CALIFORNIA SUSTAINABLE POLICY AND BEST PRACTICES MANUAL

California Department of General Services
Office of Sustainability

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Introduction

The State of California continues to lead the nation in the development and implementation of sustainability policies related to greenhouse gas emissions, energy, water, transportation, and green operations. California leads by example by implementing these policies on its own facilities and operations often years in advance of requiring measures of the general public. This helps the state "test the water" and ensure that these policies can be achieved, have positive results, and that tools, mechanisms and resources are developed to help support widespread implementation.

State policies normally follow governors' executive orders and/or legislation. Many policies are introduced through Management Memo's which are used to distribute management or policy information to state entities, and are often preliminary amendments to the State Administrative Manual (SAM). They provide information on matters needing immediate attention, temporary instructions, reminders, and other materials not included in SAM, as well as the material to be included in SAM.

The State Administrative Manual (SAM) is a reference resource for statewide policies, procedures, requirements and information developed by agencies including the Governor's Office, DOF, CalHR, DGS, and CDT. Content is published under the authority of the directors of DOF and DGS. Many sustainability policies are published in SAM Sections 1800, 1900, and 3800.

The State Contracting Manual (SCM) includes policies pertaining to state purchasing and Environmentally Preferable Purchasing (EPP) and is issued by the DGS Procurement Division. Sustainable purchasing policies are mostly located in SCM Volumes 2 & 3, Chapter 3, Topic 11. Much additional guidance is located in the Buying Green Guide.

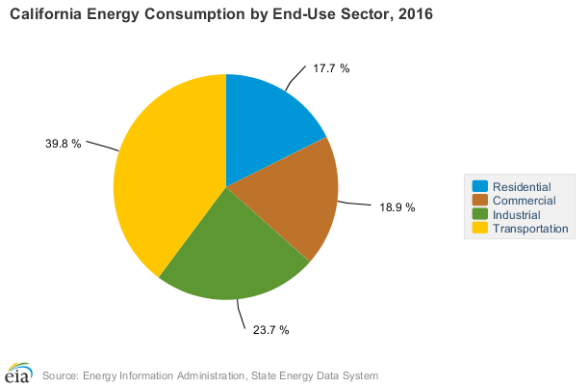
The policies in this manual were developed over years by dozens of subject matter experts from numerous state agencies. Many national experts also contributed to these policies. This manual is intended to be a living online document and to be continually updated as more policies are added, and more resources and tools are developed and identified. For any updates or corrections, please contact sustainability@dgs.ca.gov. Contact information has been included at the end of each chapter for specific policy questions and to learn more.

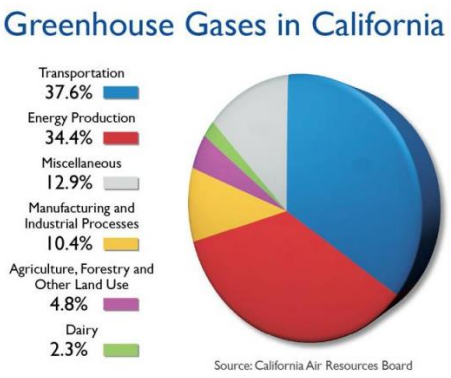
Energy

Energy Use Reduction in New, Existing, and Leased Buildings

Introduction

Buildings account for a large percentage of all energy used in California, and a significant part of greenhouse gas emissions. Reducing energy use at state facilities not only reduces energy use and emissions, but also reduces operating costs. Many technologies and strategies to reduce energy use are very cost-effective. When choosing the best energy efficiency strategy for state buildings, consider its implementation costs, savings, risks, and other effects on the building systems and occupants.





Policy

All state agencies shall achieve targets and timelines for energy use reductions established in Executive Order B-18-12 and the Green Building Action Plan for buildings they design, build, manage, or lease.

- Agencies shall include their strategies and procedures to achieve these targets in their existing building infrastructure plan updates.
- Agencies shall enter all energy consumption data into the ENERGY STAR® Portfolio Manager® annually, by March 1. As agencies automate their meters, this information will be collected monthly.

For the comprehensive policy see Management Memo 15-04: Energy Use Reduction For New, Existing, And Leased Buildings.

Requirements

Reporting Requirements

Each state agency shall be responsible for developing annual energy use reduction goals and intended actions for achieving the goals stated in its five-year infrastructure plan.

a. Agency Reporting Requirements for State-Owned (Existing) Buildings and New and Renegotiated State Building Leases.

   The annual energy use reduction goals of existing buildings, as well as new and renegotiated state building leases, shall be included in the annual state agency five-year infrastructure plan, and annual whole building energy use shall be entered into the ENERGY STAR® Portfolio Manager database, with access provided to DGS.

Benchmarking of initially occupied new buildings and build-to-suit leases should begin upon building occupancy.

Use Requirements

New Buildings and Renovations

a. All new building and renovation project computer modeling, reports, and other related documentation prepared as part of the design process shall become the property of the state once the project is closed out and/or has received an occupancy permit.
b. All new building and renovation projects shall be designed and constructed to exceed by 15 percent the applicable version of the Title 24, Part 6, Building Energy Efficiency Standards.
c. All new building and renovation projects less than 10,000 gross square feet of building area (gsf) shall meet or exceed project applicable Title 24, Part 11, California Green Building Standards Tier One requirements.
d. All new building and renovation projects larger than 5,000 gsf and exceeding an energy use intensity (EUI) of 50,000 British thermal units (BTU)/gsf, or larger than 10,000 gsf shall be commissioned in accordance with Leadership in Energy and Environmental Design (LEED) requirements and California Title 24, Part 6, Energy Efficiency Standards that are in effect at the time.
e. All new building and renovation projects larger than 10,000 gsf shall:
    i. Install and operate all design-appropriate and economically feasible clean, onsite power generation including, but not limited to solar photovoltaic, solar thermal, and wind power generation including clean backup power supplies.
        - To the extent possible, explore methods of alternative financing including but not limited to power purchase agreements (PPAs) or other mechanisms to fund, install, and/or manage on-site renewable energy generation.
    ii. Obtain LEED Silver or higher certification using the version of LEED that is in effect at the time the project schematic design documents are initiated by the state agency. Certification to an equivalent or higher rating system or standard (if any) is acceptable only when approved by the Sustainability Task Force.
f. All new state buildings, major renovations, and build-to-suit leases beginning design after October 23, 2017, shall be designed and built following cost-effective energy efficiency strategies for achieving Zero Net Energy (ZNE) as outlined in SAM Section 1815.31 – Zero Net Energy for New and Existing State Buildings, and as outlined in the Zero Net Energy chapter of this manual.
g. All new buildings and renovation projects shall include an Energy Management Systems (EMS) with a training program for energy management and maintenance staff; or shall include an Energy Management Plan.

Existing Buildings

a. EO B-18-12 requires that before January 1, 2016, all existing buildings over 50,000 gsf shall complete LEED for Existing Building Operations and Maintenance (LEED-O+M) certification. Additionally, these larger buildings shall meet or exceed an ENERGY STAR

rating of 75, to the maximum extent cost-effective. Departments should continue to pursue LEED-O+M certification on these large buildings using cost effective strategies and methods, to achieve this certification.

b. All state agencies were required to take measures to reduce annual grid-based energy purchases for existing buildings by 20 percent by the end of calendar year 2018, compared to a 2003 calendar year baseline. Total grid-based energy purchases shall be calculated in equivalent thousand British thermal units (kBtu) when compared to purchases in calendar year 2003 for all forms of energy provided (for example, electricity, natural gas, propane, and any other forms of energy) according to Table 1 below.

Table 1: Site Energy kBtu Conversion

Energy Type	Energy Unit	Site Energy Conversion
Electricity	1 kilowatt hour	3.412 kBtu
Natural Gas	1 therm	99.976 kBtu
Propane	1 gallon	95.500 kBtu

   i. Agencies shall enter current energy use data into the ENERGY STAR Portfolio Manager database, including electricity, natural gas, propane, on-site renewable energy, and any other forms of energy. Onsite renewable energy generated counts toward energy reductions and is not included in total energy purchases.
      - Online access to the ENERGY STAR Portfolio Manager database shall be provided to the DGS Office of Sustainability.
      - Retail electricity purchases for water management activities directly associated with water conveyance and flood control are excluded.
   ii. Agencies shall set up automated energy data transfers from their utility into the ENERGY STAR Portfolio Manager database, if available from their utility.

c. Before January 1, 2025, all state agencies shall take measures toward achieving ZNE for at least 50 percent of total state-owned building area (gsf) that they manage in accordance with SAM Section 1815.31 – Zero Net Energy for New and Existing State Buildings, and as outlined in the Zero Net Energy chapter of this manual. Measures can include:
   iii. Reduce non-facility energy use (including plug loads affected by building occupant behaviors, computers, equipment and appliances).
   iv. Assess feasibility, methods, and mechanisms to install long-term on-site or off-site renewable energy to generate as much energy over a year as all combined sources of energy used on the site during the same year.
   v. To the extent possible, explore methods of alternative financing including, but not limited to energy service companies (ESCOs), on-bill financing, GS- $Mart, PPAs, and community solar.

d. All state agencies shall participate in all available demand response power supply programs designed to reduce peak electrical loads when such programs do not adversely affect state agency building operations, occupant performance or indoor environmental quality.

e. Existing buildings shall incorporate building commissioning to facilitate improved and efficient building operations as set forth in Table 2 below.

Table 2: Building Commissioning Criteria for Existing State Buildings

Building Type	Building Area (gsf)	EUI (kBtu/sq. ft.)	Required Commissioning
All Existing State Buildings	>50,000 gsf	EUI > 20	Monitoring-based Commissioning (MBCx)
	>5,000 gsf	EUI > 100	MBCx
Metered State Buildings	>10,000 gsf	EUI > 30	MBCx

Building Leases

a. All state agency build-to-suit leases shall be designed and constructed to meet the requirements of Section 1 above for New Buildings and Renovations.
b. All new and renegotiated state building leases shall encourage lower than industry-standard energy and other resource use to the extent possible and economically feasible. These leases should also encourage landlords to participate in available utility programs that offer financial incentives and alternative financing to cover energy efficiency measure and renewable power system incremental costs.
c. All new state building leases shall, where economically feasible, require the use of submeters for gathering energy use data as needed to complete ENERGY STAR Portfolio Manager reports.
d. Renegotiated state building leases for buildings, where the state is a sole tenant, shall provide energy use data, if possible, for completing ENERGY STAR Portfolio Manager energy use evaluations and for benchmarking reports.
e. All state-leased facilities shall participate in cost-effective demand response power supply programs designed to reduce peak electrical loads, if available, without adversely affecting state agency building operations, occupant comfort and performance, or indoor environmental quality requirements outlined in the State Administrative Manual (SAM), Sustainable Operations and Practices Ch. 1800.

Best Practices/Case Studies

Best Practices

- Best Practices in Energy Efficiency – Practice Greenhealth – Describes demand-side management, a facility management approach reduces the need for energy through system-wide energy conservation approaches including:
  - Retro-commissioning (RCx) & monitoring-based commissioning (MBCx)
  - Lighting upgrades to efficient light sources, fixtures and controls including automatic dimming and motion sensors
  - Supplemental load reduction through more efficient equipment, computers, task lighting, power management software, etc.
  - HVAC upgrades to highly efficient, right-sized systems, and regular maintenance, filter replacement, and adjustments
- Monitor and track energy use, including after hours, to identify and reduce energy use and phantom electric loads.

Case Studies

- Energy Efficiency Case Studies – California Commissioning Collaborative

Resources

Alternative funding sources to support agency five-year infrastructure plans to meet or exceed the requirements of this management memo can include power purchase agreements (PPA's), GS $Mart, the Energy Efficient State Property Revolving Fund, or other funding mechanisms.

Title 24, Part 6, Energy Efficiency Standards http://www.energy.ca.gov/title24/

Design Guidelines to Consider

- Energy Design Resources, Investor-Owned Utilities PG&E, SDG&E, SCE, SMUD, and LADWP
- Savings by Design Program
- Savings by Design Participant Handbook
- Saving Energy in Commercial Buildings, NREL , U.S. Department of Energy
- Energy Star Building Upgrade Manual, U.S. Environmental Protection Agency
- Whole Building Design Guide, National Institute of Building Sciences
- California Commissioning Guides for New Buildings and Existing Buildings
- Leadership in Energy and Environmental Design (LEED) Resources, US Green Building Council
- Database of State Incentives for Renewables & Efficiency

Contact Information

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Zero Net Energy

Introduction

The state of California intends to lead the state by example, while curbing greenhouse gas emissions and moving state facilities toward Zero Net Energy (ZNE), designing and building efficient state buildings that produce as much clean, renewable energy as it consumes annually. This is also being applied toward half of existing state building area, and aligns with Executive Order B-18-12 and State Administrative Manual (SAM) chapter 1815.31.

