



UNIVERSITY
of HAWAII
MANOA

Office of Facilities and Grounds

Campus Energy Update

January 2012

26 January 2012

UHM Office of Facilities and Grounds

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FY 2007 Energy Usage Reduction Plan

Baseline Electrical Usage	2006	2007	2008	2009	2010	2011	2012	2013	2014
Baseline Annual kWh	121,350,873	121,350,873	121,350,873	121,350,873	121,350,873	121,350,873	121,350,873	121,350,873	121,350,873
Energy Program Savings kWh									
Mechanical Systems kWh	8,500,000	9,000,000	12,400,000	13,000,000	15,000,000	17,000,000	19,000,000	21,000,000	23,000,000
Conservation kWh				2,000,000	6,000,000	8,000,000	8,000,000	8,000,000	8,000,000
Performance Contracting kWh					2,000,000	8,000,000	12,000,000	16,000,000	20,000,000
RCx kWh				200,000	800,000	2,000,000	2,000,000	2,000,000	2,000,000
PV Systems kWh					1,000,000	2,000,000	2,000,000	2,000,000	4,000,000
Total Program Savings kWh	8,500,000	9,000,000	12,400,000	15,200,000	24,800,000	37,000,000	43,000,000	49,000,000	57,000,000
Net Requirement kWh	112,850,873	112,350,873	108,950,873	106,150,873	96,550,873	84,350,873	78,350,873	72,350,873	64,350,873
Percent Reduction Targets									
Mechanical Upgrades		7.4%	10.2%	10.7%	12.4%	14.0%	15.7%	17.3%	19.0%
Conservation		0.0%	0.0%	1.6%	4.9%	6.6%	6.6%	6.6%	6.6%
Performance Contracting		0.0%	0.0%	0.0%	1.6%	6.6%	9.9%	13.2%	16.5%
RCx		0.0%	0.0%	0.2%	0.7%	1.6%	1.6%	1.6%	1.6%
PV Systems		0.0%	0.0%	0.0%	0.8%	1.6%	1.6%	1.6%	3.3%
Total Reduction	7.0%	7.4%	10.2%	12.5%	20.4%	30.5%	35.4%	40.4%	47.0%



Sustainability Program: Energy Retrofits

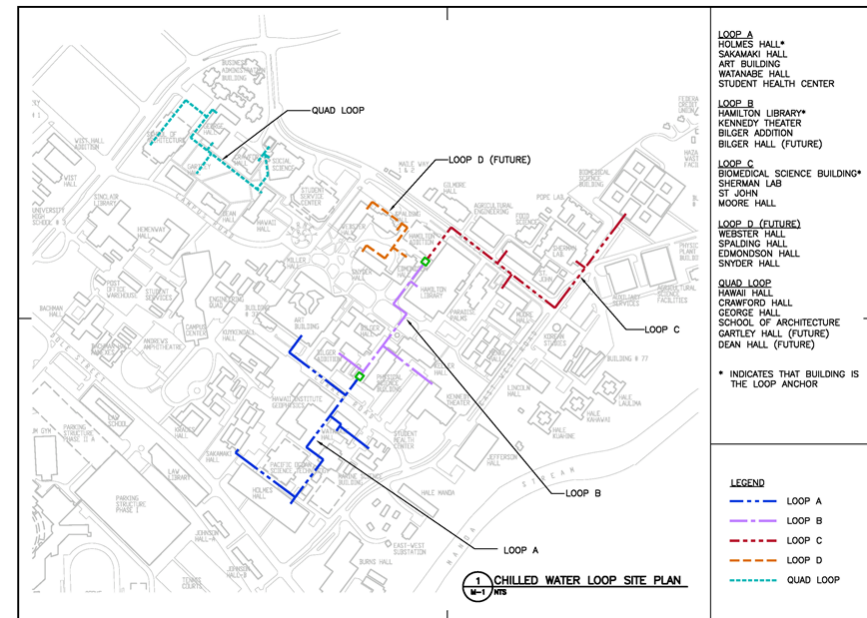
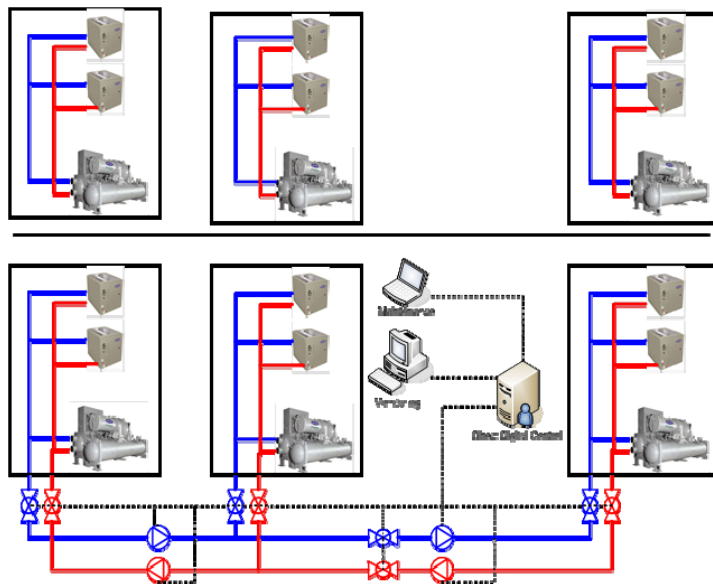
Art Building HVAC Replacement	\$5,035,130
Bilger Addition Preliminary Repairs	\$7,909,125
Bilger Hall, Mechanical Repairs, Upgrade Chilled Water sys. & controls	\$119,883
BioMed, Laboratory Animal Services, HVAC System Upgrades	\$90,253
Biomedical Sciences Bldg HVAC Repairs	\$3,856,000
Coconut Island, HIMB, A/C and Misc. upgrades	\$3,650,000
Campus Wide EMCS Upgrades - Phase 1	\$804,543
George Hall, Air conditioning and ventilation modifications	\$34,686
Gilmore Hall HVAC Repairs - Phase 1	\$2,742,802
Hamilton Library	\$7,576,079
IFA Manoa HVAC Repairs	\$541,000
Kennedy Theatre HVAC Repairs	\$228,000
Moore Hall HVAC - Phase 1	\$466,000
Moore Hall HVAC - Phase 2	\$2,117,187
Music Building Complex (Orvis) HVAC Repairs	\$840,000
PE Athletic Complex Hot Water System	\$10,776
Sakamaki Hall HVAC Replacement -Phase 1 and 2	\$5,688,220
SCBA Mechanical Repairs-Chilled Water Plant Improvements	\$2,683,246
St. John Laboratory Complex HVAC Repairs	\$695,000
Stan Sheriff Center HVAC Repairs	\$1,297,000
Watanabe Hall HVAC Repairs	\$2,612,672
Campus Wide Water Conservation Upgrades - Phase 1	\$1,099,941
TOTAL	\$50,097,543

