

BENEFITS OF A CAMPUS WIDE SUSTAINABILITY EFFORT

LONGWOOD
UNIVERSITY

MOSELEYARCHITECTS
A PROFESSIONAL CORPORATION



Presenters

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Why This Presentation?

- Campus Perspective
- Sustainability at Longwood University
 - Campus-wide Initiatives
 - LEED Gold Heath and Wellness Center
- Performance Results
- Life Cycle Savings
- Lessons Learned



Campus Perspective

- Higher education can play a critical role in sustainable development and serve as a model by fully integrating sustainability into all aspects of campus life.
- “Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” ¹

¹Report of the World Commission on Environment and Development, Our Common Future, 1987

Higher Education's Involvement

- Ability to inspire and mold current & future *Citizen Leaders*
- Can influence communities outside of their own
- Devoted to new ideas, research, discovery, and freedom of thought
- Has the mass & diversity of skills necessary to affect change
- 4,276 U.S. Colleges and Universities with over 17.9 million students¹

¹ From: 2005 Digest of Education Statistics, US Dept. of Education.

- In 2006 Higher Education was responsible for 67% of the Commonwealth's public expenditure for energy²

²2006 Report on Energy Conservation by State Agencies, Executive Order 54



What Longwood is Doing



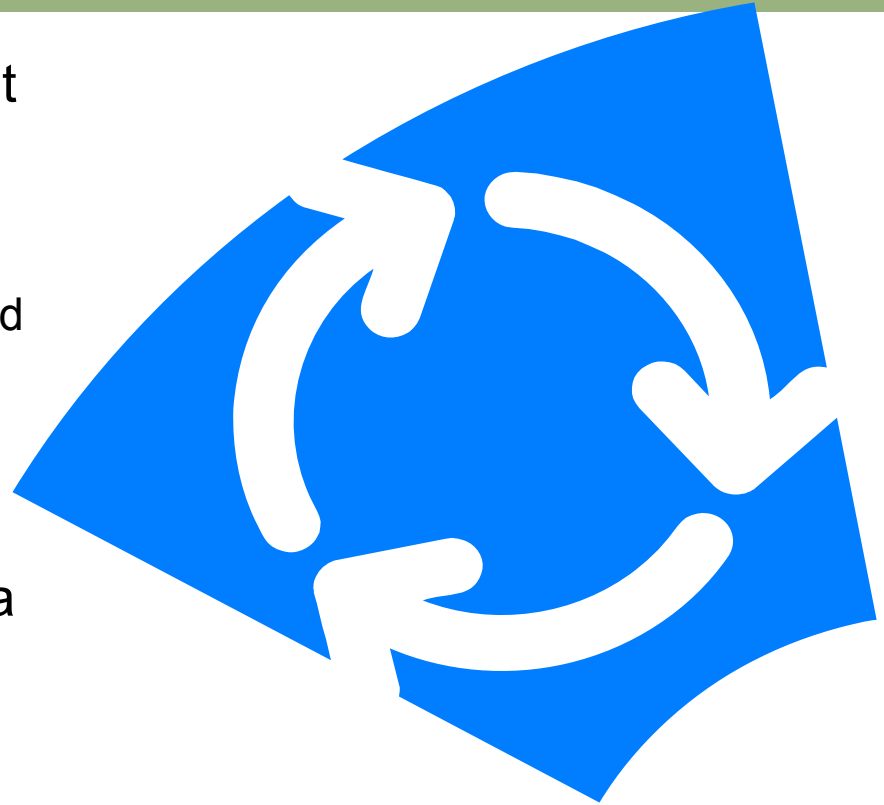
Sustainable Development

- Boiler Plant – Biomass
- Parking Garage – Green Roof
- Dorrill Dining Hall – Geothermal Heating & Cooling
- Health & Fitness Center – LEED Gold Certified
- Bedford Addition and Renovation – LEED Silver targeted design
- Green Space Enhancement
- Wheeler Hall – 29% water use reduction
- Regional Cooling



Sustainable Operations

- Reducing the Carbon Footprint
- Conserving Energy
 - High Efficiency Lighting
 - Laptops vs. Desktops
 - Focus on Building Envelope and Mechanical Upgrades
- Reuse & Recycle
- Landscaping & Grounds Management
- Storm Water Management at a Regional Level
- 'Green Seal' Cleaning Supplies
- Organic Waste Management