Policy

Executive Order B-18-12 requires the following actions to reduce the environmental impact of state facilities on climate change:

- All new State buildings and major renovations beginning design after 2025 shall be constructed as Zero Net Energy facilities.
- 50% of new facilities beginning design after 2020 shall be Zero Net Energy.
- State agencies shall also take measures toward achieving Zero Net Energy for 50% of the square footage of existing State-owned building area by 2025.

To facilitate achieving these goals the following shall apply:

- All new state buildings, major renovations, and build-to-suit leases beginning design after October 23, 2017, shall be designed and built following cost-effective energy efficiency strategies for achieving ZNE identified below.
- Departments shall work to improve energy efficiency in existing buildings in the most cost cost-effective manner to meet or exceed energy efficiency targets established in energy efficiency strategies for achieving ZNE identified below.
- Renewable energy generation shall be added to state facilities either onsite, and/or offsite to achieve EO B-18-12 targets by following renewable energy generation prioritization and strategies identified below.

Definition

The state of California determined to utilize source energy in its calculation of ZNE, and defined it as follows:

> ***ZNE Source*** *– Energy Efficient building that produces as much clean renewable energy as it consumes over the course of a year, when accounted for at the energy generation source.*

Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all fuel extraction, transmission, delivery, and production losses. By taking all energy use into account, the ZNE definition provides a complete assessment of energy used in buildings. Definitions of other terms can be found in the Green California Glossary.

Source energy is calculated by multiplying each energy source (electricity, natural gas, propane, steam, chilled water, etc.) by its respective source energy conversion factor into common energy units (kBtu) for a 12-month duration. These conversion factors are included in a ZNE Calculator developed by DGS, and generally follow conversion factors determined by the American Society of Heating, Refrigerating

and Air-Conditioning Engineers (ASHRAE), which are subject to updates every few years. The next anticipated update to these conversion factors is late 2019, and the state's ZNE calculator will be updated when that occurs.

Energy Measurement and Calculation

Measurement of source energy converts all energy sources into common units of Source kBtu using established conversion factors for each energy source. Energy use quantities are included in the Energy Star Portfolio Manager reporting[1]. Source energy conversion factors shall be applied to energy metrics from all energy sources, including district energy and renewable energy and shall be based on national averages in ASHRAE Standard 105-2014[2]. They are also included in a ZNE Calculator for State Buildings. Energy used for Zero Emission Vehicle charging or fueling is excluded from building total energy for ZNE calculations.

Two components make up a ZNE building: energy efficiency, and renewable energy generation. State agencies shall utilize the following strategies to achieve ZNE at state facilities whenever possible and cost-effective to ensure the highest output and efficiency possible, reduce long-term operating budgets and reduce or avoid any uneconomical overgeneration of renewable energy:

Energy Efficiency

Ultra-low energy use should always be the initial focus for each building pursuing ZNE through energy conservation, passive systems and whole-building integrated energy efficiency measures.

New Construction, Major Renovations and Build-to-Suit Leases

All new projects shall exceed the applicable version of California code (California Code of Regulations, Title 24, Part 6), by fifteen percent or more. (This is already required by EO B-18-12 and identified in its Green Building Action Plan, and outlined in SAM 1815.3)

- Build-to-suit leases apply where the state will likely become the eventual owner of the building, and the state is the sole tenant.
- All new projects should design and construction facilities to maximize efficiency, and accommodate on-site renewable energy to the extent feasible and cost-effective, whether onsite renewables are installed with new project, or at a later date. This may include site orientation, massing, layout, landscape design, roof design and orientation, and mechanical/electrical room layouts. If onsite renewable energy is not possible, or feasible, other renewable energy generation strategies may be utilized (see Renewable Energy Generation categories below.)
- Design and install conduits and chases for eventual wiring and plumbing required for connecting site and/or building renewable energy systems to mechanical/electrical rooms.
- Departments with decision-making authority are responsible to implement energy efficiency measures into all new construction and major renovation projects, and meet energy efficiency targets, or exceed them to the extent cost effective. The Department

[1] State agency and facility energy use is posted on the governor's green building website, and will eventually include energy efficiency metrics and ZNE data.
[2] ASHRAE Standard 105-2014, Table J2A. Primary Energy Conversion Factors for National Comparisons

of General Services (DGS) is responsible for implementing these measures into buildings for Departments without this authority.

- All departments are responsible to conserve energy to the extent feasible, through procurement of energy-efficient office equipment, and other measures identified in SAM Section 1805.3 – Standard Operating Efficiency Procedures.
- A ZNE Decision Making Matrix for State Agencies helps identify measures and responsibilities of owners, tenants of new and existing state buildings pursuing ZNE.

Existing Buildings

Existing state buildings should strive to achieve high levels of energy efficiency before adding renewable energy to achieve ZNE. While state agencies are required to take measures toward achieving ZNE on 50 percent or more of their building area, they should work to achieve high energy efficiency levels in their entire portfolios to the extent cost effective.

- Energy efficiency for ZNE is to be measured using Source Energy Use Intensity (Source EUI), and uses the following units of measurement – kBtu/sq. ft. Source (thousand British thermal units per square foot of building area). This metric can currently be extracted from the Energy Star Portfolio Manager in a report, but can also be calculated using the ZNE Calculator.
- Energy efficiency targets for existing state buildings are derived from 2015 historic state-owned building energy data and some national data. These energy efficiency targets are established as the top quartile of energy use for each building type. For some building types (i.e. offices & other types) EUI targets are established for some specific state occupancies, as well. This accounts for variations from differences in occupancy, hours of use, equipment, etc.
- Source EUI targets for Existing State Buildings are all listed in the linked table and includes variations for each of the 16 California Climate Zones. These are soft EUI targets that state agencies should attempt to achieve for buildings or facilities pursuing ZNE. They are intended as a guide, as some circumstances may vary affecting the feasible achievability of some targets.
- Energy use reduction in existing buildings can be achieved through a variety of measures including:
    - Upgrading lighting systems and controls to more efficient systems
    - Upgrading heating, ventilation and air conditioning (HVAC) systems and/or controls for improved efficiency
    - Improving thermal performance of building envelope (insulation, glazing, roofing, etc.)
    - Reducing plug loads by improving efficiency of equipment and appliances used in building (see SAM chapter 1805)
    - Energy conservation measures of occupants
    - Retro-commissioning and monitoring-based commissioning, as required and outlined by SAM Section 1815.3
    - The DGS Energy Efficiency Retrofit Program provides support for state departments on energy efficiency upgrades utilizing ESCo's, and other alternative financing options.

- A ZNE Decision Making Matrix for State Agencies helps identify measures and responsibilities of owners, tenants of new and existing state buildings pursuing ZNE.

Renewable Energy Generation

In addition to achievement of energy efficiency targets, renewable energy must be generated and used to offset the annual energy use of the facilities achieving ZNE. Renewable energy generation should come from the following sources, as much as possible in the priority listed (a through d below), but can include a combination of the following approaches. In all cases Renewable Energy Credits (RECs) must be retired (not sold to other customers) for all renewable energy systems.

Building

Generate and use renewable energy on-site to the extent possible and cost-effective.

- This can utilize rooftops, or the building site (parking lot, adjacent land) for on-site renewable generation.
- On-site systems can be purchased as part of projects, procured through Power Purchase Agreements (PPA's), or through other means. DGS provides assistance procuring PPA's through its Clean Energy Generation Program.
- It is strongly advised that all on-site renewable energy system procurement include services for operation and maintenance to assure that system operation and generation persists for the life of the equipment.

Campus

Generate and use renewable energy within a multiple building campus to the extent possible.

- This can utilize rooftops, or the building or campus site (parking lot, adjacent land, common areas) for on-site renewable generation.
- Advantages of campus generation include that excess renewable energy generation, above the amount of the building(s) achieving ZNE can be used to offset other campus loads.

Portfolio

Generate and use renewable energy within an owner's portfolio to the extent possible.

- Multiple building sites by the same owner could be used and aggregated so that the combined on-site renewable energy could offset the combined building energy generated off-site from the aggregated building sites. This could apply to the entire portfolio, or portions of the portfolio.
- This approach would allow ZNE to be achieved for energy-efficient buildings within the portfolio where the capacity for on-site renewable energy is very restricted. While preferable, it is not required that renewable generation using the portfolio approach be in the same utility grid as the building achieving ZNE.
- This approach may require a cooperative agreement with the utility, and could also provide an outlet for excess renewable energy production during periods of the day when over-generation of electricity is likely, to avoid financial losses from selling back excess energy wholesale to utilities.

Community

Generate renewable energy within the state for use at the facility, after other feasible options have been exhausted to the extent possible.

- This could be applied to allow long-term purchase agreements of state-generated, renewable energy, dedicated to providing energy for the building(s). Agreements should extend a minimum of 20 years, and must specify that the RECs are owned by the electricity customer and retired by the utility.
    - Some utilities may offer customers the opportunity to enter a long-term contract to purchase renewable energy from the utility for some portion of the energy used at the site. The contract must be for at least 20 years and must specify that RECs are owned by the electricity customer and will be retired by the utility.
- Short-term RECs would not be allowed to be counted toward achievement of ZNE, while they are still effective to reduce GHG emissions.

Other renewable generation strategies to consider

- **Share excess generation** – Whenever possible, excess generation should be utilized on-site through energy storage, with other buildings on campus, or through utility agreements with other buildings in portfolio.
- **Install energy storage** – Utilize on-site energy storage (batteries, thermal, etc.) to shift energy use for peak load reduction, limit overgeneration sent back to the grid, reduce demand charges, reduce energy costs by taking advantage of time-of-use (TOU) rates, and provide cloud cover and outage protection for the facility.
- **PV array orientation** – To the extent possible, orient the PV arrays in way that maximizes alignment of the onsite generation with the onsite electrical load. This approach should be reviewed and adjusted over time to provide alignment with the needs of the utility grid.
- **Use over-generated energy for EVSE charging** – Electric vehicle service equipment (EVSE) can utilize excess energy generated to charge electric vehicles. This will help reduce or avoid export of over-generated electricity, and help agencies meet zero-emission vehicle charging infrastructure goals. Energy used for electric vehicle charging does not count toward building energy use, nor does it need to be included in ZNE building calculations. However, electricity generated through on-site renewables that is used for EV charging can be used in ZNE calculations to offset non-EV-charging electricity and natural gas use at the site.
- **Renewable heating and cooling** (including ground source heat pumps or district heating), electrification, and other technologies to improve efficiency.
- **Mixed sources of renewable energy** – Consider mixed sources of renewable energy from multiple sources, to mirror best grid optimization. For example, wind power also generates without sunlight, and during non-daylight hours. • Renewable heating and cooling (including ground source heat pumps or district heating), electrification, and other technologies to improve efficiency.
- **Renewable heating and cooling** (including ground source heat pumps or district heating), electrification, and other technologies to improve efficiency.

Additional Energy Reference Policies

State departments should have implemented the practices incorporated into the State Administrative Manual (SAM) Chapter 1800, Sustainable Operations and Practices, in the operation and maintenance of their facilities. Chapters that contain energy policies include:

- Standard Operating Procedures for Energy Management in State Buildings (Section 1805)
- Procedures for Energy Management in State Buildings During Electrical Emergencies (Section 1810)
- Energy Use Reduction for New, Existing and Leased Buildings (Section 1815)
- Energy Efficiency in Data Centers and Server Rooms (Section 1820)

State of California Zero Net Energy Resources and Guides

- State of California Energy Efficiency Targets for Existing State Buildings Pursuing Zero Net Energy (ZNE) – Table identifying Source Energy Use Intensity (Source EUI) targets for existing state buildings to achieve or exceed when pursuing ZNE. Targets use Source EUI metrics for energy use that can be retrieved from Energy Star Portfolio Manager in a report, or calculated using ZNE Calculator.
- ZNE Calculator – Spreadsheet calculator developed by California Department of General Services to calculate Source EUI, estimate renewable energy generation and/or photovoltaic array requirements, and to verify achievement of ZNE after 12 months of energy data is verified.
- ZNE Decision Making Matrix for State Agencies – Guideline for what decisions need to be made by owners, tenants, etc., for state ZNE buildings.

Directories

- Getting to Zero Database – Database of verified and emerging ZNE buildings. Agencies are encouraged to submit information on their buildings that have been built or upgraded to be ZNE, as well as after 12 months of energy data have verified achievement. Database is managed by the New Buildings Institute.

