

Green Buildings Make Cents

MOSELEYARCHITECTS

Jay Moore, Vice President, AIA
Carrie Webster, Environmental Analyst, LEED AP

Virginia Association of Counties
Annual Conference

November 10, 2008

PERCEPTION



Third Creek Elementary School
LEED-NC v2.0 Gold
MOSELEYARCHITECTS



REALITY

T.C. Williams High School
LEED-NC v2.1 Registered
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REALITY

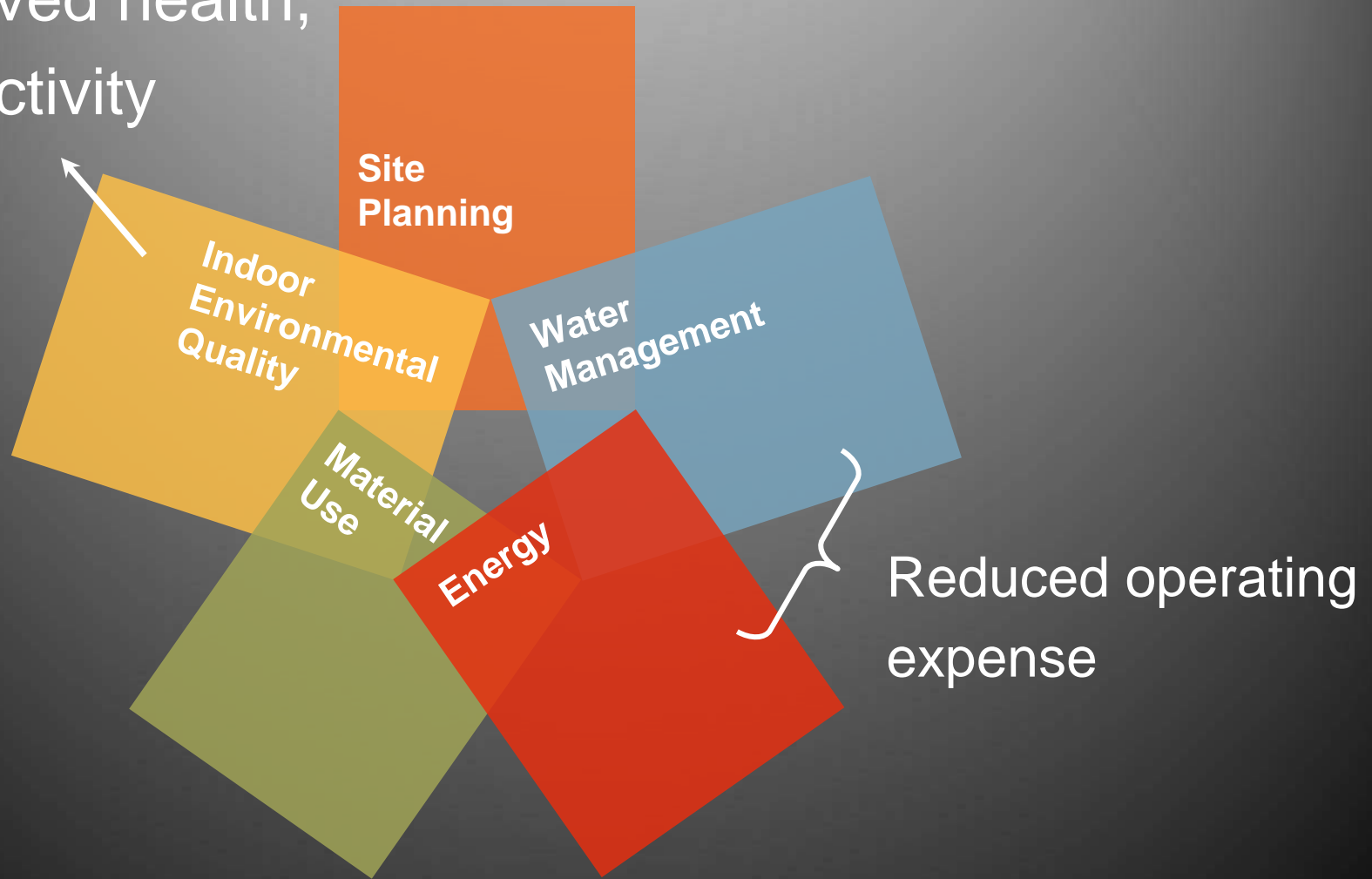
Chesterfield County Community Development Customer Service Center
LEED-NC v2.1 Certified
MOSELEY ARCHITECTS



REALITY

What Makes a Building 'Green'?

Improved health,
productivity



Green Design = High Performance Design = Sustainable Design

How Is Green Measured?

ENGINEERS NON PROFIT LEADERS INTERIOR DE
PRODUCT MANUFACTURERS ARCHITECTS CODE OFF
PROPERTY MANAGERS FEDERAL, LOCAL, AND STATE
GROUNDSKEEPERS CAPITAL PLANNING STAFF GR
LANDSCAPE ARCHITECTS UTILITY MANAGERS PLANNERS
BUILDING TENANTS FINANCIAL PLANNERS BUILDING
CODE OFFICIALS PRODUCT MANUFACTURES ENGINE
BUILDING OWNERS INTERIOR DESIGNERS BUILDING
OFFICIALS FEDERAL, LOCAL, AND STATE GOVERNMENT
LEADERS PROPERTY MANAGERS NON

