



*Sustainable*  
ENERGY • AIR • WATER • EARTH



# Greening Your Existing Buildings for LEED-EB O&M

**Thomas J. McGeachen, PE, LEED AP**

Environmental Sustainability Coordinator

The DOE Princeton Plasma Physics Laboratory

Princeton, New Jersey



Source USGBC

# LEED for Existing Buildings: Operations & Maintenance

Ongoing certification of all projects

# The Basics

Source USGBC

**9** prerequisites

**34** credits

**3** - month performance period

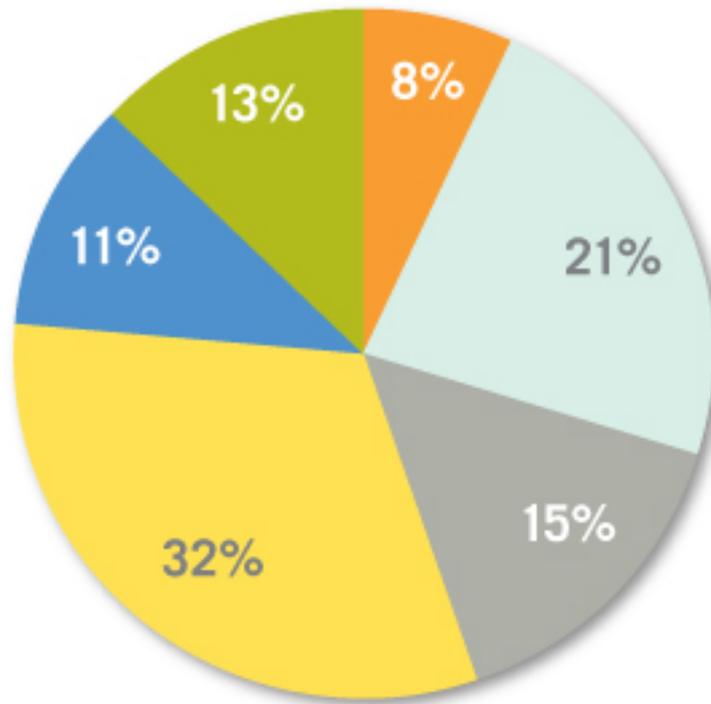
## Minimum Program Requirements

- Full occupancy for at least 12 continuous months
- Applies to whole buildings
- Federal, state and local environmental law/regulation compliance

# Point Distribution Comparison

Source USGBC

Key: **SS** **WE** **EA** **MR** **EQ** **IO**



**LEED for Existing Buildings:  
Operations & Maintenance**

# Sustainable Sites (SS)

Source USGBC

Yes ? No

0 0 0

## Sustainable Sites

12 Points

	Credit 1	<b>LEED Certified Design and Construction</b>	<b>1</b>
	Credit 2	<b>Building Exterior and Hardscape Management Plan</b>	<b>1</b>
	Credit 3	<b>Integrated Pest Management, Erosion Control, and Landscape Management Plan</b>	<b>1</b>
	Credit 4	<b>Alternative Commuting Transportation</b>	<b>4</b>
		10%	1
		25%	1
		50%	1
		75% or greater	1
	Credit 5	<b>Reduced Site Disturbance - Protect or Restore Open Space</b>	<b>1</b>
	Credit 6	<b>Stormwater Management</b>	<b>1</b>
	Credit 7	<b>Heat Island Reduction</b>	<b>2</b>
		Non-Roof	1
		Roof	1
	Credit 8	<b>Light Pollution Reduction</b>	<b>1</b>

Yes ? No

0 0 0

## Water Efficiency

10 Points

Y	Prereq 1	<b>Minimum Indoor Plumbing Fixture and Fitting Efficiency</b>	<b>Required</b>
	Credit 1	<b>Water Performance Measurement</b>	<b>2</b>
		Whole building metering	1
		Submetering	1
	Credit 2	<b>Additional Indoor Plumbing Fixture and Fitting Efficiency</b>	<b>3</b>
		10%	1



