Sustainability Standards for New Construction

**Brief**

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**BRIEF**

**Policy Summary**

This policy identifies sustainability standards for new facilities construction at Berkeley Lab. New facilities construction presents a unique opportunity to pursue integrated, performance-driven designs to minimize energy use and other environmental impacts associated with buildings at the lowest possible cost. The purpose of this policy is to:

1. Reduce constraints on growth of Laboratory research
2. Establish a practical path to comply with federal and University of California (UC) sustainability requirements
3. Drive continuous improvement in the area of high-performance, low-cost building design that is consistent with the leadership position demonstrated by Berkeley Lab research
4. Minimize life-cycle costs within the constraints of capital budgets
5. Provide leadership and support for state climate-related policy and strategic goals for greenhouse gas emissions reduction

**Who Should Read This Policy**

This policy applies to persons involved with the management of new building construction projects undertaken by the Laboratory. Section D.14, *Large Procurements*, in the POLICY tab of this policy also applies to persons involved with the procurement of major energy-consuming equipment or systems. This policy does not apply to persons involved with renovations (major or minor), retrofits, or installation of temporary structures.

**To Read the Full Policy, Go To:**

The POLICY tab on this wiki page

**Contact Information**

Chief Sustainability Officer
Directorate
sbl@lbl.gov

**Policy**

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**POLICY**

**A. Purpose**

This policy identifies sustainability standards for new facilities construction at Berkeley Lab. New facilities construction presents a unique opportunity to pursue integrated, performance-driven designs to minimize energy use and other environmental impacts associated with buildings at the lowest possible cost. The purpose of this policy is to:

1. Reduce constraints on growth of Laboratory research
2. Establish a practical path to comply with federal and University of California (UC) sustainability requirements
3. Drive continuous improvement in the area of high-performance, low-cost building design that is consistent with the leadership position demonstrated by Berkeley Lab research
4. Minimize life-cycle costs within the constraints of capital budgets
5. Provide leadership and support for state climate-related policy and strategic goals for greenhouse gas emissions reduction
B. Persons Affected

This policy applies to persons involved with the management of new building construction projects undertaken by the Laboratory. Section D.14, Large Procurements, below, also applies to persons involved with the procurement of major energy-consuming equipment or systems. This policy does not apply to persons involved with renovations (major or minor), retrofits, or installation of temporary structures.

C. Exceptions

Exceptions to this policy require formal approval by the Laboratory Director. Exceptions are expected to be rare and not violate the spirit of the policy.

D. Policy Statement

1. Living Laboratory. Berkeley Lab will strive to cultivate a living laboratory in its buildings to:
   a. Support, strengthen, and apply research
   b. Ensure that new knowledge is systematically generated to inform future projects or improve current operations
   c. Collect information on how a building performs relative to initial goals as an important feedback to future designs

2. Energy Efficiency – Whole Building Performance Targets. Building designs must meet whole-building energy performance targets based on type of use. A committee will develop specific whole-building performance targets based on guidance from the Laboratory Director’s Committee Consensus Policy Recommendations – Sustainability Standards for New Construction (see Other References in the Document Information tab of this policy), along with reference to comparable facilities and other applicable data. Targets will initially be less than half of typical equivalent facilities benchmarked to average energy use at the turn of the millennium. Efficiency targets will be made more stringent over time following demonstrated practical achievement of initial targets, and recognizing efficiency-enabling technology advancements. Design teams must prepare energy models to confirm compliance with targets. Models are to be developed beginning at schematic design or Critical Decision 2 (CD-2), updated with building program and material changes at end of design and end of construction administration, and represent the best estimate of as-operated building energy use and peak demands, before accounting for on-site energy generation. Targets are intended to be verifiable in actual operation.

3. Energy Efficiency – Code Compliance. In addition to meeting whole-building performance targets, building designs must demonstrate energy performance 30% lower than the maximum allowed by ASHRAE 90.1-2010, before accounting for on-site energy generation. This requirement will be revisited with each new code release. Current California Title 24 may be designated as an alternate code reference for energy performance requirements by the building design and construction project manager.

4. Energy Efficiency – Mechanical Systems. Refrigeration cycle-based cooling may be employed in office and other low-heat-load spaces built in the mild Berkeley climate only after all other options are proven to be inadequate. An example of measures to provide appropriate space temperatures during warm weather to be pursued before refrigeration cycle-based cooling include:
   a. Building orientation where possible
   b. Careful window and envelope design
   c. Shading and thermal mass
   d. Reductions in internal thermal loads from lighting and equipment
   e. High-performance glazing
   f. High R-value for insulation
   g. Pre-cooling with nighttime outside air
   h. Occupant-controlled or automated natural ventilation
   i. Low-energy means to improve personal comfort (such as ceiling fans)
   j. Evaporative cooling including cooling towers (warside economizers)

5. Energy Efficiency – Lighting Systems. Lighting circuits and lighting controls must be designed to allow for separate control for any area with a distinct occupancy pattern. Exterior and interior lighting controls must be installed consistent with mandatory requirements in the 2013 nonresidential California energy building code (Title 24). These requirements involve multilevel lighting controls, demand-response controls, automatic daylighting controls, occupant-sensing controls, security and egress lighting, secondary interior spaces, exterior luminaires, exterior building facade and ornamental hardscape lighting, and glare control.