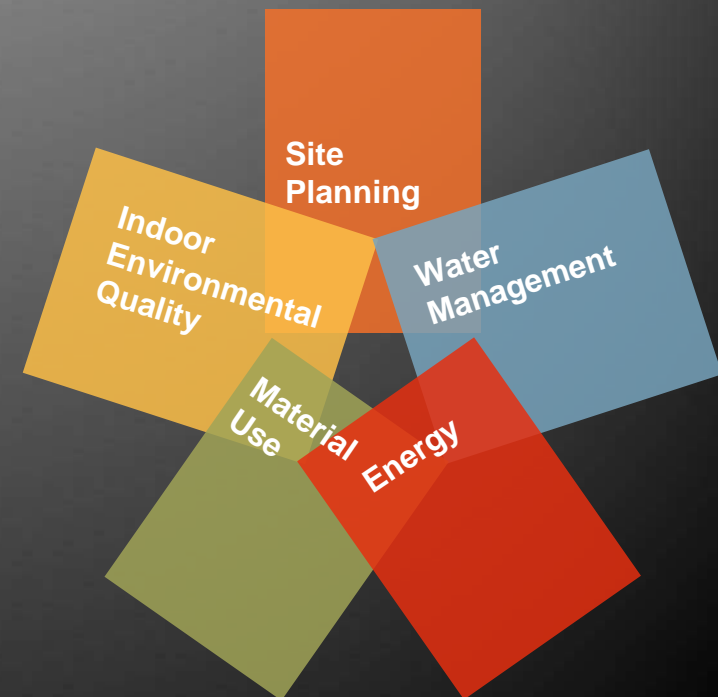
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Together comprise the US Green Building Council (USGBC)

How Is Green Measured?



Leadership in
Energy and
Environmental
Design

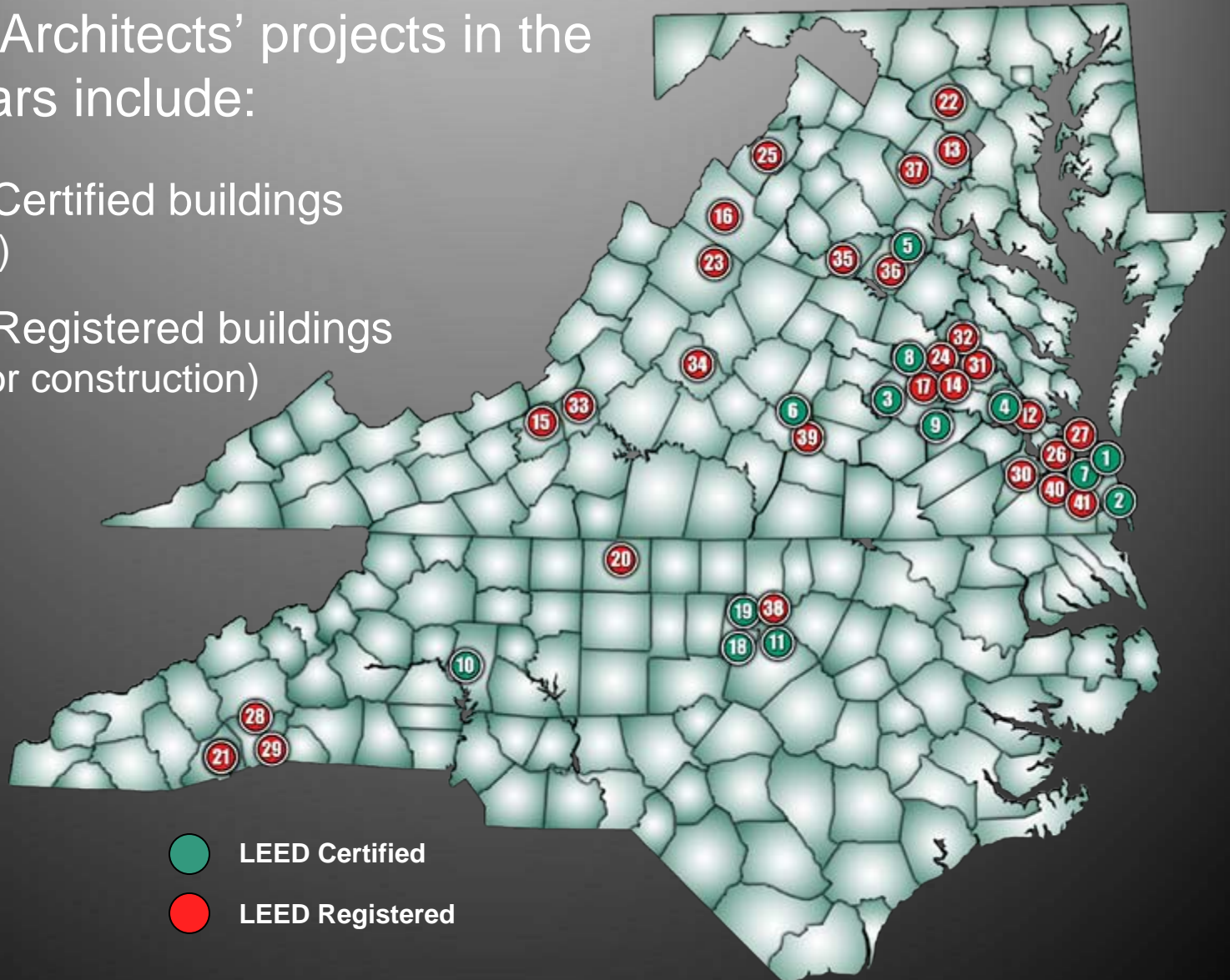


Green is Going Mainstream

Moseley Architects' projects in the last 8 years include:

13 LEED Certified buildings
(completed)

28 LEED Registered buildings
(in design or construction)



Green is Going Mainstream



Isle of Wight County Courts Facility



Shenandoah County District Courts Building



Amherst Adult Detention Center
(Blue Ridge Regional Jail Authority)

Green Building Policies in Virginia

VIRGINIA BEACH GREEN RIBBON IMPLEMENTATION COMMITTEE RECOMMENDATIONS
REPORT TO CITY COUNCIL
July 1, 2008
Page 26

ITEM #6: GREEN BUILDING GUIDELINES

Green Building Guidelines – LEED Certification for City Building Capital Projects

Background: The Green Ribbon Committee Report recommendation for this item is as follows.

