



Leadership in Energy and Environmental Design (LEED™)/Green at Sandia National Laboratories

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Albuquerque, New Mexico**

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.





Sandia Overview

New Mexico Site



- Located on Kirtland Air Force Base in Albuquerque, NM
- Almost 11,300 personnel, including on-site contractors
- 2,937 acres of DOE-owned land, 5,633 acres of permitted land (totaling 8,570 acres)
- 952 buildings totaling 6,242,788 gross square feet
- 35 miles of paved roads, 38 miles of unpaved roads; 206 acres of roads and walkways
- Other utilities include high voltage and standby electrical; steam; natural gas; potable water and fire protection; sanitary and process waste water; storm drainage; chilled water; communications; landscaping; and site access control



Opportunities for Improvement

- Last year SNL spent **\$13,500,000** in combined gas & electric usage
- Last year SNL used a total of **550,000,000** gallons of water
- Over the last 3 years, Lab & Industrial energy intensity has increased by **15%**



Problem Statement: Why LEED/Green at Sandia?

- DOE Order 430.2B requires all new buildings >\$5M to be LEED New Construction (NC) Gold certified
- Executive Order 13423 requires
 - Certify 15% of capitol asset building stock to High Performance Sustainable Building (HPSB) Guiding Principles (e.g., LEED)
 - Reduce energy intensity by 30%
 - Reduce water consumption by 16%
 - Include green buildings in site Environmental Management System
- The right thing to do – for the most part, LEED buildings are higher performing



What Is LEED?

- LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings
- There are several LEED categories; Sandia focuses on New Construction (NC) and Existing Building (EB)
- LEED NC and EB buildings are scored using a point system based on sustainability, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation (points available: NC 69, EB 85)

Certification Level	NC	EB
Certified	26 – 32 points	32–39 points
Silver	33 – 38 points	40–47 points
Gold	39 – 51 points	48–63 points
Platinum	52+ points	64–85 points



Sandia LEED Activities to Date

- Sandia has more than 600,000 square feet of LEED NC certified space, equivalent to 10 percent of total building space
 - Joint Computational Engineering Laboratory (JCEL) (Silver) – first building at Sandia that incorporated sustainable design from the beginning of the project
 - Microsystems and Engineering Sciences Applications (MESA) MicroFab Facility (Certified) – the first microchip fabrication facility in the world to obtain LEED certification
 - MESA Microsystems Laboratory (Silver)
 - MESA Weapons Integration Facility (WIF) (Silver)
 - Center for Integrated Nanotechnology (CINT) (Certified)



National Nuclear Security Administration





Sample LEED Checklist

MFAB			MLAB			WIF			Possible Points	Credit Category	Credit Title
Y	N	Points	Y	N	Points	Y	N	Points			
Sustainable Sites (SS)											
Y		0	Y		0	Y		0	Required	SS Prerequisite 1	Erosion and Sedimentation Control
Y		1	Y		1	Y		1	1	SS Credit 1	Site Selection
	N			N			N		1	SS Credit 2	Urban Redevelopment
	N			N		Y		1	1	SS Credit 3	Brownfield Redevelopment
Y		1	Y		1	Y		1	1	SS Credit 4.1	Alternative Transportation, Locate Near Public Transportation
Y		1	Y		1	Y		1	1	SS Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms
	N		Y		1	Y		1	1	SS Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations
Y		1	Y		1	Y		1	1	SS Credit 4.4	Alternative Transportation, Minimum or No New Parking
Y		1		N			N		1	SS Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space
	N		Y		1	Y		1	1	SS Credit 5.2	Reduced Site Disturbance, Reduce Footprint & Increase Open Space
	N			N			N		1	SS Credit 6.1	Stormwater Management, No Net Increase or 25% Decrease
	N		Y		1	Y		1	1	SS Credit 6.2	Stormwater Management, Treatment Systems
	N		Y		1	Y		1	1	SS Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Site Surfaces
Y		1	Y		1	Y		1	1	SS Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof Surfaces
	N			N			N		1	SS Credit 8	Light Pollution Reduction
		6			9			10	14	SubTotal Points	



Sample LEED Checklist, cont.

MFAB		MLAB		WIF		Possible Points	Credit Category	Credit Title			
Y	N	Y	N	Y	N						
Project Points		Project Points		Project Points							
Water Efficiency (WE)											
Y		1	Y		1	Y		1	2	WE Credit 1.1 : 1.2	Water Efficient Landscaping, Reduce by 50%:100%
	N			N			N		1	WE Credit 2	Innovative Wastewater Technologies, 50% Reduction OR Treat 100%
Y		2	Y		1	Y		1	2	WE Credit 3.1 ;3.2	Water Use Reduction, 20%; 30% Reduction from EPAAct 1992
3		2		2		5		SubTotal Points			
Energy and Atmosphere (EA)											
Y		0	Y		0	Y		0	Required	EA Prerequisite 1	Fundamental Building Systems Commissioning
Y		0	Y		0	Y		0	Required	EA Prerequisite 2	Minimum Energy Performance
Y		0	Y		0	Y		0	Required	EA Prerequisite 3	CFC Reduction in HVAC&R Equipment
Y		2	Y		4	Y		2	10	EA Credit 1.1, 1.2, 1.3	Optimize Energy Performance, Reduction from ASHRAE 90.1-1999 20%, 30%, 40%, 50%, 60%
	N			N			N		3	EA Credit 2.1	Renewable Energy, 5%, 10%, 15%
	N		Y		1	Y		1	1	EA Credit 3	Additional Commissioning
Y		1	Y		1	Y		1	1	EA Credit 4	Elimination or HCFC's and Halons
	N		Y		1	Y		1	1	EA Credit 5	Measurement and Verification
				N			N		1	EA Credit 6	Green Power
3		7		5		17		SubTotal Points			



Sample LEED Checklist, cont.