6. Renewables. In an effort to support a 100% renewable energy goal for all new office and laboratory facilities, and after pursuing aggressive energy efficiency through the policies above, new building projects should pursue on-site renewable energy generation, direct interest in off-site renewable generation, or purchase of green power products. In keeping with federal requirements, renewable generation must be designed to generate at least 7.5% of the estimated project energy consumption from a renewable energy source. New projects must at a minimum be solar ready, i.e., designed to the maximum extent feasible to enable the installation of solar photovoltaic and heating systems even if they are installed after the building is constructed. Project-specific renewable energy goals will be defined as a Key Performance Parameter at the time the project is baselined for CD-2.

7. Green Building. Building designs for projects exceeding $5 million must achieve a minimum LEED Gold certification and where applicable meet at least the prerequisites of the Laboratories for the 21st Century (Labs21) or Environmental Performance Criteria (EPC) for Data Centers. For high-energy mission-specific facilities (HEMSFs), non-office and non-laboratory portions of the project without directly applicable LEED or EPC criteria may be excluded from the project submitted for certification, consistent with U.S. Green Building Council guidance.

8. Waste Minimization and Diversion. Building designs must comply with a zero-waste action plan that will be developed for each project by the Berkeley Lab Chief Sustainability Officer. Construction waste diversion of 90% (by weight) must be targeted and a minimum achievement of 75% (by weight) of construction waste must be diverted from the landfill.

9. Water. All new construction projects must achieve the following credits that are not currently required as prerequisites within the LEED rating system:
   a. Water-use reduction (WEc3) for 30–40% fixture savings
   b. Water-efficient landscaping (WEc1) designed to not require irrigation after an initial establishment period of 18 months
c. Process water efficiency (EPC Cr 4) that requires documentation of baseline annual process water use and process wastewater generation and implementation of strategies to reduce 20% from baseline

10. **Transportation.** All new construction projects must:

   a. Achieve the alternative transportation (SSc4.2) credit within the LEED rating system for bicycle storage, showers, and changing rooms (currently voluntary within LEED and not required as a prerequisite)
   
   b. Be served by the Berkeley Lab shuttle system or other means to reduce vehicle parking requirements

11. **Metering.** Interval metering is required to confirm as-operated building performance. Meters are to be integrated to an electronic system that will allow ongoing monitoring of metered data. Interval metering is required for:

   a. Each energy commodity at the building level (electricity, natural gas, delivered chilled water, delivered hot water, delivered steam)
   
   b. Inputs and outputs to major energy-using systems (chiller plants, boiler plants, water-heating systems) sufficient to calculate operational efficiencies
   
   c. Electricity end-use metering (which can be achieved cost-effectively if electrical circuits are separated by end-use and metering is specified as part of the electrical breaker) for the categories of HVAC (heating, ventilation, and air conditioning), lighting, plug loads, significant atypical loads (including high-performance computing clusters, data centers, server rooms, commercial kitchens, high-energy mission-specific facilities, and other (i.e., all remaining loads)
   
   d. On-site generation, such as renewable electric or thermal systems
   
   e. Water end-use metering for the categories of potable water, hot water, industrial water, and cooling tower makeup

12. **Metrics.** The following information will be documented by design teams for each building design:

   a. Most likely maximum (MLM) loads, design loads, and lowest partial load conditions assumed for the mechanical, electrical, and plumbing basis of design.
   
   i. For all equipment and subsystems, the applied margins of safety between the MLM and the design conditions must be reviewed to ensure that they represent an appropriate balance between extra capacity and the available budget.
   
   b. Solar-ready on-site renewable generation potential per building (annual kWh or MMBtu/gsf)
   
   i. This number will be maintained going forward along with actual project generation.

13. **Reporting.** The Chief Sustainability Officer will collaborate with site contacts to compile an annual performance report that includes as-operated performance in comparison to whole-building performance targets and metering points identified in Section D.11, of this policy. All underlying data will be made transparent and available.

14. **Large Procurements.** Award of procurement contracts for major energy-consuming equipment or systems (i.e., expected use greater than 1,000 MWh or 3,412 MMBtu annually), which includes high-performance computing clusters) must consider a life-cycle cost that includes estimated energy cost over the useful life of the equipment.

