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UHM Facilities Management



UHM 2007 *APPA* Facilities Performance Indicators
Preliminary Report and Implications
December 2007 – Revised March 2008

David Hafner – UHM AVC Campus Services



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Preface

There material contained in this report is the product of data collected for submission to the 2007 APPA Facilities Performance Indicator Report.

The information and the conclusions contained in this report are preliminary and should be treated as such until further work can be completed. Due to the lack of a comprehensive physical audit of the Manoa physical plant several analytical models and assumptions were employed to create a range of maintenance and cost factors. For purposes of the analysis contained herein the most conservative cost model was used.

For further information please contact David Hafner at hafner@hawaii.edu

<http://www.manoa.hawaii.edu/ovcafo/FacilitiesManage/index.htm>



UHM Facilities Management Home



<p>Campus Map</p> <p>Virtual Tour</p>	<h3>Facilities Management Organization Mission, Vision, and Goals</h3>	
<p>Facilities Management Divisions</p> <p>---</p> <p>Administrative Services</p> <p> Design</p> <p> Project Management</p> <p> Purchasing</p> <p>Physical Plant</p> <p>---</p> <p> Electrical</p> <p> Mechanical</p> <p>Buildings And Grounds Management</p>	<p>Our Mission</p> <p>We help improve the University environment</p> <p>Our Vision</p> <p>To affect the world around us by creating a world class learning environment</p> <p>Our Goals</p> <ul style="list-style-type: none"> • To become the best in our field by applying our experience, knowledge and commitment as advocates and practitioners of practical and sustainable development of our campus facilities. <ul style="list-style-type: none"> ○ Demonstrated capability ○ Recognition ○ Certification • Develop the University community's (political, faculty, and student) awareness of the learning environment through improved planning, communications, and feedback mechanisms. <ul style="list-style-type: none"> ○ Communications • Achieve the University community's consensus of short-term and long-terms campus planning. <ul style="list-style-type: none"> ○ Five, ten, and twenty-five year facility plans ○ Develop public financial plans • Serve Hawaii's goals to develop needed intellectual resources through the effective involvement of our campus facilities and environment as active teaching spaces and laboratories. <ul style="list-style-type: none"> ○ Direct engagement with instructional programs ○ FMO Intern program - "Every graduate gets a job" 	<p>In Case of Emergency: 7:30-4:30 Monday Through Friday Work Coordination Center (808) 956-7134</p> <p>After Hours: Campus Security (808) 956-6911</p> <hr/> <p>Contact Info:</p> <p>Facilities Management 2002 East-West Road Honolulu, HI 96822 Phone: (808) 956-6142 Fax: (808) 956-2165</p>

Google:
Manoa Facilities

<http://www.manoa.hawaii.edu/ovcafo/FacilitiesManage/findex.htm>



UHM Facilities Dimension

- 7,899,571 GSF Total Campus
- 4,785,156 GSF UHM FMO Administered
- 358 FTE (down from 368 in 2003)
 - 241 House and Grounds
 - 68 Maintenance Trades
 - 29 A&E and CM Professionals
 - 20 Admin and Support
- Work Orders
 - Average Time for Work Order: 13.48 Days
 - Average Time for Work Order requiring parts: 74.13 Days
 - Average Number of Work Orders completed per month: 950
 - Total Current Work Order Backlog: 4,607



Major Cost Drivers

- Projected FY2008 Electricity Expense of \$19,431,265
 - Electricity consumes 43% of the Facilities O&M Budget
 - Variance to budget of **(\$2,339,262)**
- Expense per kWh has increased 17% from 0.158/kWh in 2006 to 0.185/kWh in 2008
- Net Electricity usage is down 3.34% in 2007 from prior year period 2006 due to M&R upgrades saving \$792,170 annually at current rates.



Current UHM Expense Summary

	Revised 11/28/07	FY08Q1 Results	FY08Q2 Results	Projected Variance
Labor	13,418,880	3,027,002	3,282,654	
Current	2,694,799	397,869	338,719	
Equipment	40,975		2,090	
Maintenance	1,908,943	662,079	344,287	
Utilities	19,481,710	3,223,295	6,044,044	(3,642,526)
TOTAL	37,545,307	7,310,245	10,011,794	(3,642,526)
Major Utilities				
Electricity	17,092,003	2,771,229	5,001,244	(2,339,262)
Water/Sewer*	1,483,210	332,685	790,726	(1,036,076)
TOTAL	18,575,213	3,103,914	5,791,970	(3,375,338)

*Sewage Expenses have increased 81.87% effective 7/1/2007



Institutional Expense Comparisons

	UHM	APPA PCAPPA	APPA RU/VH	APPA OVERALL
FCI Index	10.5%	6.0%	11.2%	8.1%
Costs GSF⁻¹				
Operations	\$3.99	\$5.18	\$4.48	\$4.43
	46%	68%	59%	66%
Utilities	\$4.66	\$2.41	\$3.08	\$2.28
	54%	32%	41%	34%
TOTAL Costs GSF⁻¹	\$8.65	\$7.59	\$7.56	\$6.71