# Sustainable

ENERGY • AIR • WATER • EARTH



## Sustainable Sites (SS)

B-20 powered 4 wheel drive utility vehicles using biobased deicers



Restore areas to native vegetation

Green cleaning products for exterior building cleaning



Utilize Green cleaning products for exterior window cleaning



# Sustainable

ENERGY • AIR • WATER • EARTH



## Sustainable Sites (SS)



Storm water Drainage Ditch flow restored with curved stepped channel

Storm water Drainage Ditch flow restored with removal of brush & saplings



Preferred parking for alternative-fuel vehicles

Fully shielded exterior lights



Install Energy Star rated roofs

# Water Efficiency (WE)

Source USGBC

Yes ? No

0 0 0

## Water Efficiency

10 Points

Y

Prereq 1 **Minimum Indoor Plumbing Fixture and Fitting Efficiency** Required

Credit 1 **Water Performance Measurement** 2


Whole building metering 1

Submetering 1

Credit 2 **Additional Indoor Plumbing Fixture and Fitting Efficiency** 3


10% 1

20% 1

30% 1

Credit 3 **Water Efficient Landscaping** 3


Reduce Potable Water Use by 50% 1

Reduce Potable Water Use by 75% 1

Reduce Potable Water Use by 100% 1

Credit 4 **Cooling Tower Water Management** 2


Chemical Management 1

Non-Potable Water Source Use 1

Yes ? No

0 0 0

## Energy & Atmosphere

30 Points

Y

Prereq 1 **Energy Efficiency Best Management Practices - Planning, Documentation, and Opportunity Assessment** Required

Y

Prereq 2 **Minimum Energy Efficiency Performance** Required

Y

Prereq 3 **Refrigerant Management - Ozone Protection** Required

--	--	--

Credit 1 **Optimize Energy Efficiency Performance** 15



# Sustainable

ENERGY • AIR • WATER • EARTH



## Water Efficiency (WE)



Perform a potable water usage audit and reduce potable water usage below (120% or 160%) the UPC or IPC 2006 requirements



Cooling tower management automated & intranet controlled

NON potable make up water



For landscaping gardens only utilize efficient water methods

# Energy & Atmosphere (EA)

Source USGBC

Yes ? No

0 0 0

## Energy & Atmosphere

30 Points

Y	Prereq 1	<b>Energy Efficiency Best Management Practices - Planning, Documentation, and Opportunity Assessment</b>	Required
Y	Prereq 2	<b>Minimum Energy Efficiency Performance</b>	Required
Y	Prereq 3	<b>Refrigerant Management - Ozone Protection</b>	Required
	Credit 1	<b>Optimize Energy Efficiency Performance</b>	<b>15</b>
	Credit 2	<b>Existing Building Commissioning</b>	<b>6</b>
		Investigation and Analysis	2
		Implementation	2
		Ongoing Commissioning	2
	Credit 3	<b>Performance Measurement</b>	<b>3</b>
		Building Automation System	1
		System-Level Metering, 40%	1
		System-Level Metering, 80%	1
	Credit 4	<b>Renewable Energy</b>	<b>4</b>
		On-site 3% / Off-site 25%	1
		On-site 6% / Off-site 50%	1
		On-site 9% / Off-site 75%	1
		On-site 12% / Off-site 100%	1
	Credit 5	<b>Refrigerant Management</b>	<b>1</b>
	Credit 6	<b>Emissions Reduction Reporting</b>	<b>1</b>

Yes ? No

0 0 0

## Materials & Resources

14 Points



# Sustainable

ENERGY • AIR • WATER • EARTH



## Energy & Atmosphere (EA)

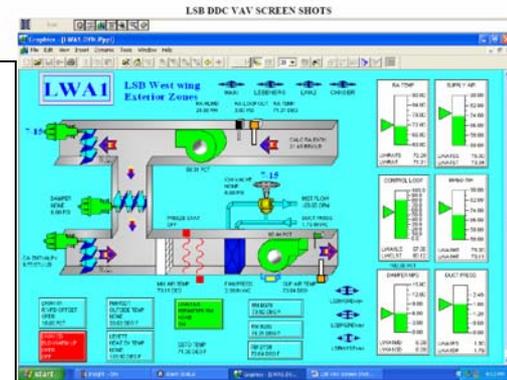


You must become proficient with ENERGY STAR® Portfolio Manager. Building MUST have a EStar rating of 69 to qualify for LEED!



