



The Biggest Loser

REDUCING HIGHER EDUCATION COSTS BY 50%



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AGENDA

- Who is UALR?
- Background Training
- Boot Camp
- Counting the Calories
- The First Weigh-In



Who is UALR?

- Metropolitan campus + Bowen Law + Benton Campus
- 2.9 million gross square feet
- 3 main campus Electric meters + 47 minor meters
- 4 main campus Gas Meters + 38 minor meters
- 5 LEED Certified Projects





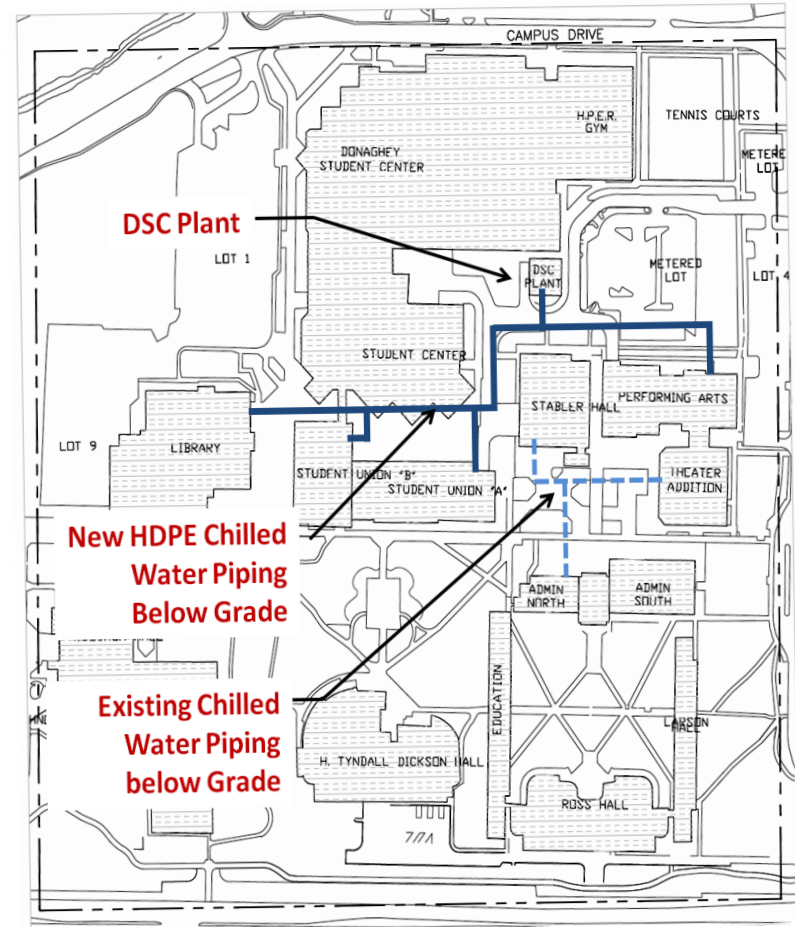
Current Conditions

Background Training

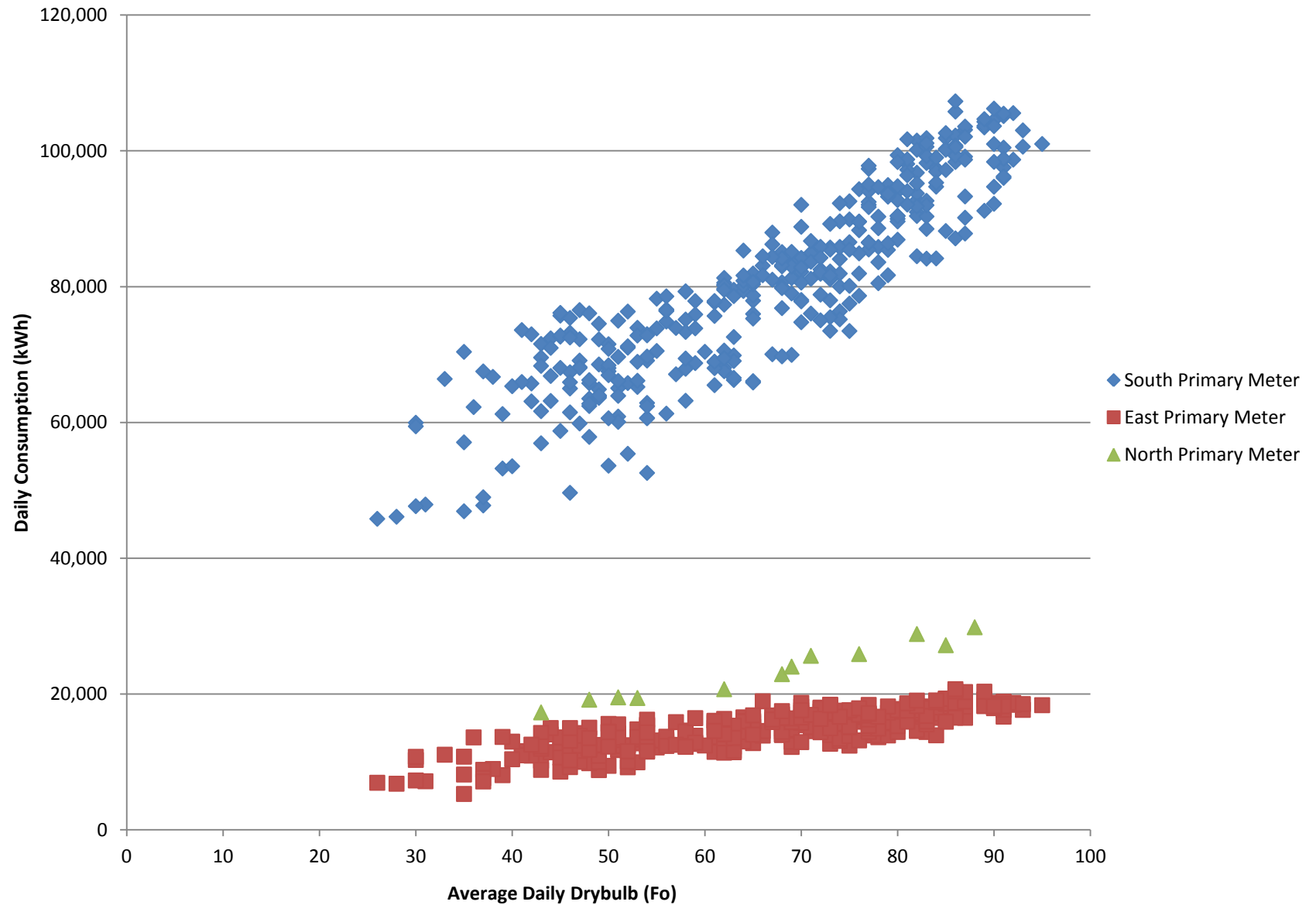


RECENT HISTORY

- New Buildings
 - CINS, Student Services, Trojan Grill
- Energy Projects
 - ARRA: expanded district cooling, replaced chillers, lighting retrofit
- University Village