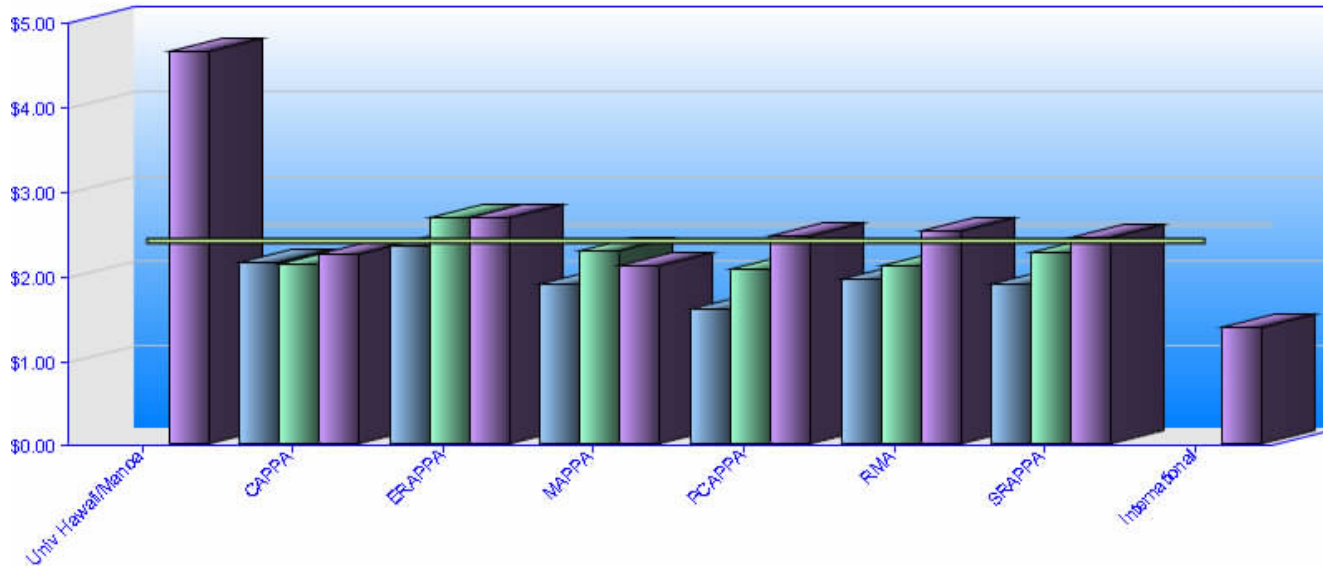
APPA FPI Report Fiscal Year 2006-2006

6,200 kWh Year⁻¹ Student⁻¹



Energy Total Cost per GSF

Energy Total Cost per GSF with Purchased Utilities -- Averages Summarized By: APPA Region -- Fiscal Year 2006-07 APPA FPI Report



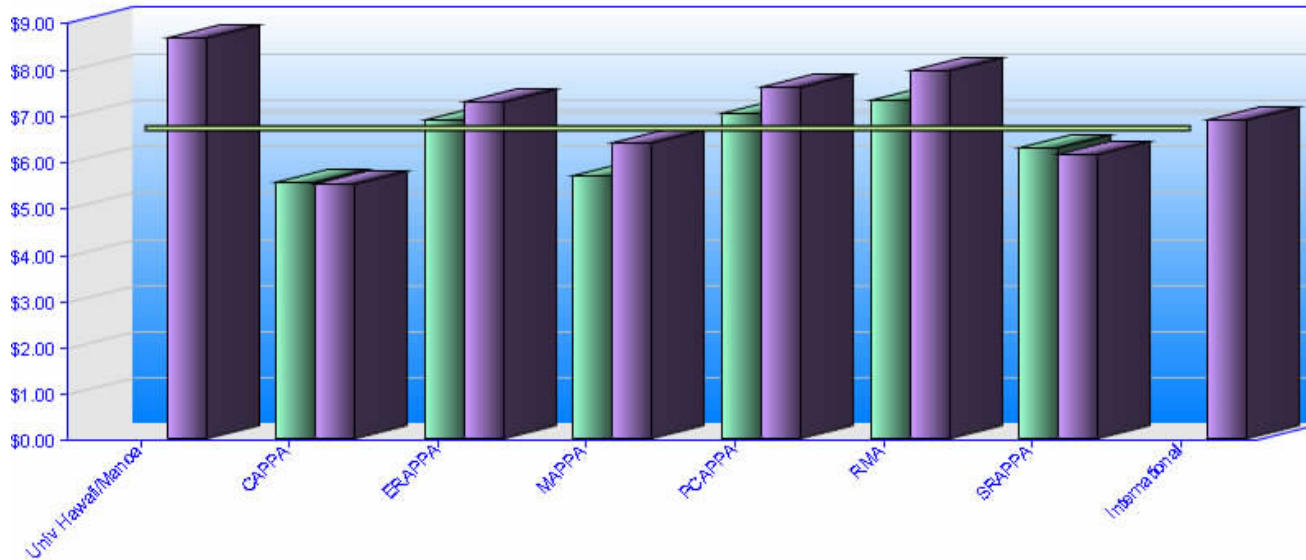
■ 2005
 ■ 2006
 ■ 2007
 ■ 2007 Overall Average

	Univ Hawaii/Manoa	CAPP	ERAPPA	MAPP	PCAPP	RMA	SRAPPA	International
2005		2.16	2.35	1.9	1.6	1.95	1.9	
2006		2.132	2.68	2.298	2.082	2.111	2.276	
2007	4.662	2.259	2.694	2.124	2.47	2.521	2.443	1.392
2007 Overall Average	2.413	2.413	2.413	2.413	2.413	2.413	2.413	2.413



Total Operating Cost per GSF

Total Operating Cost per GSF w Purchased Utilities -- Averages Summarized By: APPA Region -- Fiscal Year 2006-07 APPA FPI Report



Legend: 2005 (blue), 2006 (green), 2007 (purple), 2007 Overall Average (light green line)

	Univ Hawaii/Manoa	CAPP	ERAPP	MAPP	PCAPP	RMA	SRAPP	International
2005								
2006		5.548	6.881	5.693	7.037	7.303	6.281	
2007	8.651	5.498	7.291	6.396	7.591	7.967	6.164	6.904
2007 Overall Average	6.708	6.708	6.708	6.708	6.708	6.708	6.708	6.708



