

This is a guidance document with sample specification language intended to be inserted into project specifications on this subject as appropriate to the agency's environmental goals. Certain provisions, where indicated, are required for U.S. federal agency projects. Sample specification language is numbered to clearly distinguish it from advisory or discussion material. Each sample is preceded by identification of the typical location in a specification section where it would appear using the SectionFormat™ of the Construction Specifications Institute; the six digit section number cited is per CSI Masterformat™ 2004 and the five digit section number cited parenthetically is per CSI Masterformat™ 1995.

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**SECTION 48 30 00 (SECTION 13600) – BIOMASS ENERGY ELECTRICAL POWER GENERATION EQUIPMENT**

**SPECIFIER NOTE:**

*resource management:* Once energy efficiency is maximized for a project, providing the required energy via clean, renewable resources is more sustainable than using fossil fuels which are finite in supply and incur environmental impacts throughout their lifecycle. The Federal Energy Management Program (FEMP) provides information on technologies that have been proven in field testing or recommended by reliable sources.

The US Federal Government is one of the largest energy users; it purchases \$10–20 billion in energy-related products annually. With ownership of more than 500,000 buildings, including 422,000 housing structures, the Federal Government has a tremendous interest in energy efficiency in buildings.

The Energy Policy Act of 1992 and Executive Order 13123 set goals for energy reduction and provide some guidelines for implementing conservation measures and renewable energy measures. Annual energy use in Federal buildings has dropped from 140,000 Btu/sq ft (1,600 MJ/m<sup>2</sup>) in 1985 to 116,000 Btu/sq ft (1,300 MJ/m<sup>2</sup>) in 1997. To meet the Executive Order 13123 requirements, annual energy use must drop to 90,800 Btu/sq ft (1,000 MJ/m<sup>2</sup>) by 2010. EO13123 also directs agencies to significantly increase the use of renewable energy and to install 20,000 solar energy systems by 2010. Agencies have set a goal of 2.5 percent of Federal energy use from renewables by 2010 from green power purchases, on-site renewable energy projects, or other projects developed on Federal land.

Executive Order (E.O.) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance*; was signed on October 5, 2009. <http://www.ofee.gov/execorders.asp> It expands upon the energy and environmental performance requirements of previous Executive Orders. In particular, it requires that all new Federal buildings, entering the design phase in 2020 or later, are designed to achieve zero net energy by 2030.

[http://www1.eere.energy.gov/femp/regulations/printable\\_versions/eo13423.html](http://www1.eere.energy.gov/femp/regulations/printable_versions/eo13423.html)

Refer to "Greening Federal Facilities: An Energy, Environmental, and Economic Resource Guide for Federal Facility Managers and Designers" <http://www.eere.energy.gov/femp/pdfs/29267-0.pdf> Renewables are characterized by a high initial cost and low operating cost, and are often designed to minimize life cycle cost.

*toxicity/IEQ:* Electric renewables systems include battery storage if off-grid, and safeguards should be taken while installing and maintaining the electrolyte and batteries shall be properly recycled at the end of their useful life.

While there are well-known concerns regarding the toxic components of batteries, overall the systems that utilize renewable energy sources are generally considered to be less hazardous to human health and environmental health because they do not involve the combustion of a fossil fuel.

*performance:* This is a rapidly changing field. DOE – Energy Efficiency and Renewable Energy (EERE) and the National Renewable Energy Laboratory (NREL) offer resources for renewable energy, green power, and high performance buildings. Refer to <http://www.nrel.gov/> and to <http://www.eere.energy.gov>

Energy can be derived from biomass by burning it directly, by converting it into energy-rich gases (gasification) that can fuel advanced gas turbines or fuel cells, and by converting it into liquid fuels (biofuels) that can fuel vehicles and other power-supply equipment. Biomass power systems range in size from a few kW (enough for an average U.S. home) up to 80 MW for power plants. In today's "direct-fired" biomass power plants, generation costs are about \$0.09/kWh. DOE estimates that future, advanced technologies such as gasification-based systems could generate power for as little as \$0.05/kWh.

Other options for renewable energy include contracting for "green power" generated and supplied by a utility. Refer to Section 01 81 30 Green Power Requirements.

## PART 1 GENERAL

### 1.1 SUMMARY

- A. Section Includes:
1. Biomass Energy Systems(s)

### 1.2 SUBMITTALS

- A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

**SPECIFIER NOTE:**

Specifying local materials may help minimize transportation impacts; however it may not have a significant impact on reducing the overall embodied energy of a building material because of efficiencies of scale in some modes of transportation.

Green building rating systems frequently include credit for local materials. Transportation impacts include: fossil fuel consumption, air pollution, and labor.