Sustainable Education

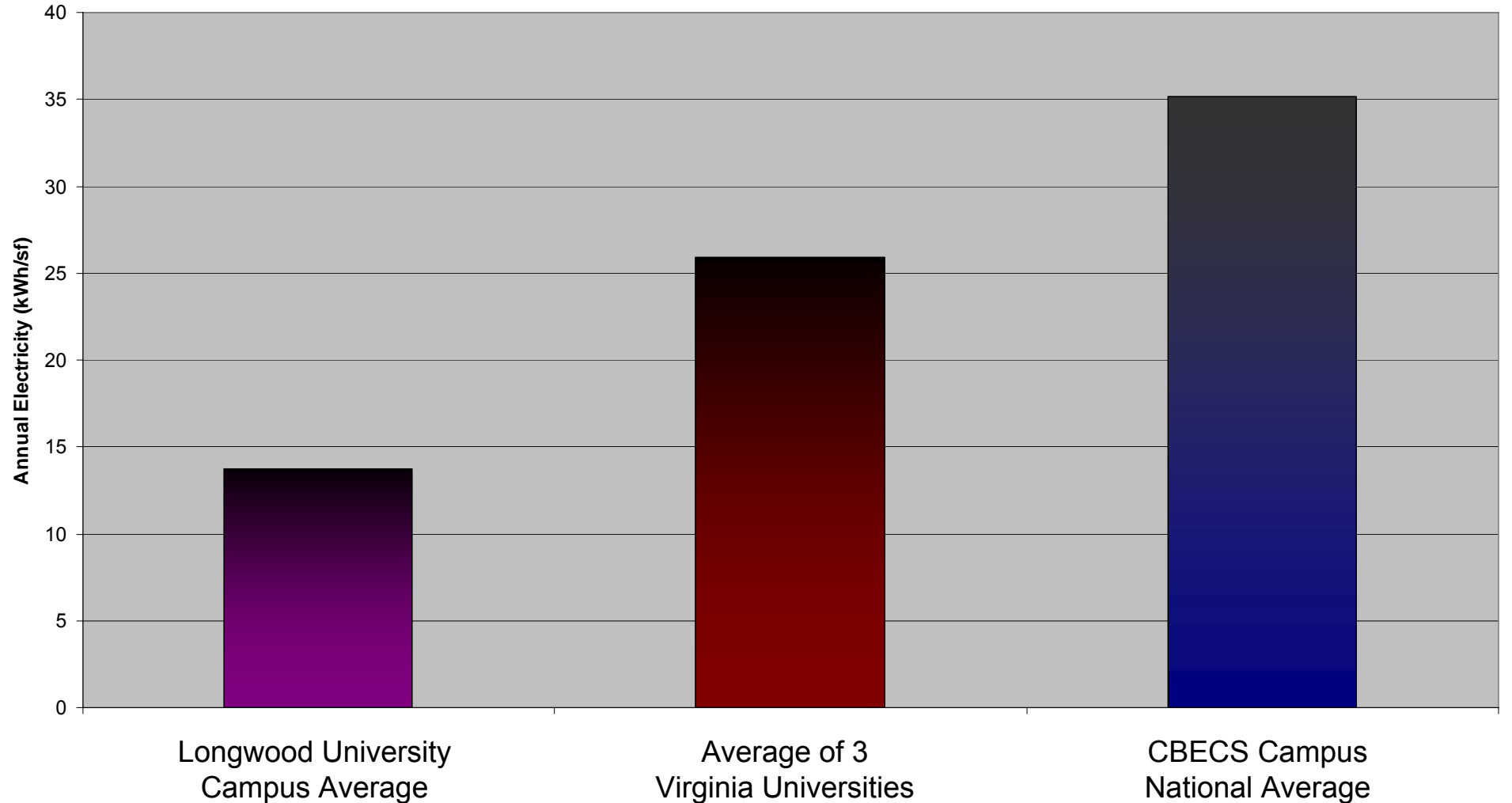
- Two-Year Academic Theme
 - Longwood Seminar & First Year Experience
 - American Democracy Project
 - Leadership Program
 - Major Speakers will Focus on Sustainability
 - New Employee Orientation
 - Recognition Program
 - Modification of General Education Courses
- Sustainability Committee
- Sustainability Program Office
- Student Involvement
 - Research
 - Assignment
 - Engagement



Is It Working?