Distribution revenues and expenses UHM vs. L4 RU/VH Peer Group

National Center for Education Statistics		
IPEDS Data Feedback Report 2007		
Research		
	University of Hawaii at Manoa	Comparison Group Median
Percent distribution of core revenues, by source: Fiscal year 2006		
Tuition and fees (N=59)	12%	20%
State appropriations (N=59)	31%	28%
Local appropriations (N=59)	0%	0%
Government grants and contracts (N=59)	49%	29%
Other core revenues (N=59)	9%	20%
Percent distribution of core expenses, by function: Fiscal year 2006		
Instruction (N=59)	31%	31%
Research (N=59)	35%	23%
Public service (N=59)	5%	6%
Academic support (N=59)	8%	8%
Institutional support (N=59)	1%	6%
Student services (N=59)	4%	3%
Other core expenses (N=59)	16%	20%

Integrated Post Secondary Education Data System (IPEDS)
<http://nces.ed.gov/ipeds/pas/ExPT/default.aspx>



Distribution revenues and expenses UHM vs. all other UH

National Center for Education Statistics		
IPEDS Data Feedback Report 2007		
Research		
	University of Hawaii at Manoa	Comparison Group Median
Percent distribution of core revenues, by source: Fiscal year 2006		
Tuition and fees (N=9)	12%	14%
State appropriations (N=9)	31%	45%
Local appropriations (N=9)	0%	0%
Government grants and contracts (N=9)	49%	29%
Other core revenues (N=9)	9%	4%
Percent distribution of core expenses, by function: Fiscal year 2006		
Instruction (N=9)	31%	44%
Research (N=9)	35%	0%
Public service (N=9)	5%	8%
Academic support (N=9)	8%	10%
Institutional support (N=9)	1%	10%
Student services (N=9)	4%	9%
Other core expenses (N=9)	16%	19%

Integrated Post Secondary Education Data System (IPEDS)
<http://nces.ed.gov/ipeds/pas/ExPT/default.aspx>

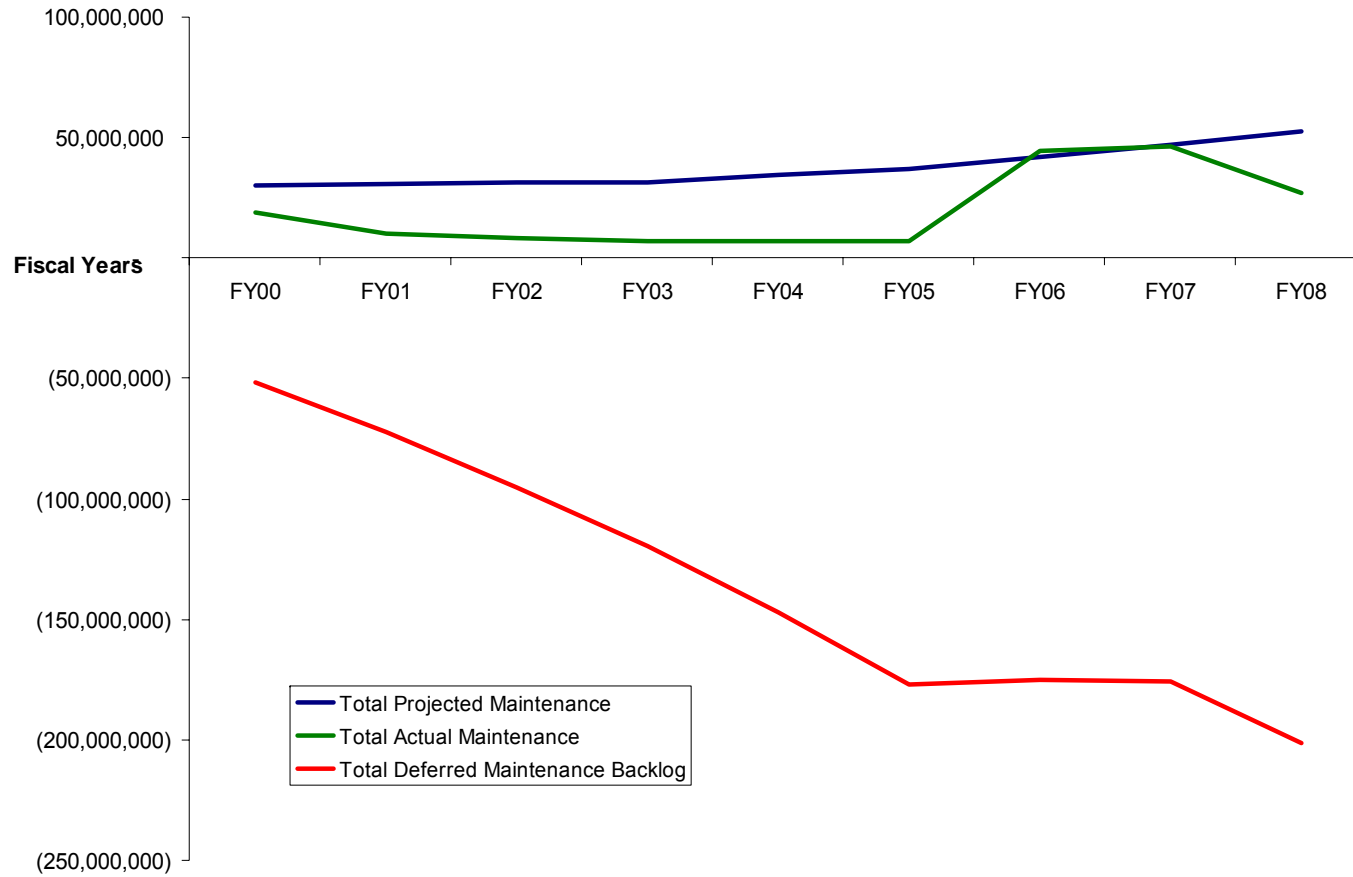


Major Issues

- Deferred Maintenance Backlog
 - Lack of comprehensive physical audit
 - Less than 5% PM activity
 - Insufficient funding profile
- Rising Utility Expenses
 - Electricity
 - Water and Sewage
 - Waste
- Capacity and Throughput
 - Current A&E capacity of \$20M CIP year⁻¹
 - Workforce Configuration
 - Breakdowns are consuming labor hours
 - Staff lacks training to support new technologies