Over 20 Projects Implemented since FY2008



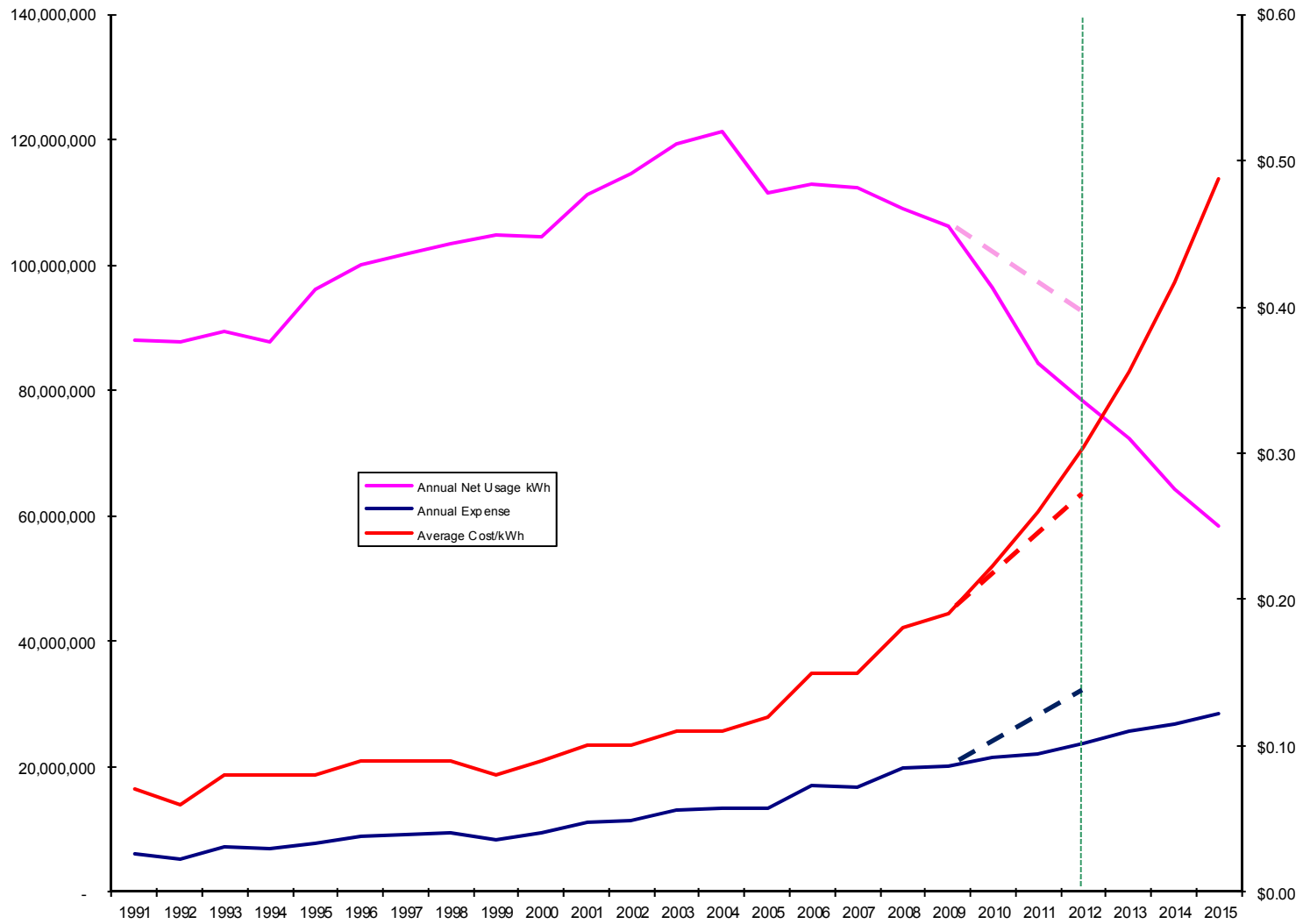
Sustainability Program: Distributed Chill Water Loops

- The key success factor has been UHM designed chill-water “Smart Water” Systems that permits the sharing of interconnected building chill water plants so that on cooler days a single building chill water system – operating at higher efficiency – can provide chill water to multiple buildings