MFAB		MLAB		WIF		Possible Points	Credit Category	Credit Title			
Project Points	Project Points	Project Points	Project Points	Project Points	Project Points						
Materials and Resources (MR)											
<input checked="" type="checkbox"/>	<input type="checkbox"/>	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0	Required	MR Prerequisite 1	Storage & Collection of Recyclables
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		3	MR Credit 1.1; 1.2; 1.3	Building Reuse, Maintain 75% of Existing Shell; 100% Shell; 100% Shell & 50% Non-Shell
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	2	MR Credit 2.1; 2.2	Construction Waste Management, Salvage or Recycle 50%; 75%
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		2	MR Credit 3.1; 3.2	Resource Reuse, Specify 5%;10%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	2	MR Credit 4.1; 4.2	Recycled Content, Specify 25%; 50%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	1	MR Credit 5.1	Local/Regional Materials, 20% Manufactured Locally
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		1	MR Credit 5.2	Local/Regional Materials, of 20% Above 50% Harvested/Reclaimed Locally
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		1	MR Credit 6	Rapidly Renewable Materials
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	1	MR Credit 7	Certified Wood
5		7		7		13		SubTotal Points			
Innovation & Design Process (ID)											
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	1	ID Credit 1.1	Innovation in Design,
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	1	ID Credit 1.2	Innovation in Design,
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		1	ID Credit 1.3	Innovation in Design,
<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>		1	ID Credit 1.4	Innovation in Design,
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	1	ID Credit 2	LEED™ Accredited Professional
3		2		3		5		SubTotal Points			



Sample LEED Checklist, cont.

MFAB		MLAB		WIF		Possible Points	Credit Category	Credit Title
Project	Project	Project	Project	Project	Project			
<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	Points		
Indoor Environmental Quality (IEQ)								
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	Required	IEQ Prerequisite 1	Minimum IAQ Performance
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	0	Required	IEQ Prerequisite 2	Environmental Tobacco Smoke (ETS) Control
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 1	Carbon Dioxide (CO2) Monitoring
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 2	Increase Ventilation Effectiveness
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 3.1	Construction IAQ Management Plan, Prior
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 3.2	Construction IAQ Management Plan, During
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 4.1	Low-Emitting Materials, Adhesives
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 4.2	Low-Emitting Materials, Paints
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 4.3	Low-Emitting Materials, Carpet
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 4.4	Low-Emitting Materials, Composite Wood
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 5	Indoor Chemical and Pollutant Source Control
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 6.1	Controllability of Systems, Operable Windows
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	1	IEQ Credit 6.2	Controllability of Systems, Individual Controls
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992
<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 7.2	Thermal Comfort, Permanent Monitoring System
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 8.1	Daylight and Views, Diffuse Sunlight to 75%
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		<input type="checkbox"/> Y <input checked="" type="checkbox"/> N		1	IEQ Credit 8.2	Daylight and Views, Direct Line of Site to 90%
	8		8		8	15	SubTotal Points	



Achieving LEED NC Certification

- Certification is easiest if built into the design and construction of a building or renovation; early involvement is key
- Sandia has architectural and engineering specifications (<http://www.sandia.gov/engstds/>) that address sustainability and provide LEED credits:
 - Section 01350 specifically addresses LEED requirements, laying out guidelines for several LEED credits
 - Focus is on materials and resources, indoor environmental quality, and innovation & design
- Other credits pursued depending on unique characteristic of project (water conservation, site considerations)



Cost of Certification

- US Green Building Counsel estimates the additional construction cost to be 3% to 5% for silver
 - Sandia builds buildings with 50-year anticipated life; this lends itself well to LEED certification
- Cost to prepare certification package: difficult to calculate; contractor does part of this work
- Certification fee depends on size of building and whether you are a member of USGBC; varies from \$1,750 to \$22,500
 - Cost for member to certify 100,000 GSF building is \$3,500



Planned LEED Activities

- Use LEED EB Guiding Principles to “green” the remaining 5% of 15% requirement
- This is a challenge; many of Sandia’s buildings are 30-50 years old and cannot be LEED certified without significant renovations
- Newer buildings are candidates, and one building will be LEED EB certified in FY09. Based on the experience of certifying that building, we will look at certifying other buildings



Issues with Certifying Existing Buildings

- Key issue is energy usage; building has to meet a minimum score in Energy Star portfolio manager (energy model available on Energy Star web page – www.energystar.gov/benchmark)
 - So far, Sandia buildings considered for LEED EB have not met this minimum score
 - Some of this is due to building operators not understanding control systems designed into the buildings
 - Retro-commissioning identifies deficiencies



Other Green Activities and Accomplishments

- Retro-commissioning
- Central Irrigation Control System
- District Chilled Water Cooling
- Metering and Energy Reporting
- Lighting Retrofits
- Variable Frequency Drive (VFD) Installation
- Thermostat Setback
- Energy Awareness
- Solar
- De-centralized Heating
- Water Recycling



Questions?