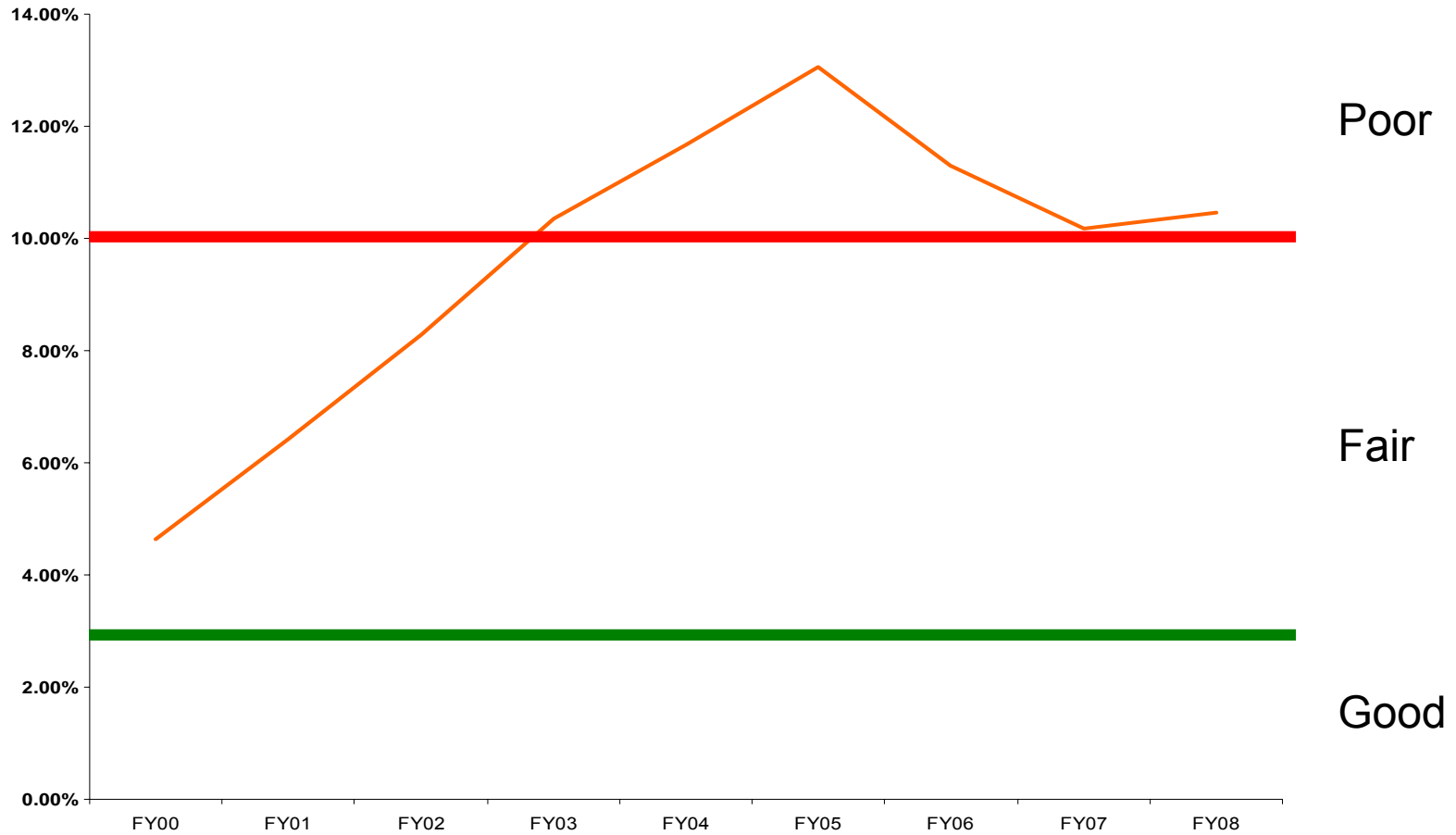


Deferred Maintenance Backlog (GSF)





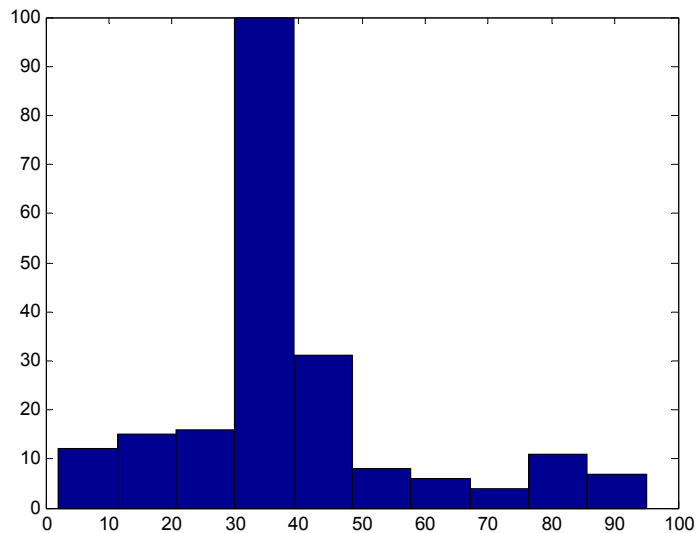
APPA Facilities Condition Index = $\frac{\text{Deferred Maintenance Backlog}}{\text{Current Replacement Value}}$