15. **Peer Reviews.** External peer reviews, managed by the Senior Project Manager, are required for mechanical, electrical, and plumbing designs to confirm compliance with this policy.

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**E. Roles and Responsibilities**

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<tr>
<td>Facilities Division Director</td>
<td>Implements this policy</td>
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| Chief Sustainability Officer        | • Assesses consistency or conflict with this policy at all major project milestones, including design team selection, input and review of schematic and detailed design, value engineering, construction, and commissioning  
  | • Coordinates and prepares Zero Waste Action Plans                             |
|                                     | • Reports annually as defined in Section D.13 of this policy                  |
| New Building Senior Project Director| After each new building project has been commissioned for occupancy, provides an update to the Laboratory Director that includes: (1) a summary of project performance with respect to the policy, (2) successes and challenges in implementing the policy, and (3) an assessment of the effectiveness and cost-appropriateness of the policy with suggestions for improvement |
| Laboratory Director                 | As needed, convenes a committee to update the policy                          |

**F. Definitions/Acronyms**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>High-energy mission-specific facility (HEMSF)</td>
<td>High-energy mission-specific facilities (HEMSFs) are defined by the U.S. Department of Energy. HEMSFs are separately constructed missionspecific facilities, such as accelerators (particle and light sources), reactors (fusion and fission), high-performance computers, high-performance lasers and similar facilities, and the closely coupled conventional facilities necessary for their operations.</td>
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<tr>
<td>Living laboratory</td>
<td>A living laboratory refers to an operational built environment in which applied research projects are conducted. The intent of a living laboratory is to ground research questions in a relevant operational context and enable quicker adoption of new techniques to achieve operational goals.</td>
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<tr>
<td>Major energy-consuming equipment or systems</td>
<td>Major energy-consuming equipment or systems are equipment or collections of equipment operating together that use greater than 1,000 MWh or 3,412 MMBtu annually, including high-performance computing clusters.</td>
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<td>LEED rating system</td>
<td>LEED or Leadership in Energy and Environmental Design is a program that provides third-party verification of green buildings. Building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system. The rating system referenced by this policy is LEED 2009 for New Construction and Major Renovations.</td>
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<td>Solar-ready</td>
<td>Solar-ready is defined as a building design that includes key aspects to enable solar photovoltaic and heating systems at some time after the building is constructed. For guidance, see the Solar Ready Buildings Planning Guide (NREL/TP-7A2-46078). Solar-ready includes steps to define a viable third-party (or self-financed) renewable energy project within the project boundary and steps to lower the cost of the project, such as orienting structures for maximum energy generation potential, maximizing free rooftop or parking-lot space, and providing open conduit and breaker space.</td>
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| Zero Waste Action Plan | A written plan that:  
1. Includes an estimate of the weight and volume of all waste streams, including at least solid waste (where construction and demolition waste is tracked separately from routine waste), medical waste, and hazardous waste  
2. Targets zero waste for solid waste, and encourages waste minimization and diversion for all waste streams  
3. Describes the management approach for each waste stream  
4. Describes how the building design supports the chosen management approaches for each waste stream  
5. Identifies further actions necessary to support the action plan  
6. Establishes diversion metrics to be reported |

**G. Recordkeeping Requirements**

See Section D.13, Reporting, of this policy.

**H. Implementing Documents**

Not applicable

**I. Contact Information**

Chief Sustainability Officer  
Directorate  
sbl@lbl.gov

**J. Revision History**

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>By whom</th>
<th>Revision Description</th>
<th>Section(s) affected</th>
<th>Change Type</th>
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<tr>
<td>9/18/2013</td>
<td>0</td>
<td>J. Elliott</td>
<td>New</td>
<td>All</td>
<td>Major</td>
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**Document Information**

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<tbody>
<tr>
<td>Document number</td>
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<td>Policy Area:</td>
<td>Major Construction</td>
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<td>RPM Section (home)</td>
<td>Facilities Management</td>
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Source Requirements Documents

- Federal sustainability requirements contained in EO 13514, EISA 2007, EO 13423, and EPACT 2005
- UC Sustainable Practices Policy, effective August 22, 2011, and specific requirements found at http://sustainability.universityofcalifornia.edu/policy.html
- DOE O 436.1, Departmental Sustainability
- Contract 31, Clause I.139 (EO 13423)
- Contract 31, Clause I.140, DEAR 970.5223-7, Sustainable Acquisition Program (Sep 2010)
- Contract 31, Clause I.138, DEAR 952.223-78 Sustainable Acquisition Program (Sep 2010)

Other References


Implementing Documents

Not applicable