"Require LEED Certification (U. S. Green Building Council's Leadership in Energy and Environmental Design) for all new City buildings."

Considerations: The City Council formally received and accepted the Green Ribbon Committee report on December 4, 2007. One of the recommendations included in that report was to implement a "green building" certification program. Likewise, the Mayor of the City of Virginia Beach has signed the U.S. Mayors Climate Protection Agreement resolution which provides for Practice and promote sustainable building LEED program. Further, the Virginia program which includes the a facilities.

Whenever technically and fiscally possible, square feet of conditioned space and employees will be designed and constructed. The level of LEED certification from C basis with consideration of the opportunity functions of the proposed site and building Capital Improvement Program (CIP). available project budget.

The Public Works Department Facilities Department Director stakeholders (i.e. the Management Services Department) will be included in the LEED certification

Recommendation: City staff has developed U. S. Green Building guidelines for C
Attachments: Draft Administrative D



Chesterfield County, Virginia

James J. L. Stegmeyer, County Administrator

9901 Led Road - P.O. Box 46 - Chesterfield, VA 23832-0046

Phone: (804) 748-1211 - Fax: (804) 717-6297 - Internet: chesterfield.gov

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North District

MEMORANDUM

TO: Leadership Distribution List
FROM: James J. L. Stegmeyer, County Administrator
DATE: May 12, 2008
SUBJECT: Sustainable (LEED) Building Guidelines

I am pleased to report that the county has made an informed decision to consider environmental and sustainability factors for future construction of county facilities. The progression of sustainable building practices has reached the point that environmentally conscious building has many proven benefits. In addition, these practices have a logical extension of building high quality buildings. As a government, we build long-term and therefore we must consider all of the implications of operating buildings, including the impacts on the environmental, human, and financial resources with which we are entrusted.

The attached Sustainable Building Guidelines have been developed to guide the design and construction of new buildings, and the upcoming CIP development process. The Leadership Team meeting on April 15 yielded several modifications to the original draft, which have been incorporated into this document. Furthermore, the Board of Supervisors confirmed the county's commitment to sustainable building practices, and the use of the LEED criteria, at the April 23, 2008 meeting.

COMMONWEALTH OF VIRGINIA



OFFICE OF THE GOVERNOR

Executive Order 48 (2007)

ENERGY EFFICIENCY IN STATE GOVERNMENT

Importance of the Initiative

Commonwealth agencies and institutions spent over \$290 million in fiscal year 2006 for facility and transportation energy. It is critical that the Commonwealth use energy in the most efficient manner possible to save taxpayer money and provide leadership to all Virginians in using our natural resources wisely. Improvements in energy efficiency and protection of our priceless natural resources are inseparable goals. Reducing the amount of energy we consume will reduce the emission of greenhouse gases that are largely responsible for global climate change. State government has the capacity and responsibility to save taxpayer money while protecting our climate and natural resources for future generations.

The Commonwealth's citizens, businesses, and governments are also faced with managing the effects of more costly and less reliable supplies of energy, as well as the environmental effects of energy production and consumption. In response, the General Assembly enacted into law in 2006 a state energy policy and directed the Department of Mines, Minerals and Energy to develop the Virginia Energy Plan. This requires coordination of energy activities among many private organizations and state agencies and institutions.

Green Building Policies in Virginia

VML's Green Government Challenge reflects this growing trend:

Green Building

- | | |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 | Establish a policy of LEED certification for all new government facilities See background materials |
| 10 | Approve or build a LEED certified government or school building OR renovate an existing building to the LEED certified level. See background materials |

Out of 39 entries,

N = 15 (39%)

N = 18 (46%)

Many localities have several green buildings ea. (32 total)

NACo Support for Green Building



How Counties Are Going Green: An Overview of NACo's Green Government Initiative



Green Government

An Initiative of the National Association of Counties



develop services, policies, counties helping deliver the economic benefits communities. Conducted by the National Association of Architects (AIA), living in the country's program. The study has increased by years.

of Energy (DOE) buildings as "those designed for any use other than farming, or agriculture from schools to grocery stores." Commerce the environment, worker productivity STAR®, a product Environmental EPA), commercial of total U.S. energy contribute an estimated as emissions.



Office Building

About Green Buildings

The U.S. Green Building Council (USGBC) reports that green building involves the maximization of the building's and site's efficiency in using, generating and recycling energy, water and materials, as well as the minimization of the impact of buildings on health and the environment. This includes both the construction of new buildings and the renovation, operation and maintenance of existing buildings. Aspects of green commercial buildings may include:

- a site selected to take advantage of mass transit, protect the existing landscape and minimize the disruption of natural elements, taking into account soil, the use of native plants for landscaping elements and existing infrastructure (for more information, see the section on "Protecting the Existing Environment" on page 3);
- the use of sustainable materials, which may be biobased, made from recycled materials, or reused from other buildings (for more information, see the "Green Materials" section on page 5);
- the use of cleaner fuels to power construction equipment and minimization of emissions through the use of retrofitted vehicles and equipment;
- the use of ENERGY STAR-labeled appliances, which are more energy efficient than other products on the market (for more information, visit www.energystar.gov);
- properly sized heating, ventilation and air-conditioning (HVAC) systems, which moderate temperature in the building more efficiently (for more information on selecting right-sized appliances, visit www.energystar.gov);
- high water efficiency, including the use of "grey" recycled water for toilet flushing and site irrigation, the installation of ultra-low-flush toilets and the collection of rainwater for use in landscaping irrigation (for more information on water conservation and efficiency, visit www.epa.gov/OW/index.html);
- better indoor air quality, including dedicated ventilation systems, separate ex-

haust systems in areas with high pollution sources, the regulation of ventilation air quantities based on occupation needs, a no-smoking policy, high-efficiency filtration and use of interior finish materials with low amounts or no volatile organic chemicals (VOCs) (for more information on indoor air quality, visit www.epa.gov/ebipages/airindoorairpollution.html); and

- better lighting efficiency, which may include using daylight, more efficient light bulbs or new lighting technology (for more information, see NACo's Green Government Initiative fact sheet, "Energy Efficient Lighting in County Facilities," located at www.greencounties.org).