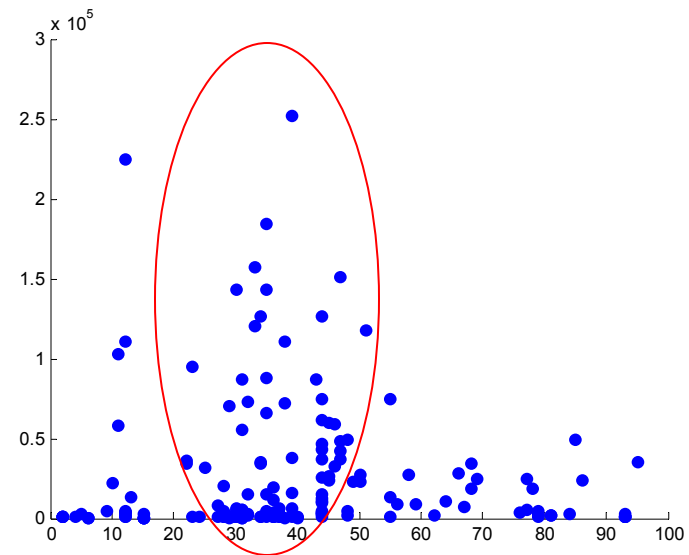


Driving Factors

- Age of buildings (Mean Age 33 years)
- CRV inflation at $>10\%$ year⁻¹ increases Cost ft⁻²
- Insufficient Maintenance and Renewal Investment
 - High Utilization factors



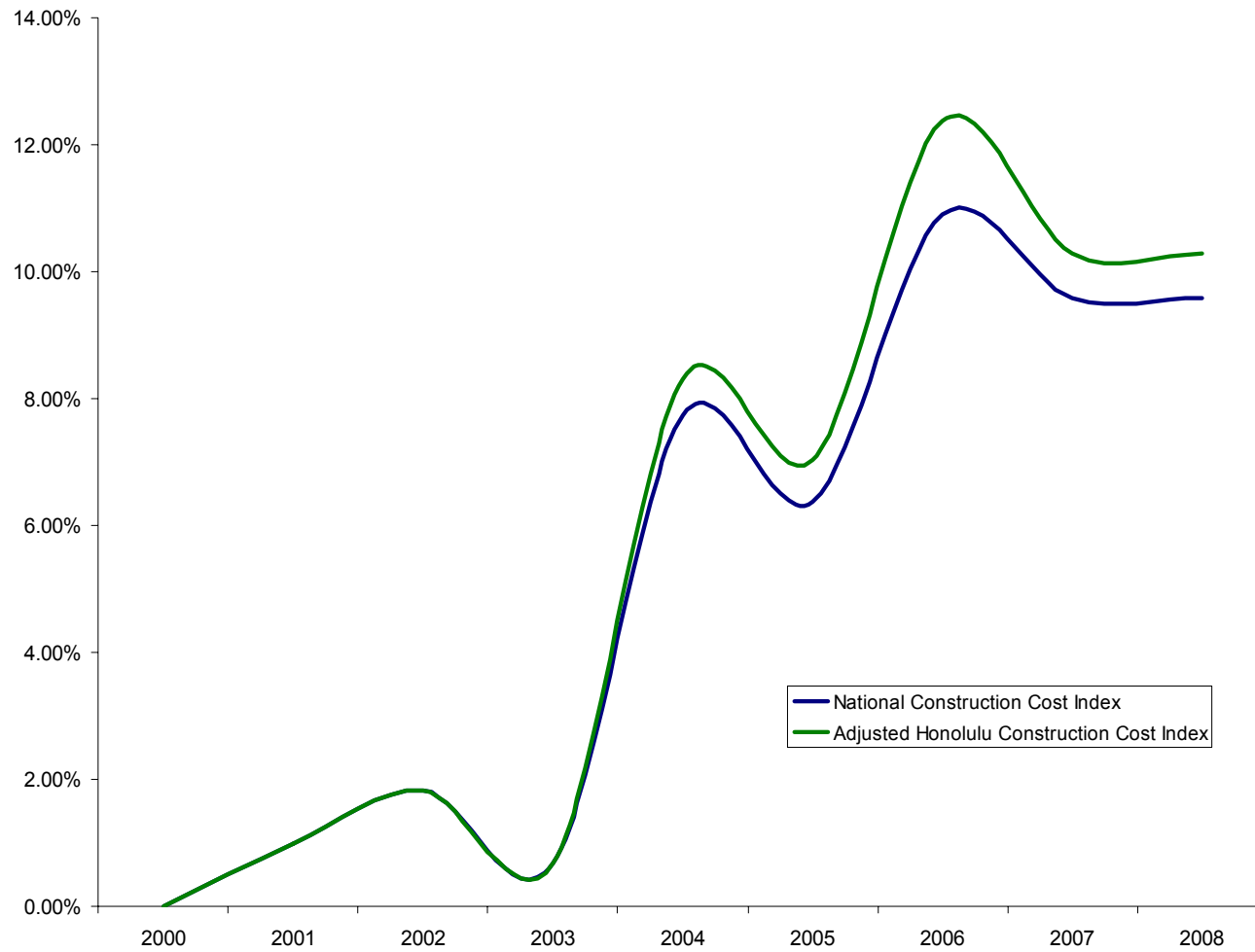
Distribution of Buildings by Age



Scatter plot of Buildings Age by GSF



Percent Change in Construction Costs





UHM Buildings, GSF and CRV

Gross Square Feet (GSF) Current Replacement Value (CRV)

Buildings	Type	GSF	COST ft ²	CRV
37	LAB	1,476,579	477	\$704,328,374
65	CLASS/ADMIN	1,528,682	385	\$588,542,570
78	RESIDENTIAL	1,370,438	361	\$494,727,974
3	PARKING	1,211,800	100	\$121,180,000
5	LIBRARY	404,771	455	\$184,170,805
8	MEDICAL	532,357	750	\$399,267,750
41	SPECIAL	982,325	350	\$343,813,820
12	HISTORIC	168,622	350	\$59,017,700
85	OTHER	224,176	200	\$44,835,280
334	TOTAL	7,899,751		\$2,939,884,272
248	UHM FMO	4,785,156		\$1,924,708,549