- In 2006 Longwood
 - Ranked 11th among 58 reporting Commonwealth agencies for energy efficiency
 - Ranked 3rd among Commonwealth public higher education agencies for energy efficiency
 - Consumed 32,492 BTU's of total energy per building GSF (2003 DOE average for education buildings between 10,000 and 100,000 GSF was 78,600 BTU's per building GSF)
 - Consumed 13.14 kWh of electrical energy per building GSF (includes all electrical consumption)
- In 2008 Longwood has already surpassed EO48 Goal !

Campus Annual Electrical Energy Use Average



Moseley Arch – collected data

Dept of Energy - Commercial Building Energy Consumption Survey



2020 Campus Master Plan

- Water
 - Develop a University Water Management Policy
 - Reduce Storm Water Runoff
 - Reduce Storm Water Contaminates Leaving the Site
- Material Flows
 - Reduce the Amount of Non-food Waste
 - Reduce the Amount of Food Waste
 - Reduce the Amount of Nutrients Purchased for Landscaping
- Energy and CO2
 - Reduce Greenhouse Gas Emissions
 - Reduce the Annual cost of Non-renewable energy purchases
 - Improve the fuel efficiency and reduce the carbon emissions from fleet vehicles
- Transportation
 - Reduce the number of cars brought by commuter students, faculty and staff
 - Increase bicycle and pedestrian trips
 - Reduce carbon emissions related to vehicle trips to/from Longwood University



THE QUESTION

Can the University incorporate environmentally-friendly and energy-conservation measures into its rapid physical development at an acceptable cost (initial & life cycle), consistent with the institution's design standards, and produce an effective live/work/learn environment for our students, faculty and staff?



HIGH PERFORMANCE

Longwood University

Student Health & Fitness Center



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Longwood University

Student Health & Fitness Center



Project Goals

Provide a first class health and fitness facility for students and staff

Meet the objectives of Longwood University's Green Campus program

First higher ed health and fitness/recreation facility in SE to earn LEED Gold certification

Serve as pilot project for greening of Longwood University's campus

LEED Points	Energy Points	D+C Cost	LEED Premium	Annual Savings	Payback
39	10	\$14.3M	\$158k	\$58k	2.7 yrs



Longwood University

Student Health & Fitness Center



Sustainable Design Features

6 Sustainable Site points – site, parking, bicycle, stormwater quantity

Over 40% water use reduction – Ultra Low flow fixtures (2 points + 1 innovation)

10 Energy Points – 7 for optimum energy performance (43% projected energy savings over AHRAE baseline)

11% of project energy supplied by Bio-fuels (2 points)

Over 97% Construction Waste Management – major components used as structural fill for Farmville Water Treatment Plant or Recycled. (2 points)

Over 28% recycled content. (2 points + 1 innovation)

54% local / regional manuf. materials (2 points + 1 inno)

10 indoor air quality points (CO2, Thermal comfort, low emitting materials)

LEED Points	Energy Points	D+C Cost	LEED Premium	Annual Savings	Payback
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Challenges