Other ZNE Guidelines and Resources

- New Buildings Institute Zero Net Energy Hub – Website with resources and tools supporting ZNE, energy efficiency and other related efforts.
- The Technical Feasibility of Zero Net Energy Buildings in California – A ZNE technical report by ARUP for PG&E published December 2012.
- The Road to ZNE: Mapping Pathways to ZNE Buildings in California – A ZNE report by HMG for California Utilities, published December 2012.
- Net Zero Energy Design: A Guide for Commercial Architecture, Thomas Hootman, 2012
- Design Professional's Guide to Zero Net Energy Buildings, Charles Eley, 2016
- How-To Guide for Energy-Performance-Based Procurement: An Integrated Approach for Whole Building High Performance Specifications in Commercial Buildings – NREL, 2013
- Introduction to Cost Control Strategies for Zero Energy Buildings: High-Performance Design and Construction on a Budget – NREL, 2014
- Cost Control Strategies for Zero Energy Buildings: High-Performance Design and Construction on a Budget – NREL, 2014

- An Energy-Performance-Based Design-Build Process: Strategies for Procuring High Performance Buildings on Typical Construction Budgets: Preprint – NREL, 2014

Case Studies

- Zero Net Energy Case Study Buildings Volume 1 – Six case studies of ZNE buildings published in September 2014, written by Edward Dean for PG&E
- Zero Net Energy Case Study Buildings Volume 2 – Five case studies of ZNE buildings published April 2016, written by Edward Dean for PG&E
- Zero-Net Energy Case Studies – New Buildings Institute, 2014. Brief case studies of various ZNE buildings in US. More NBI case studies at this link.

Contact Information

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Standard Operating Procedures for Energy Management

Introduction

In an effort to decrease energy use, the Department of General Services seeks to employ requirements and suggestions for state offices. The general requirements utilize automatic processes and thoughtful use of common areas. State-owned and leased buildings typically will be operational from 6:00 AM through 6:00 PM Monday through Friday (excluding facilities that are designated as 24/7 or continuously operational). All non-essential lighting and other electrical loads shall be minimized outside of normal building hours. State agencies are expected to make a reasonable determination as to what functions must continue outside of these hours.

General Requirements

1. At the end of the workday or when not needed, employees shall turn off all lights and equipment in their work space, except for equipment designated as 24/7 or for which there is a specific need for after-hours operations (e.g., email servers, fax machines or other essential equipment). Facility managers are encouraged to install reminder labels.
2. If occupancy controls are not used in common areas, facility managers or appropriate designees shall turn off all equipment and non-emergency lighting at the end of the workday or when not needed.
3. Information Technology managers or appropriate designees shall enable the automatic power-down or "Energy Saver" feature on all computers, copiers, printers, and other electrical equipment, consistent with IT Policy Letter 10-09 and subsection 12 of the State Administrative Manual Section 4819.31.
4. When purchasing equipment, state agencies shall purchase the most energy efficient ENERGY STAR rated equipment that is practical, considering Environmentally Preferable Purchasing principles.

Standard Operating Efficiency Procedures

Policy/Introduction

All state agencies shall follow the Standard Operating Efficiency Procedures[3] for managing energy usage in state-owned buildings and, as practical, in state-leased buildings. Department directors or their designees shall designate energy coordinators for each location their department occupies. Energy coordinators are responsible for ensuring that the Standard Operating Efficiency Procedures are carried out to the extent that funding is available and they do not conflict with health and safety requirements or operations necessary for a department to fulfill its mission and responsibilities.

For the comprehensive policy see Management Memo 14-07: Standard Operating Procedures for Energy Management in State Buildings.

[3] Management Memo 09-04

Requirements

Building Heating and Cooling Systems

Energy use for computers and office equipment is increasing. In office buildings that have improved the efficiency of lights, heating and cooling it can represent as much as 50% of the total electricity use.

1. Facility managers shall allow building temperatures to fluctuate within an acceptable range to avoid wasteful over-control patterns. This range may vary with each building's control system; the target range is plus or minus two degrees Fahrenheit from the temperature set point, for a total fluctuation of four degrees Fahrenheit. The temperature set point should be no higher than 68°F in winter and no lower than 78°F in summer; unless such a temperature in a particular job or occupation may expose employees to a health and safety risk. Simultaneous or alternate heating and cooling operations to maintain exact temperature in work areas shall be avoided.
2. Whenever practical, facility managers shall operate and adjust controls to get optimum advantage from outside temperatures for meeting cooling demand (e.g., using outside air economizers and night flush cycles). Avoid operating chillers and compressors when possible. All "pre-cooling" options for buildings shall be employed.
3. State employees are prohibited from using personal heaters without the express written consent of the facility manager or an approved reasonable accommodation request.
4. State employee shall keep windows and doors closed to prevent loss of heated or cooled air, unless the facility manager has indicated that the building is specifically designed for natural ventilation efficiency.
5. State employees in state-occupied locations shall adjust window blinds or coverings, if installed, to prevent solar heat gain during summer and prevent heat loss in winter
6. Facility managers shall order data center operators to maintain ambient temperature settings at manufacturer specification maximums.
7. Facility managers shall not set domestic hot water temperatures above 105° F unless this conflicts with a code requirement for the facility. Facility managers and state employees in state-occupied locations shall take every opportunity to minimize hot water usage.

Year-Round Maintenance

1. Facility managers shall inspect and maintain ducts, air filters, and related hardware to maximize effectiveness at the lowest acceptable power use.
2. Facility managers shall tune up all forced and induced draft gas and oil-fired boilers at least twice annually. If there are automated combustion controls, verification of combustion efficiency shall be conducted at least twice annually.

Lighting

1. State employees in state-occupied locations shall turn off all lights in unoccupied rooms. Facility managers shall install occupancy sensors whenever practical. Occupancy sensors shall be selected to be appropriate to the room geometry and usage patterns of the space. When areas served exceed 10,000 square feet, occupancy sensors should undergo quality assurance testing included in building systems that are commissioned.
2. Facility managers shall reduce lamps and/or luminaires in number and/or wattage to provide the lighting level appropriate for the activities of the work area affected.

3. Facility managers shall replace any incandescent lighting with higher efficiency sources, such as fluorescent, high intensity discharge (HID), light-emitting diode (LED), or induction lighting whenever replacement is required.
4. For fluorescent lights, facility managers were asked to have a place in place by December 2015 to replace any older "core and coil" magnetic ballasts with newer energy-efficient electronic ballasts
5. Facility managers shall install some form of daylight controls in day-lit zones (near windows and under skylights). When such day-lit areas exceed 10,000 square feet, or are part of new construction or a major renovation, these day lighting controls (e.g., sensors that adjust artificial lighting in response to the available natural light) should be included in building systems that are commissioned.
6. Where practical, facility managers shall consider the significant energy savings made possible by the selection of lower level general ambient lighting with small area, high-efficiency fluorescent or LED task lighting for higher level task lighting requirements – an approach particularly appropriate for work stations and computer use areas.
7. When painting or renovating, use light colored ceiling, wall, floor and desk surfaces throughout building to boost overall ambient illumination levels (dark surfaces absorb light). Keep lighting fixtures clean to maintain lighting levels.
8. Facility managers shall have custodial personnel turn lights on only as needed and turn lights off when their work is done. Where practical, have custodial personnel work in teams to complete cleaning on each floor of multi-story buildings.

Plug Loads

Plug loads are any devices that plug into a building's electrical system. Plug and process loads (PPLs) are referred as energy loads that are not related to general lighting, heating, ventilation, cooling, and water heating, and that typically do not provide comfort to the occupants. PPLs account for 33% of U.S. commercial building electricity consumption. Today, the typical office worker uses an ever-growing suite of electronic devices, all drawing from the power grid and running up the utility bill. Electricity use associated with plug loads is on the rise, and plug loads in commercial buildings are now one of the fastest growing end uses of energy. Minimizing PPLs is a critical part of the design and operation of an energy-efficient building.

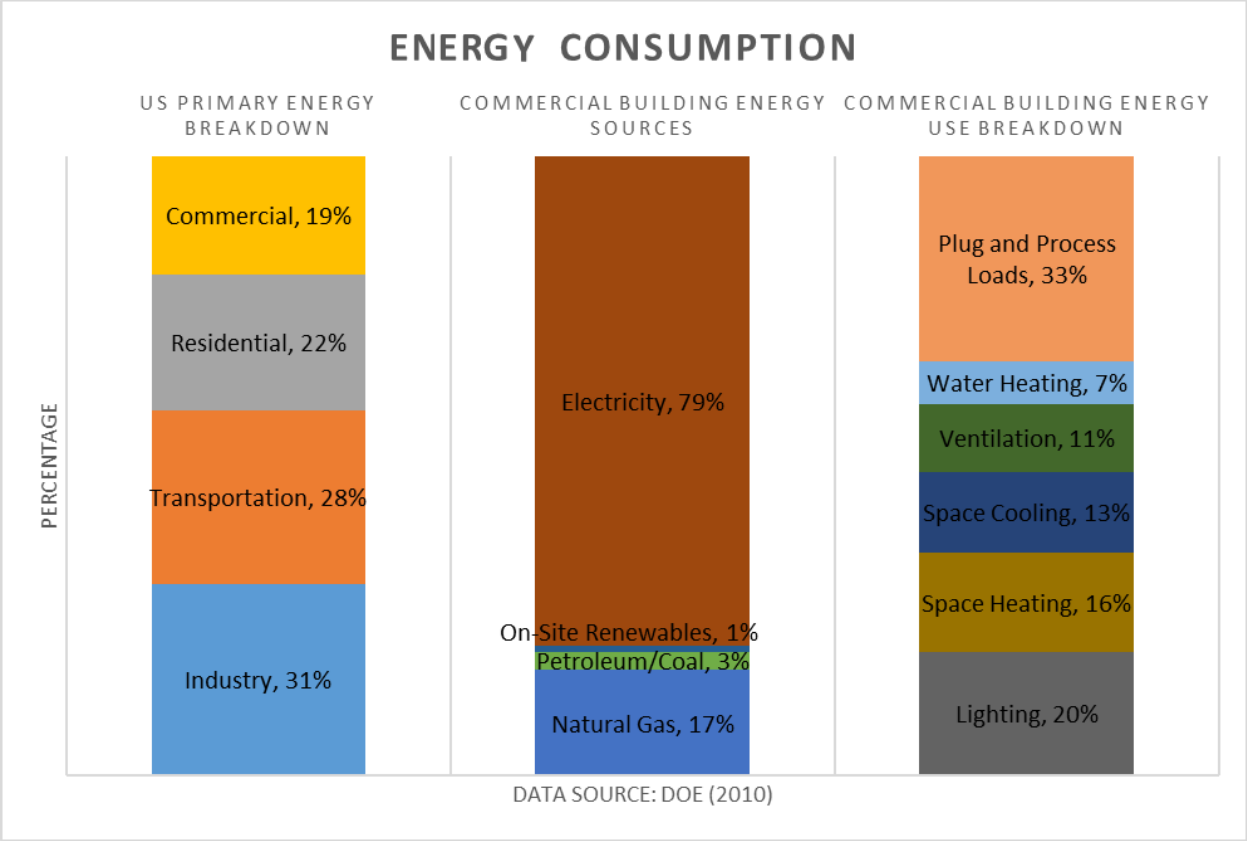


Figure 1: PPLs account for 33% of the total energy consumed by commercial buildings.

1. State employees shall not plug in any personal devices, including but not limited to coffee pots, microwaves, refrigerators, and heaters, in workspaces. Exception: the following may be allowed if the facility manager determines that the circuit can safely accommodate the electrical load:
    a. Cell phones and tablets
    b. Task lighting that is Underwriters Laboratory (UL) approved and does not use incandescent or halogen bulbs.
2. Facility managers shall work with employees and vendors to ensure that all equipment in employee kitchens, lunch rooms, and other shared spaces complies with the following:
    a. Additions of new equipment must have a current ENERGY STAR rating, when available;
    b. As practical, strive to replace refrigerators and equipment manufactured prior to 2000 with more efficient models;
    c. Refrigerated beverage vending machines and hot/cold water dispensers that are purchased, leased, or supplied by an outside vendor must be ENERGY STAR rated to the current version, when available;
    d. All vending machines with non-perishable items must comply with one of the following:
        i. Have built-in low power modes for lighting and refrigeration, as applicable and described in ENERGY STAR program requirements for refrigerated beverage machines, version 3.0, section 3(B); or
        ii. The facility manager has installed an after-market occupancy sensor.
    e. Coffee makers must shut off automatically;
    f. Equipment must be regularly cleaned and maintained to optimize efficiency.