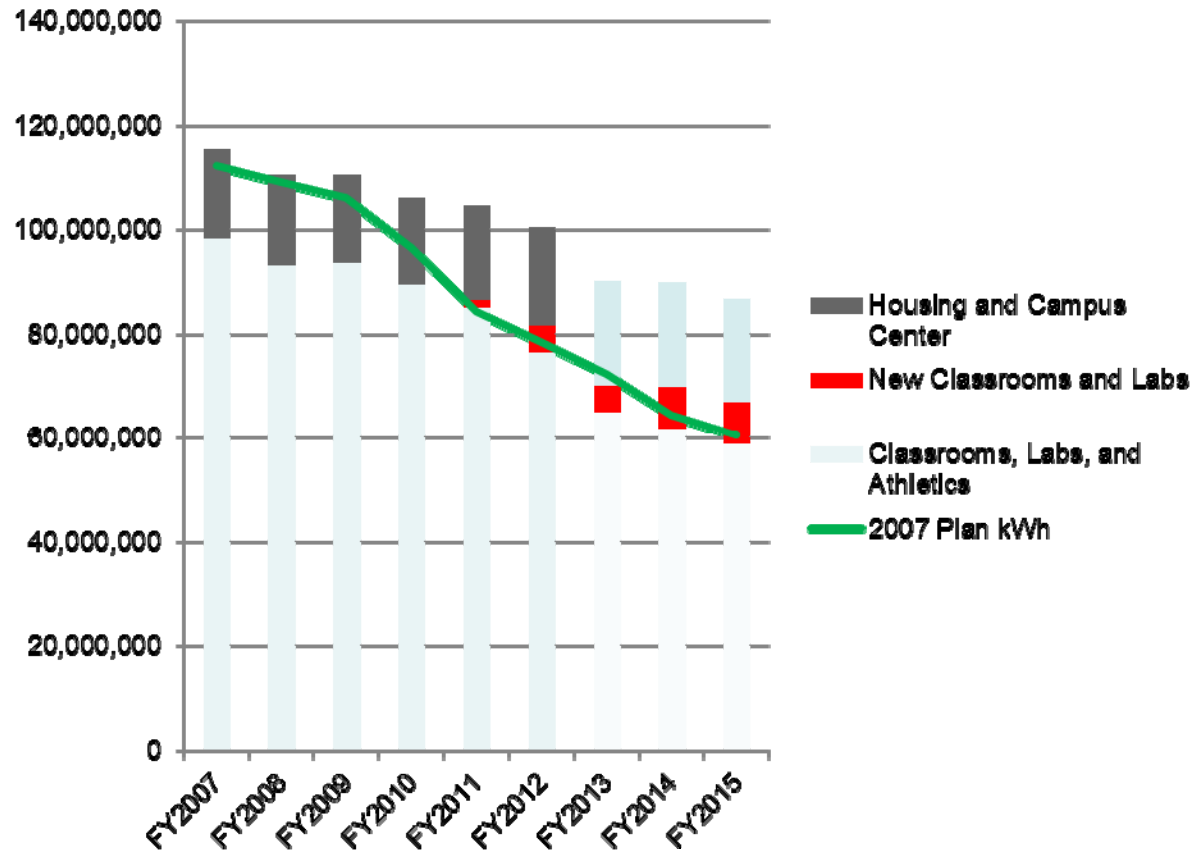


Energy Usage and Expense Trends 1Q FY2008 – 1Q FY2012





Mānoa Campus Energy Sustainability Program



GF Total usage has decreased 13.5%

Total Campus usage has decreased 9.4%

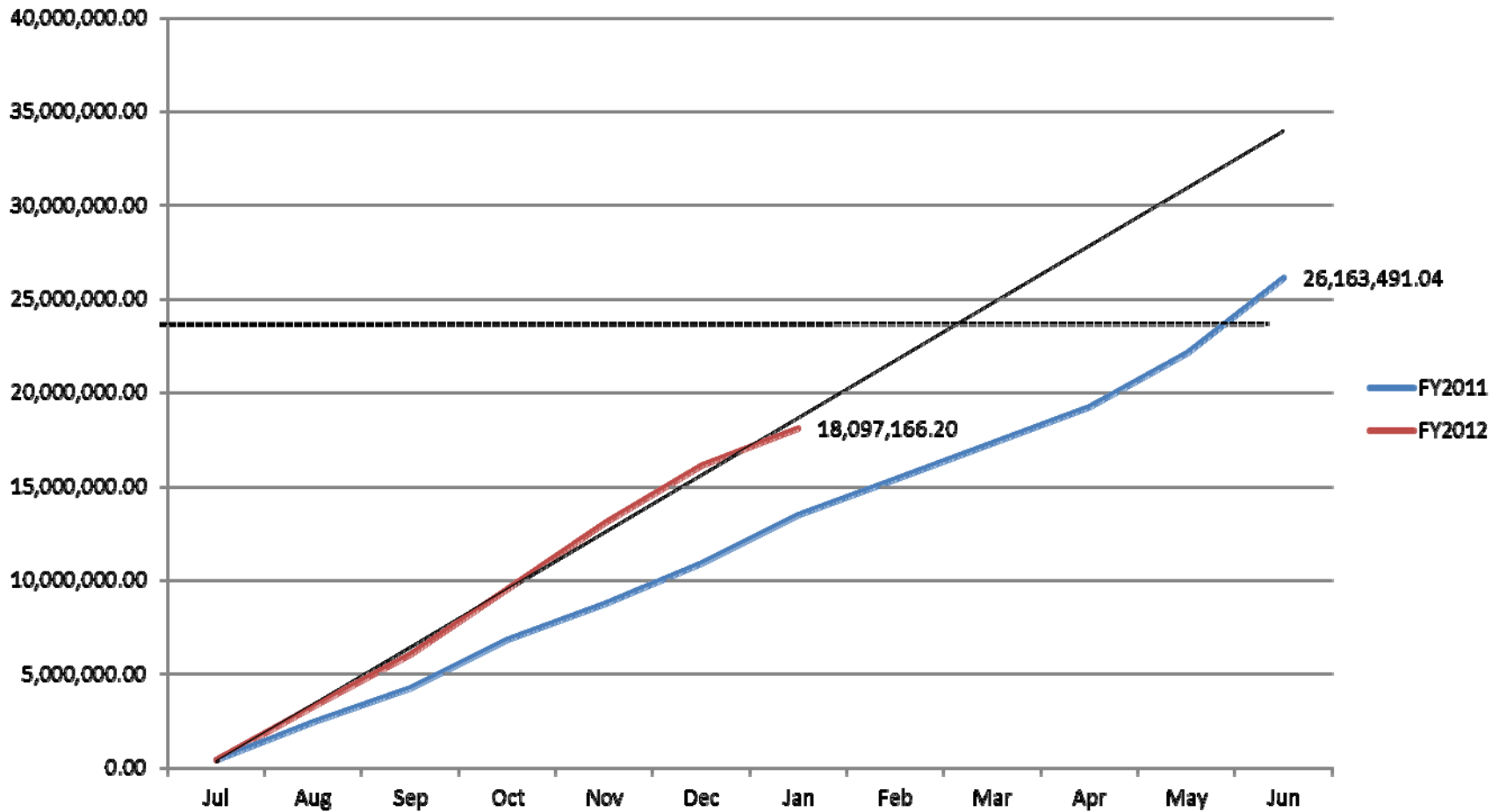


Annual Mānoa Campus Energy Expenses

	FY2007	FY2008	FY2009	FY2010	FY2011
Classrooms, Labs, and Athletics	\$16,313,577	\$19,006,153	\$18,999,335	\$16,872,090	\$17,798,432
New Classrooms and Labs					\$345,330
Housing and Campus Center	\$2,870,567	\$3,580,285	\$3,434,611	\$3,147,387	\$3,784,775
Total Electrical Expense	\$19,184,144	\$22,586,437	\$22,433,946	\$20,019,477	\$21,928,537