UALR Main Electric Meters 2012



RATE ANALYSIS

Natural Gas Rate Analysis

Base Rate:

Small Commercial Service - Transportation Supply Option
SCS-1 TSO

Base Rates

Item	Units	Baseline	Actual
Customer Charge	\$/Month	13.00	13.00
Administrative Charge	\$/Month	350.00	350.00
Distribution Charge - First 150	\$/MMBtu	1.494	1.494
Distribution Charge - Next 1350	\$/MMBtu	1.130	1.130
Distribution Charge - Over 1500	\$/MMBtu	0.484	0.484
Base Rate Adjustment	\$/MMBtu	0.0750	0.0750
Energy Efficiency Program Rate	\$/MMBtu	0.0900	0.0000
Pipeline Demand Charge	\$/MMBtu	7.4257	7.4257
Pipeline Commodity Charge	\$/MMBtu	0.0116	0.0116
Compressor Fuel	%	4.500	4.500
Commodity Rate	\$/MMBtu	3.50000	3.50000
Municipal Franchise Rider	%	5.200%	5.200%
State Sales Tax	%	6.500%	6.500%
County Sales Tax	%	1.500%	1.500%
City Sales Tax	%	1.000%	1.000%
Overall Average Unit Cost	\$/MMBtu	6.63715	6.54247

Billing Determinants*

Baseline	Actual
12	12
12	12
3,600	3,600
8,584	8,584
0	0
12,184	12,184
12,184	12,184
960	960
12,184	12,184
548	548
12,732	12,732
\$ 21,441	\$ 20,345
\$ 44,563	\$ 44,563
\$ 44,563	\$ 44,563
\$ 44,563	\$ 44,563

Base Rate Costs

Baseline	Actual
\$ 156	\$ 156
\$ 4,200	\$ 4,200
\$ 5,377	\$ 5,377
\$ 9,698	\$ 9,698
\$ -	\$ -
\$ 914	\$ 914
\$ 1,097	\$ -
\$ 7,129	\$ 7,129
\$ 141	\$ 141
\$ 2,467	\$ 2,467
\$ 44,563	\$ 44,563
\$ 1,115	\$ 1,058
\$ 2,897	\$ 2,897
\$ 668	\$ 668
\$ 446	\$ 446
\$ 80,867	\$ 79,713

Subtotal



Boot Camp

The Baseline Equation Form

Baseline Regression Coefficients

$$y = (M_1(X_1)^2 + M_2(X_2)^2 + M_3X_1 + M_4X_2 + B) * GFA$$

Where:

- y = predicted utility use (per meter)
- M_{1-4} = regression coefficients established during model calibration
- X_1 = average daily dewpoint temperature (°F)
- X_2 = average daily drybulb temperature (°F)
- B = constant established during model calibration (i.e., baseload)
- GFA = gross floor area of the buildings served by the meter (in 1000 SF)

2012 BASELINE COSTS

Item	Effective Dates	Electricity (\$)	Natural Gas (\$)	Water (\$)	Total (\$)	Accumulated Total (\$)
Baseline Cost	Jan 12 - Dec 12	3,440,770	644,842	786,281	4,871,893	4,871,894
Additional Buildings (HH, SSC, Trojan Grill, CIBN)		482,169	54,309	12,152	548,631	5,420,525
RLF District Cooling and Lighting Retrofit Project Savings		(219,835)	1,116	0	(218,719)	5,201,806
Admin South Renovation Savings		(9,370)	(389)	0	(9,759)	5,192,047
Weather Variances		48,440	140,000	53,360	241,800	5,433,847

Peak Electrical Demand: 10 MW (Main Campus)

Electricity Consumption: 49,936,776 kWh

Natural Gas Consumption: 131,327 MMBtu

BASELINE VALIDATION

	FY10	FY11	FY12	FY13	FY14
Weather Data					
Average Drybulb	64	64	66	62	61
Average Dewpoint	50	52	52	50	48
Predicted Cost					
Total Predicted Cost	\$5,439,440	\$5,429,165	\$5,433,530	\$5,415,360	\$5,422,801

COUNTING THE Calories



ENCON Calorie Count

- 10 MW campus generation station
- OIS Rider and other riders
- Retro-Cx (EBCx)
- BAS Upgrade
- BAS Integration
- Expanded district heating and cooling loops
- Installed heat pump chiller heaters
- Removed steam boilers