Benefits of Commercial Green Buildings

Properly designed, constructed and operated green buildings can have significant health, economic and environmental benefits. This occurs through decreased energy use, improved ventilation and lighting, a reduction in the use of fossil fuels and decrease in the amount of associated greenhouse gases released into the atmosphere, enhanced community education and an increased understanding, availability and uptake of green building technology.

Financial Benefits

Green buildings are designed to be more energy- and water-efficient than traditional buildings, also yielding savings in these areas. According to studies conducted by the USGBC, investing an average premium of 2% to build green can result in an average lifecycle savings of 20% of the total construction costs for the building – more than ten times the initial investment. An investment of \$4 per square foot can yield an average of a \$58 benefit over 20 years. In addition, "The





Green Building Myths

- You'll only find them in places like Seattle
- The aesthetics won't fit with my community
- Building codes get in the way
- They cost too much to build and maintain

Additional Construction Costs

Conventional Building Cost (100%)

Additional Cost

PLATINUM (2 buildings)

6.8%

GOLD (9 buildings)

2.2%

SILVER (21 buildings)

1.9%

CERTIFIED (8 buildings)

.66%

Average for offices and schools; based on 40 buildings



Third Creek Elementary School



Iredell-Statesville Schools, NC

92,500 SF

800 students

Moseley's First LEED Project

World's First LEED Gold
K-12 School

5 years of operational data





Third Creek Elementary School

Energy Saving Features

Architectural

- Super Insulated Envelope
 - Roof R-45
 - Walls R-22
- Separate Daylight and Vision Glazing
 - Glass windows $U-0.34, T_{vis} 46\%$
 - Light shelves $U-0.30, T_{vis} 70\%$



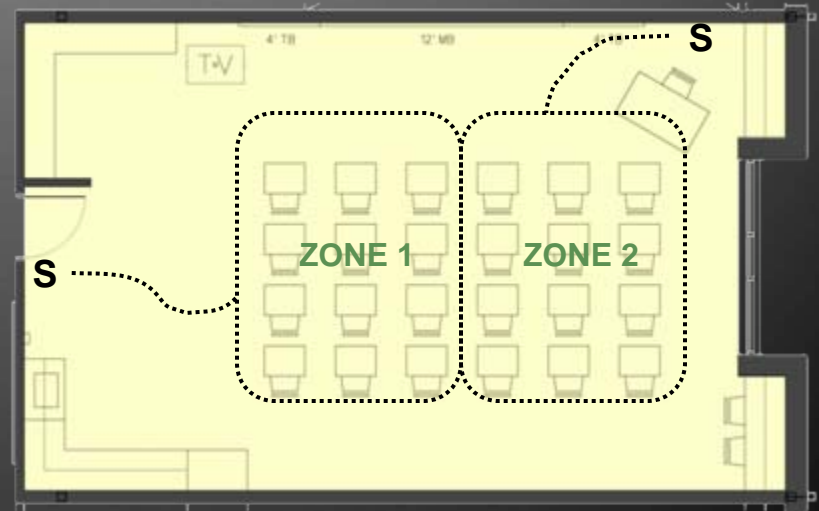


Third Creek Elementary School

Energy Saving Features

Electrical

- Dual-lighting zones in classrooms
- T-8 indirect lighting fixtures
- Occupancy sensors





Third Creek Elementary School

Energy Saving Features

Mechanical

- High Efficiency Water Source Heat Pumps
 - 14.5 EER, 4.4 COP
- Energy Recovery Ventilators (ERV)





Third Creek Elementary School

Energy Saving Features

Mechanical (con't)

- Variable Frequency Drive (VFD)
- Two-stage Condensing Boilers
- CO₂ Sensors





Third Creek Elementary School

The cumulative and individual effects of these inputs are determined through a building energy model.