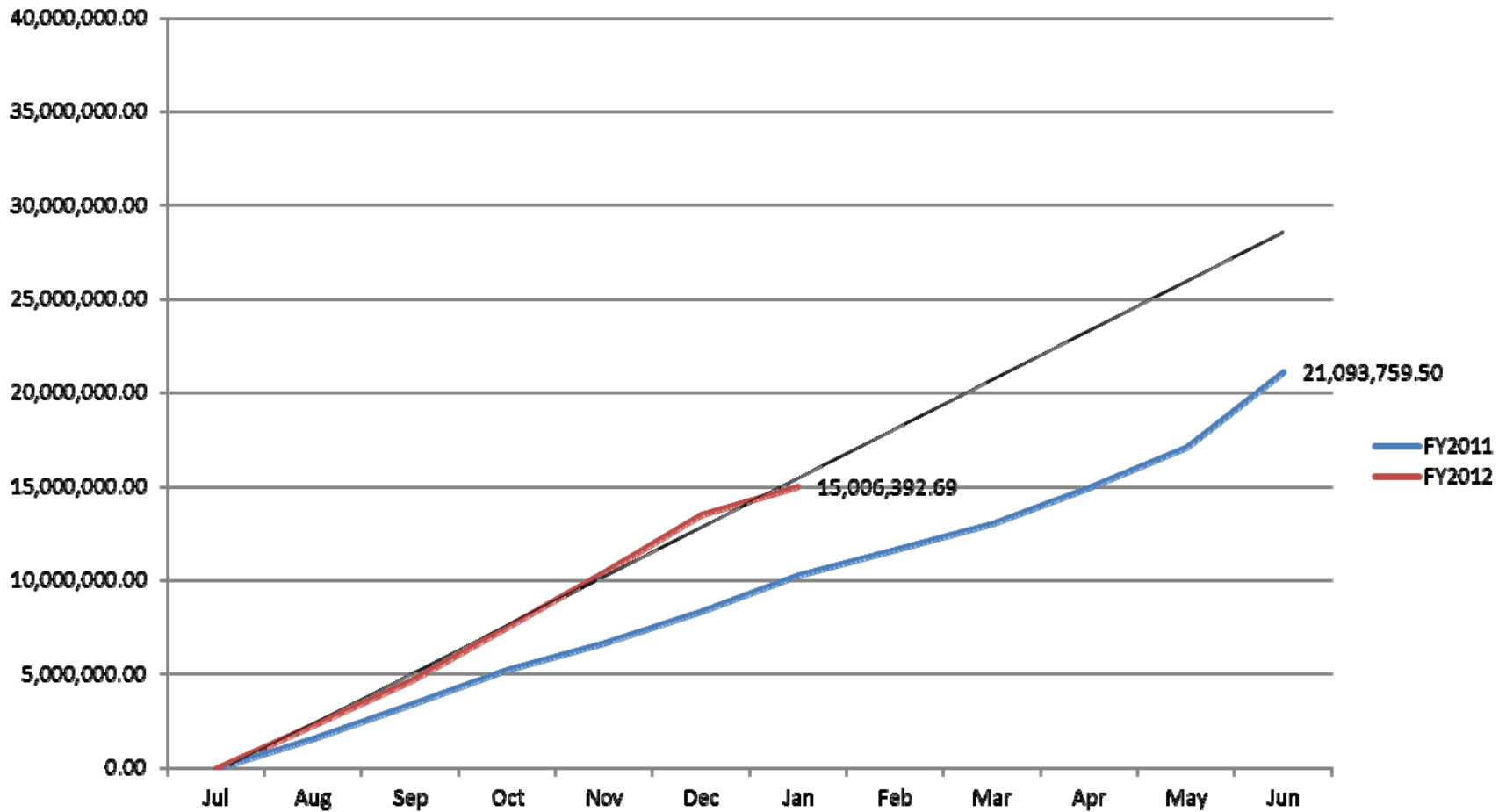


TOTAL Utility Cost Trends FY 2011 vs. FY 2012



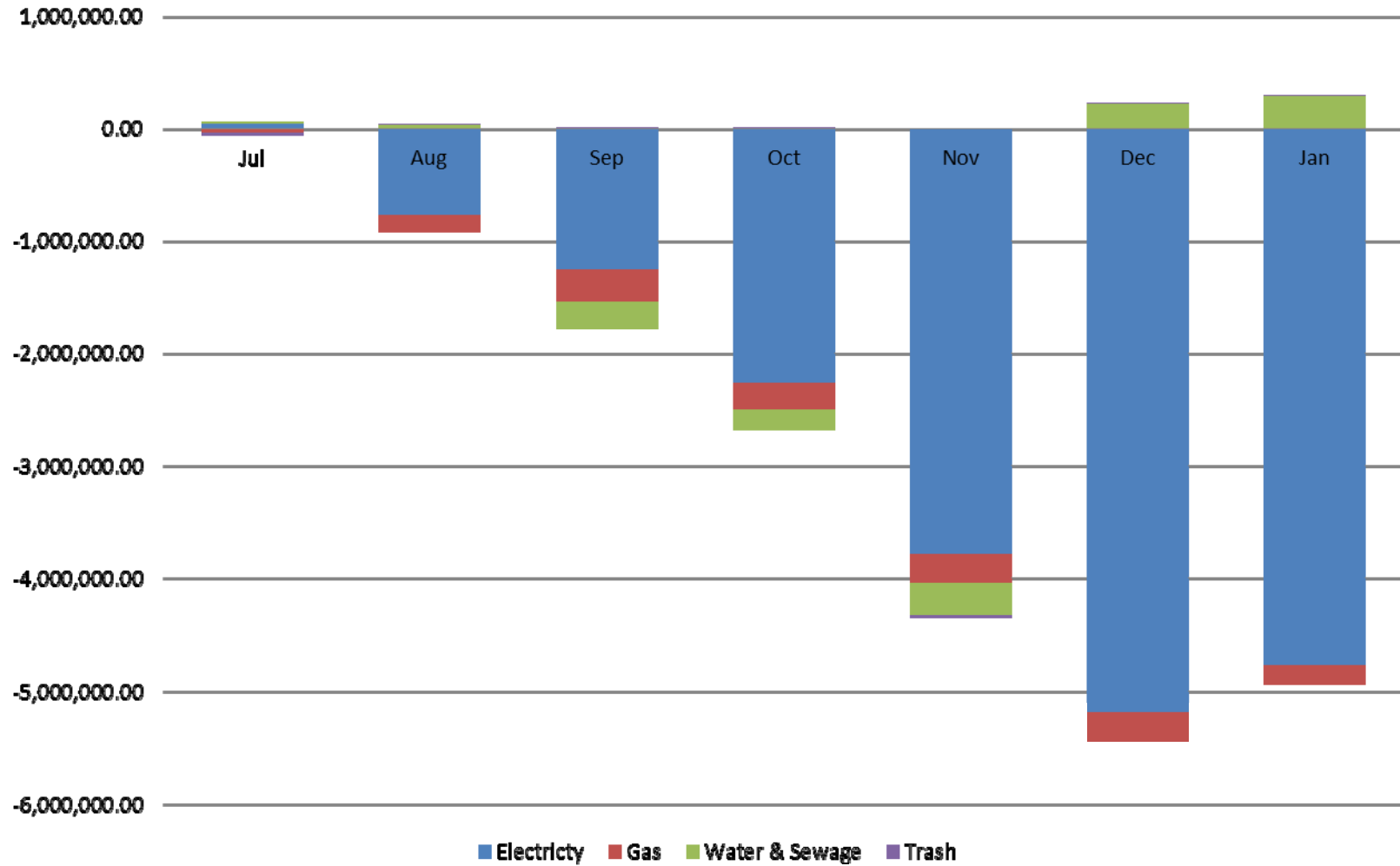


