	Supply Fan kWh 84,634	Supply Fan \$ 9,310	Cooling cost / CFM \$ 0.94	Supply Fan kWh 603	Supply Fan \$ 66		
	Exhaust Fan kWh 164,417 Total kWh 380,369	Exhaust Fan \$ 18,086 Total \$ 48,400	Heating cost / CFM \$ 0.46	Exhaust Fan kWh 164,405 Total kWh 367.573	Exhaust Fan \$ 18,085 Total \$ 40,434	Heating cost / CFM \$ 0.00 Reheat cost / CFM extra \$ -	Exhaust Fan kWh 12 Total kWh 12.797	Exhaust Fan \$ 1 Total \$ 7.967		
	Total Therms 6,560	Total \$ 48,400	Reheat cost / CFM extra \$ 2.41 Fan cost / CFM \$ 1.98	Total Therms 1	10081 5 40,434	Fan cost / CFM extra \$ -	Total Therms 6,559	Total \$ 7,967		
	Peak kW 303		Pan Cost / CPM \$ 1.96	Peak kW 230		ran cost/ CFM \$ 1.96	Peak kW 73			
	Fedik KVV 303	ı		reak kvv 250			FERR KWV 75			
		Annual Unocc Energy	Total Annual Costs			Total Annual Costs	Annual Unocc Energy Units	Annual Unocc Energy Cost		
UnOcc	Annual Unocc Energy Units	Costs	at Unocc Average Flow	Annual Unocc Energy Units	Annual Unocc Energy Costs	at Unocc Average Flow	Saved	Savings		
	Cooling kWh 114,888	Cooling \$ 12,638	\$ 3.34 per CFM	Cooling kWh 94,434	Cooling \$ 10,388	\$ 2.54 per CFM	Cooling kWh 20,454	Cooling \$ 2.250		
	Heating Therms 9,777	Heating S 9,777		Heating Therms 577	Heating \$ 577		Heating Therms 9,201	Heating \$ 9,201		
	Reheat Therms 5,313	Reheat \$ 5,313		Reheat Therms -	Reheat \$ -		Reheat Therms 5,313	Reheat \$ 5,313		
	Heating kWh -			Heating kWh -			Heating kWh -			
	Reheat kWh -		Costs per CFM	Reheat kWh -		Costs per CFM	Reheat kWh -			
	Supply Fan kWh 73,454	Supply Fan \$ 8,080	Cooling cost / CFM \$ 0.81	Supply Fan kWh 61,626	Supply Fan \$ 6,779	Cooling cost / CFM \$ 0.77	Supply Fan kWh 11,828	Supply Fan \$ 1,301		
	Exhaust Fan kWh 148,596	Exhaust Fan \$ 16,346	Heating cost / CFM \$ 0.63	Exhaust Fan kWh 148,171	Exhaust Fan \$ 16,299	Heating cost / CFM \$ 0.04	Exhaust Fan kWh 425	Exhaust Fan \$ 47		
	Total kWh 336,938	Total \$ 52,154	Reheat cost / CFM extra \$ 2.41	Total kWh 304,231	Total \$ 34,042	Reheat cost / CFM extra \$ -	Total kWh 32,707	Total \$ 18,112		
	Total Therms 15,091		Fan cost / CFM \$ 1.56	Total Therms 577		Fan cost / CFM \$ 1.72	Total Therms 14,514			
	Peak kW 179			Peak kW 131			Peak kW 48			
		П	Total Annual Costs		Annual Total HVAC Energy	Total Annual Costs	Annual Total Energy Units	Annual Total Energy Cost		
Total	Annual Total Energy Units	Annual Total Energy Costs	at All Average Flows	Annual HVAC Total Energy Units	Costs	at All Average Flows	Saved	Savings		
	Cooling kWh 245,604	Cooling \$ 27,016	\$ 3.41 per CFM	Cooling kWh 212,968	Cooling \$ 23,426	\$ 2.73 per CFM	Cooling kWh 32,636	Cooling \$ 3,590		
	Heating Therms 16,208	Heating \$ 16,208		Heating Therms 577	Heating \$ 577		Heating Therms 15,631	Heating \$ 15,631		
	Reheat Therms 5,443	Reheat \$ 5,443		Reheat Therms -	Reheat \$ -		Reheat Therms 5,443	Reheat \$ 5,443		
	Heating kWh -		0.11	Heating kWh -		0.1.	Heating kWh -			