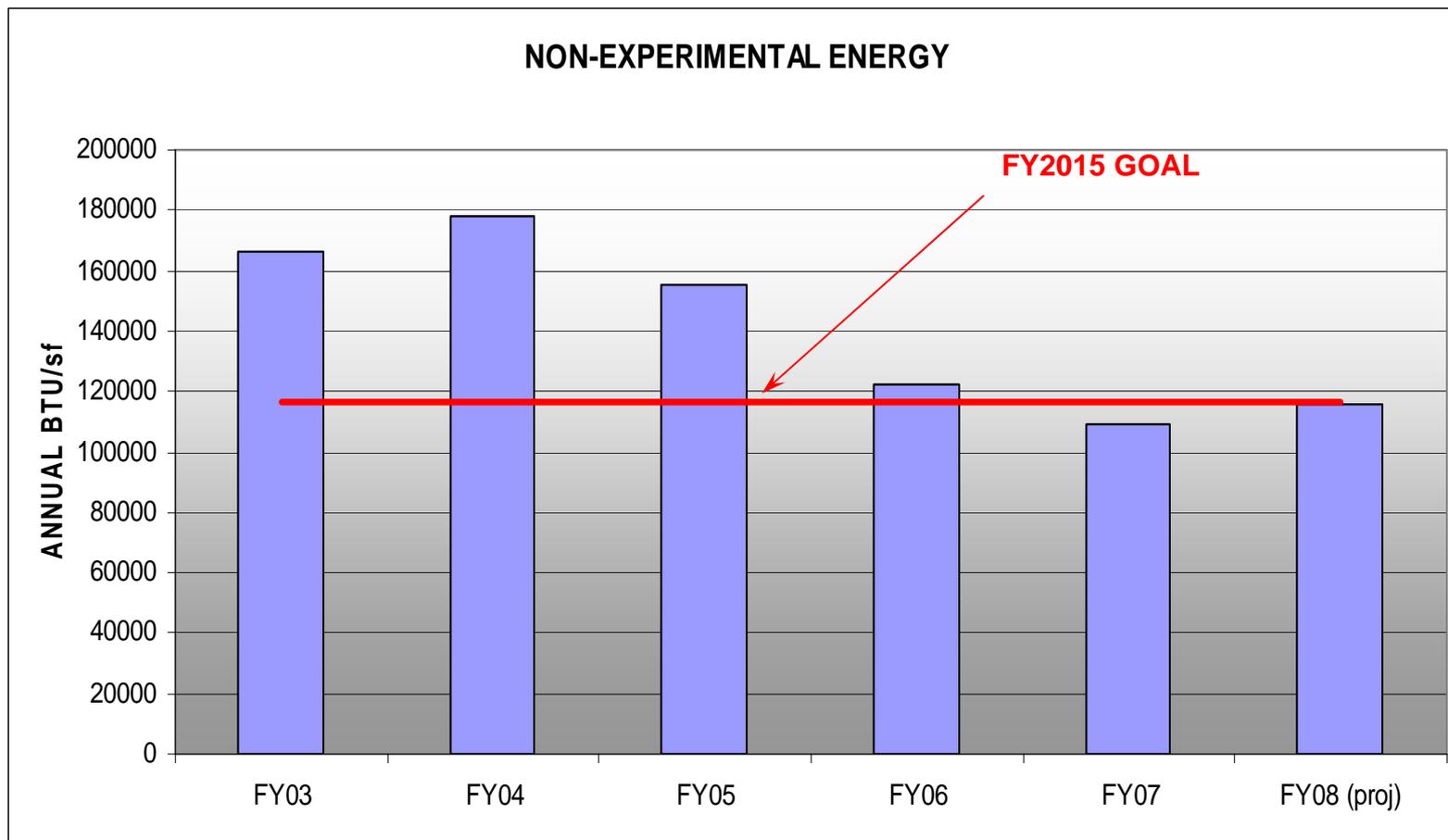
TREND all your major energy consumption

Utilize your Building Automation System to maximum possible extent





## Energy & Atmosphere (EA)



# Materials & Resources (MR)

Source USGBC

Yes ? No

0 0 0

## Materials & Resources

14 Points

Y  
Y

Prereq 1	<b>Sustainable Purchasing Policy</b>	Required
Prereq 2	<b>Solid Waste Management Policy</b>	Required
Credit 1	<b>Sustainable Purchasing</b>	<b>3</b>
	Ongoing Consumables, 40%	1
	Ongoing Consumables, 60%	1
	Ongoing Consumables, 80%	1
Credit 2	<b>Sustainable Purchasing</b>	<b>2</b>
	Durable Goods, electric	1
	Durable Goods, furniture	1
Credit 3	<b>Sustainable Purchasing - Facility Alterations and Additions</b>	<b>1</b>
Credit 4	<b>Sustainable Purchasing</b>	<b>2</b>
	Reduced Mercury in Lamps, 90 pg/lum-hr	1
	Reduced Mercury in Lamps, 70 pg/lum-hr	1
Credit 5	<b>Sustainable Purchasing - Food</b>	<b>1</b>
Credit 6	<b>Solid Waste Management - Waste Stream Audit</b>	<b>1</b>
Credit 7	<b>Solid Waste Management</b>	<b>2</b>
	Ongoing Consumables, 50%	1
	Ongoing Consumables, 70%	1
Credit 8	<b>Solid Waste Management - Durable Goods</b>	<b>1</b>
Credit 9	<b>Solid Waste Management - Facility Alterations and Additions</b>	<b>1</b>

Yes ? No

0 0 0

## Indoor Environmental Quality

19 Points