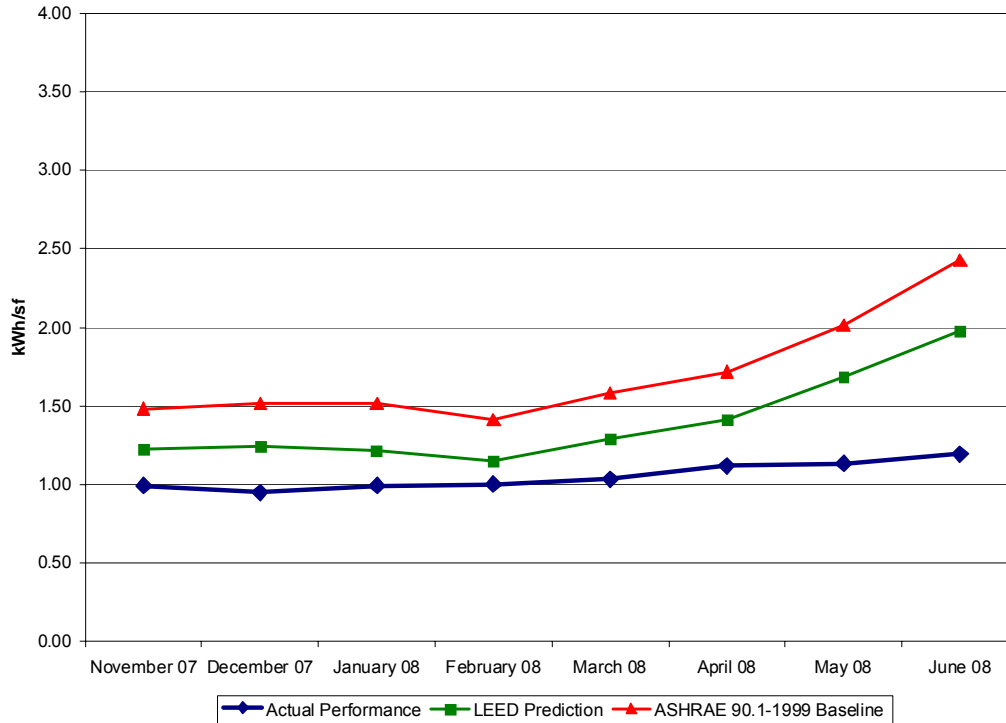
- Performance Data Retrieval
 - Energy Monitoring Software
 - Record and store data from day one
 - Insufficient monitoring sensors
 - Multiple energy sources
 - Water
 - Special process loads
 - Understanding the Data
 - Performance “Anomalies”
 - Downward or Upward Trends
- Relevant Benchmarking
 - ASHRAE 90.1-1999
 - “Apples to Apples”
 - Commercial Building Energy Consumption Survey, Campus Average, etc.