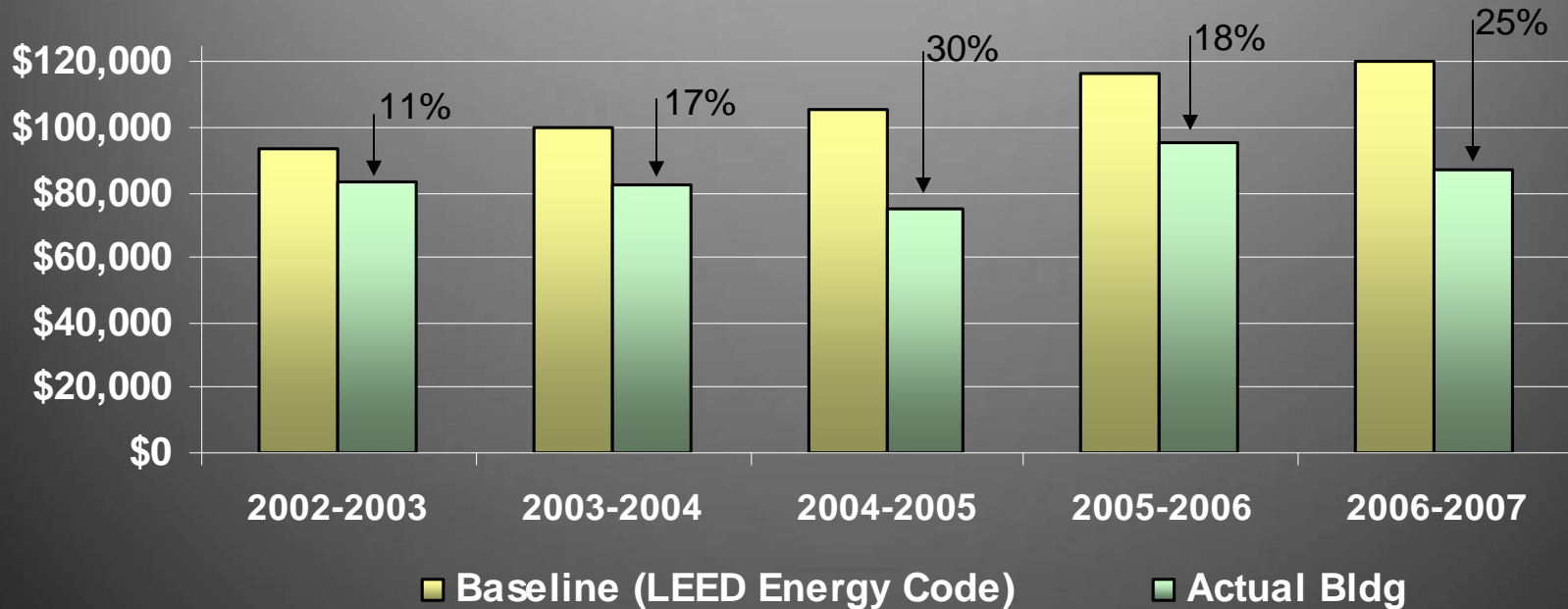
Energy and Cost Summary by Fuel Type						
	DEC' Use (kWh/yr)	DEC' Cost (\$)	ECB' Use (kWh/yr)	ECB' Cost (\$)	DEC' / ECB' Energy	DEC' / ECB' Cost
Electricity	2,227,473	\$ 53,104	3,341,575	\$ 77,739	67%	66%
Natural Gas	3,308,600	\$ 33,342	3,411,600	\$ 34,370	97%	97%
Other	-	\$ -	-	\$ 0	-	0%
Total Nonrenewable	5,536,073	86,446	6,753,175	112,109		
Renewable					-	-
Total including Renewable	5,536,073	\$ 86,446	6,753,175	\$ 112,109		
			Percent Savings = (ECB' \$ - DEC' \$) / ECB' \$ =			23%

Third Creek's model predicted a 23% savings over the LEED-mandated energy code (ASHRAE 90.1-1999)



Third Creek Elementary School

Energy Bills of Actual vs. Modeled Building



Cumulative savings
to date:

vs. LEED's Energy Code
vs. State's Energy Code

\$108,881
\$130,144



Third Creek Elementary School

Water Saving Features

Plumbing Fixtures

- Low-flow lavatories, showers
- Waterless urinals



Estimated savings: \$2,087

Irrigation

- No permanent irrigation





Third Creek Elementary School

Estimated Cost of High Performance Features

Sustainable Sites	\$28,000
Water Efficiency	-\$5,000
Energy & Atmosphere	\$44,250
Materials & Resources	\$50,000
Indoor Environmental Quality	\$19,000
USGBC Certification Fees	\$1,200
Total	\$138,450

= 1.4% of total construction cost (\$9.85M)