2012 Utility cost Baseline
\$5.4M

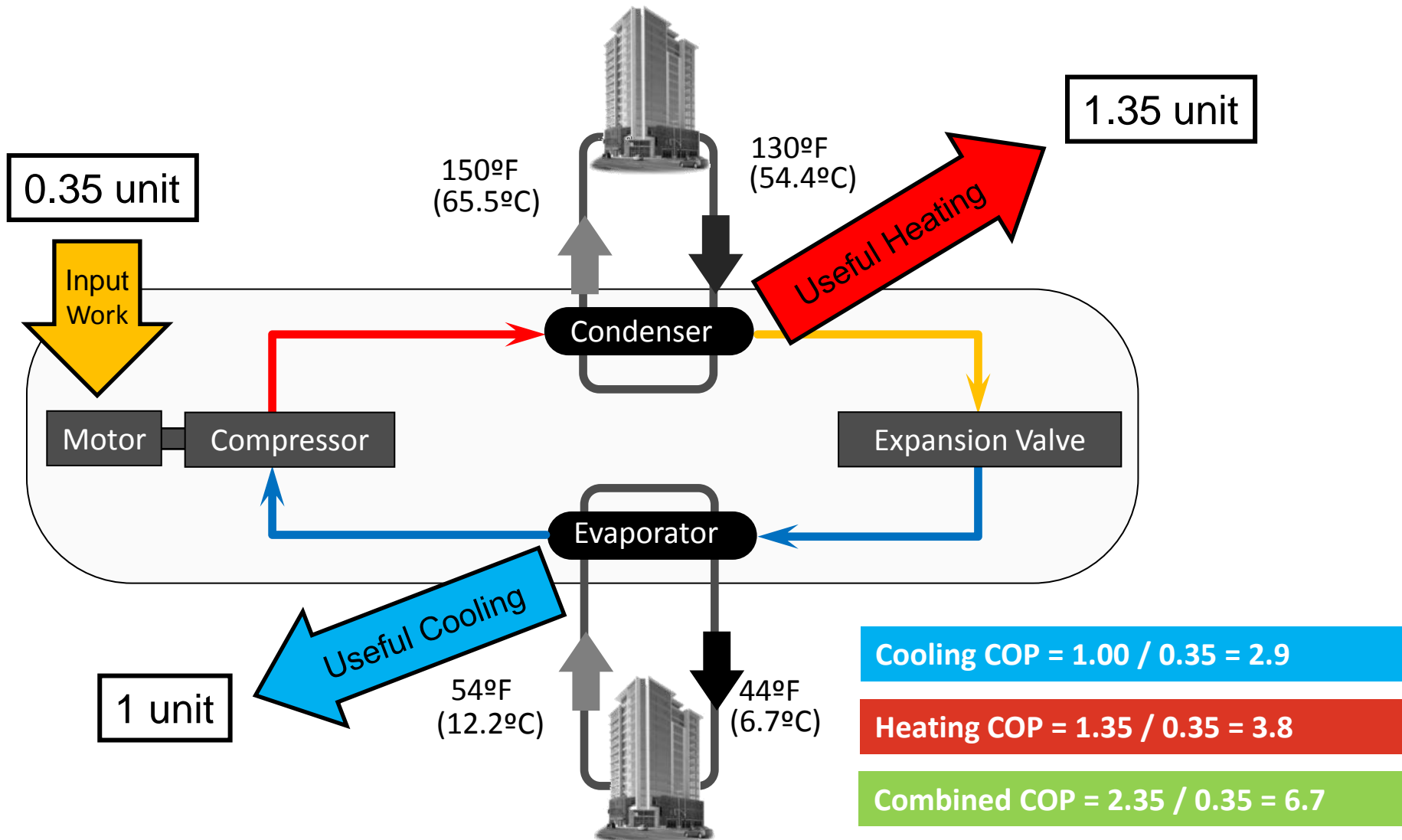
Projected Utility Costs Post Project
\$2.8M

Heat Pump Chiller Heater Application

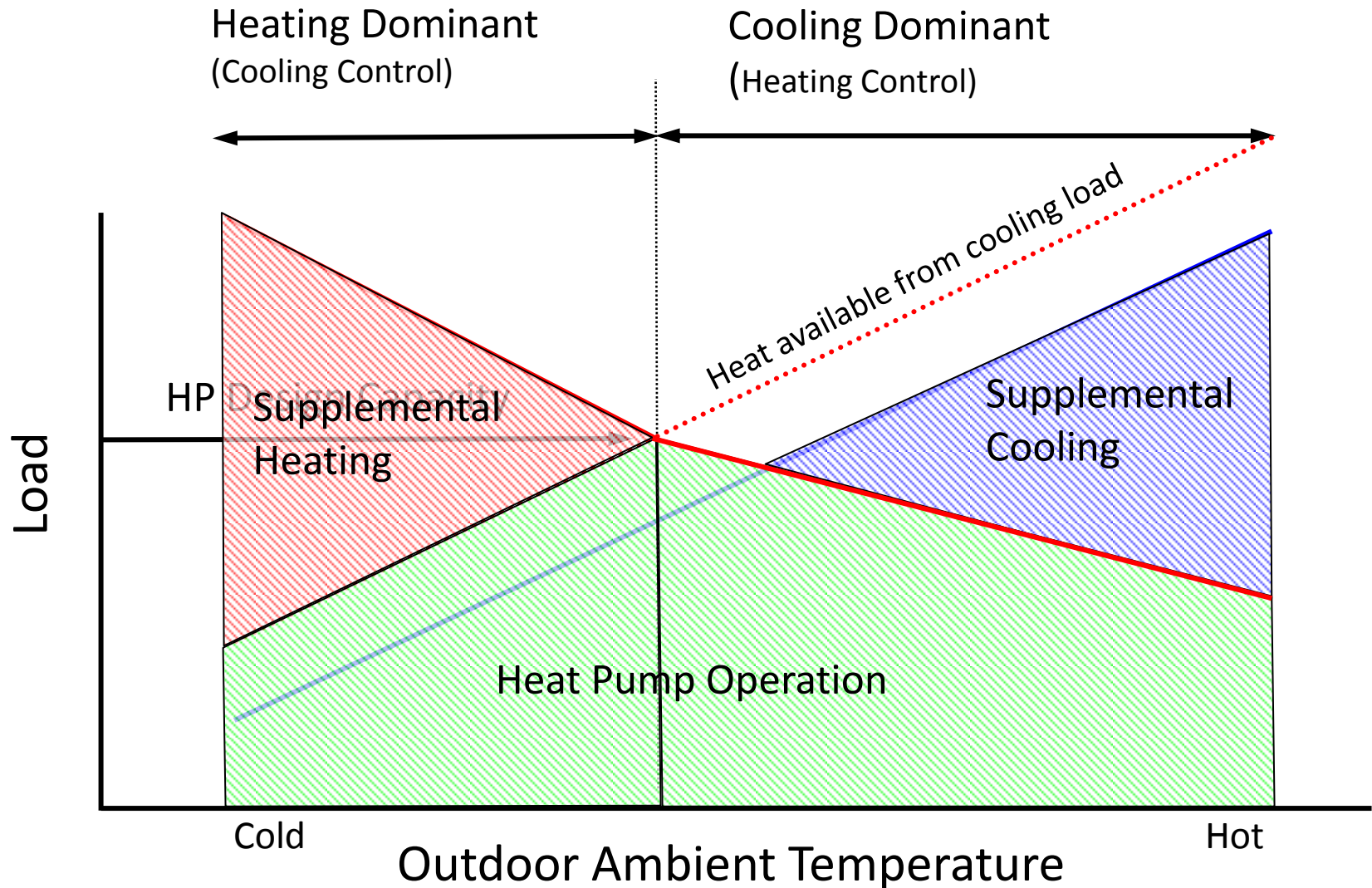
- **General** – Simultaneous heating and cooling w/lots of operating hours
- **Favorable Utility Costs**
High gas cost, low electric cost is ideal
- **Variable hot water set point** –VSD allows for more efficient part load for applications where set point for reheat can be changed based on outside air temp
- **Replacement of boilers with design around 120-150°F** – Efficiency at least 6+ times higher than boilers