Cost Per Square Foot: Rider Hunt Levett & Bailey, *Building Type Unit Costs of Construction*, 2006, plus 15%
Excluded from UHM FMO GSF Totals



Deferred Maintenance Backlog Models

- Whitestone/RLB %CRV \$406,000,000
- Pacific Consulting \$120,000,000 - \$328,000,000
- *APPA AFRA* \$262,000,000
- Whitestone/RLB GSF \$206,000,000
- UHM FMO Identified \$144,000,000

*The Whitestone Building Maintenance and Repair Cost Reference 2007-2008, Whitestone Research, 2007
Quarterly Construction Cost Report, Rider Hunt Levett & Bailey, 4Q2007*



APPA Annual Facility Renewal Allowance (AFRA)

$$\text{Annual Facility Renewal Allowance} = \sum \left(\frac{\text{age}_{25 \text{ year systems}}}{325} \right) (\text{CRV}_{25 \text{ year systems}}) + \sum \left(\frac{\text{age}_{50 \text{ year systems}}}{1275} \right) (\text{CRV}_{50 \text{ year systems}})$$

	CRV	AFRA 25- year Elements	AFRA 50- year Elements	AFRA TOTAL						
UHM Core GSF (1,000)		20%	70%							
4,785	1,924,708	23,688,720	21,134,055	44,822,775						
UHM Facilities Actuals (1,000)		FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08
PM & Repair		7,600	7,400	7,800	7,000	6,900	6,900	6,900	6,900	6,900
Renewal CIP		9,007	2,791	527				37,352	39,426	20,056
AFRA Predicted		29,736	31,301	32,948	34,682	36,508	38,429	40,452	42,581	44,822
DEFERRED MAINTENANCE	(40,000)	(60,729)	(89,239)	(121,660)	(156,342)	(192,850)	(231,279)	(234,379)	(237,534)	(262,300)





APPA Definitions

- *Operations*: Activities related to normal performance of the functions for which a building is used (i.e., utilities, janitorial services, waste treatment, etc.).
- *Maintenance*: Work necessary to realize the originally anticipated life of a fixed asset, including buildings, fixed equipment, and infrastructure.
- *Renewal*: An exchange of one fixed asset for another that has the same capacity to perform the same function. In contrast to repair, replacement generally involves a complete identifiable item of reinvestment (i.e., a major building component or subsystem).
- *Alterations*: Work performed to change the interior arrangements or other physical characteristics of an existing facility or fixed equipment so that it can be used more effectively for its current designated purpose or adapted to a new use.



UHM/APPA Budget Categories

- **Major CIP** is consider either a New Project or an *Alteration*
- **Campus Renewal and Deferred Maintenance (CRDM)** projects are needed to repair and or replace existing systems that can no longer be repaired.
- **Health Safety and Code Requirements (HSCR)** projects are considered *Alterations* if they are upgrades to meet a new requirement
- **Operations** consist of all non-capitalized facility expenses
 - Admin, A&E, CM, BM and Support Labor, Equipment and Supplies
 - Custodial and Groundskeeping Labor, Equipment and Supplies
 - Building Maintenance Labor, Equipment and Supplies including PM and R&M
 - Utilities

However...it's not just what you can afford to repair,
but what you can afford to run



UHM Operations Expense GSF⁻¹ Scenario 2007 – 2027

	UHM 2007	UHM 2017	UHM 2027
FCI Index	10.5%	5.0%	5.0%
Costs GSF⁻¹			
Administration	\$0.29	\$0.44	\$0.59
A&E + CM	\$0.85	\$1.31	\$1.68
Custodial & Grounds	\$1.79	\$2.40	\$3.21
Maintenance Only	\$1.06	\$2.56	\$3.43
Subtotal	\$3.99	\$6.71	\$8.91
	46%	58%	55%
Utilities	\$4.66	\$4.89	\$7.33
	54%	42%	45%
TOTAL Costs GSF⁻¹	\$8.65	\$11.60	\$16.24



Baseline M&R Cost Estimates

	UHM FY08	Whitestone \$/GSF	APPA AFRA	Whitestone \$%CRV
Maintenance				
PM & Minor Repair	4,037,907	13,374,262		22,115,905
Unscheduled Repair	1,047,739	8,406,637		12,607,474
Maintenance Subtotal	5,085,646	21,780,899		34,723,379
Renewal (CRDM)	18,685,000	30,598,143		49,655,137
TOTAL Maintenance and Renewal	23,770,646	52,379,041	74,317,555	84,378,516
Cost Per GSF 4,785,156	4.97	10.95	15.53	17.63

*All Costs include Direct Labor plus Benefits, Supplies, Materials, and External Service Contracts
The Whitestone Building Maintenance and Repair Cost Reference 2007-2008, Whitestone Research, 2007
Quarterly Construction Cost Report, Rider Hunt Levett & Bailey, 4Q2007*



APPA Annual Facility Renewal Allowance (AFRA)

$$\text{Annual Facility Renewal Allowance} = \sum \left(\frac{\text{age}_{25 \text{ year systems}}}{325} \right) (CRV_{25 \text{ year systems}}) + \sum \left(\frac{\text{age}_{50 \text{ year systems}}}{1275} \right) (CRV_{50 \text{ year systems}})$$

	CRV	AFRA 25-year Elements	AFRA 50-year Elements	Predicted Annual Allowance
UHM Core GSF		50%	50%	0.00%
	4,785,156	1,924,708	59,221,802	15,095,753
				74,317,555





M&R Effects on Total Expenses

	UHM FY08	Whitestone \$/GSF	APPA AFRA	Whitestone \$%CRV
Administration	1,373,125	1,373,125	1,373,125	1,373,125
Construction+A&E Costs	2,569,963	2,569,963	2,569,963	2,569,963
Custodial Operations	7,763,299	7,763,299	7,763,299	7,763,299
Landscaping/Grounds	2,292,173	2,292,173	2,292,173	2,292,173
Maintenance and Renewal	23,770,646	52,379,041	74,317,555	84,378,516
Utilities	23,258,904	23,258,904	23,258,904	23,258,904
TOTAL FACILITIES	61,028,110	89,636,505	111,575,019	121,635,980
Cost Per GSF	12.75	18.73	23.32	25.42
4,785,156				

