

# Energy Reduction In Existing Buildings

## GMU's Energy Performance Contract A Case Study

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# Energy Performance Contracting

- **Authorized procurement - Code of Virginia § 11-34.3**
- **Encouraged by Executive Order (54 and 48)**
- **Financed infrastructure investments paid from avoided utility costs**
  - Energy utilities (electricity, natural gas, fuel oil, etc)
  - Non-energy utilities (water/sewer)
  - Qualified O&M savings
- **Performance Guaranteed**
  - Requires Measurement and Verification (M&V) of savings
  - Savings reported to COV annually
- **Competitively bid from pool of COV qualified ESCOs**
- **Requires BCOM and DMME review**
- **Maximum contract term – 20 years**

# Phase I

**Total Investment** **\$12,215,500**

Lighting

Water Conservation

Central Plant Chiller Upgrade

Thompson Hall Chiller/Boiler Upgrade

HVAC Reconditioning/Repair/Replacement/Upgrade

Energy Management Systems Expansion/Upgrade

Loop Conditioning/Coil Cleaning

**Savings During Construction** (1time) **\$145,000**

**Annual Guaranteed Savings** **\$1,169,500**

Energy/Utilities

**\$997,100**

Operational & Maintenance

**\$172,400**

**Contract Term**  
**years**

**15**

# The Results

**Total Investment** **\$12,215,500**

**No Change Orders**

**No Schedule Delays**

**Savings During Construction (FY 06)** **\$783,000** (540%)

**1<sup>st</sup> Year Savings (FY 07)** **\$2,043,090** (175%)

**Energy/Utilities** **\$1,870,711** (188%)

**Operational & Maintenance** **\$172,400** (100%)

## **Savings in Excess of Guarantee**

**Savings During Construction** **\$571,228**

**Annual Energy/Utilities** **\$873,640**

# Savings by ECM Category

<b>ECM Category</b>	<b>Electricity (KWH)</b>	<b>Natural Gas (DTherm)</b>	<b>Water/Sewer (Kgal)</b>
Lighting/Lighting Controls	7,765,670		
Water Conservation			64,495
HVAC - Central Plant	3,536,381		
HVAC - Individual Facility Upgrades, Reconditioning and Recommissioning	3,607,112	69,794	
High Efficiency Motors	284,648		
BAS Upgrades	Savings were attributed to other ECMs		
Vendmizers™	149,438		
<b>Total Annual Savings</b>	<b>15,343,249</b>	<b>69,794</b>	<b>64,495</b>
Baseline Consumption (FY04)	98,196,000	224,344	150,420
Percent Reduction	15.6%	31.1%	42.9%

# Benefits To The University

- ✓ **Increased Central Plant Cooling Capacity**
  - From 3,200 → 4,900 tons
  - New chillers & towers installed *before* summer load
  - Accommodate campus expansion
- ✓ **Central Plant Optimization**
- ✓ **Enhanced Energy Accounting**
  - Submetering most buildings (electricity, CHW, HTHW)
  - Utility bill verification; Cost allocation
  - Measurement & Verification
- ✓ **Increased Cooling Capacity**
  - Johnson Center Library
  - Science & Technology I & II Server Rooms
  - Mason Hall →
- ✓ **Upgraded boilers, chillers/towers in Thompson Hall**