## Material & Resources (MR)

**All Federal Facilities MUST follow the EPA CPG guidelines for Environmentally Preferred Purchasing (EPP) Products**

A key component of the EPP program is EPA's list of designated products and the accompanying recycled-content recommendations. EPA has already designated products which are grouped into 8 categories:

- Construction Products**
- Landscaping Products**
- Non-paper Office Products**
- Paper and Paper Products**
- Park and Recreation Products**
- Transportation Products**
- Vehicular Products**
- Miscellaneous Products**

Ref: <http://www.epa.gov/epaoswer/non-hw/procure/index.htm>



# Sustainable

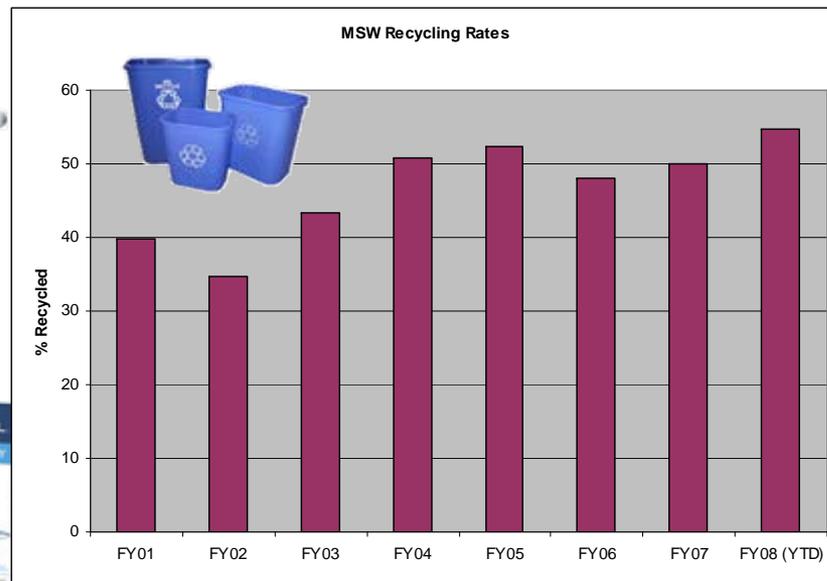
ENERGY • AIR • WATER • EARTH



## Material & Resources (MR)



Cool-Zero®  
(carbon neutral)  
carpeting



# Indoor Environmental Quality (EQ)

Source USGBC

Yes ? No

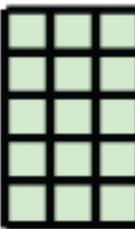
0 0 0

## Indoor Environmental Quality

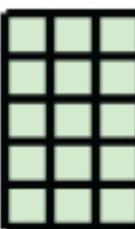
19 Points

Y  
Y  
Y

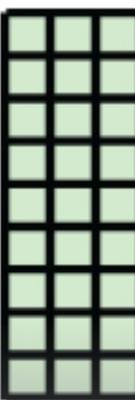
- Prereq 1 **Outdoor Air Introduction and Exhaust Systems** Required
- Prereq 2 **Environmental Tobacco Smoke (ETS) Control** Required
- Prereq 3 **Green Cleaning Policy** Required



- Credit 1 **IAQ Best Management Practices** **5**
  - IAQ Management Program 1
  - Outdoor Air Delivery Monitoring 1
  - Increased Ventilation 1
  - Reduce Particulates in Air Distribution 1
  - IAQ Management for Facility Alterations and Additions 1