3. Facility managers shall install power strips with timer settings and/or inexpensive, energy-efficient timers to turn off equipment during non-work hours (including paper shredders, lighted ambient snack vending machines, and hot/cold water dispensers). In implementation of this section, facility managers shall follow any applicable procurement guidelines established for such equipment.
4. Department directors or their designees shall distribute an annual email to educate all employees about the importance of minimizing electrical plug loads and to review relevant state policies and guidelines

Demand Response

Facility managers should be proactive in contacting their local utility to research the various demand response programs and select appropriate options, when applicable. When an electrical emergency is predicted for the day, the facility manager shall alert state employees and building operations in anticipation of the emergency, and shall implement curtailment measures immediately upon or before the emergency declaration. In facilities with appropriate energy management systems installed, automated demand response should be considered.

Energy Best Practices & Case Studies

Best Practices

General Efficiency Practices

1. Always buy ENERGY STAR qualified products when available for your work needs. The ENERGY STAR mark indicates the most efficient computers, printers, copiers, refrigerators, televisions, windows, thermostats, ceiling fans, and other appliances and equipment.
2. Turning off machines when they are not in use can result in enormous energy savings. Automatic switching to sleep mode or manually turning monitors off is always the better energy-saving strategy.
3. Common misconceptions sometimes account for the failure to turn off equipment. Many people believe that equipment lasts longer if it is never turned off. This incorrect perception carries over from the days of older mainframe computers.
4. Consider buying a laptop for your next computer upgrade; they use much less energy than desktop computers, resulting in long-term savings.
5. Studies have shown that using rechargeable batteries for products like cordless phones and PDAs is more cost effective than throwaway batteries. If you must use throwaways, check with your trash removal company about safe disposal options.

Heating and Cooling

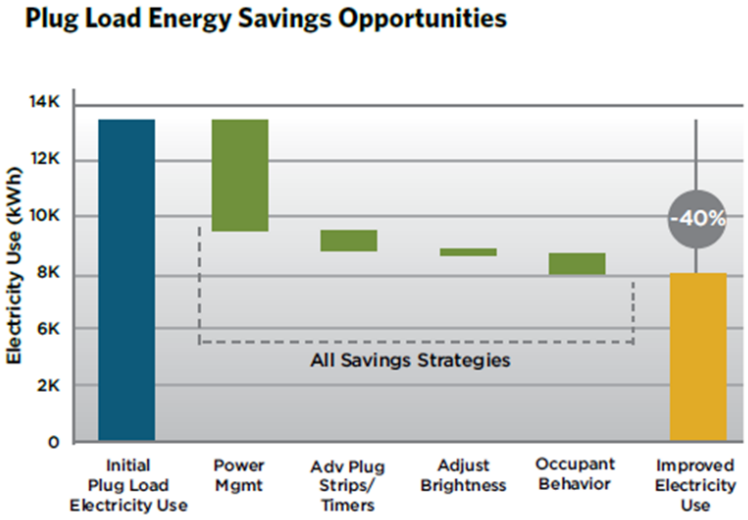
1. Replaced chillers, boilers, and water pumps with a more efficient options
2. Installed variable air volume (VAV) fans and motors with adjustable speeds.
3. Installed electric sensor water faucets in restrooms.
4. Replaced transformers with new higher efficient electrical transformers.

Plug Loads

1. If you discover devices that are not being used, consult with your IT department. When appropriate, simply remove the unused devices or at least make sure they're turned off.
2. Many appliances continue to draw a small amount of power when they are switched off. These "phantom" loads occur in most appliances that use electricity, such as VCRs, televisions, stereos,

computers, and kitchen appliances. In the average home, 75 percent of the electricity used to power home electronics is consumed while the products are turned off. This can be avoided by unplugging the appliance, or using a power strip and the strip's on/off switch to cut all power to the appliance.

3. One way to make it easier to power down is to use an advanced plug strip. Two types of strips are particularly helpful:
    a. Load-sensing plug strips use a master/slave approach. They can be set so that when you turn off your computer, everything else in the plug strip also turns off.
    b. Occupancy-sensing plug strips detect the presence or absence of a user and automatically turn equipment on and off in response.
    Unplug battery chargers when the batteries are fully charged or the chargers are not in use.
4. To maximize savings with a laptop, put the AC adapter on a power strip that can be turned off (or will turn off automatically); the transformer in the AC adapter draws power continuously, even when the laptop is not plugged into the adapter.
5. Remember that buildings don't use energy, people do. Everyone has a role in managing plug loads. To get the best results from new energy-saving measures, keep office staff well-informed. Offer training on new devices such as timers, advanced plug strips and power management settings. And make sure your staff understands why these measures are so important



In a small office in California, low- and no-cost energy-saving measures reduced plug load energy use by 40%.

[4]

[4] https://newbuildings.org/sites/default/files/PlugLoadBestPracticesGuide.pdf

Case Studies

California Science Center

By utilizing best practices outline above, the California Science Center (CSC) has become more economical and sustainable. Department of General Services (DGS) completed the project in 52 months in June 2018 with 2,940,229kWh electric consumption savings annually, which is equivalent to 2,188 metric ton Carbon Dioxide annual emission.

The project included significant facility improvement measures:

- Interior and exterior lighting included upgrading lighting to LED lamps at the museum retail store, general public areas, non-public space, IMAX Lobby, exhibit lighting, parking structure, streets and outdoor pathways.

Central Plant upgrades (heating and cooling):

- Removed existing thermal energy storage system and converted from Glycol based chiller plant to new water cooled chiller plant.
- Replaced chillers with more efficient options and new cooling towers, replace boilers, water pumps.
- Installed variable air volume (VAV) fans and motors with adjustable speeds.
- Upgraded the building system controls and electrical systems.
- Installed electric sensor water faucets in restrooms.
- Installed a VOIP telecommunications system.
- Replaced transformers with new higher efficient electrical transformers.
- Installed adjustable speed drives in the aquarium systems motors.

Over the next 30 years the energy upgrades will reduce Carbon Dioxide emissions by 2,188 metric tons and save the DGS CSC $3,671,544. The project successfully connects art and science to the environment.

San Diego State Office Building

The San Diego State Office Building is a 171,770 square foot building with over 80% occupancy. The 1962 building now has an Energy Star score of 96 in August 2018, significantly exceeding the state score requirement of 75 for buildings of their size and construction year. The upgrades resulted in high savings in the utility and water bill.

Building Upgrades

- The LED lighting retrofit included 1,400 fixtures. The brighter fixtures allowed for some fixtures to be removed therefore decreasing the total number of light fixtures. The new fixtures also result in a lower maintenance cost since the fixtures are functional longer. A lighting control system with occupancy sensors and local dimming controls were installed to save energy.
- Outdoor parking lot fixtures were changed from 250W low pressure sodium to 55W and 25W LED fixtures.

Large Upgrades:

- A new HVAC reduces fan energy in addition to shutting down heating with it is not needed.
- A chiller was replaced that is more energy efficient
- Toilets, aerators, and showerheads were replaced for water efficiency upgrades

- 32 Level I and 20 Level II EVSEs were installed

The ESCO project resulted in a total annual energy saving of over 400,000 kWh or approximately 30% of the utility bill. The aerators and two showerheads were replaced which resulted in over 50% savings.

Additional Tips and Resources

1. Plug Load Best Practices Guide: Managing Your Office Equipment Plug Loads, New Buildings Institute
2. Commercial Plug Load Energy Use Policy: What's in Place, Pending and Possible, New Buildings Institute, April 2013.
3. http://www.gsa.gov/graphics/pbs/PlugLoadControl_508c.pdf
4. Assessing and Reducing Plug and Process Loads in Office Buildings, National Renewable Energy Laboratory, April 2013
5. Selecting a Control Strategy for Plug and Process Loads, NREL, September 2012.
6. Reducing Plug and Process Loads for a Large Scale, Low Energy Office Building: NREL's Research Support Facility, NREL, February 2011.

Contact Information

Plug Loads

Dan Burgoyne, DGS: Daniel.Burgoyne@dgs.ca.gov

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Energy Efficiency

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Energy Efficiency in Data Centers and Server Rooms

Introduction

All state agencies should meet data center and server room energy efficiencies. Small server rooms account for 1 percent of all electricity use in the United States and represent a large share of data centers' electricity use. Technologies to significantly reduce energy waste in server rooms such as virtualization, power management, and cloud computing, are very cost-effective. When choosing the best energy efficiency strategy for optimizing data centers and server rooms, consider the strategy's implementation, costs, savings, risks, and available information.

State agencies will achieve energy operating efficiency in data centers and server rooms in state owned and state leased buildings.

Policy/Requirements

Beginning December 31, 2014, all state-owned and leased data centers and server rooms greater than 200 square feet shall be operated within the 2011 ASHRAE - TC 9.9, Class A1 – A4, recommended guidelines for temperature and humidity in addition to all applicable Title 24 Building Energy Efficiency Standards (https://www.energy.ca.gov/title24/). In most cases it will not be necessary to control humidity and/or dew point in order to stay within the specified ASHRAE- recommended guidelines. If this becomes a problem, the Department of Technology can assist agencies by recommending solutions.

Temperature and humidity in data centers and server rooms shall be measured at the information technology (IT) equipment air inlets for temperature and humidity compliance. It is recommended that supply air inlet temperatures in data centers remain in the 23 to 27 degree Celsius (C) (73 to 81 degrees Fahrenheit) range.

Equipment Environmental Specifications

Class	Product Operations	
	Dry-Bulb Temperature (°C)	Humidity Range, Non-condensing
A1 to A4	18 to 27	5.5°C Dew Point to 60% Relative Humidity and 15°C Dew Point

1. Beginning December 31, 2014, All state data centers that exceed 1,000 square feet shall measure and report their power usage effectiveness (PUE) annually by December 31 to the Department of Technology using the Power Usage Effectiveness Report (TECH 408A (Air Cooled) or TECH 408B (Chilled WaterCooled). For agencies whose cooling is supplied through the downtown Sacramento Central Plant, the Department of Technology can provide specific instructions for the calculations. Agencies are responsible for submitting these reports, and must base their PUE calculations on the criteria outlined in the Green Grid publication.

   Data centers that exceed a PUE of 1.5 shall reduce their PUE by a minimum of 10 percent per year until they achieve a 1.5 or lower PUE. These reductions can be achieved through energy saving measures and/or through scheduled and budgeted power and cooling supply equipment

replacements. If agencies that manage data centers 1,000 square feet or larger do not have the expertise to reduce PUE, the Department of Technology can provide suggestions. The Department of General Services and local utilities also are excellent resources to suggest energy savings measures.

2. When purchasing network switches and routers, all state agencies must specify the Energy Efficient Ethernet IEEE (Institute of Electrical and Electronics Engineers) 802.3-2012 Section 6 standard to the maximum extent possible. (Download a free copy of this IEEE standard from (the IEEE Standards Association).

3. All state agencies must consider virtualization (options when refreshing equipment or standing up new systems. Virtualization is the creation of a virtual rather than actual version of something such as an operating system a server a storage device or network resources. Use of the most energy efficient power supplies available should be included in the purchase of new IT equipment.

Best Practice/ Case Studies

- Server virtualization consolidates servers by running multiple different workloads on one physical host server. Virtualization enables using fewer servers, thus decreasing electricity consumption and waste heat. Virtualization also enables the repurposing and decommissioning of some existing servers.
- Decommissioning of unused servers allows data centers to retire servers and/or defer purchases of new servers, thus decreasing electricity consumption and waste heat.
- Assessing all servers and their utilization rates will uncover servers that are performing single, infrequent, or limited tasks. Consolidating lightly utilized servers will eliminate systems and reduce energy, hardware, and support costs.
- Utilizing better data storage best practices through storage resource management tools.
- Purchasing More Energy-Efficient Servers, Uninterruptible Power Supplies (UPSs), and Power Distribution Units (PDUs).
- Hot Aisle/Cold Aisle Layout: The rows of server racks should be oriented so that the fronts of the servers face each other and the backs of the server racks should also face each other. This orientation creates alternating "hot aisle/cold aisle" rows and greatly reduces energy losses and also prolongs the life of the servers.
- Containment/Enclosures: Use various physical barriers in addition to a hot aisle/cold aisle arrangement that further eliminate the mixing of cold ("supply") air and hot exhaust air.
- Variable Speed Fan Drives: Reducing 10 percent in CRAC (computer room air conditioning) unit fans' speed can lower fans' use of electricity by approximately 25 percent.
- Properly Deployed Airflow Management Devices maximize cooling by supplying cooling air directly to equipment, eliminating the mixing and recirculation of hot equipment exhaust air.
- Server Inlet Temperature and Humidity Adjustments: Many data centers can save energy simply by raising the thermostat from the traditional range 68°F to 77°F (the 2004 level) to 65°F to 80°F.
- Air-Side Economizer brings outside air into a building and distributes it to the servers. The exhaust air from the servers is simply directed outside instead of being recirculated and cooled.