	Reheat kWh -	0	Costs per CFM	Reheat kWh -	0	Costs per CFM	Reheat kWh -	0		
	Supply Fan kWh 158,691 Exhaust Fan kWh 313,013	Supply Fan \$ 17,456 Exhaust Fan \$ 34,431	Cooling cost / CFM \$ 0.92 Heating cost / CFM \$ 0.55	Supply Fan kWh 146,260 Exhaust Fan kWh 312,576	Supply Fan \$ 16,089 Exhaust Fan \$ 34,383	Cooling cost / CFM \$ 0.86 Heating cost / CFM \$ 0.02	Supply Fan kWh 12,431 Exhaust Fan kWh 437	Supply Fan \$ 1,367 Exhaust Fan \$ 48		
	Glycol Pump kWh -	Glycol Pump \$ -	rieating cost / CFM \$ 0.55	Glycol Pump kWh -	Glycol Pump \$ -	Heating cost / CFM \$ 0.02	Glycol Pump kWh -	Glycol Pump \$ -		
	Total kWh 717,307	Total \$ 100,554	Reheat cost / CFM extra \$ 2.41	Total kWh 671,803	Total \$ 74,476	Reheat cost / CFM extra \$ -	Total kWh 45,504	Total \$ 26,079		
	Total Therms 21,651	100,004	Fan cost / CFM \$ 1.76	Total Therms 577	1000	Fan cost / CFM \$ 1.85	Total Therms 21,073	26%		
	Peak kW 303			Peak kW 230			Peak kW 73			
Full CV	Annual Energy Units	Annual Energy Costs	Total Annual Costs	Net Lab & Other Areas Electrical	Net Lab Electrical Load	П	GSF Building Electrical Loads	GSF Building Electrical Load		
Flow			at Average Flow	Loads (Plugs, Lights, etc.)	Energy Costs	<b>  </b>	(Plugs, Lights, etc.)	Energy Costs		
	Cooling kWh 415,382 Heating Therms 2.116		\$ 2.85 per CFM	Day Clg Load kWh 731,871 Nite Clg Load kWh 709.353	Day Clg Load \$ 80,506 Nite Clg Load \$ 78,029	ll .	Day Clg Load kWh 841,652 Nite Clg Load kWh 815,756	Day Clg Load \$ 92,582 Nite Clg Load \$ 89,733		
	Heating Therms 2,116 Reheat Therms 0	Heating \$ 2,116 Reheat \$ 0		Nite Clg Load kWh 709,353 Total Clg Load kWh 1,441,224	Nite Clg Load \$ 78,029 Total Load \$ 158,535	<b>{ </b>	Nite Clg Load kWh 815,756 Total Clg Load kWh 1,657,408	Nite Clg Load \$ 89,733 Total Load \$ 182,315		
	Heating kWh -	Reneat 5 0		Peak Clg Load Kw 312	Total Load \$ 156,535	4	Peak Clg Load Kw 359	Total Load \$ 182,315		
	Reheat kWh -		Costs per CFM	reak Cig Load KW 312		1	Leav Cid Foad VM 328			
	Supply Fan kWh 440,790	Supply Fan \$ 48,487	Cooling cost / CFM \$ 0.88	NSF Lab & Other Energy	Base Proposed	-1	Building GSF Energy	Base Proposed		
	Exhaust Fan kWh 462.829	Exhaust Fan \$ 50.911	Heating cost / CFM \$ 0.88	HVAC Energy in equiv KBTU	4,613,234 2,350,613		HVAC Energy in equiv KBTU	5,305,219 2,703,204		
	Glycol Pump kWh -	Glycol Pump \$ 50,911	Reheat cost / CFM extra \$ 0.00	Total energy in equiv. KBTU	9,532,133 7,269,511	4	Total energy in equiv. KBTU	10,961,953 8,359,938		
	Total kWh 1.319.001	Total \$ 147.206	Fan cost / CFM \$ 1.92	Total energy in equiv. BTU/ft2	158,869 121,159		Total energy in equiv. BTU/ft2	118.754 90.566		
	Total Therms 2.116	147,200		Total energy in equiv. kWh/ft2	46.5 35.5		Total energy in equiv. kWh/ft2	34.8 26.5		
	2,110			. o.c. onorgy in oquiv. Kavillitz	40.0		. o.a. chorgy in odair, Kaaibitz	20.0		