All Costs include Direct Labor plus Benefits, Supplies, Materials, and External Service Contracts



Maintenance and Renewal Implications

- Given the current UHM GSF profile the Maintenance Budget (PM, and Minor & Unscheduled Repair) will require an increase from \$5 million to a minimum \$21M in annual funding and the Renewal Budget (CRDM) must be sustained at a level of between \$30M and \$50M in annual funding *just to prevent further deterioration.*
- In Total, even after spending \$200M-\$400M in Major CIP/Capital Renewal to address the Deferred Maintenance Backlog, the Total UHM Facilities Budget will require an increase from the current annual budget of \$61M to between \$89M and \$120M *just to prevent further deterioration.*



Conclusions

- Current Institutional Model is Not Sustainable
- Increasing Utility (kWh) and Construction Costs (CRV) are creating untenable Cost GSF⁻¹ facility expenses
- UHM Needs to 1) increase facilities funding; 2) decrease Cost GSF⁻¹; **and** 3) decrease Total GSF to match available funding profile
 - *Programs at Risk*
 - *Capital Intensive*
 - *Obsolete Facilities*
 - *Science Output*
 - *Faculty Turnover*
 - *CRV increasing at 10% year⁻¹*



Solution Space

- Increase Physical Plant Budget \$40M → \$80M
 - GIE Share 3.5 % → 14% \$70M
 - Shift Indirect Share 0% → 30% \$10M
 - Create a UHM Facilities Special Revolving Fund*
 - Move to Full Recharge System* (UHFMC)

UHM Facilities Must Become Financially Stable



Solution Space (Cont.)

- Decrease Physical Plant Expenses
 - Reduce GSF⁻¹Utility Expenses by 20% \$4.68 → \$3.74
Retro-Commission Existing Buildings
 - Invest in Energy Efficient High Density Laboratories
Labs21
 - Decommission GSF to Reduce Expense Footprint

For $FCI \geq 5$ and $(\text{Annual Actual Expense GSF}^{-1} \text{ GSF}) \leq 4.0 \times 10^7$

$$FCI = \frac{\sum_{Past}^{Present} [(\text{Annual Calculated Expense GSF}^{-1} \text{ GSF}) - (\text{Annual Actual Expense GSF}^{-1} \text{ GSF})]}{CRV_{Present}}$$