Payback Period: 4.9 yrs

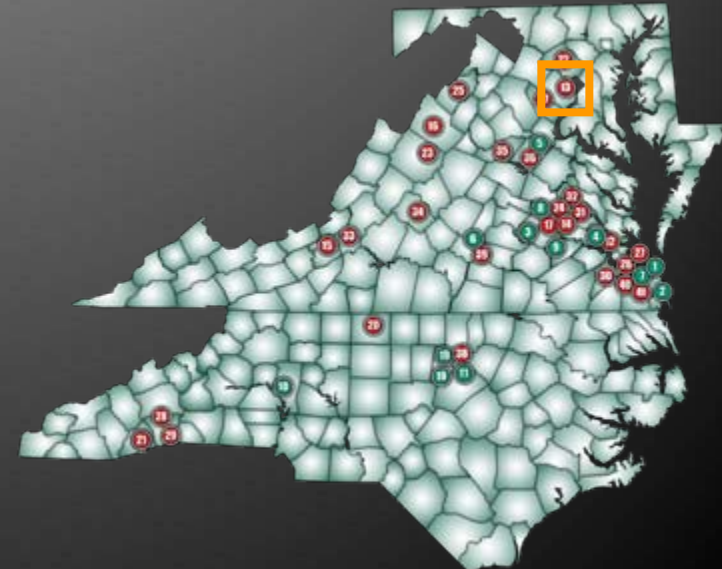
T.C. Williams High School



Alexandria City Public Schools
461,000 SF
2,500 students

Targeting LEED Gold

Opened in August 2007



T.C. Williams High School

Energy and Water Saving Features

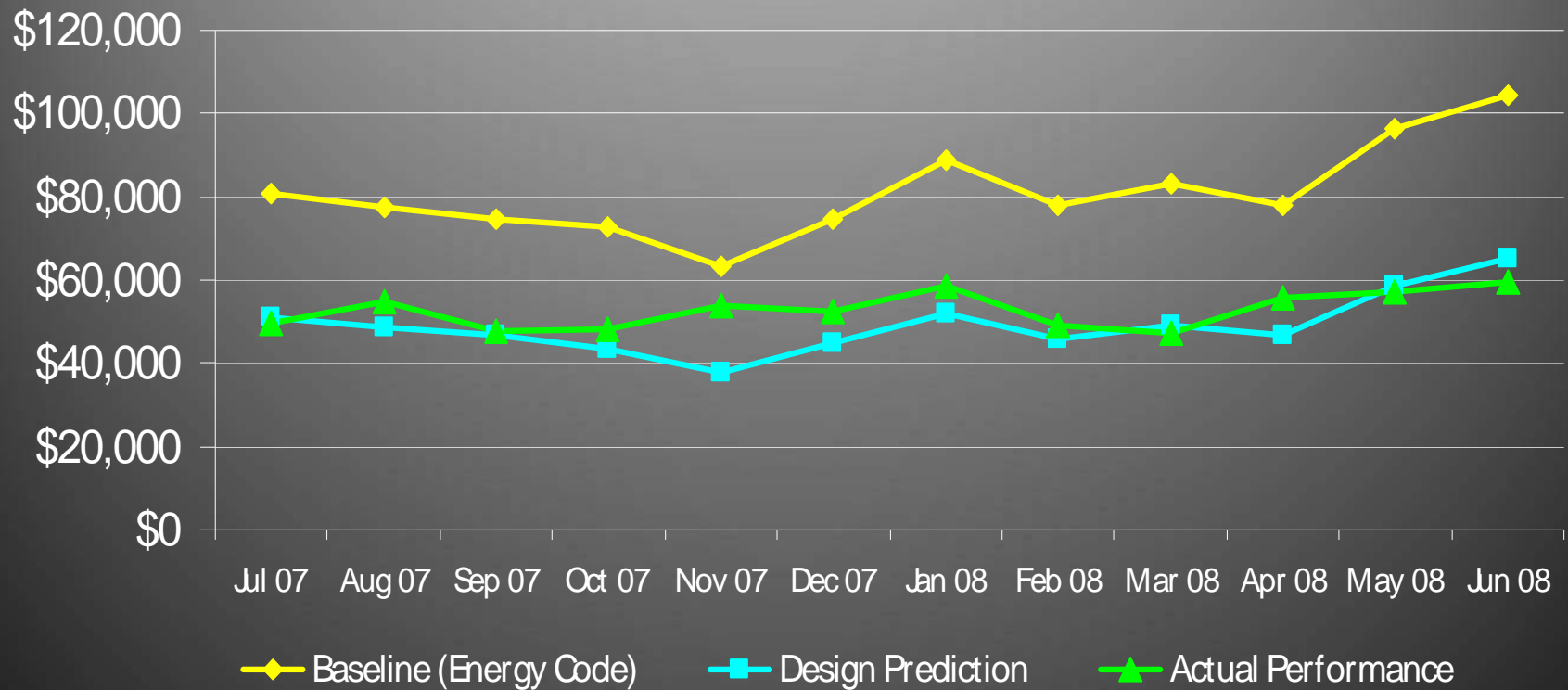
In addition to those used at Third Creek:

- Rainwater cistern
- Garden roof
- Improved HVAC Controls
- T5 lighting
- Less insulation



T.C. Williams High School

Energy Consumption of Actual vs. Modeled Building



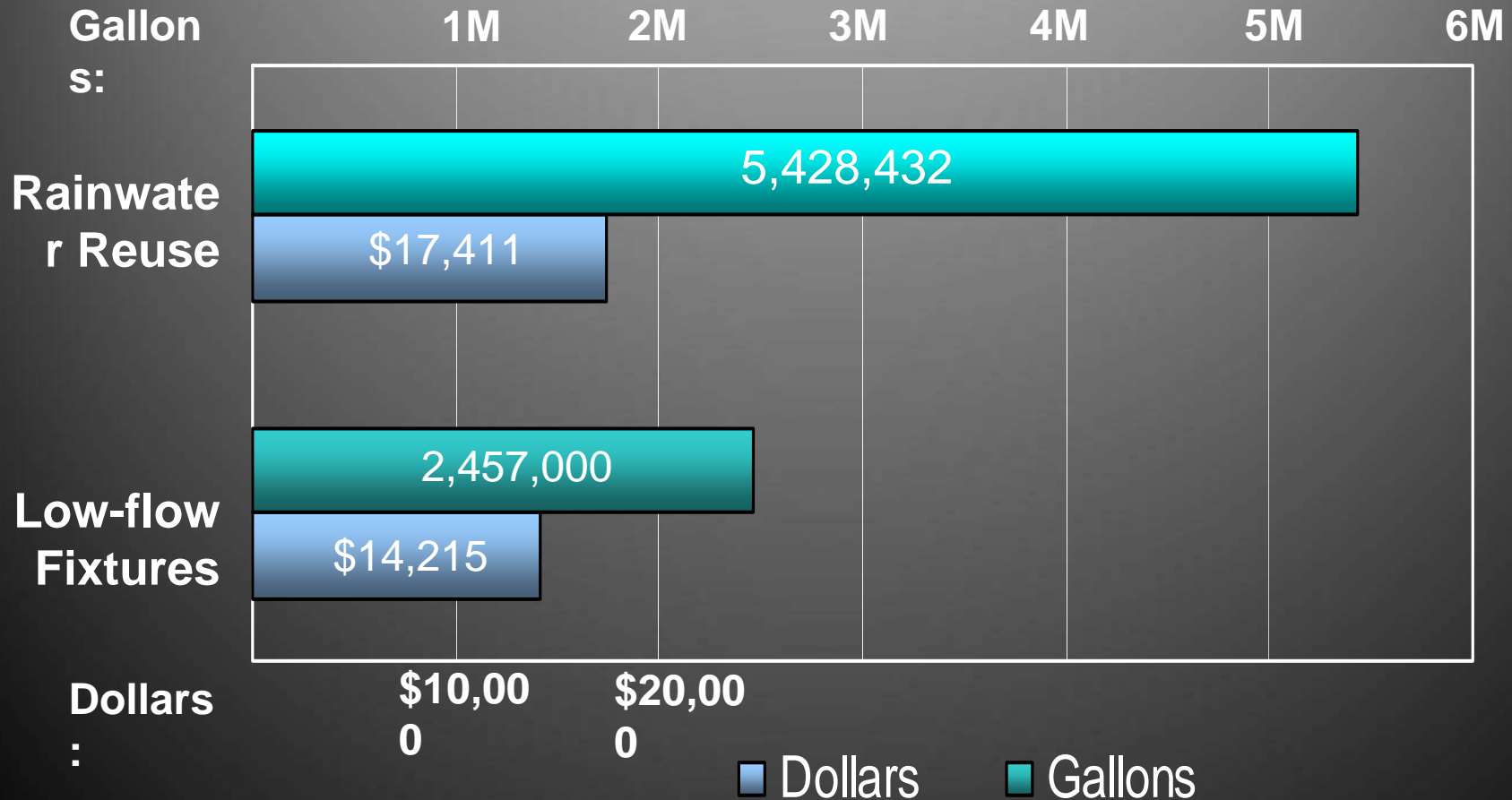
Annual
Savings:

Electricity
Natural Gas

\$312,289
\$25,707

T.C. Williams High School

Annual Water Savings (estimated)



T.C. Williams High School

Combined Annual Utility Savings

Electricity	\$312,289
Natural Gas	\$25,707
Water	\$31,626
Total Savings	\$369,622
Sustainability Investment	\$1.2M

1.9% of total construction cost (\$80.2M)

Payback Period: **3.2 yrs**



T.C. Williams High School

Added benefits:

Saving on **energy** costs also reduces greenhouse gas emissions:

1,940 tons of CO₂ annually

equivalent to 381 average US automobiles

Saving on **water** costs through cistern reuse also reduces stormwater runoff:

5.89 acres of impervious
roof area negated

38% reduction in stormwater
runoff velocity (10-yr storm)



Chesterfield County CD Building



Chesterfield County

92,175 SF

257 staff

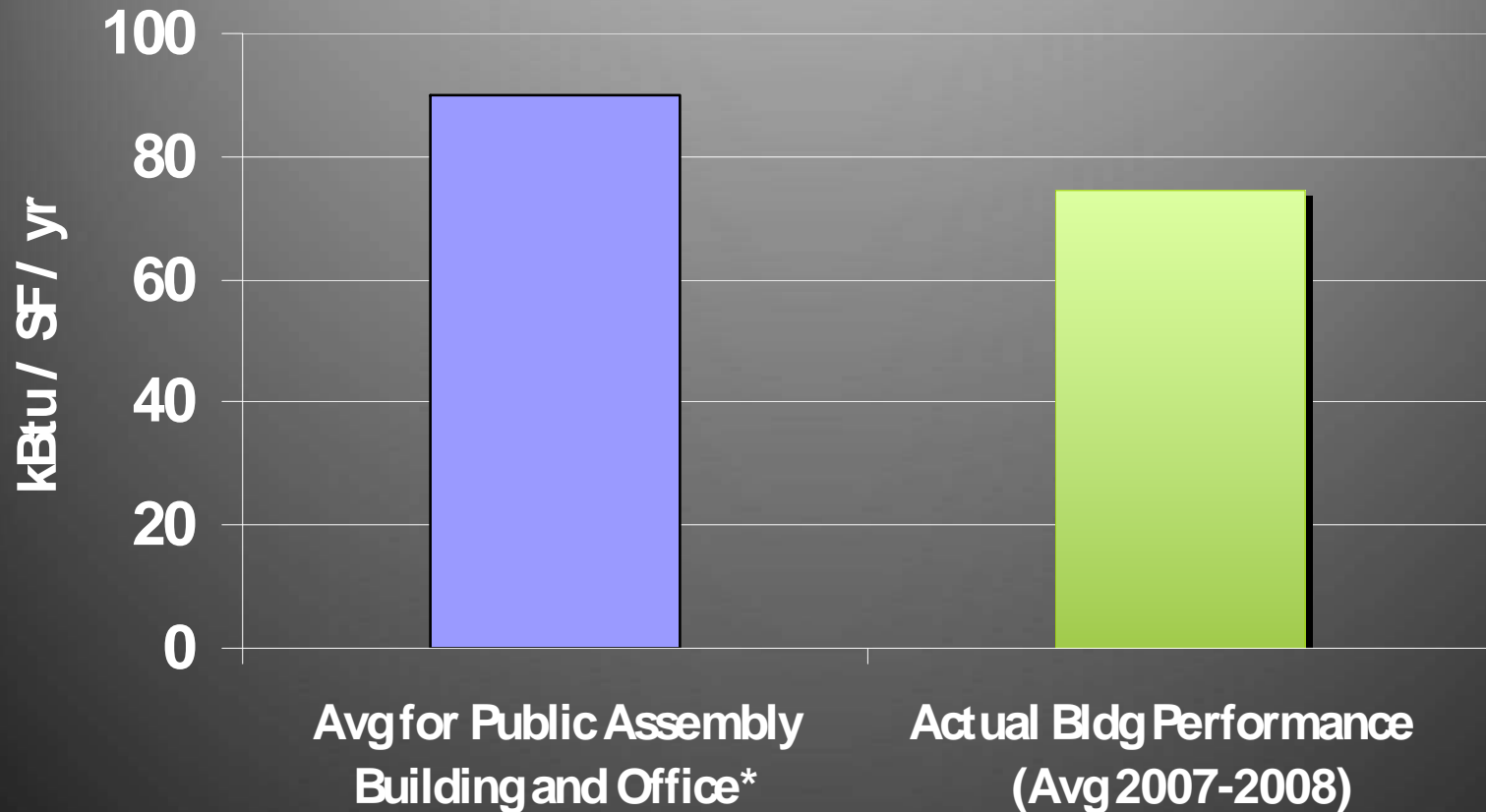
- Chesterfield's first LEED building
- Certified within original budget

Opened in October 2006





Chesterfield County CD Building



* from the US Energy Information Administration's CBECS Data

Maintenance Adjustments

High performance features require different maintenance, but not necessarily more of it

Filter replacement for indoor air quality

- Using pre-filters recommended for longer life of the main filtration media

CO2 sensor calibration for energy savings

- Should be done annually



Maintenance Adjustments



Waterless urinal cartridge replacement

- Several manufacturers now have a pint-flush alternative

Other considerations:

- Native landscaping = less maintenance
- Commissioning can reduce callbacks
- Walk-off mats in entryway systems keep pollutants out of the building to begin with



Recycling

What Features Make Cents for My Project?