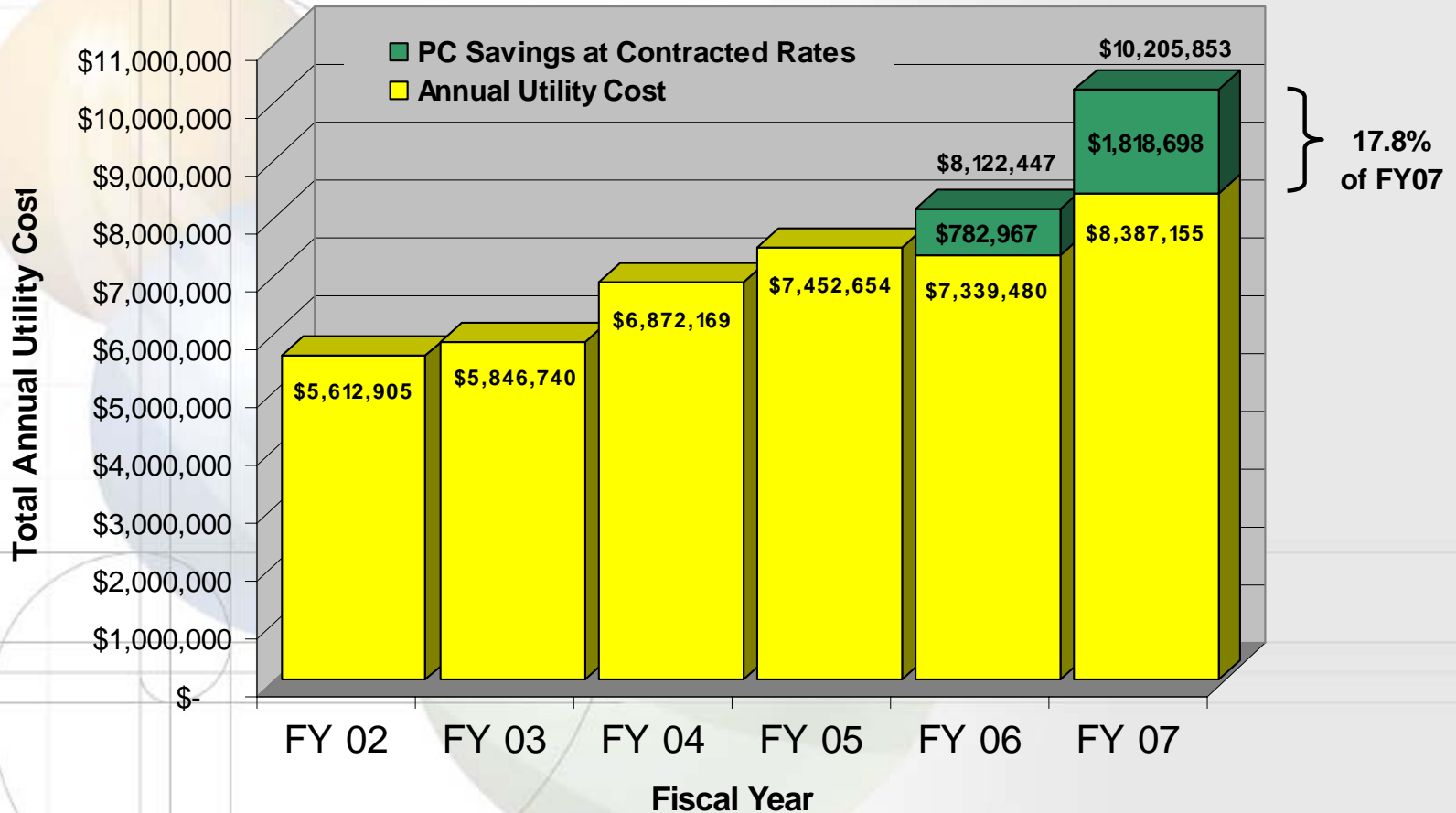
# Benefits to GMU Quality of Life

- ✓ Improved Lighting Levels and CRI
- ✓ Improved Temperature/Humidity Control
- ✓ Improved Indoor Air Quality
- ✓ Flexibility of Operations
- ✓ Reduced Air Emissions

	Annual	15 yr Term	Equivalent
CO <sub>2</sub>	29,152,173 lbs	437,282,591 lbs	} 2,522 Cars off the Road or 3,976 Acres of Forest
SO <sub>2</sub>	133,333 lbs	1,999,992 lbs	
NO <sub>x</sub>	76,716 lbs	1,150,744 lbs	