Electrical Cost Trends FY 2011 vs. FY 2012





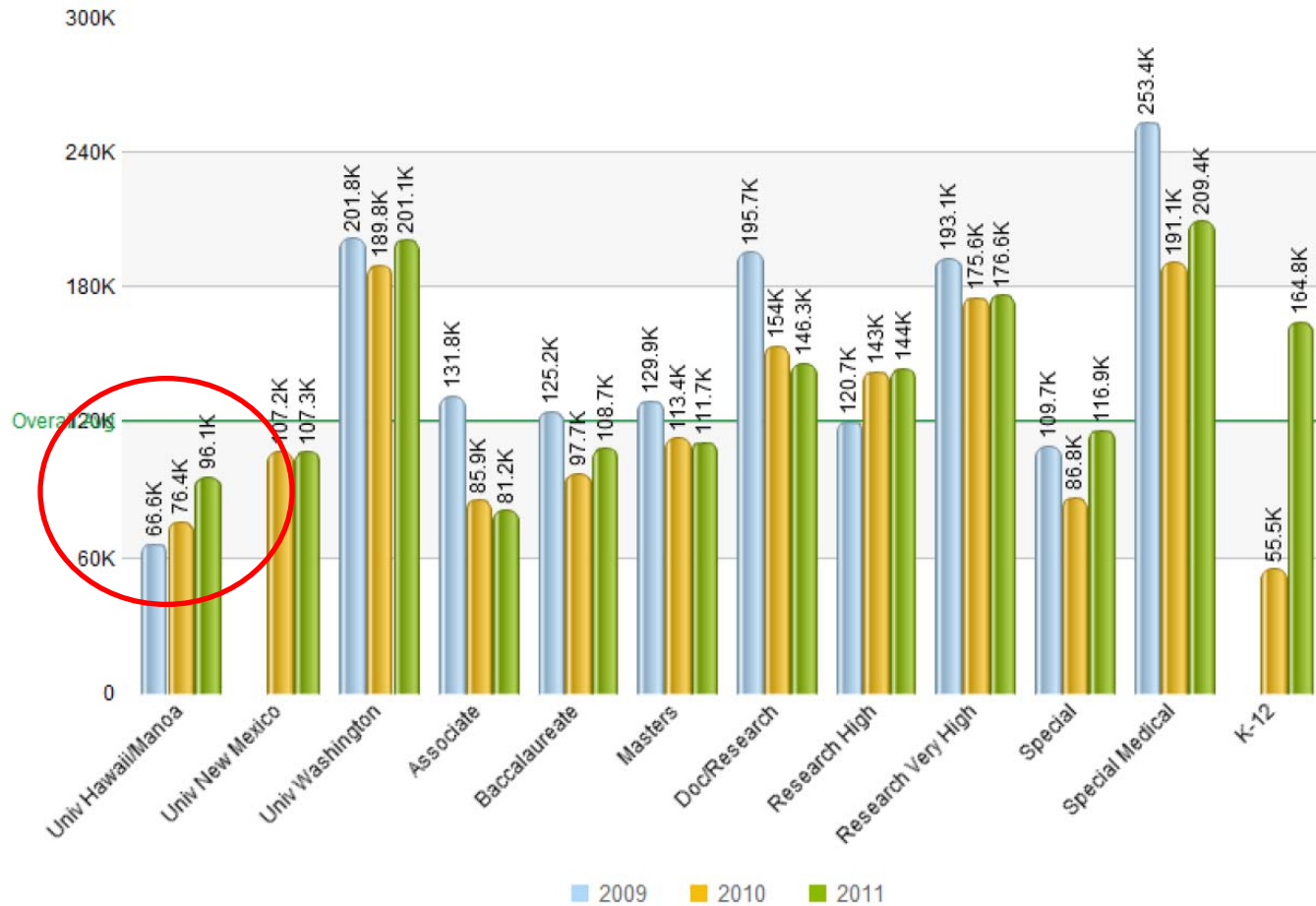
Cumulative Annual Variance by Cost Element