Step 1

Reflective roofing
CO₂ monitors
T-5 lighting ballasts
Occupancy sensors
Energy Star products
Low-flow fixtures

Step 2

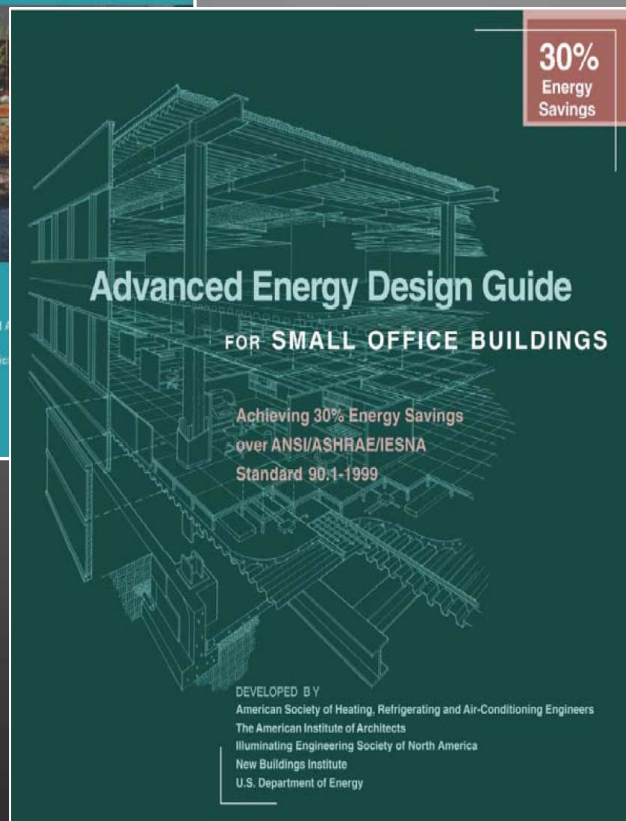
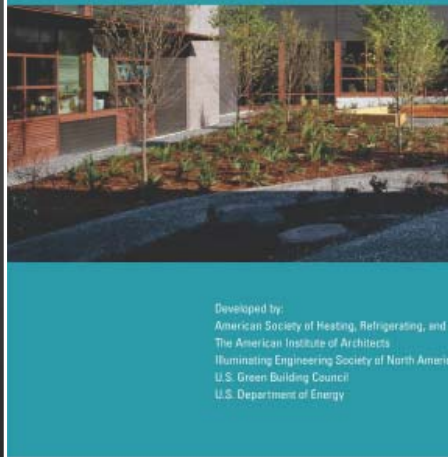
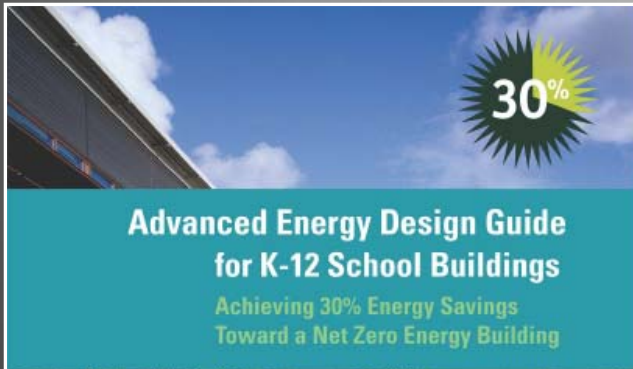
Solar Hot Water
Window upgrades
Energy recovery units
Wall / roof insulation
Daylight harvesting

Step 3

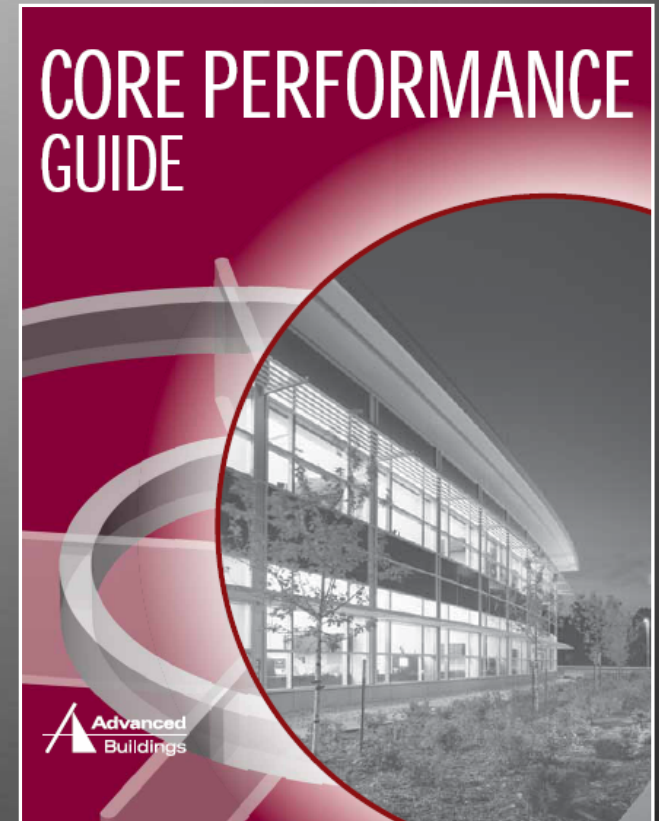
Rainwater cisterns
Photovoltaic panels
Wind turbines
Garden roofs



Good Places to Start



www.ashrae.org



www.advancedbuildings.net

Questions?



Green Buildings Make Cents

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Carrie Webster, Environmental Analyst, LEED AP

THANK YOU!