#### Heat Recovery Energy Units & Energy Dollar Savings Detailed Comparison



Customer Sample Non Lab

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	Annual E	Annual Energy Costs		
Cooling kWh	212,968	Cooling	\$	23,426	\$
Heating Therms	577	Heating	\$	577	· ·
Reheat Therms	1.5	Reheat	\$	-	
Heating kWh	:-:				
Reheat kWh	-				Costs p
Supply Fan kWh	146,260	Supply Fan	\$	16,089	Cooling
Exhaust Fan kWh	312,576	Exhaust Fan	\$	34,383	Heating
Glycol Pump kWh	-	Glycol Pump	\$	-	Reheat
Total kWh	671,803	Total	\$	74,476	Fan cos
Total Therms	577				Ser.
Peak kW	230				

its	Total Annual Costs at	Average i	low
23,426	\$ 2.52	per CFM	
577			
-			
	Costs per CFM		
16,089	Cooling cost / CFM	\$	0.79
34,383	Heating cost / CFM	\$	0.02
-	Reheat cost / CFM extra	\$	
74,476	Fan cost / CFM	\$	1.71
- 1	No. 1		

#### HR Proposed Metrics with Heat Recovery & Lab DCV:

A	and Halle	Annual E		04-	Tatal Assess Contact	A	- Fl
Annual Ener	gy Units	Annual E	nergy	Costs	Total Annual Costs at Average F		
Cooling kWh	212,968	Cooling	\$	23,426	\$ 2.73	per Cl	FM
Heating Therms	577	Heating	\$	577			
Reheat Therms	15.	Reheat	\$	-			
Heating kWh	-						
Reheat kWh					Costs per CFM		
Supply Fan kWh	146,260	Supply Fan	\$	16,089	Cooling cost / CFM	\$	0.86
Exhaust Fan kWh	312,576	Exhaust Fan	\$	34,383	Heating cost / CFM	\$	0.02
Glycol Pump kWh	-	Glycol Pump	\$	-	Reheat cost / CFM extra	\$	-
Total kWh	671,803	Total	\$	74,476	Fan cost / CFM	\$	0.98
Total Therms	577		3//				100
Peak kW	230						

]	Annual Energy U	Annual Energy Savings			
]	Cooling kWh -		Cooling	\$	-
1	Heating Therms	2	Heating	\$	027
	Reheat Therms	-	Reheat	\$	1.7
	Heating kWh	-			
1	Reheat kWh	-			
1	Supply Fan kWh	-	Supply Fan	\$	(5)
ı	Exhaust Fan kWh	-	Exhaust Fan	\$	9-0
ı	Glycol Pump kWh	2	Glycol Pump	\$	929
ı	Total kWh	-	Total	\$	-
_	Total Therms	-			0%
	Peak kW	-			

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**



Sample Non Lab Customer Name Project Name

Enter Project Name Here
Project City (Using weather data from Boston, Massachusetts)
Enter Your Name and Your Company Name Here City Submitted by