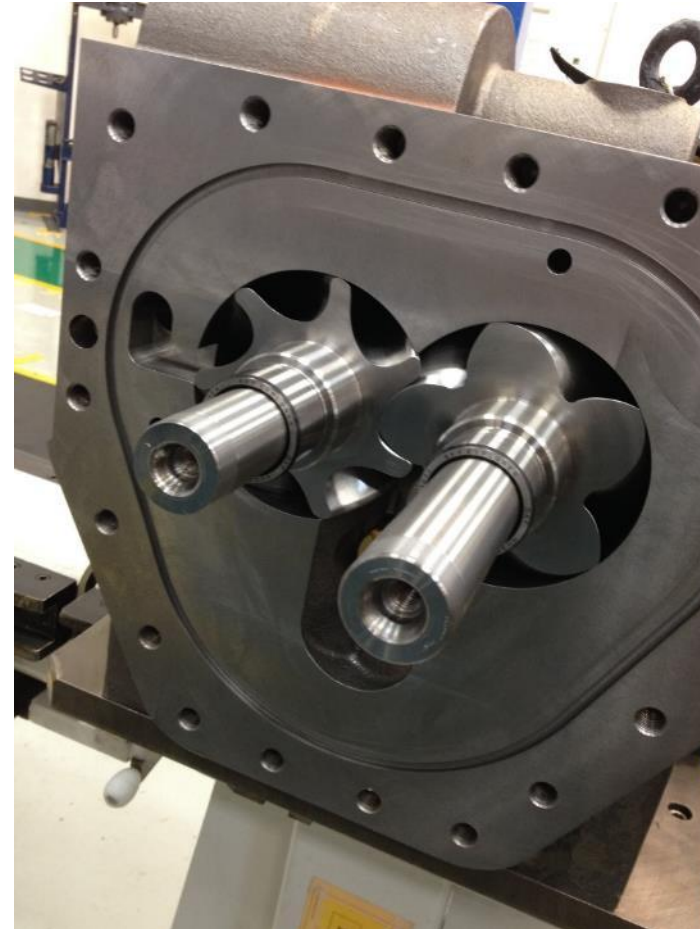
Heat Pump Benefits

ECONOMIC ADVANTAGES

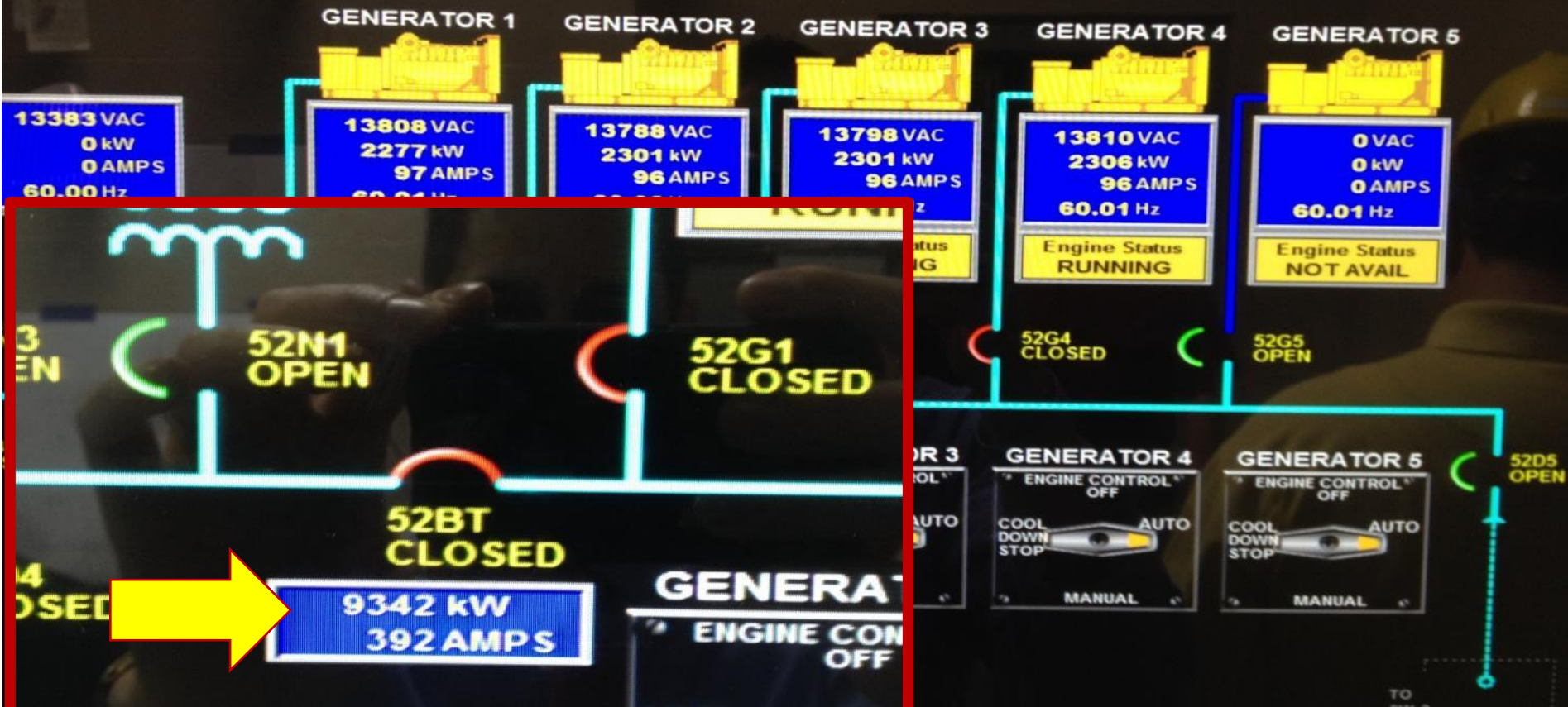


Sizing and Control