Resources

1. Power Usage Effectiveness Report http://www.cio.ca.gov/pdf/PUE-ReportingReport.pdf
2. Institute of Electrical and Electronics Engineers (IEEE) Standards http://standards.ieee.org/about/get/802/802.3.html
3. Small Server Rooms, Big Energy Savings
4. 12 Ways to Save Energy in Data Centers and Server Rooms

Questions & Answers

The following questions and answers came from a November 4, 2014 webinar for the Sustainable Building Working Group, and was updated December 18th, 2015. Answers were provided by the Department of Technology.

1. **Question: Please provide a definition for Data Center/Computer Room**

   Answer: A data center is generally a building or room designed and dedicated for the support of data processing. A data center is a facility used to house computer systems and associated components, such as telecommunications and storage systems. It generally, but not always, includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g., air conditioning, fire suppression) and various security devices.

2. **Question: Will PUE reporting deadline become your baseline year?**

   Answer: Management Memo 14-09 and SAM Section 1820 will be an annual requirement for all departments under the Executive Branch. Departments who reach the goal of a PUE at or under 1.5 will still be required to submit their PUE information in subsequent years to verify that their PUE meets the requirements of the policy. Not PUE reporting is only required for Data Center/Computer Room/Server Rooms over 1,000 square feet in size.

3. **Question: Which form do I use, TECH 408A or 408B?**

   Answer: If your data center is air cooled, please use TECH 408A. If your data center is water cooled, please use TECH 408B.

4. **Question: Where do we send the completed form?**

   Answer: TECH 408A and TECH 408B are designed to be completed and submitted online. When you click on the SUBMIT button, the form will be sent to the correct place.

5. **Question: After data is collected from state agencies, what will the Department of Technology do with the information?**

   Answer: The information will be compiled and a report will be generated and submitted to the state CIO. The report will include the department name, the PUE reported, and a summary of energy efficient efforts planned by the department to lower their PUE. The Department of Technology will track departments' efforts to meet or maintain the PUE goal of 1.5 or better.

6. **Question: Because Management Memo 14-09 requires reporting for leased property (as well as state-owned) and many leased spaces are not sub-metered at the data center level, how are agencies supposed to gather the necessary data for data center input and PUE reporting?**

Typically, private sector lessors do not allow the state to work on their building (they probably will not allow the state to access their electrical panels due to liability concerns, as well as the 2012 NFPA 70E requirements). If no data is available from the lessor, during this reporting period (data due 12/31) what should agencies do? Should they indicate that sub meters are not installed at the privately owned space, consequently no PUE reporting is possible? Please advise.

Answer: A data center of over 1,000 square feet uses a significant amount of energy. Reporting for state leased data centers over 1,000 square feet is still required. If the facility's BMS and/or the electrical and mechanical distribution equipment cannot provide the necessary data, a licensed electrician can access electrical panels and record amp clamp reading and/or readings directly from the computer room air conditioners necessary for PUE calculations.

7. **Question: Is DGS redrafting its standard lease agreement to make it a requirement for lessors to sub-meter data centers and server rooms and provide energy use data, dry bulb temperatures and humidity compliance data to the state (lessee) consistent with theis new MM? This would seem to be a necessity if the state wants to consistently capture the data for leased buildings.**

   Answer: For facilities with a data center 1000 square feet or greater, if hiring an electrician to record readings on behalf of state departments proves problematic, RESD can be consulted to determine if any changes need to be made to the lease. Changing the standard lease agreement will not be necessary as monitoring temperature and humidity can be done with a simply monitoring gauge. Because of recent technology advances, and governor directives, there have been no new data centers over 1,000 square feet built in the past several years, and no new ones planned.

8. **Question: Within each agency, who is the responsible party for reporting? It appears that the CIO is the signature authority on Form TECH 408, which suggests that the CIO is the responsible party. Please confirm.**

   Answer: The department CIO is the responsible party for signature authority.

Contact Information:

Energy Efficiency in Data Centers:
Ian Noumov, Computer Room Efficiency Coordinator, California Department of Technology, (916) 228-6109
email: ian.noumov@state.ca.gov

Procedures for Energy Management in State Buildings During Electrical Emergencies

Introduction

California has experienced periods of time with critical electrical load emergencies that have affected continuous electrical services to state facilities. These may result from high peak demands brought on by extreme weather events, natural disasters, or other events affecting continued electrical power supply. It is important that all facilities have a plan in place to reduce impacts to health, public safety, security and continued operations at state facilities.

Policy

State agencies shall designate personnel to receive Department of General Services (DGS) Electrical Emergency Notifications (EENS) list server. Additionally, state agencies shall incorporate the procedures for electrical emergencies into their departmental Emergency Plans.

For the comprehensive energy policy see Management Memo 14-09: Energy Efficiency in Data Centers and Server Rooms and;
Management Memo 14-07: Standard Operating Procedures for Energy Management in State Buildings.

Authority

Executive Order B-18-12 mandates that state agencies participate in "demand response" programs to obtain financial benefits for reducing peak electrical loads when called upon, to the maximum extent that is cost-effective for each state-owned or leased facility, and does not materially adversely affect agency operations.

Federal law requires that the California Independent System Operator (CAISO) maintain specified levels of energy reserves available to the electrical grid. When reserves reach dangerously low levels because electrical demand is high, the CAISO may declare a Stage 1 Electrical Emergency to bring about a reduction in demand. The CAISO can escalate the emergency to Stage 2 and then Stage 3 if curtailment measures do not successfully reduce demand. Finally, the CAISO may use rotating outages to balance the demand for electricity to the available supply.

Electrical Emergency Notification System (EENS)

The DGS EENS Manager will use email to notify all parties that have registered for the EENS list server on the EENS Web page.

All state agencies should have one or more persons from each state-owned or state leased facility subscribe to the list server so they can receive electrical emergency notifications. It is the responsibility of the agencies to update the contact e-mail addresses on the list server as required.

For information on the EENS system, copies of energy instruction documents, and additional energy conservation information and links, please send an e-mail to EENS@dgs.ca.gov.

The DGS Real Estate Services Division periodically conducts tests of its notification system. The test messages will also contain information on how to update agency contact information.

Procedures for Electrical Emergencies

The DGS Real Estate Services Division will alert departments, universities, and community colleges when the CAISO declares a Stage 1, 2, or 3 Electrical Emergency and when those Stages are cancelled.

This table contains links to documents that provide detailed instructions on controlling energy usage. The energy management practices of all state agencies should conform to these procedures.

Emergency Status	**Link to Procedures**
Stage 1 Electrical Emergency	Curtailment Measures
Stage 2 Electrical Emergency	
Stage 3 Electrical Emergency	
Rotating Outage or Blackout	Safety Tips During Outages and Blackouts Emergency Preparedness

State agencies should print a copy of these procedures and incorporate them in departmental Emergency Plans in order to be prepared for an electrical emergency.

Based on operational needs, some departments may need to employ conservation measures that are more or less restrictive. Department energy management personnel must communicate department-specific instructions to the appropriate staff.

Demand Response

Executive Order B-18-12 mandates that state agencies participate in "demand response" programs to obtain financial benefits for reducing peak electrical loads when called upon, to the maximum extent that is cost-effective for each state-owned or leased facility, and does not materially adversely affect agency operations.

State Administrative Manual (SAM) Section 1815.3 requires all state all state agencies to participate in all available demand response power supply programs designed to reduce peak electrical loads when such programs do not adversely affect state agency building operations, occupant performance or indoor environmental quality.

State agencies should be proactive in contacting their local utility to research the various Demand Response programs and selecting an appropriate option, when applicable. When an electrical emergency is predicted for the day, the agency should prepare the occupants and operations in anticipation of the emergency and implement curtailment measures immediately upon or before the emergency declaration.

In facilities with appropriate energy management systems, Automated Demand Response should strongly be considered.

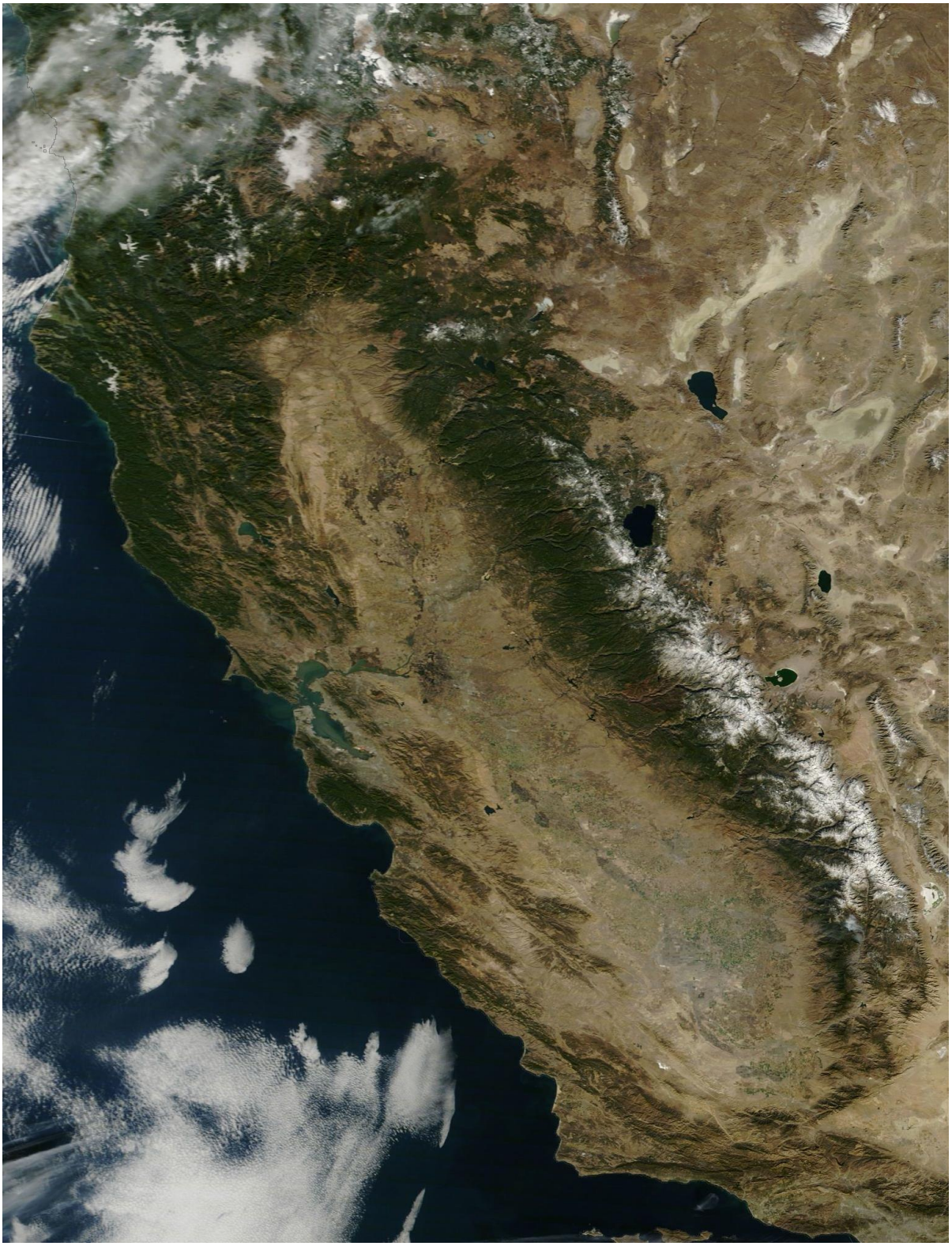
Resources

1. California Energy Alert
2. Department of Personnel Administration Employee Leave and Safety during Rolling Blackouts, January 23, 2001
3. Emergency Electricity Reduction Measures – GSA
4. Electrical Emergency Action Plans - CPUC

Contact Information:

Office of Sustainability, Department of General Services
sustainability@dgs.ca.gov

Greenhouse Gas Emissions



Greenhouse Gas Emission Reductions

Introduction

The state of California intends to lead the state by example, while curbing greenhouse gas emissions. State facilities and operations contribute to greenhouse gas emissions through energy and water use, as well as vehicle emissions in state fleets.

Policy

Executive Order B-18-12 and its Green Building Action Plan requires the following actions to reduce the environmental impact of state facilities on climate change:

- State agencies, departments and other entities under the governor's direct executive authority (State agencies) shall take actions to reduce entity-wide greenhouse gas emissions by 10% by 2015 and 20% by 2020, as measured against a 2010 baseline.