- Credit 2 **Occupant Comfort** **5**
  - Occupant Survey 1
  - Occupant Controlled Lighting 1
  - Thermal Comfort Monitoring 1
  - Daylight and Views, 50% Daylight / 45% Views 1
  - Daylight and Views, 75% Daylight / 90% Views 1



- Credit 3 **Green Cleaning** **9**
  - High Performance Cleaning Program 1
  - Custodial Effectiveness Assessment, < 4 1
  - Custodial Effectiveness Assessment, < 3 1
  - Sustainable Cleaning Products and Materials, 30% 1
  - Sustainable Cleaning Products and Materials, 60% 1
  - Sustainable Cleaning Products and Materials, 90% 1
  - Sustainable Cleaning Equipment 1
  - Entryway Systems 1
  - Indoor Integrated Pest Management 1

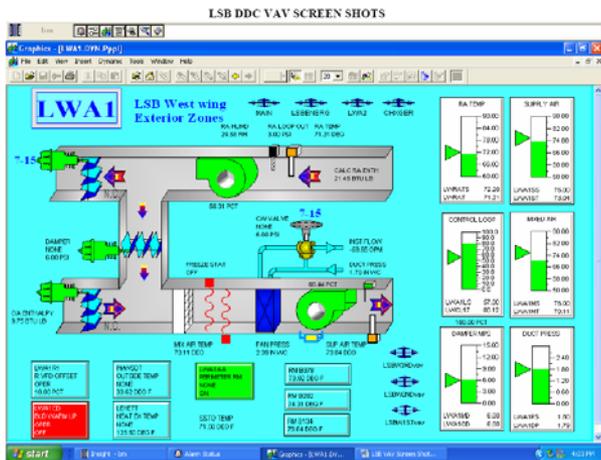


# Sustainable

ENERGY • AIR • WATER • EARTH



## Indoor Environmental Quality (EQ)



Utilize your Building Automation System monitor & TREND: outside air ventilation rates, CO<sub>2</sub> levels, occupant comfort levels



Document your Green Cleaning practices!





## BAS report: Energy & Atmosphere (EA) & Indoor Environmental Quality (EQ)

Office Building # 123 Previous Year EStar Rating was 80  
 Current YTD is tracking for an EStar rating of 80

LEED-EB O&M Building Automation System Report: Office Building #123					Gross SQ FT	100,000	
Report Data	kWh	CHW MMbtu	Steam MMbtu	Potable H2O kGal	% OA average	CO2 average PPM Above OA Value	EUI KBTU/SQ FT
Current Month to Date	150,000	70,000	40,000	20	15	550	5.1191
Previous Month total	300,000	140,000	80,000	40	20	500	10.2382
Current Year to Date	900,000	420,000	240,000	120	23	530	30.7146
Previous Year total	2,100,000	980,000	560,000	280	20	525	71.6674

# Innovation in Operations (IO)

Source USGBC

Yes ? No		
0	0	0
Innovation in Operations		7 Points
Credit 1	<b>Innovation in Operations</b>	<b>4</b>
<input type="checkbox"/>	Innovation in Operations	1
<input type="checkbox"/>	Innovation in Operations	1
<input type="checkbox"/>	Innovation in Operations	1
<input type="checkbox"/>	Innovation in Operations	1
Credit 2	<b>LEED Accredited Professional</b>	<b>1</b>
Credit 3	<b>Documenting Sustainable Building Cost Impacts</b>	<b>2</b>



## Innovation in Operations (IO)

### IO Credits 1.1-1.4

#### Document All Recognition & Utilize Your Site Awards

**NJDEP Award for Outstanding Achievement in Recycling**  
*with the New Jersey Association of Recyclers  
in the category of "Institution"*

**Environmental Protection Magazine**  
**Facility of the Year Competition - Honorable Mention**  
*Only Federal facility to be recognized in both 2006 & 2007*

**Sustained Recycling Performance**

- Office of Science "Best Practice" Pollution Prevention Award
- DOE "Pollution Prevention Star" Award

**Alternative Fleet Fuels**

- Office of Science "Noteworthy Practice" Award
- DOE "Pollution Prevention Star" Award" Honorable Mention

**HPAC Magazine Award for HVAC Retrofit of Lyman Spitzer Building**

- 25 year old pneumatic controlled VAV system was replaced with Building Automation System Direct Digital Controlled VAV system

### IO Credit 2

Encourage employees to attain LEED-AP status

### IO Credit 3

Document all your performance metrics for

- Energy
- EPP
- Water
- Recycling
- Sustainability