- ✓ Improved Environmental Impact / Sustainability

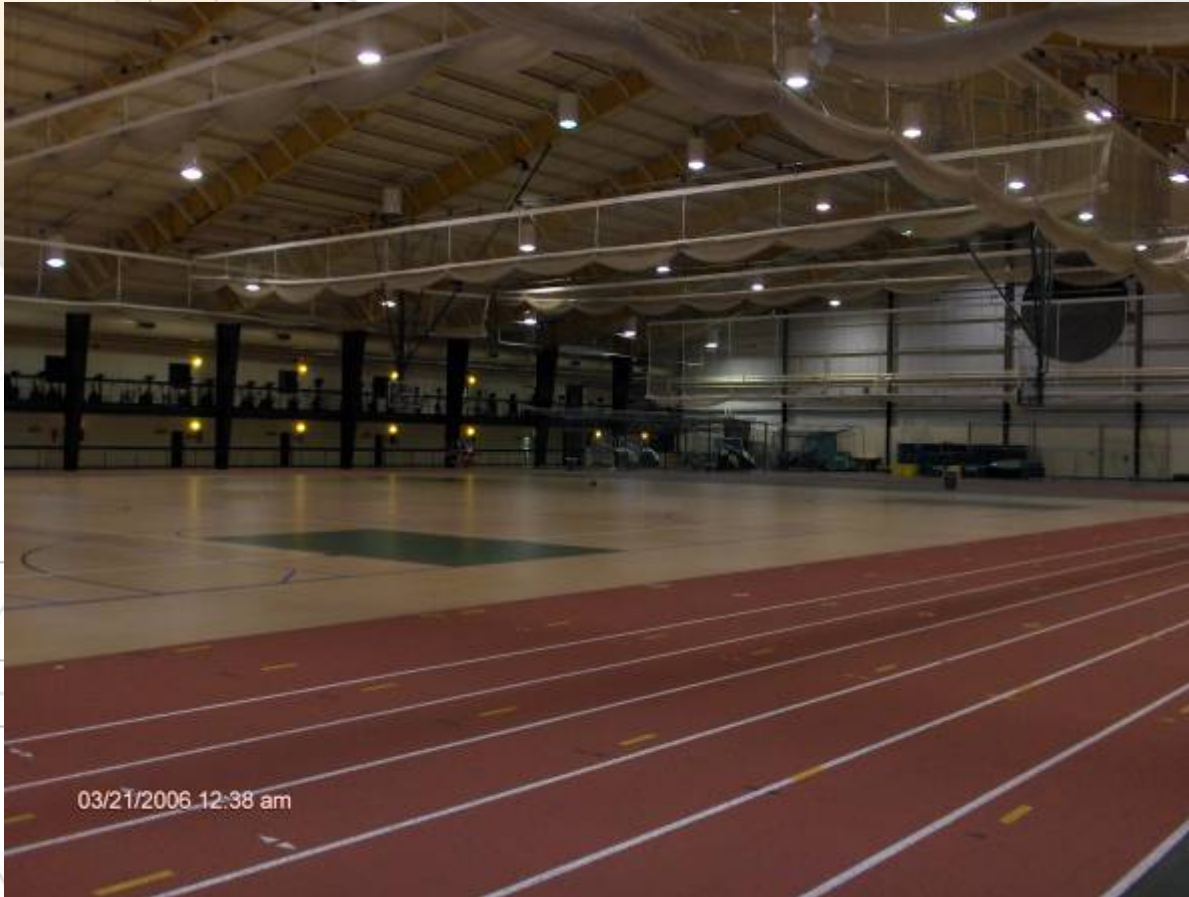
# Impact to the Utility Budget & EO 48



Per EO 54 - FY 06 savings are a **13.9%** reduction from FY 02 baseline  
 Per EO 48 - FY 07 savings are a **24.8%** reduction from FY 06 baseline

# Benefits to GMU Quality of Life

## Field House Lighting



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## Field House Lighting



# Benefits to GMU Quality of Life

## Krasnow Hall Lighting



# Benefits to GMU Quality of Life

## Krasnow Hall Lighting



# Benefits to Operational Control

## Central Plant Chiller & Cooling Tower Upgrades



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## *Drivers:*

- **Executive Order 48 – Energy Reduction Goals**
  - Reduce annual cost of non-renewable energy purchases by at least **20 percent** of 2006 expenditures by fiscal year 2010.
  - Any agency/institution that can demonstrate to DMME that they met the **10 percent** energy savings goal established for 2006 in Executive Order 54 (2003) shall reduce costs of non-renewable energy purchase by an additional **15 percent** of 2006 expenditures by fiscal year 2010.
- **GMU’s Environmental Sustainability Goals**
  - LEED Certification design guides
  - Climate neutrality goals of the *American College and University Presidents Climate Commitment*

## Phase II Scope

- **Building Recommissioning**
- **Chilled Water Demand Flow**
- **Demand Limiting**
- **Outdoor Lighting Upgrade to LED**
- **Storm Water Capture**
- **Automated Irrigation Systems**
- **Green Roof**
- **Solar PV/Thermal**
- **Alternative fuels**
- **Other LEED / Green Building Initiatives**



Questions?