Executive Order B-55-18 established a statewide goal to "achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. This goal is in addition to existing statewide targets of reducing greenhouse gas emissions."

Definition

Greenhouse gas (GHG) is defined it as follows:

> *Any gas that absorbs infrared radiation, slowing down the passage of re-radiated heat through Earth's atmosphere. Greenhouse gases include carbon dioxide, water vapor, methane, chlorofluorocarbons, nitrous oxide and ozone, as well as other gases, and absorb heat at different rates. Some greenhouse gases are naturally occurring, and others result from human activities, such as burning of fossil fuels.*

Definitions of other terms can be found in the Green California Glossary.

Source energy is calculated by multiplying each energy source (electricity, natural gas, propane, steam, chilled water, etc.) by its respective source energy conversion factor into common energy units (kBtu) for a 12-month duration. These conversion factors are included in a ZNE Calculator developed by DGS, and generally follow conversion factors determined by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), which are subject to updates every few years. The next anticipated update to these conversion factors is late 2019, and the state's ZNE calculator will be updated when that occurs.

Annual Inventories of GHG Emissions

To facilitate achieving these goals, the Green Building Action Plan requires the following in 17.3:

- State agencies shall prepare annual inventories of greenhouse gas emissions generated in their course of business and enter these inventories into The Climate Registry's CRIS database.

The Climate Registry

The Climate Registry is a 501(c)(3) non-profit organization governed by U.S. states and Canadian provinces and territories. They design and operate voluntary and compliance GHG reporting programs

globally, and assist organizations in measuring, verifying and reporting the carbon in their operations so they can manage and reduce it.

Climate Registry Information System (CRIS)

The Climate Registry Information System (CRIS), is a cloud-based platform for accurate and transparent greenhouse gas (GHG) data.

- Calculation, reporting and verification tool
- State of California Executive branch agencies are members of The Climate Registry, and its membership is paid by CalEPA.
- The CRIS database collects data from state agencies including:
    - Facility energy use
    - Fuel use for vehicle fleets as well as emergency generators
    - Renewable energy and green energy purchases
    - Additional optional GHG data, such as fugitive emissions from refrigerants
- Agencies are required to submit their data into the CRIS database by April 1st each year
- GHG metrics from CRIS are also uploaded each year to the Green California website, and are summarized by year, statewide, and by each state agency.
    - https://www.green.ca.gov/buildings

California GHG Guidelines and Resources

1. CA State Agency Quick start guide
2. TCR General Reporting Protocol
3. CA Agency Resources page and reporting toolkit, which has other calculation resources.
4. The Climate Registry (TCR) Public Agency Leadership Program, including video of State of California facility climate actions

Case Studies

- CDCR case study: https://www.theclimateregistry.org/wp-content/uploads/2014/11/SuccessStory_CDCR_09.pdf

Contact Information

- TCR program associate in government services:
    - Ryan Cassutt, rcassutt@theclimateregistry.org, (213) 891-6931

Water

Water Conservation

Introduction

To track water efficiency, state facilities are required to track the amount of water used or delivered. California is in a unique position to bolster its climate and drought resilience by increasing water efficiency and reducing water wastage. Water efficiency policies add to a broader comprehensive framework aimed at water security. Water conservation also contributes to energy savings, since all water is pumped, some water used is heated, and waste water is treated, all of which use energy.

Policy

California state agencies were charged to reduce their facility water consumption by 10 percent by 2015 and 20 percent by 2020 as measured against a 2010 baseline. Facility water use data must be entered monthly into the Energy Star Portfolio Manager (ESPM) and annual water use verified by ESPM by March 1 of each year with access provided to the Department of General Services (DGS).

For the comprehensive policy see Management Memo 14-02: Water Efficiency and Conservation.

Definitions

Process Water

Water used for manufacturing processes, for testing and maintaining manufacturing equipment, and water used in combined heat and power facilities.

Graywater

Untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. Includes wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

Requirements

Reporting Requirements

General Requirements

By March 1 of each year, state agencies shall verify complete annual water use data for the preceding year into the Energy Star Portfolio Manager database. Agencies shall provide online access to this data upon completion to the Department of General Services, Office of Sustainability, and notify upon completion to sustainability@dgs.ca.gov.

Agencies may exclude process water from the annual reporting and water use reduction requirements. Water used for fish and wildlife habitat, livestock maintenance, and firefighting is also excluded. Annual usage will be measured against the 2010 baseline data previously reported by each state agency to determine if water reduction targets are met.

Leased Facilities

New and renegotiated state leased facilities shall include provisions for reporting water use where it is economically feasible. If agencies lease a building or space (state owned) managed by DGS, DGS will report the water use for that building space. If a state agency other than DGS manages the building or space, that agency will be responsible for reporting the water use for that building.

Facilities without Water Meters

While metering and sub-metering may be inaccessible, agencies and facilities are not exempt from actively managing water consumption and reporting water use. Baseline and ongoing water use can be estimated based on the water use ratings of fixtures and appliances at the site, the duration per use, amount of usage, and the number of occupants. Department of Water Resources Water Use Reduction Guidelines and Criteria document provides guidance on how to baseline water usage and report annual usage for facilities without meters. Agencies operating in these facilities should also apply Best Management Practices for Water Use, and document policies for purchasing/replacing water-using fixtures and/or equipment with higher efficiency models. If not cost prohibitive, state agencies should make water meter installations a priority so they can obtain accurate measurements of water use.

Use Requirements

1. State agencies shall purchase, install and operate WaterSense or equivalent (labeled) industry standard fixtures and equipment (including irrigation equipment) whenever it is available, cost-effective, and meets quality requirements.
2. Landscape plants shall be selected based on their suitability to local climate and site conditions, and reduced water needs and maintenance requirements.
3. All new and renovated state buildings and landscapes shall utilize alternative sources of water wherever cost-effective. Sources may include, but are not limited to: recycled water, graywater, rainwater capture, storm water retention, and other water conservation measures

4. State agencies should perform the following critical activities for water use reduction:
    a. Implement Best Management Practices (BMPs)
    BMPs are ongoing actions that establish and maintain water use efficiency. State agencies must implement the BMPs in the Water Use Reduction Guidelines and Criteria. State agencies are responsible to review and apply these BMPs to all facilities they occupy.
    b. Complete Building and Landscape Inventories State agencies should complete a Building and Landscape Inventory every five years. The quantitative inventory requires a facility walk- through to assess the types, numbers and condition of all water using fixtures, appliances, and irrigation equipment.
    c. Implement a Landscape Water Budget Program Large landscape areas over 20,000 sq. ft. should be managed and water use tracked with a landscape water budget program. Large landscape water use often represents a significant percentage of a facility's water use, and significant water savings can often be achieved through better irrigation scheduling or inexpensive improvements in irrigation hardware.
    Landscape maintenance staff should attend an Environmental Protection Agency WaterSense-labeled training program to become proficient in landscape water budgeting and water management.

Exemptions

Buildings or facilities that meet or exceed the 2010 CalGreen water efficiency standards may be exempted from water use reduction requirements, since they already meet low water use targets. Supporting documents or data must be provided if requested and may include monthly/annual utility water use reports and/or water use calculation tables that document the water use ratings.

Agencies are still required to report the water use of these facilities in the Energy Star Portfolio Manager database on an annual basis as outlined in Reporting Requirements

Resources

Best Practices:

- Fix leaks
  Many gallons of water and dollars may be wasted due to small leaks. Water conservation saves energy and money.
- Use waterless or reduced water flow features whenever possible
- Install an insulation blanket on water heaters seven years of age or older and insulate the first 3 feet of the heated water "out" pipe on both old and new units
- If purchasing a new water heater, always buy the most efficient model possible. In areas of infrequent use, consider "tankless" water heaters to reduce "standby" storage costs and waste.
- Set water temperature only as hot as needed to prevent scalds and save energy. Standard Operation Efficiency Procedures state that facility managers shall not set domestic hot water temperatures above 105° F.
- Industrial facilities often have domestic water uses such as toilet flushing, sinks for hand washing, and showering facilities. These represent great opportunities for water savings. Examples of fixtures that can be retrofitted include:
    - High-Efficiency Toilets - AWE Toilet Introduction Page

    - High-Efficiency Urinals - AWE Urinal Introduction Page
    - Faucet aerators in sinks used for hand washing – AWE Faucet Fixtures Introduction Page
    - Efficient showerheads – AWE Bath and Shower Introduction Page
- When changing domestic water infrastructure, consider replacing toilets with a manual flush and faucets with motion sensors to reduce wasted water
- Install drought-resistance landscaping.
- If WaterSense features are not available, revise landscape watering times. Be sure not to water during the hottest part of the day, or to overwater the landscape.

Additional Tips and Practices

https://energy.gov/eere/femp/best-management-practices-water-efficiency

https://energy.gov/sites/prod/files/2013/10/f3/epa_watercspdf.pdf

https://www3.epa.gov/watersense/docs/california_state_fact_sheet.pdf

Case Studies

WaterSense – Water Management Strategy

The U.S. Environmental Protection Agency (EPA) owns or operates 30 research laboratories across the country. In 2002, the EPA began accessing its water use by reviewing historical water use, identifying utility cost information, inventorying all of the water-using equipment, identifying and fixing leaks, and identifying project opportunities to reduce water use. Due to these efforts, between 2002 and 2007, the EPA was able to reduce its water use intensity by 8.4 percent.

Since 2007, the EPA has completed a variety of projects across its laboratories to continue to reduce water wastage. As of 2010, the EPA has reduced its water use intensity by 18.7 percent from the required 2007 baseline. This amounts to approximately 23.4 million gallons in total water savings and more than $200,000 in water and sewer cost savings.

San Diego State Office Building

Water efficiency upgrades were completed at the San Diego State Office Building on Front Street in San Diego. The upgrades included replacing aerators, two showerheads, toilets, and urinals. By replacing the aerators and two showerheads, the building has already seen over 50% in savings. The toilets were replaced with a ¾ gallon flush to conserve water.

Tools

https://www.fedcenter.gov/_kd/Items/actions.cfm?action=Show&item_id=14213&destination=ShowItem (Establishing Baselines and Meeting Water Conservation Goals of Executive Order 13423)

https://www3.epa.gov/watersense/outdoor/irrigation_professionals.html (Water sense)

http://www.ebmud.com/water-and-drought/conservation-and-rebates/water-conservation-publications/watersmart-guidebook/ (Water Smart Guidebook; a Water-Use Efficiency Plan)

http://www.municipalservices.saccounty.net/Pages/default.aspx (River Friendly Guidelines for Landscape Professionals)

Additional Information

http://www.water.ca.gov/wateruseefficiency/ (Department of Water Resources, Water Use and Efficiency Branch)

http://www.sustainablesites.org/ (SBX7-7 Sustainable Sites Initiative)

http://www.nrel.gov/docs/fy01osti/29267.pdf (Greening Federal Facilities Graywater regulations)

http://www.arcsa.org/ (American Rainwater Catchment Association)

http://www.irrigation.org/ (Irrigation Association)

http://www.clca.org/water-pro/(California Landscape Contractors Association WMCP (Water Management Certification Program))

http://www.green.ca.gov/Resources.aspx (Green California)

http://www.bsc.ca.gov/Home/CALGreen.aspx(CalGreen)

Contact Information

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Transportation

Zero-Emission Vehicles

Introduction

In an effort to decrease Greenhouse Gas emissions (GHGe), state agencies are required to purchase Zero-Emission Vehicles (ZEV) and increase the number of available charging stations to achieve the executive order of 5 million ZEV on the road by 2030. ZEVs contribute to California's sustainability agenda by decreasing the use of fossil fuels.