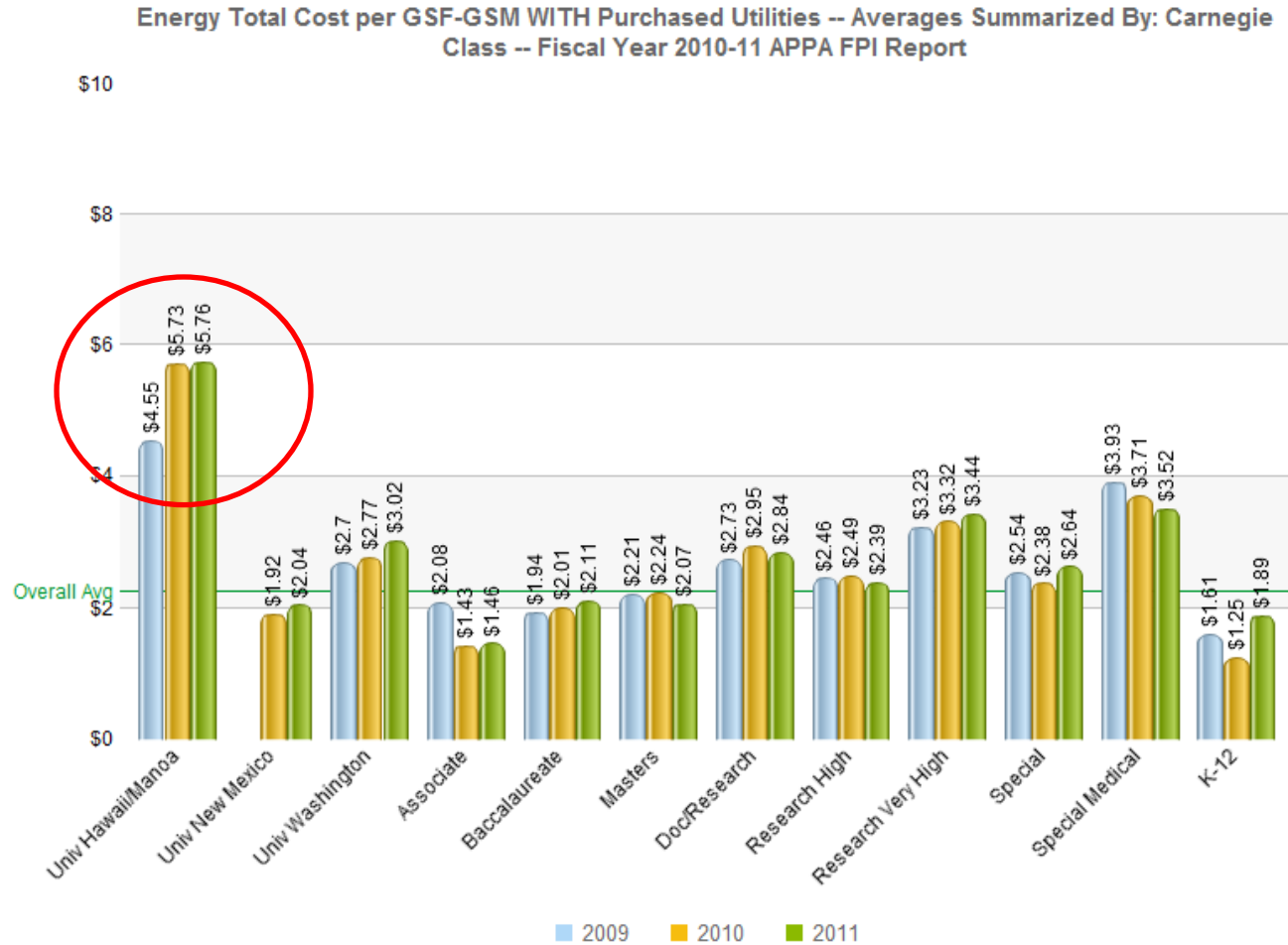
Mānoa Energy BTU per GSF

Energy BTU per Energy Total GSF-GSM -- Averages Summarized By: Carnegie Class -- Fiscal Year
2010-11 APPA FPI Report



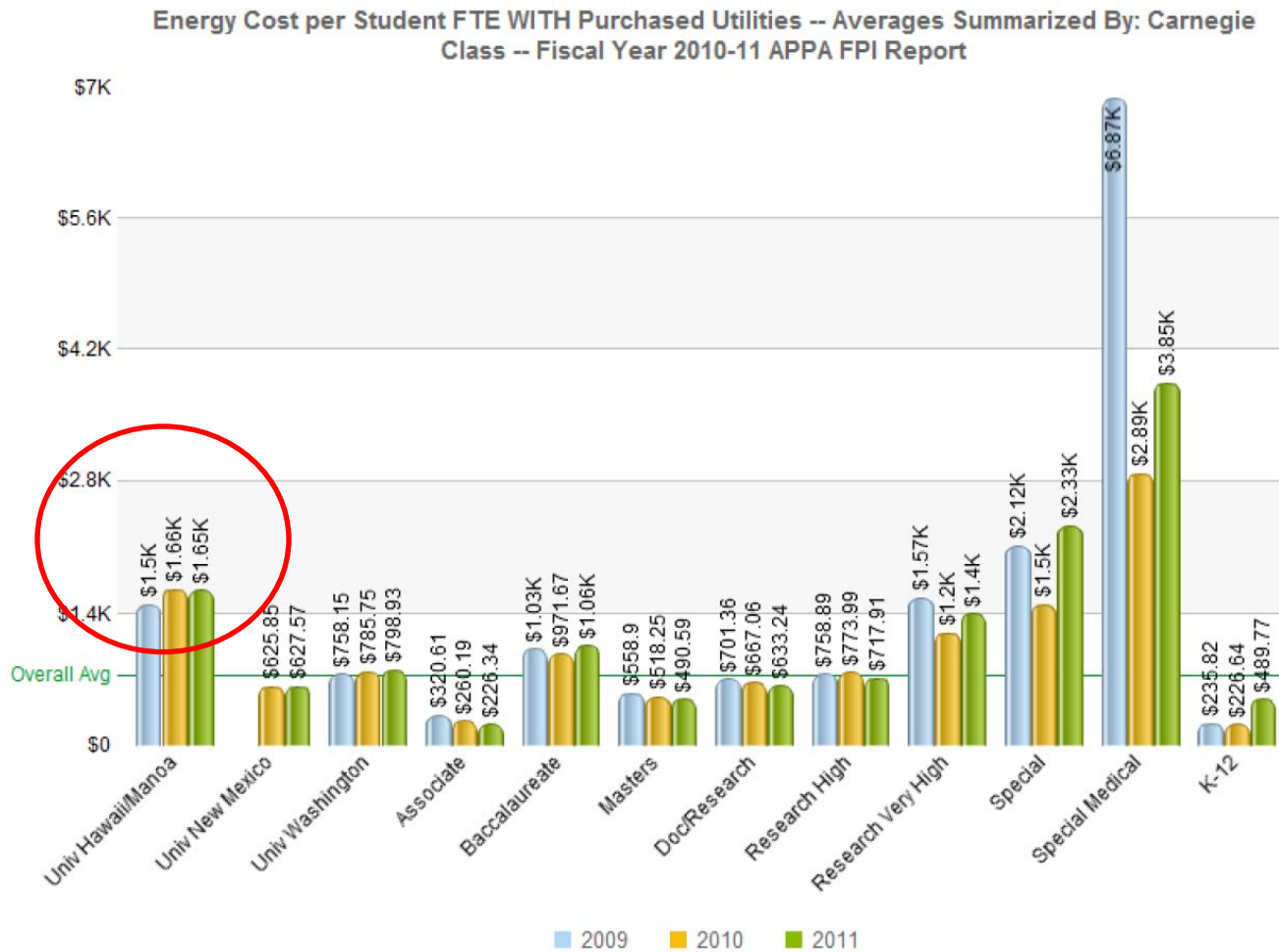


Mānoa Energy Cost Comparison per GSF





Cost per Student FTE





Sustainability Program: Mānoa Green Days

- Over twenty main campus buildings currently participate in the program representing nearly 1,000,000 GSF of campus floor space.
- July 2009 pilot “power-downs” were implemented on selected buildings.
- In November 2010 the program was expanded to all participating buildings during the weekends, Thanksgiving break, and Christmas breaks.
- As a result of the MGD program the campus has experienced a **reduction of over 900,000 kWh or 1% of its annual usage** in addition to allowing UHM Facilities to gain critical experience exercising real-time control over its chill water and electrical distribution system.