CATERPILLAR POWER SYSTEMS



Generator

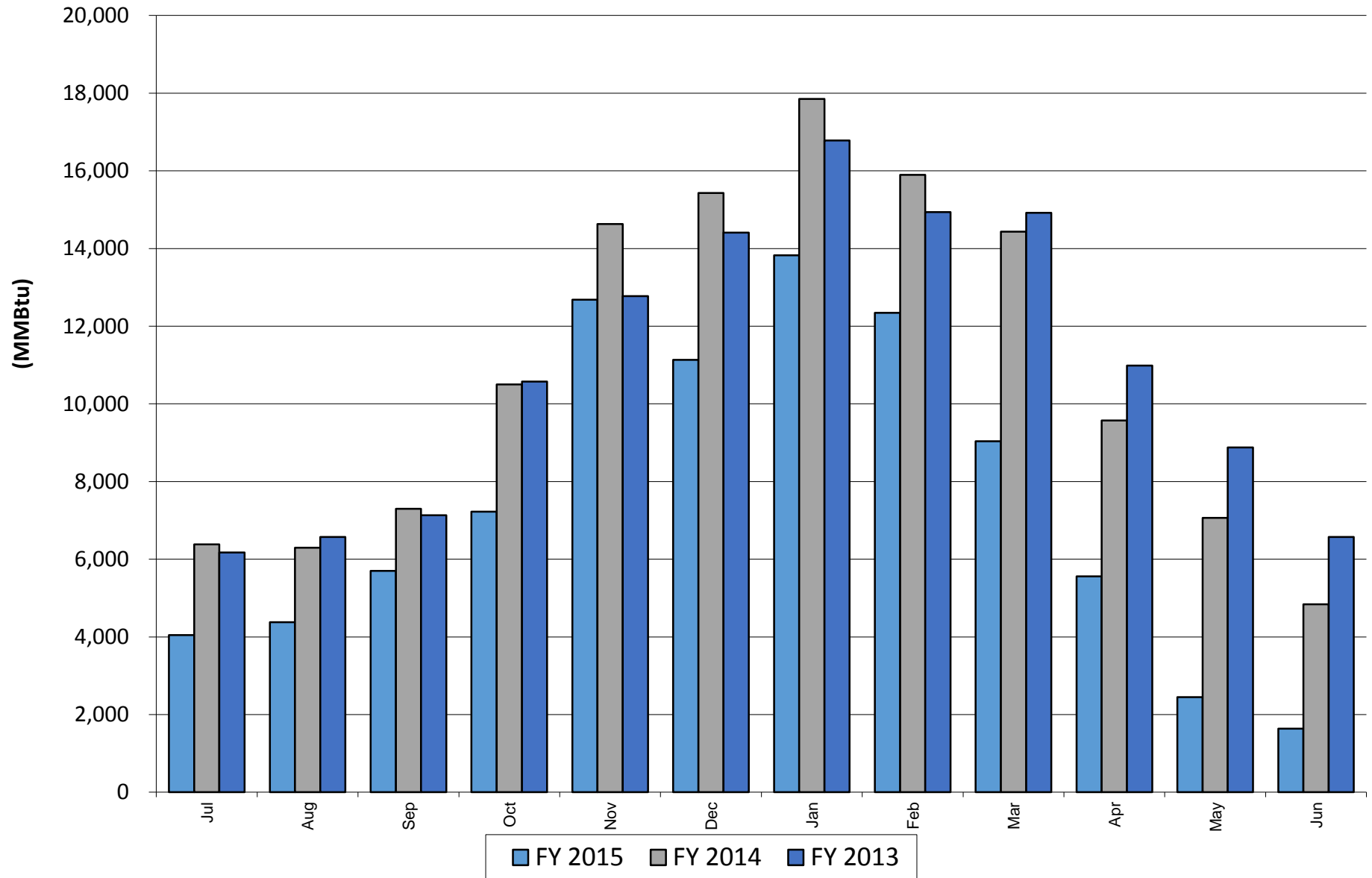




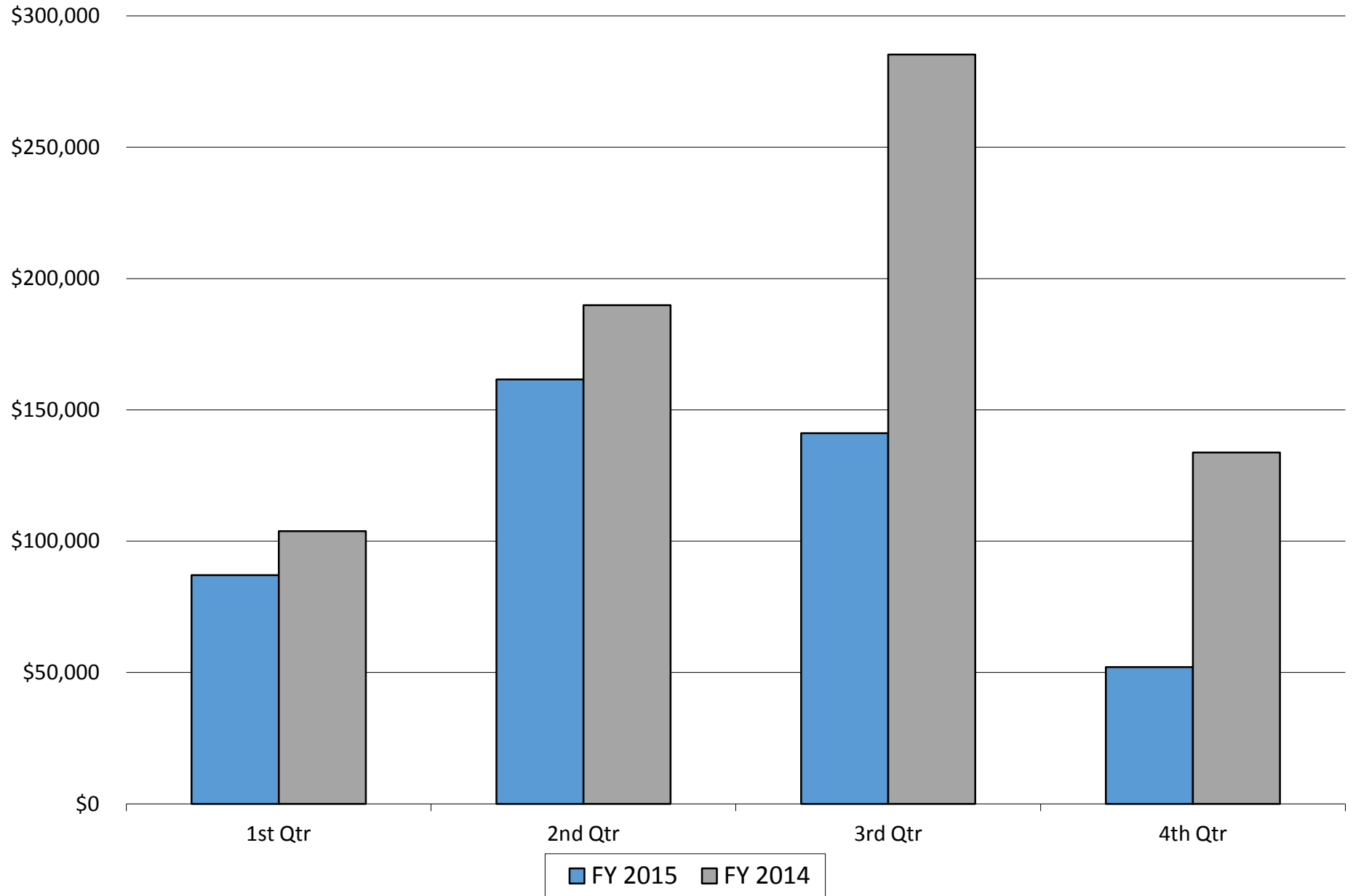


The First Weigh-In