General Requirements

1. **Expanded ZEV Purchasing:** By FY 2024/2025, state agency light-duty fleet acquisitions will now meet or exceed 50% ZEVs on an annual basis. Beginning in FY 2017/2018, state agency ZEV purchasing requirements will increase by 5% each year through FY 2024/2025.
2. **ZEV Telematics Option:** Beginning in FY 16/17, state agencies will no longer be required to make 50% of annual ZEV purchases be pure ZEVs (i.e. battery electric or hydrogen fuel cell vehicle) where an agency has integrated vehicle telematics within 100% of its ZEV fleet.
3. **EV Infrastructure:** When submitting a Fleet Acquisition Plan (FAP) to the Department of General Services (DGS), Office of Fleet and Asset Management (OFAM), state agencies must be able to demonstrate sufficient ZEV infrastructure (to support an agency's existing and requested ZEV's) in order to receive FAP approval.
4. **ZEV / Hybrid First Purchasing:** Beginning in FY 17/18, state agencies will be subject to a "ZEV/Hybrid First" policy requiring state agencies to procure battery electric, hydrogen fuel cell, plug-in hybrid, and/or hybrid vehicles, in-lieu of fossil fuel consuming internal combustion vehicles and other specified vehicles, when available in a comparable vehicle class on state contract.
5. **Special Performance Requirements:** State agencies that choose to exempt public safety vehicles from annual ZEV purchasing requirements shall do so in accordance with the updated public safety exemption requirements outlined in State Administrative Manual (SAM) section 4121.4.
6. **ZEV Infrastructure Planning:** By February 15, 2017, state agencies shall submit to the Department of General Services (DGS), Office of Sustainability, a Five-Year ZEV Infrastructure Readiness Survey which evaluates each state agency's ability to support 5% workplace charging and projected ZEV integration within its fleets through FY 2020/2021. State agencies with 25 or more facilities may complete the survey for all facilities, or may complete the survey in two parts. If completing in two parts, the first response covering those facilities supporting their fleet is due by February 15, 2017; supplemental survey responses for the remainder of facilities that do not support fleet vehicles are due by June 1, 2017. Upon completion of the survey, state agencies shall begin comprehensive site assessments on those facilities identified to be in need of EV charging infrastructure improvements in order to support the agency's workplace charging and ZEV fleet procurements through FY 2020/2021.
7. **EV Charging Reimbursement Authority:** When an agency elects not to charge a monetary fee for use of the EV charging station, such an action may be considered a public benefit and not a gift of public funds that is prohibited by Section 6 of Article XVI of the California Constitution.

Background

Pursuant to Executive Order (EO) B-16-12 state agencies are required to increase the number of ZEVs within the state fleet through the normal course of fleet replacement so that at least 10 percent of fleet

purchases of light-duty (LD) vehicles are ZEV by 2015 and 25 percent by 2020. In accordance with the Governor's 2016 ZEV Action Plan, beginning in Fiscal Year (FY) 2017/2018, state agencies will be required to increase upon EO B-16-12's 10 percent ZEV purchasing requirement by 5 percent each year through FY 2024/2025. As EO B-16-12 presently directs each state agency to ensure that at least 10% of its annual LD fleet purchases be a ZEV, a state agency will now be required to increase its annual LD ZEV purchasing.

ZEVs include pure zero emission vehicles such as hydrogen fuel cell vehicles (FCVs) and battery electric vehicles (BEV). Plug-in hybrid electric vehicles (PHEVs) are considered transitional ZEVs and may be partially considered toward the ZEV requirement. Additionally, medium duty (MD) and heavy duty (HD) ZEV and PHEV purchases may also be considered for the fulfillment of the LD ZEV requirement. However, consideration towards the LD ZEV requirement will be based on their certified electric driving range established by the California Air Resources Board (CARB).

To meet the expanded ZEV purchasing targets, beginning in FY 2017/2018 state agencies are required to purchase ZEVs (including Battery Electric, Fuel Cell, and PlugIn Hybrid) and Hybrid-Electric Alternative Fuel Vehicles (Hybrid AFVs), in designated light-duty vehicle categories, in lieu of light-duty vehicles that are powered solely by internal combustion engines utilizing fossil fuels and flex-fuel vehicles or bi-fuel vehicles powered by petroleum based fuels.

At least half (50 percent) of the vehicles required to comply with the ZEV purchasing mandate must be pure ZEVs, unless an agency meets the exemption criteria. LD vehicles having special performance requirements necessary for the protection of public safety and welfare are exempted from these mandates.

Policy

Executive Order (EO) B-16 12

On March 23, 2012, Governor Brown issued EO B-16-12 ordering "California's state vehicle fleet increase the number of its zero-emission vehicles through the normal course of fleet replacement so that at least 10 percent of fleet purchases of light-duty vehicles be zero-emission by 2015 and at least 25 percent of fleet purchases of light-duty vehicles be zero-emission by 2020. This directive shall not apply to vehicles that have special performance requirements necessary for the protection of the public safety and welfare." EO B-16-12 also established a goal that "by 2020 the State's zero-emission vehicle infrastructure will be able to support up to one million vehicles."

Executive Order (EO) B-18-12

On April 25, 2012, Governor Brown issued Executive Order (EO) B-18-12 ordering that "state agencies identify and pursue opportunities to provide electric vehicle charging stations, and accommodate future charging infrastructure demand, at employee parking facilities in new and existing buildings."

Executive Order (EO) B-48-18

Governor Brown issued Executive Order (EO) B-48-18 calling for "a new target of 5 million AEVS in California by 2030." The Administration also proposed new initiatives to continue the state's clean vehicle rebates and spur more infrastructure investments.

ZEV Purchasing and Credits

State agencies are expected to integrate ZEVs into their fleets through the normal course of vehicle replacements. Where an agency exceeds the amount of ZEVs it is required to purchase in a given FY, the agency will receive credits that it can apply toward its ZEV purchasing requirements in future years. State agencies are encouraged to exceed their annual ZEV purchasing requirements where opportunities for further ZEV integration exist within their respective fleets. Please refer to State Administrative Manual (SAM) Section 4121 for further information on PHEV purchasing and ZEV credit ratios as established by the Air Resources Board (ARB).

Fiscal Year	EO B-16-12 ZEV Purchasing Requirements (New)
2018/2019	20%
2019/2020	25%
2020/2021	30%
2021/2022	35%
2022/2023	40%
2023/2024	45%
2024/2025	50%

Statewide Contracts

DGS has established statewide, vehicle contracts for specific FCV (light duty), BEV (light and medium duty) and PHEV (light and medium duty) models to ensure the state fleet meets the EO requirements. DGS has also established Electrical Vehicle Supply Equipment (EVSE) contracts for Level 1, 2, and 3 electric vehicle charging stations that are available to all state agencies. As manufacturers expand their ZEV models that would support further ZEV integration into the state fleet, DGS will add additional items to the state's vehicle and EVSE contracts.

State Fleet Fuel Reporting

Public Resources Code Section 25722.5(e) (10) requires state agencies to report to DGS their total annual fuel consumption, including alternative fuels. EO B-2-11 also directs state agencies to provide OFAM's Fleet Asset Management System (FAMS) with monthly updates including fleet utilization and fuel use data. State agencies are required to collect and report into FAMS the amount of electric fuel and hydrogen fuel used by the ZEVs in their fleet as part of their alternative fuel reporting.

2016 ZEV Action Plan

In October 2016, Governor Brown issued the second iteration of the Zero Emission Vehicle Action Plan (Plan) which provides an updated roadmap toward EO B-16-12's call for 1.5 million Zero Emission Vehicles on California Roadways by 2025. Amongst several updates, the Action Plan:

1) Requires that 50% of all state agency light-duty vehicle procurements be ZEV by 2025
2) Directs state agencies, in coordination with DGS, to install EV charging stations at a minimum of 5% of all workplace parking spaces at state owned facilities
3) Directs DGS to evaluate and update EO B-16-12's ZEV purchasing exemption for public safety vehicles with special performance requirements to ensure that ZEVs are integrated into public safety mobile assets under all feasible circumstances.

References

State Electric Vehicle Charging Guide

Contact Information

ZEV Fleets

Office of Fleet and Asset Management (OFAM)
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Minimum Fuel Economy Standards

Introduction

As vehicle fuel efficiency continues to improve over time, and emissions are reduced, state agencies are able to purchase more vehicles using less fuel, reducing their environmental impacts. This policy established targets for vehicle purchases meeting or exceeding fuel economy standards.

Statutory Requirements

PRC Section 25722.7 requires DGS, in consultation with the CEC, to establish minimum fuel economy standards for the purchase of passenger vehicles and light duty trucks that are powered solely by internal combustion engines utilizing fossil fuels. This section of the PRC was amended with the enactment of Senate Bill (SB) 1265 (Hueso), Chapter 398, Statutes of 2014. Specifically, the statute was amended to add passenger vehicles and light duty trucks that are "…powered by more than one source, such as nonplug-in hybrid electric vehicles" under the minimum fuel economy standard. The inclusion of this verbiage requires nonplug-in hybrid electric vehicles to be subject to the minimum MPG standard. These requirements do not apply to plug-in hybrid electric vehicles or battery electric vehicles.

Management Memo 15-03 superseded and rescinded MM 08-04 and set a new fuel economy standard for passenger vehicles as an average of 38 MPG while the standard for light duty trucks, vans and sport utility vehicles remains at 22.2 MPG.

- Public Resources Code Section 25722.5 et seq prescribes requirements for fleet acquisitions, including the reduction of petroleum consumption;
- The federal Energy Policy Act of 2005 requires 75 percent of light-duty vehicles acquired by state fleets be alternative fuel vehicles;
- Executive Order B-16-12 requires a growing percentage of zero emission vehicles be included in fleet acquisitions (for light duty vehicles only).

Policy

Effective July 1, 2015, the combined annual purchases by each state entity of passenger vehicles and light duty trucks shall meet the new minimum state average fuel economy standard of 38 miles per gallon (MPG) for passenger vehicles and 22.2 MPG for light duty trucks, vans and sport utility vehicles established pursuant to SAM Section 3620.1. These fuel economy standards only apply to those passenger vehicles and light duty trucks that are powered solely by internal combustion engines utilizing fossil fuels, or that are powered by more than one source, such as nonplug-in hybrid electric vehicles. The fuel economy standards do not apply to plug-in hybrid electric vehicles or battery electric vehicles.

The policy should be read in conjunction with Management Memo 06-03, which continues in effect, specifying that 75 percent of the state's light duty vehicle purchases shall be Alternative Fuel Vehicles as required by federal law.

This policy should also be read in conjunction with Management Memo 12-05 which requires state agencies and departments that have natural gas, propane, and e85 flex fuel vehicles to utilize the appropriate alternative fuels in those vehicles wherever feasible.

Achieving the Minimum Fuel Economy Standard

The minimum MPG standard is achieved by selecting sufficient vehicles that meet or exceed the standard to offset any vehicles purchased that are below the standard. It is essential that state entities forecast carefully to meet the combined average of 38 MPG for passenger vehicles and 22.2 MPG for light duty trucks, vans and sport utility vehicles. Any vehicles purchased with MPG ratings below the standards shall be offset by vehicles that exceed the standards in order to achieve the minimum combined average MPG (see Table 1). DGS may waive application of the standards if the State is unable to secure a competitively bid contract for a vehicle that meets both the needs of the department purchasing it, and the minimum MPG standard in this policy.

Table 1: Example of Achieving a Combined MPG Average of 38

Total number of planned passenger vehicle purchases	Vehicles with lower than standard MPG	Vehicles with higher than standard MPG to offset lower MPG vehicles	Overall combined MPG average for annual vehicle purchases
50	25 Sedans @ 30 MPG	25 Hybrid Sedans @ 50MPG	40 MPG (must meet or exceed 38 MPG)
Formula: 25 x 30 = (750) + 25 x 50 = (1250) = 2000 divided by 50 = 40 MPG combined average			

To determine your annual combined fleet purchase MPG average:

1. Refer to the most current state vehicle contract for available vehicles and select vehicles to meet annual purchase need.
2. Check each vehicle's MPG (combined city/hwy) rating at www.fueleconomy.gov
3. Calculate your total purchase plan to ensure your overall annual vehicle purchase will meet or exceed the MPG standard.
4. Submit an annual vehicle acquisition plan to DGS that forecasts how your fleet will meet or exceed the combined MPG standards.

Exemptions

- Authorized emergency vehicles, as defined in Vehicle Code Section 165, that are equipped with emergency lamps or lights described in Vehicle Code Section 25252.
- Vehicles that are modified for the purpose of providing services by a state entity to an individual with a disability or a developmental disability, as defined under the statutes or regulations governing that state entity; or, as a reasonable accommodation to an employee for a known physical or mental disability, as defined in Government Code Section 12926.

References

Electronic copies of the references of this document can be found at the DGS website:
http://www.dgs.ca.gov/ofam/Resources/Publications.aspx

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Diesel, Biodiesel, and Renewable Hydrocarbon Diesel Bulk Fuel Purchases

Introduction

Transportation contributes to 38 percent of California emissions. Diesel fuel is used primarily for heavy duty trucks, delivery vehicles, buses, trains, ships, farm and construction vehicles, and shipping, as well as some emergency generators. Renewable forms of diesel can reduce emissions, and typically are made from waste materials that normally would generate GHG emissions over time. Renewable diesel has the same chemical composition as petroleum diesel, and is now widely available on state contracts, often at even lower costs than petroleum diesel. This transition helps state agencies work toward meeting state GHG emission reduction goals.