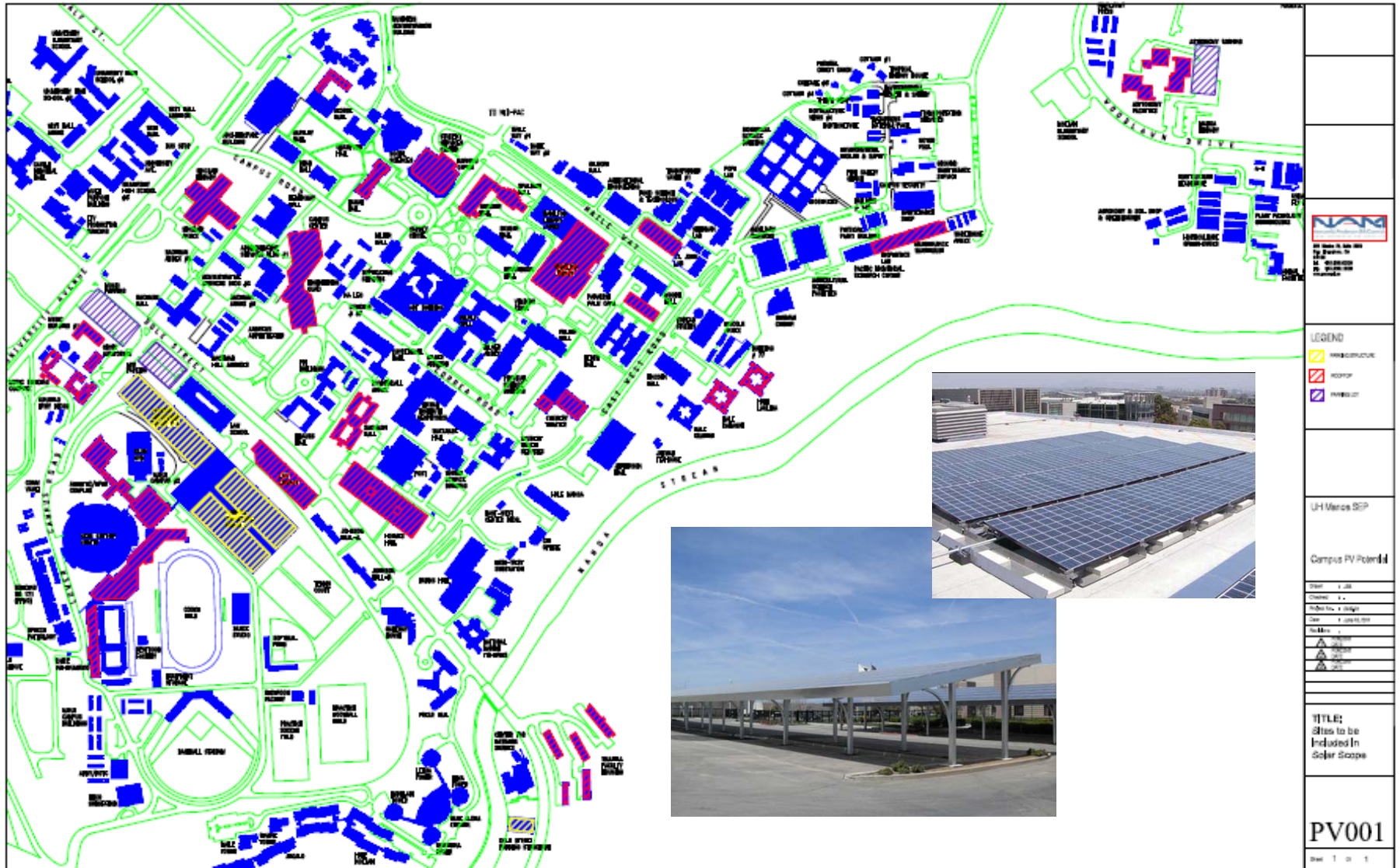


Lighting Retrofit, Photovoltaic Power, Demand Response

- Campus-Wide Lighting Retrofit Design-Build Project currently pending RFP release
 - RFP for Campus-wide lighting retrofit of up to 4.5 million GSF
 - Estimated 10-15% energy reduction
- UHM Facilities is currently teamed with energy consultants Newcomb, Anderson, and McCormick (NAM) to acquire 5 MW of Photovoltaic Electricity
 - Estimated 7-10% energy reduction
- New Energy Management Systems enable Demand Response
 - Estimated 10-15% energy reduction



Proposed On-Campus Photovoltaic Roof-top and Car Canopy Sites





Conclusions

- Manoa currently has more campus than it can afford
- Student Tuition as a source of utility funds is limited
 - \$1,665 per Student FTE FY2011
 - \$2,265 per Student FTE FY2012
- UH Manoa Must Rationalize its Facility Expenses to match available Tuition resources
 - Increased reliance on debt financing of projects
 - Increased reliance on new sources of revenues
 - New Cost Allocation Model
- We need to work together to develop a new Campus