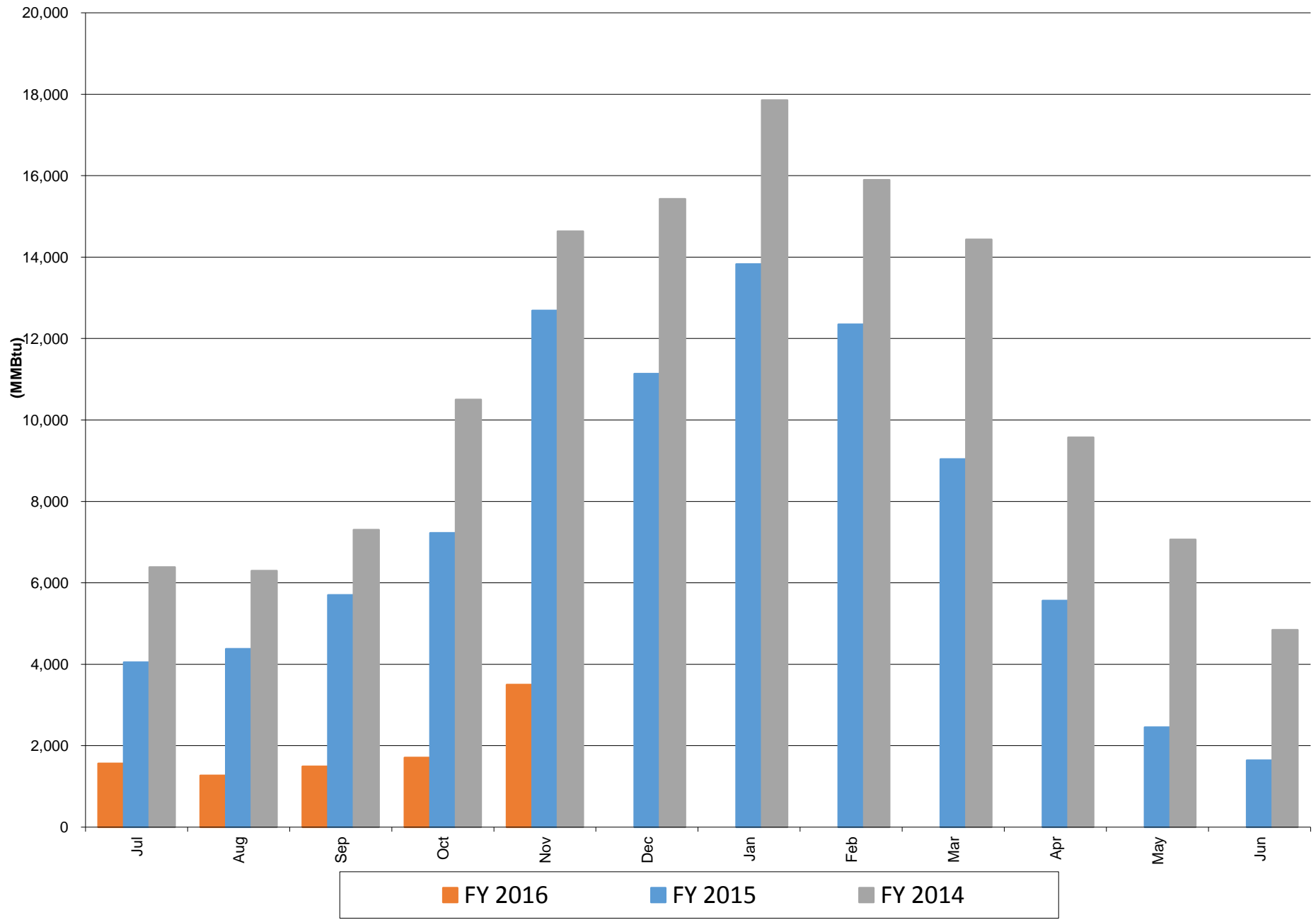
Campus Gas Consumption



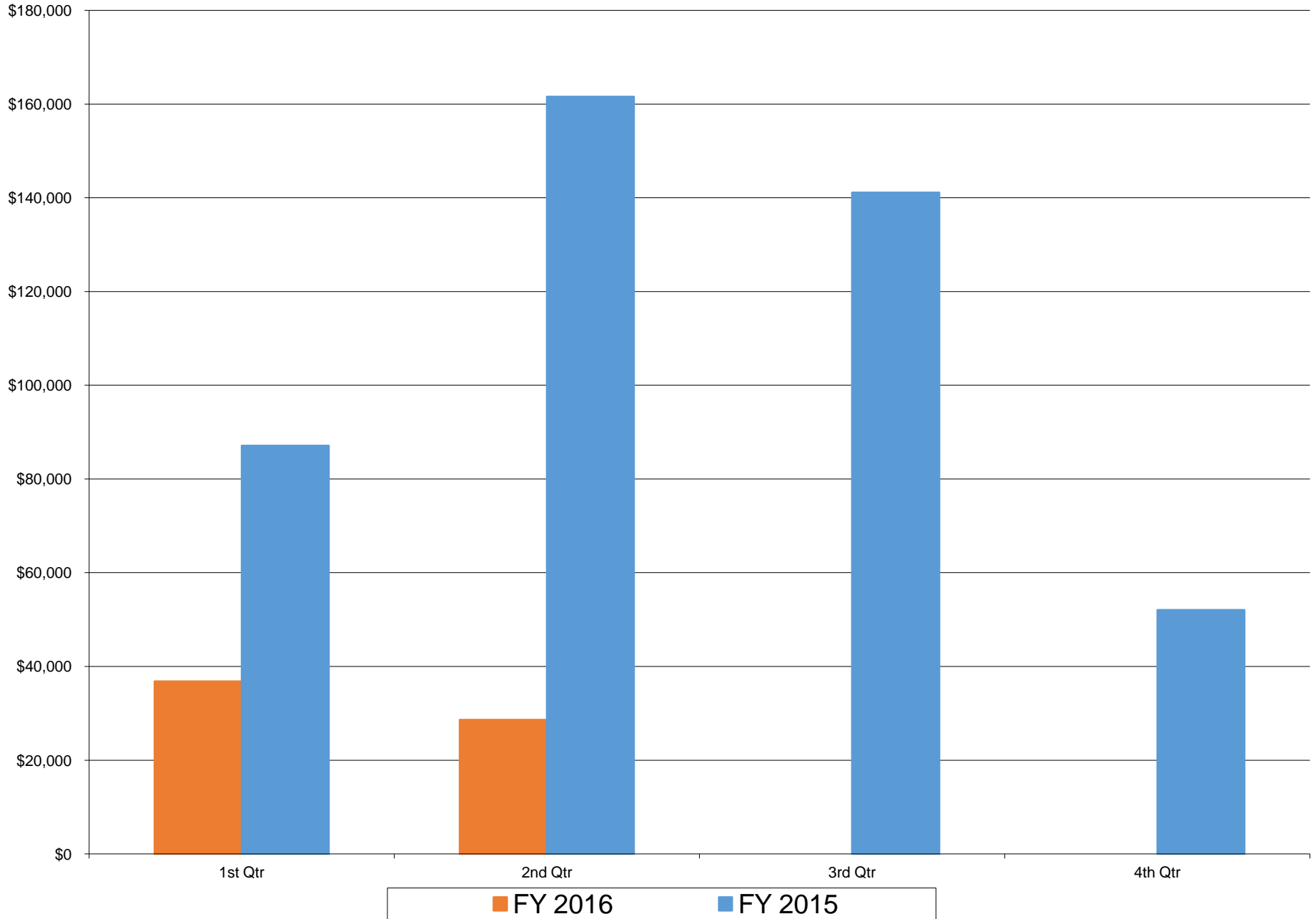
Campus Gas Cost (FY15 vs 14)