GSF Reduction 4.8M → 2.4M

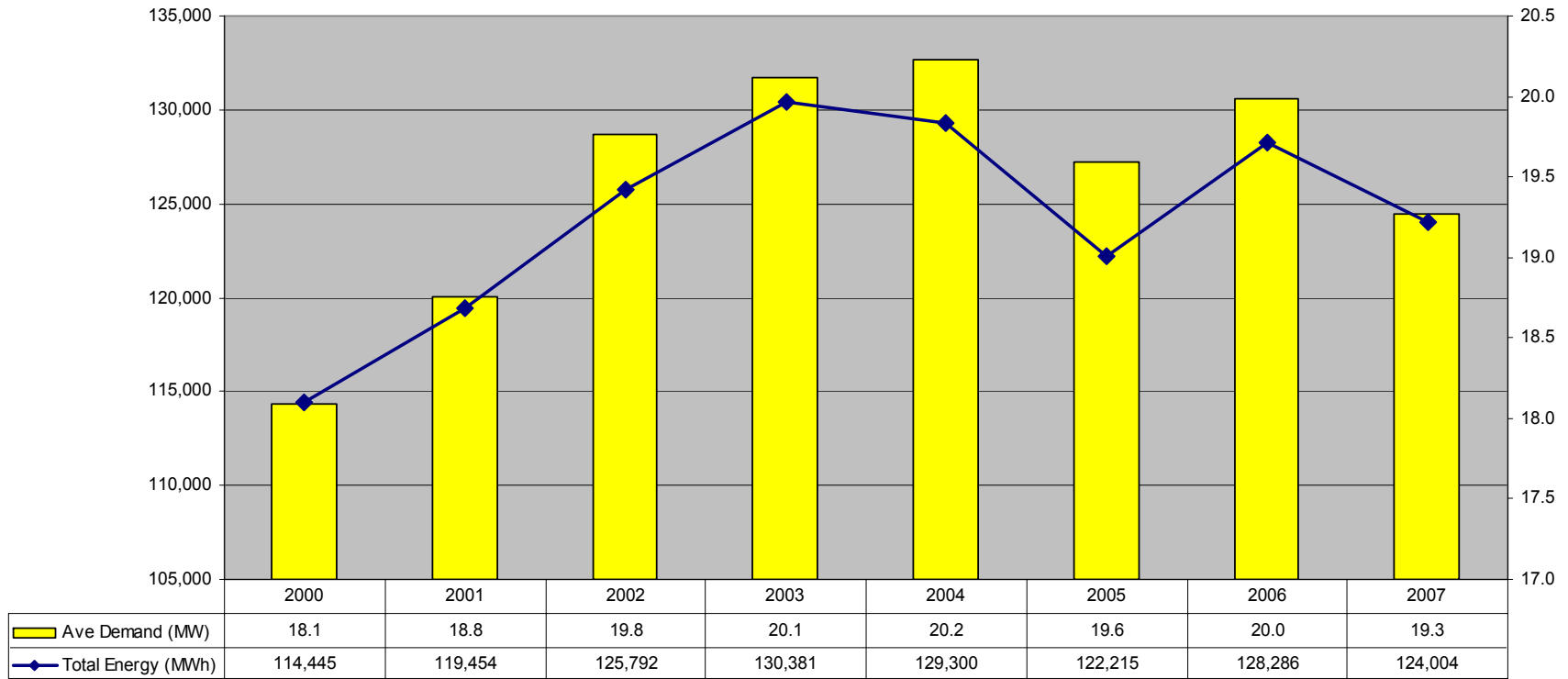


Short-Term Responses

- **Utility Management**
 - HECO “Energy Scout” Interruptible Demand Response
 - Scheduled HVAC Shutdowns
 - Total Building Closures
 - Landscape Reductions
- **Re-Prioritization of available CIP**
 - Building Envelopes – “Stop the Leaks”
 - Building Safety and Mechanical Controls
 - Spend-out of Lapsing funds (\$85M)
- **Re-Prioritization of Maintenance over Renovation**
 - Maintenance (Breakdown and PM) have priority
 - Department Requests (Renovations) on Re-Charged Basis

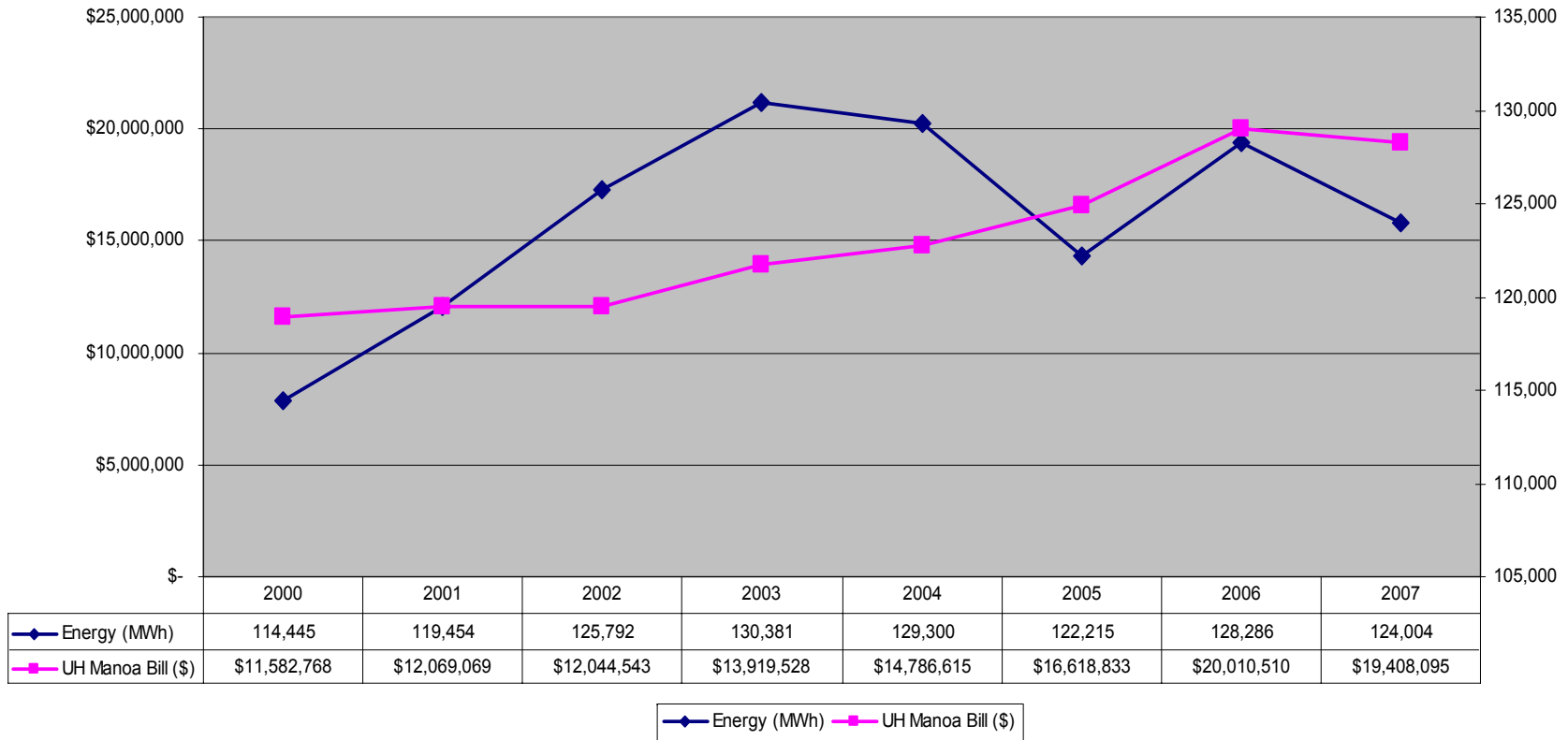


**UH Manoa Facilities (incl Temp Hamilton Library)
8816-2154-076 and 0500-6376-001**





**UH Manoa Facilities (incl Temp Hamilton Library)
8816-2154-076 and 0500-6376-001**





Long-Term Responses

- Improved Operational Efficiencies
 - New CMMS
 - Reorganize into “Maintenance Zones”
- Energy Management Programs
 - Conservation
 - Facility Recharge System
 - Retro-commissioning (RCx)
 - Performance Contracting
 - PPA
- Integrated Strategic Campus Planning
 - Rationalize UH System GSF profile
 - Public-Private Development (Manoa New Campus)



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Questions and Comments



March 2008

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Attachments

1. University of Hawaii – Building Type Unit Cost of Construction, Rider Levett Bucknall
2. Quarterly Construction Cost Report 2007 Fourth Quarter, Rider Levett Bucknall
3. Construction Boom pumps up new lab building costs, *R&D Magazine*, National Academy of Sciences 2007
4. Other Potential Approaches to Deferred Maintenance for Facilities, *Deferred Maintenance*, National Academy of Sciences 2000
5. UHM Deferred Maintenance Model Worksheets for Whitestone/GSF Projections