Submitted by Enter Your Name and Your Company Name Here								
High Hood Density (HHD) Room/Zone Assumptions								
% of Hoods in HHD zones % of Total Zone Number that are HHD Avg HHD Zone Area as % of Avg Zone	0% 0% 100%	Metrics Hoods Zones Area	All Zones 0 40 1,500	0 1,500	Non-HHD Zones 0 40 1,500			
		Total sqft	60,000	0	60,000			
Other Areas on the Sa	me AHU (Non-lab or Lab	areas wit	hout Lab DCV Contro	ol) Assumptions				
Total ft <sup>2</sup> of Other Areas  Avg Ceiling Height in ft.  Avg Peak Watts/ft <sup>2</sup> (Day)  3.00	Peak W/ft <sup>2</sup> Day 4.50 Avg W/ft <sup>2</sup> Day 2.25 Avg W/ft <sup>2</sup> Nite 1.13		Avg ACH Rates Day ACH Night ACH	4.00 3.50	Proposed Rates 3.00 2.00			
Secondary Heat Recovery System		Adv	anced Primary Heat I	Recovery Syster	m Assumptions			
Secondary HR Wheel/Wrap around Coil Secondary HR Efficiency Secondary HR Pressure Drop in "WC Secondary Glycol Pump HP/1000 cfm Secondary HR Control Approach Uses Secondary HR Bypass Dampers  Secondary HR Bypass Dampers  No  HR Dry Bulb Change Over HR Low Range Engage 10.15 Hp Primary Wheel/Bypass Control Ap Uses Primary HR Bypass D Primary "Sensible Only" H					77 55 Variable Speed No Glycol Coils			
Secondary HR Installed Price Secondary Annual HR Costs	-		Average E mary Glycol Pump mot	ontrol Approach Exh/Sup Ratio % tor HP/1000 cfm	Diff Enthalpy 90% 0.15	Нр		
	Other HVAC Syste	em Assur	nptions					
Direct Evaporative Cooling Efficiency Direct Evap. Clg pressure Drop ("WC) Direct Evap Clg Outside Air Lockout Temp  Other Fuel Type Unlisted "Unlisted" Fuel Ib CO2 / MMBtu "Unlisted" Fuel Ib CO2 / MMBtu  Total Building Net to Gross Factor	Return Air Temp Rise Chilled Beam Chilled Water COP Eff % Chilled Beam Pressure Drop Peak Elec Demand Calculation CFM/Ton Peak Design Capacity % Heating System Peak Design Capacity % Supply Fan Energy Transfer to SA % Avg. Lab Room Flow Tracking Offset % Avg. Peak FH Opening % for HVAC Sizing							
	Advanced Fan Sys	tem Assu	ımptions					
Assumptions   Exhaust Fan	Supply Fan 0.90 0.965 10%	İ	Use Design / Meas	sured Data ?	No			
Design / Measured Data  Motor Nameplate HP Measured Motor KW Peak Base Flow in CFM OccAvgCFM Base Flow UnOccAvgCFM Base Flow Calc. Design Flow's BHP  Return/Outside Air System and Occupancy Assumptions for Lab and Non-Lab Projects					l 			
· ·								
Bldg sq ft (From Assumptions - Lab DCV)  Max People/1,000ft <sup>2</sup> (Day)  Day Design Occupancy  Max People/1,000ft <sup>2</sup> (Night)  Night Design Occupancy	25.0 1,500 people 16.0 960	Night Don-L	esign Fixed Vent OA (2 esign Fixed Vent OA (2 Lab Application (No Lal ry Bulb Economizer Ch	20 CFM/person) b DCV override)		CFM CFM		
Average Night Occupancy Average Night Occupancy Average Night Min DCV OA  Average Night Min DCV				Proposed				
Average Night Mill DOV OA	9,000 JCFW		c Min Vent ACH Rate	1.92	0.96			