Campus Gas Consumption

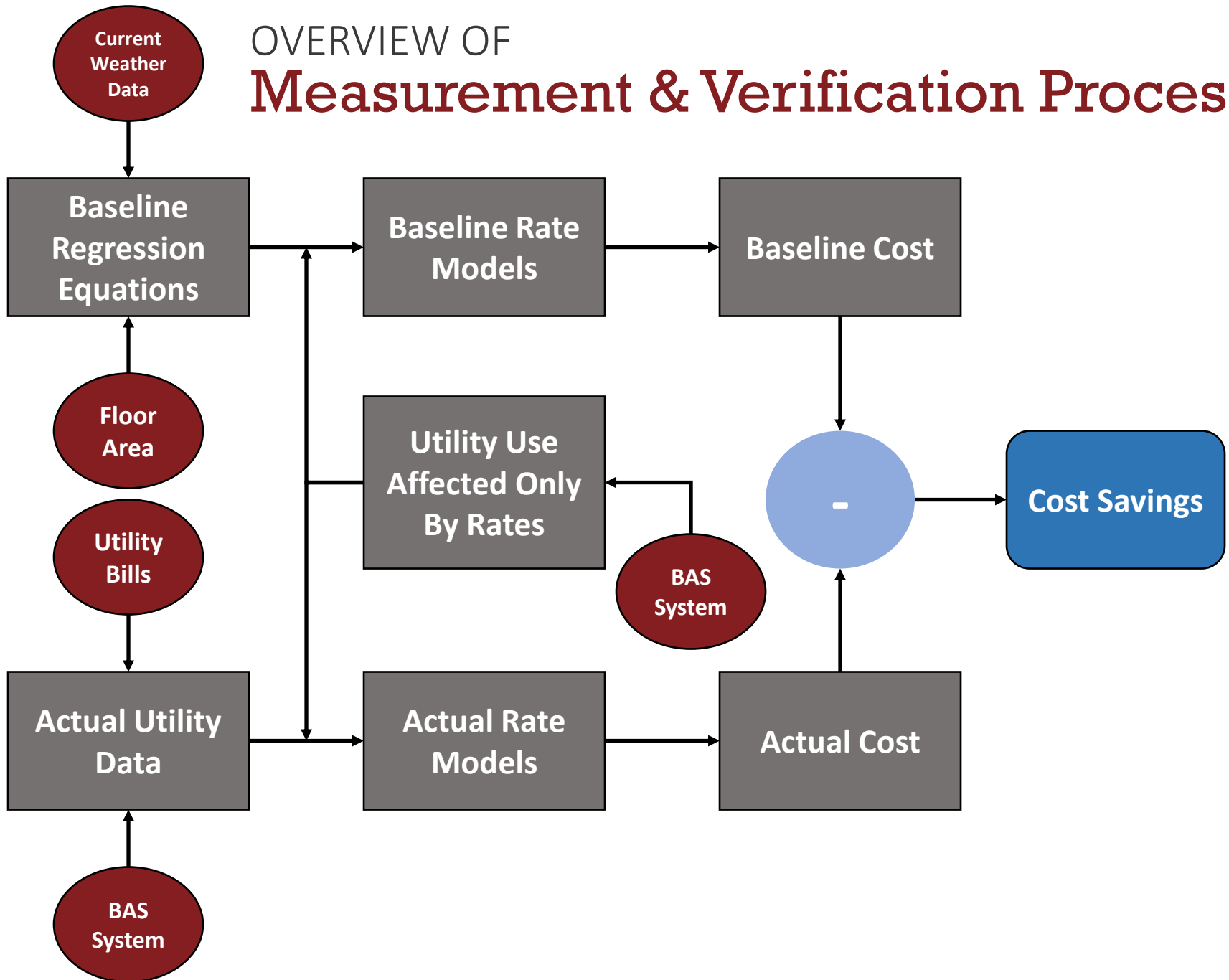


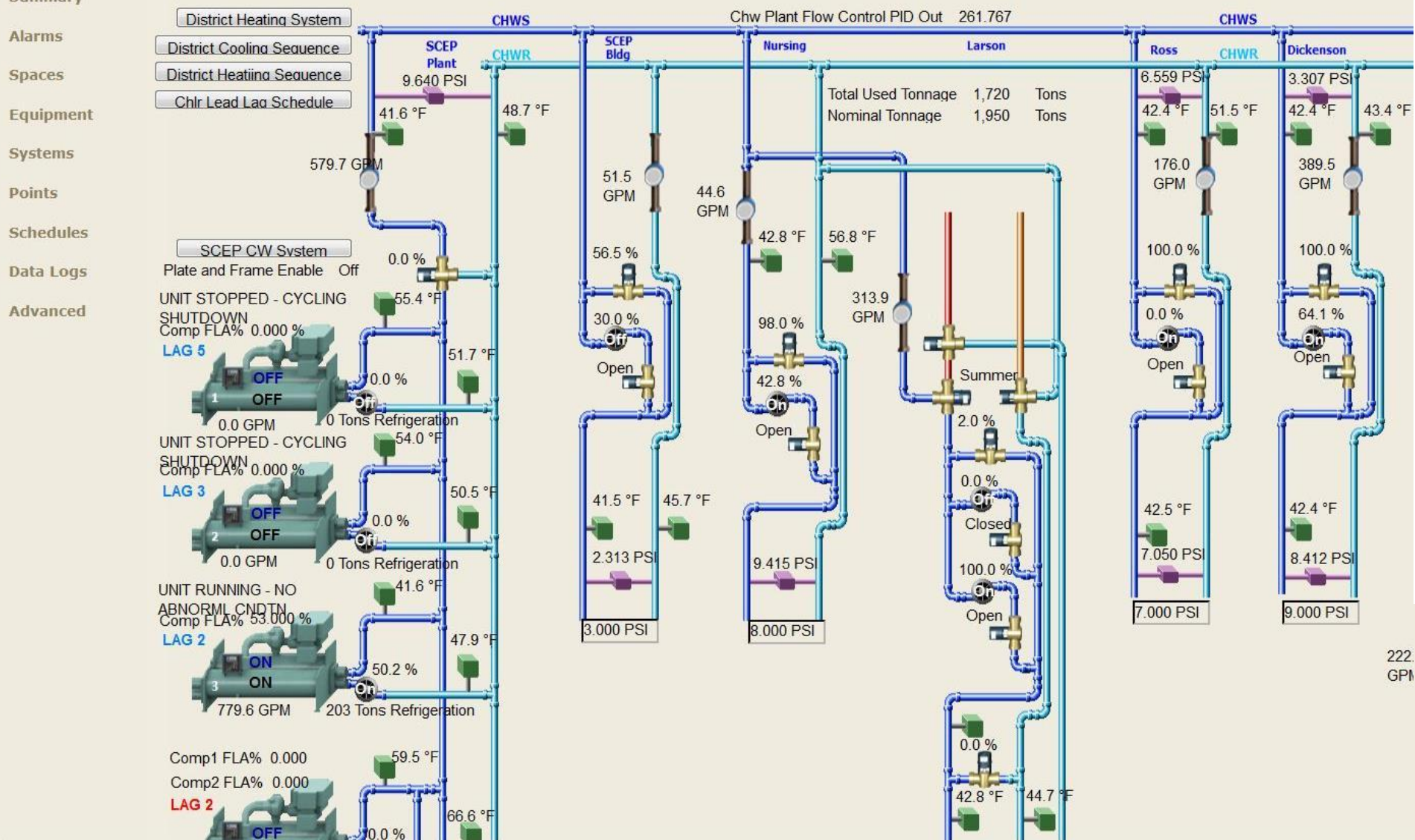
Campus Gas Cost (FY16 YTD)



OVERVIEW OF

Measurement & Verification Process





District Cooling and Heating

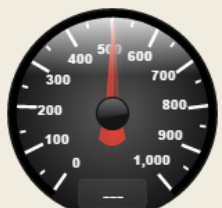
District Heating



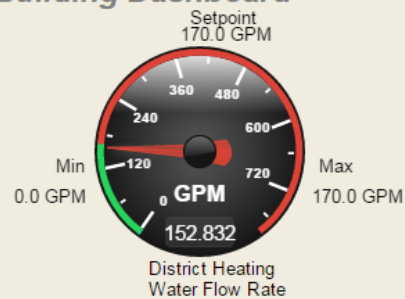
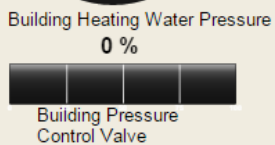
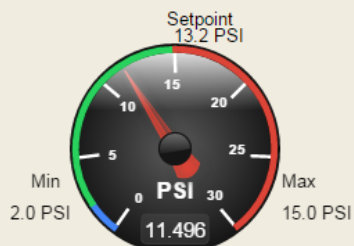
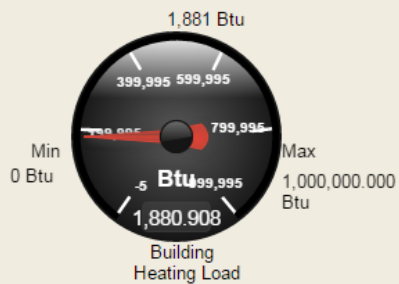
Fine Arts Building Dashboard



Total Building
Electrical Usage



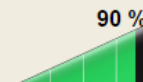
Total Building
Electrical Usage



Building Heating Water
Supply Temperature



District Heating Water
Return Temperature



Building Heating Water
Pump Speed



Building Blending
Control Valve

Scorecard

Device	05/26/15 02:00 PM	05/26/15 03:00 PM
1st Floor Power	100	100
2nd Floor Power	100	100
3rd Floor Power	100	100
Total Power Power	100	100



Date Time Stamp	Demand	Demand Pk	Energy Sum	Cu (Sk
5/26/2015 2:02:00 PM	11.469155...	26.975443...	209403.5	
5/26/2015 2:05:00 PM	11.709977...	26.975443...	209404.1	
5/26/2015 2:08:00 PM	11.709977...	26.975443...	209404.7	
5/26/2015 2:11:00 PM	11.709977...	26.975443...	209405.3	
5/26/2015 2:14:00 PM	11.709977...	26.975443...	209405.9	





Commissioning

PROJECT TEAM



General
Mechanical
Contractors

A FINAL QUESTION

How many decisions

DID YOU MAKE YESTERDAY THAT

reinforced

the status quo?

Q&A



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