Longwood University

Student Health & Fitness Center

LONGWOOD HEALTH AND FITNESS
ENERGY PERFORMANCE

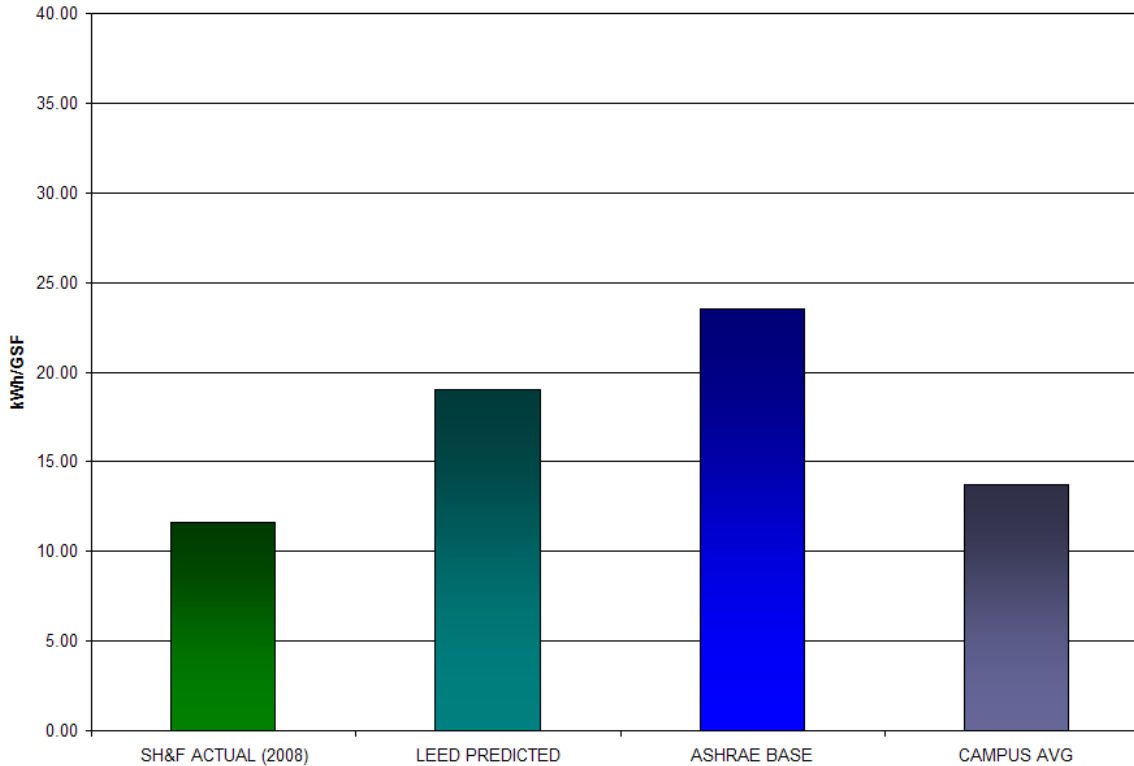


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Longwood University

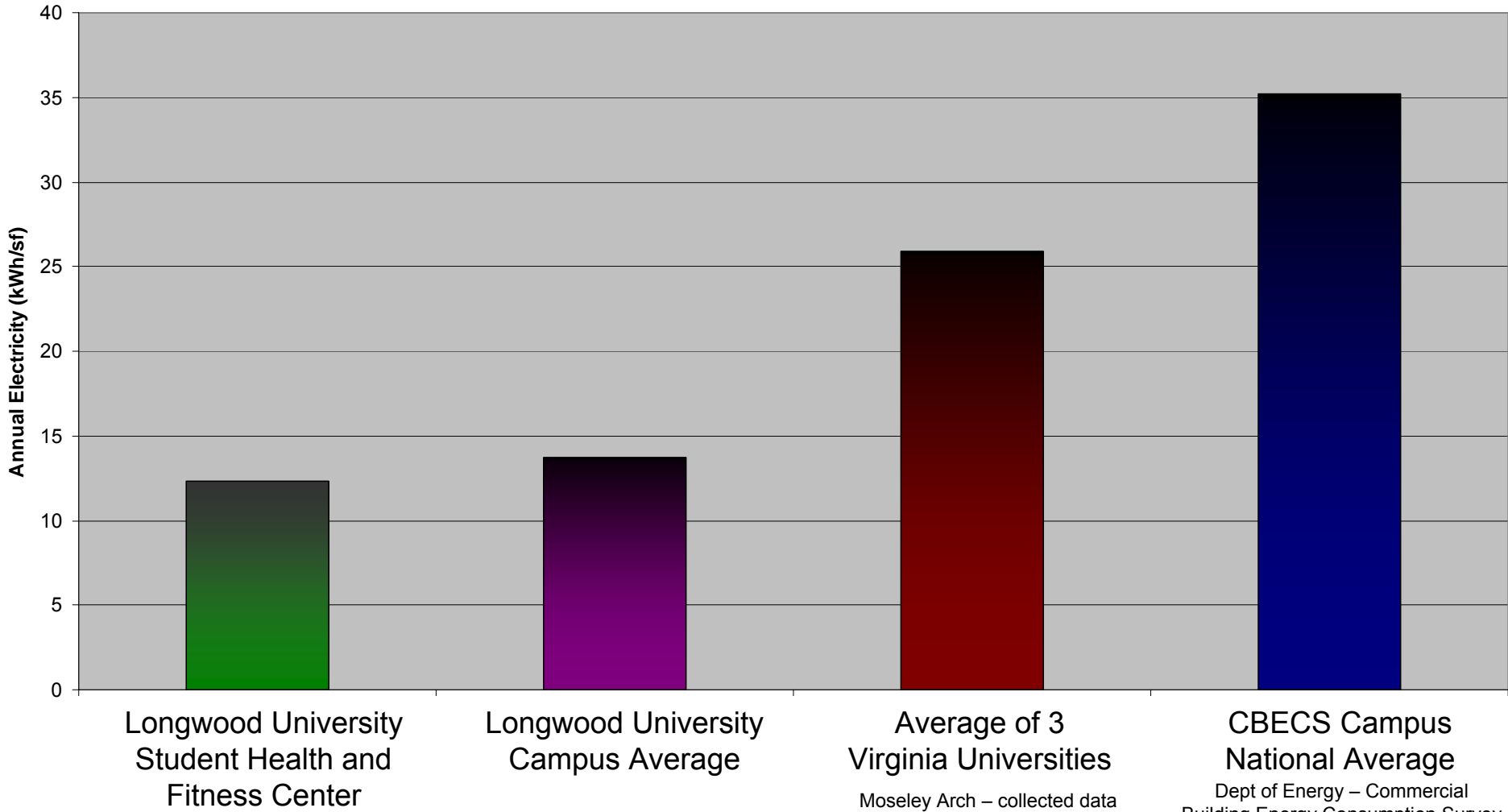
Student Health & Fitness Center



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HIGH PERFORMANCE

Annual Electrical Energy Use Average



Longwood University

Student Health & Fitness Center

Estimated Annual Reductions

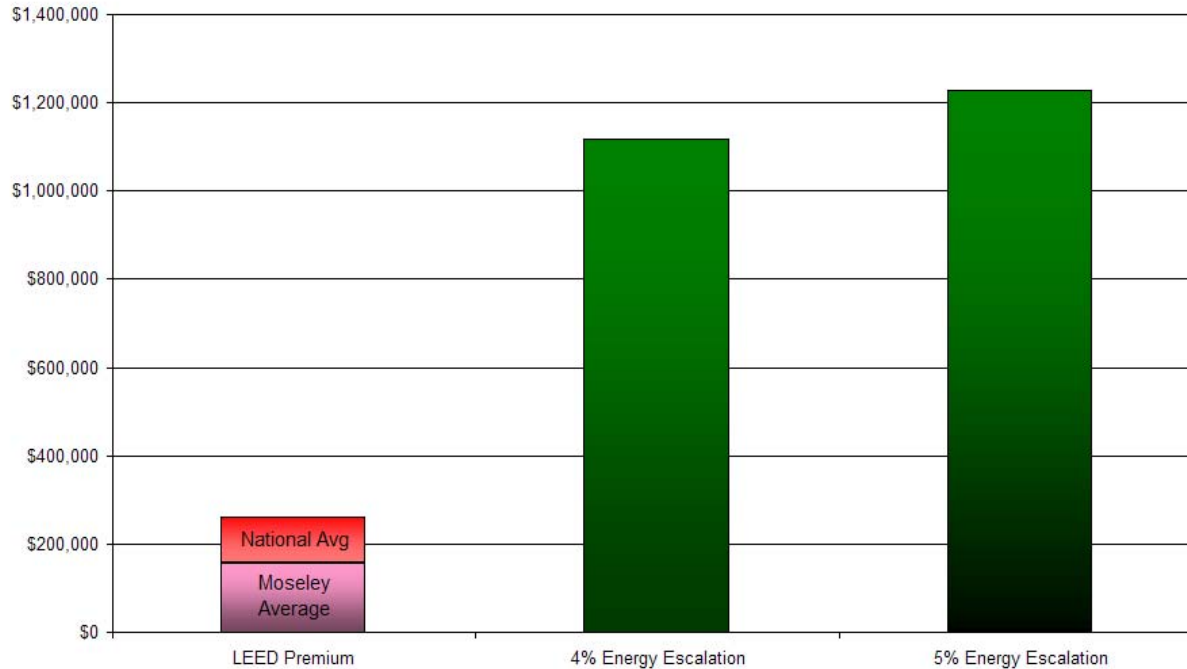
Electricity Reduction	Carbon Reduction*
831,248 kWh <small>(ASHRAE 90.1-1999)</small>	623 tons CO2

*according to www.carbonify.com

LEED Points	Energy Points	D+C Cost	LEED Premium	Annual Savings	Payback
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Longwood University Student Health & Fitness Center

20 Year NPV Energy Savings Projection
Longwood Univ Health & Fitness Center
(4% discount rate)



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Lessons Learned – Design and Construction

- Design Phase
 - Importance of sub-metering energy and water, especially when there are specific large loads (like a natatorium or data center) in the building
 - Importance of verifying that all control sequences are programmed
 - Importance of ensuring that trend logs are programmed, functional, and data is easy to understand
 - Importance that AE has remote access to trend logs, to ensure post certification relationship



Lessons Learned – Design and Construction

- Construction Phase
 - Importance of verifying that all meters and sub meters are installed
 - Prior to issuing Certificate of Final Completion, require GC/Controls Subcontractor/ to provide 2 – 3 months of building energy performance and water consumption reports validating that M&V equipment/software is operational



Reflections on Post Occupancy Evaluations

Developing a baseline can be challenging!

ASHRAE baselines

- Pro: ASHRAE baselines and design models allow “apples to apples” comparisons regarding specific design choices
- Con: ASHRAE baselines are based on many design assumptions, which may or may not play out in reality

Existing Building baselines

- Pro: Existing Building baselines allow “building to building” comparisons in similar climate conditions (which is good)
- Con: Existing Building baselines need to be normalized for size differences, ventilation rate differences, and plug load differences

Campus Average baselines

- Pro: Campus Average baselines allow “specific building” to “existing building average” comparisons in similar climate conditions
- Con: Campus average baselines can be complicated by the fact that buildings on campus have different uses, different levels of conditioning/ventilation.



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