USGBC-LEED™ v3 includes credits for materials extracted/harvested and manufactured within a 500 mile radius from the project site. Green Globes US also provides points for materials that are locally manufactured.

1. Local/Regional Materials:
  - a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
  - b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
  - c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
  - d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

**SPECIFIER NOTE:**

The Food, Conservation, and Energy Act of 2008 (also known as the 2008 U.S. Farm Bill) largely continues programs of the Farm Security and Rural Investment Act of 2002 ([2002 Farm Bill](http://www.usda.gov/farmbill/)) <http://www.usda.gov/farmbill/> Section 9002 requires each Federal Agency to develop a procurement program which will assure that items composed of biobased products will be purchased to the maximum extent practicable and which is consistent with applicable provisions of Federal procurement law. USDA designates biobased products for preferred Federal procurement and recommends biobased content levels for each designated product.

USGBC-LEED™ v3 includes credits for use of rapidly renewable materials, which USGBC describes as plants harvested within a ten-year cycle. Green Globes – US, provides credit for integration of materials from renewable sources that have been selected based on life-cycle assessment.

2. Biobased materials:
  - a. Indicate type of biobased material in product.
  - b. Indicate the percentage of biobased content per unit of product.
  - c. Indicate relative dollar value of biobased content product to total dollar value of product included in project.

**SPECIFIER NOTE:**

USGBC-LEED™ v3 includes credit for using on-site renewable energy for minimum 1 percent of the building's total annual energy. Credit is also offered for green power contracting. The contract must provide minimum 2-years of renewable energy for a minimum 35 percent of the building's total energy.

FEMP references green power as per the Center for Resource Solutions Green-e program. USGBC-LEED™ v3 also cites the Center for Resource Solutions Green-e program. Refer to <http://www.green-e.org/>

3. Renewable Energy:
  - a. Submit manufacturer's product data for system.
  - b. Submit calculations indicating the energy produced by the system relative to the total energy demand for the building.
  - c. Submit Letter of Certification from system provider indicating that energy produced by the system represents minimum **[1] [3] [5] [7] [9] [11] [13] [xxxx]** of the total energy demand for the building.

- B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

### 1.3 QUALITY ASSURANCE

**SPECIFIER NOTE:**

As defined in the Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased" means a "commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials." Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

According to the January 11, 2005 U.S. Department of Agriculture (USDA) Guidelines for Designating Biobased Products for Federal Procurement, biobased content is a percentage of the carbon in the product. The USDA will recommend the minimum biobased content of biobased products designated in the Federal Biobased Products Preferred Procurement Program, 7 CFR Part 2902. For current designations under the Federal Biobased Products Preferred Procurement Program (FB4P), refer to [www.biobased.oce.usda.gov](http://www.biobased.oce.usda.gov).

- A. Biomass Energy Systems:
  1. Performance:
    - ASTM E1758- Standard Test Method for Determination of Carbohydrates in Biomass by High Performance Liquid Chromatography
    - ASTM E1821- Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography
    - ASTM E1721- Standard Test Method for Determination of Acid-Insoluble Residue in Biomass

- ASTM E1755- Standard Test Method for Ash in Biomass  
ASTM E1690- Standard Test Method for Determination of Ethanol  
Extractives in Biomass
2. Biobased Content: Minimum **[50]** **[100]** **[xxxx]** percent for biomass fuel material.

## PART 2 PRODUCTS

### SPECIFIER NOTE:

EO 13423 includes requirements for Federal Agencies to "... improve energy efficiency and reduce greenhouse gas emissions ... by (i) 3 percent annually through the end of fiscal year 2015, or (ii) 30 percent by the end of fiscal year 2015, relative to the baseline of ... year 2003" and to "...ensure that (i) at least half of the statutorily required renewable energy consumed ... comes from new renewable sources [sources of renewable energy placed into service after January 1, 1999] and (ii) ... the agency implements renewable energy generation ... for agency use"

Under EO 13423, renewable energy means "energy produced by solar, wind, biomass, landfill gas, ocean (including tidal, wave, current and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project"

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## 2.1 EQUIPMENT

### SPECIFIER NOTE:

Decisions as to appropriateness of system requirements and design are dependent upon project goals and location. Coordinate with Divisions 22, 23, and 26 (15 and 16).

## PART 3 - EXECUTION

### 3.X SITE ENVIRONMENTAL PROCEDURES

- A. Resource Management:
  1. Energy Efficiency: Verify equipment is properly installed, connected, and adjusted. Verify that equipment is operating as specified.
  2. Renewable Energy: Verify proper operation in all modes of system operation by testing. Verify proper operation under a wide range of conditions to verify energy delivery as calculated for those conditions.

END OF SECTION