Definitions

- **Petroleum Diesel:** Conventional (petroleum-based) fossil fuels are made from crude oil — hydrocarbons, organic compounds, and small amounts of metal from millions of years ago. To make fossil-based fuels such as petroleum diesel, crude oil is removed from the ground, pumped into a refinery, and refined through a heat- and pressure-based process called hydrogenation.
- **Biodiesel**: Unlike petroleum diesel, biodiesel does not rely on fossil fuels. Instead, it is made from vegetable oils and/or animal fats, which are renewable. It is also processed differently than petroleum diesel, using a process called transesterification. This process introduces oxygen into the fuel, which can cause issues with freezing temperature, separation during storage, algae growth, and higher emissions. Biodiesel is generally blended with petroleum diesel at a 5% to 20% ratio, reducing GHG emissions.
- **Renewable Hydrocarbon Diesel (renewable diesel):** Like biodiesel, renewable diesel is not a fossil fuel. Instead, it is made of nonpetroleum renewable resources such as natural fats, vegetable oils, and greases, typically waste products. For example, waste derived after soybean crops and livestock production, after these products have been processed into food, can be refined into a clean, low-carbon fuel.

  Renewable diesel differs from biodiesel, however, in how it's processed. Renewable diesel is processed similar to the way petroleum diesel is produced, which makes it chemically the same as petroleum diesel. That means a few things:

  1. Because it's hydrogenated, renewable diesel doesn't contain oxygen, and therefore users will not encounter the challenges biodiesel presents relating to freezing temperature and storage.
  2. Thanks to hydrogenation, renewable diesel also burns cleaner than biodiesel.
  3. Because it has the same chemical structure as petroleum diesel, renewable diesel can be used in engines that are designed to run on conventional diesel fuel — with no blending required.

Statutory Requirements

Public Resources Code §25722.8 (a) requires the improvement of the overall state fleet's use of alternative fuels, synthetic lubricants, and fuel-efficient vehicles by reducing or displacing the consumption of petroleum products by the state fleet when compared to the 2003 consumption levels based on the following schedule:

1. By Jan. 1, 2012, a 10 percent reduction or displacement.
2. By Jan. 1, 2020, a 20 percent reduction or displacement.

Executive Order (EO) B-30-15, issued by California Governor Edmund G. Brown Jr. directed "that all state agencies with jurisdiction over sources of greenhouse gas emissions shall implement measures, pursuant to statutory authority, to achieve reductions of greenhouse gas emissions to meet the 2030 and 2050 greenhouse gas emissions reductions targets" of 40 percent and 80 percent below 1990 levels, respectively.

Health and Safety Code §43870 requires that, commencing Jan. 1, 2017, three percent of the aggregate annual total of state agency bulk transportation fuel purchases be procured from very low carbon transportation fuel sources. Additionally, commencing Jan. 1, 2018, the amount of very low carbon fuel purchased shall be increased every year, by one percent, until Jan. 1, 2024.

Public Resources Code §25722.8 (c) establishes DGS as the agency responsible for the encouragement of alternative vehicle and fuel adoption.

Public Resources Code §25722.5 (e) and (f) requires each state office, agency and department to report to DGS their total annual consumption of gasoline and diesel fuel, alternative fuels, and the total annual vehicle miles traveled by vehicles in the state fleet. Executive Order B-2-11 also directs department and agency heads to provide monthly updates of their vehicle and mobile equipment information that is presently being collected by DGS.

As an alternative fuel derived from nonpetroleum based stock and possessing a total carbon intensity of half, or less, than that of traditional diesel fuels, renewable diesel serves as a viable fuel option to help the state meet the above statutory requirements and the Governor's goals outlined in EO B-30-15.

Policy

State agencies shall purchase state-contracted renewable diesel fuel, in lieu of conventional diesel and biodiesel fuels, when making bulk purchases of fuel for diesel powered vehicles and/or equipment. Additional information on this policy can be found in State Administrative Manual (SAM) Section 3627, Diesel, Biodiesel, and Renewable Diesel Bulk Fuel Purchases.

Exemptions to this renewable diesel fuel purchasing requirement are processed through the Department of General Services (DGS) Office of Fleet and Asset Management (OFAM) and are outlined under the Exemptions to Renewable Diesel Purchasing Requirements section of SAM 3627, which includes provisions for fuel availability, timeliness of delivery in emergency response situations, cost, and operational viability.

Agencies that utilize one or more renewable diesel exemptions are required to provide OFAM with information (along with other requisite, annual fuel reporting data), as detailed in the Reporting of Renewable Diesel Exemption Utilization section of SAM 3627.

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Resources

Find Where to Fill Up Alternative Fuel Vehicle

State Green Fuel contracts

Reconditioned, Used, or Remanufactured Automotive Parts; Re-refined or Synthetic Motor Oil and Lubricants

Introduction

This policy, as referenced in Management Memo 12-06 is to inform State agencies that the use of reconditioned, previously used, and/or remanufactured automotive parts can help reduce the cost of repairs to the State fleet and protect the environment. And, that the use of re-refined or synthetic motor oil and lubricants can help reduce the State fleet's petroleum consumption and protect the environment. State agencies are required to request these products whenever practical and cost-beneficial when having state vehicles serviced or repaired.

Statutory Requirements

Public Resources Code §25722.8 requires state agencies to reduce their fleet's consumption of petroleum products, including through the use of synthetic lubricants (motor oil). The State Petroleum Reduction Plan identifies the use of re-refined or synthetic motor oil, and extending the intervals between oil changes as part of the plan to reduce the State fleet's consumption of petroleum, see plan at: https://www.dgs.ca.gov/OFAM/Resources/Page-Content/Office-of-Fleet-and-Asset-Management-Resources-List-Folder/Plans

Executive Orders S-14-09 and B-2-11, froze the acquisition of fleet vehicles thereby requiring those existing vehicles to remain in service longer. Extending the life of the existing fleet requires keeping those vehicles in good working condition through regular service and repairs. Using reconditioned, previously used, and/or remanufactured parts will help reduce the cost of keeping the vehicle fleet in good operating condition and protect the environment through recycling.

Who is Affected

All State entities under the jurisdiction of Government Code §11000, unless specifically exempted.

Who Should Review

Executive Officers, Administrative Officers, Fleet Coordinators, Managers, Supervisors, Business Services Officers, Department Auditors, and State Vehicle Operators.

Policy

1. When servicing fleet vehicles state agencies shall request the use of rerefined or synthetic motor oil and other lubricants when available.
2. State agencies shall follow the vehicle manufacturers' recommended oil change intervals for regular and synthetic oils as applicable. Because of improvements over the last several years in engine design and lubricants, the span between recommended oil change intervals has increased.
3. When repairing fleet vehicles state agencies shall request the use of reconditioned, previously used, and/or remanufactured parts whenever practical and if it would reduce the cost of the repairs.

Contact your local OFAM Inspector of Automotive Equipment for technical assistance.

Resources

Directory of Regional State Automotive Inspectors
State Administrative Manual (SAM) 4115
State Fleet Handbook

Contact Information

Office of Fleet and Asset Management (OFAM)
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Maintenance, Operation, and Recycling

State Buildings and Grounds Maintenance and Operation

Introduction

Government facilities are often built to last for generations. The environmental impacts during this long timeframe far outweigh the initial impacts of the construction. Americans spend 87 percent of their life indoors, so indoor air quality, daylight, views, and comfort in buildings are a major impact to us all. Additionally, building grounds and landscaping contribute to our health and well-being, and can have huge environmental impacts. Sustainable approaches to operating and maintaining our buildings and grounds can further enhance our building experience, while saving costs and greatly reducing long-term impacts through reduced energy and water use, reduced waste, low chemical use, and many other ways.

Policy

State department building and facility managers will implement practices and procedures that assist them in meeting the increased efficiency and resource conservation goals described in EO B-18-12.

In addition to the ENERGY STAR Portfolio Manager database reporting requirements for water and energy use, departments should be prepared to provide status on compliance with these policies in the Road Map to Achieving Executive Order B-18-12 and B-16-12.

Definitions

Buildings and Grounds Maintenance - routine cleaning and the day-to-day maintenance of a building's interior and exterior and the surrounding landscape and hardscape that are considered a part of that facility. Buildings and grounds maintenance can include repairs of a minor and simple nature involving mechanical and electrical systems and building elements that can readily be performed by maintenance personnel or technicians.

This does not include the following: (See green California Glossary)

- Remodeling
- Rehabilitation
- Renovation
- Restoration
- Additions, or
- Any other type of work normally performed by a construction contractor or personnel with specialized certification.

Requirements:

State departments should have implemented the practices incorporated into Sustainable Operations and Practices, in the operation and maintenance of their facilities.

See the following sections for more information:

- Water Efficiency
- Indoor Environmental Quality

- Recycling and Waste Diversion
- Environmentally Preferable Purchasing (EPP)

Example/Best Practices:

Integrated Pest Management

Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

In accordance with the California Code of Regulations Title 3, Food and Agriculture, Division 6, Pesticides and Pest Control Operation, the DGS RESD BPM recognizes IPM as a sustainable measure of EO D-16-00 and EO S-20-04.

On-site staff and contracted pest management companies shall follow an IPM strategy that focuses on long-term prevention or suppression of pest problems through a combination of techniques that may include:

- Monitoring for pest presence and establishing treatment threshold levels;
- Using non-chemical practices to make the habitat less conducive to pest development;
- Improving sanitation; and
- Employing mechanical and physical controls.

The Department of General Services (DGS) Best Practices Manual, Chapter 3 provides detailed steps on implementing an IPM plan. Topics include:

Objectives and Strategies: IPM Best Practices (pg. 3-3)
Lead Person: Assign pest management lead person for each building site (pg. 3-5)
Monitoring and Evaluation: Monitor, keep records, and evaluate IPM program activities (pg. 3-7,3-12)
Green IPM Practices: Emphasize use of cultural, nonchemical and biological controls in all IPM activities (pg. 3-8)
Communication: Notify building occupants before pesticide application (3-11)
IPM Design: Design landscape to minimize pest problems and install mowing strips and underlayment to reduce herbicide use (pg. 3-29, 3-30, 3-32)
Lighting: Install outdoor lighting that doesn't attract flying insects (pg. 3-31)
Waste: Store garbage receptacles on concrete or asphalt surfaces, away from building entrance; keep sealed after loading; empty regularly (pg. 3-31, 3-35)
Proactive Maintenance: Make building repairs that exclude pests (e.g., install door sweeps, automatic door closers), and reduce water sources, food, and harborage (e.g., seal cracks and crevices, fix HVAC and plumbing leaks) (pgs. 3-28, 3-34, 3-38)
Eliminate Food Sources: Keep food storage areas clean and dry (pg. 3-36)

When establishing a pest treatment plan, appropriately licensed personnel shall use non-chemical and biological controls. If this treatment is ineffective, use Tier 3 (least hazardous) herbicides/insecticides, progressing to Tier 2 and then to Tier 1 (most hazardous) only if necessary to manage the pests. Utilize only Tier-rated herbicides/insecticides as listed on the current San Francisco Department of Environment Hazard Screening List.

Landscaping Practices

State building and facility managers will adopt the following landscaping practices:

- Reduce landfill waste material and water use
- Promote the purchase of sustainable plant and maintenance materials
- Maintain a healthier outdoor environment.

These practices apply to all grounds and building exterior maintenance and landscape projects occurring on site[5] and will be followed by on-site staff participating contractors and vendors. They include:

Existing Landscapes: Should be maintained to survive the drought with reclaimed water whenever possible. Protect high priority landscape elements such as existing trees, ground covers and shrubs. Protect all slopes from erosion. Convert conventional spray heads or rotors to drip and/or low precipitation rate nozzles. A minimum three inch (3") layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications.

Existing Lawns: During a declared drought, low priority landscapes such as lawns without trees shall be watered only to the extent to a minimum to control dust and erosion. The University of California, Davis publication, Managing Turfgrasses during Drought, provides useful information on warm-season and cool-season grasses in California. Trees in lawn areas that provide shade to buildings and hardscapes are high priority. Add drip irrigation around the drip line of the tree or water slowly and deeply with a trickling hose to increase survival rate. Trees can develop Phytophthora root rot if soil around their base remains wet for long periods. To prevent excessive growth, do not fertilize lawns. Follow the US Composting Council guidelines when using compost to retain moisture on existing lawns.

Low Water Use Landscape: All new and rehabilitation landscape projects shall comply with the latest version of the California Department of Water Resource's model water efficiency landscape ordinance (MWELO, 2015 Revision).

I**rrigation:** Installation of irrigation sub-meters, flow meters, master valves and smart irrigation controllers are recommended. Overhead irrigation shall be scheduled between 8:00 p.m. and 10:00 a.m. unless weather conditions prevent it. If allowable hours of irrigation differ from the local water purveyor, the stricter of the two shall apply. Operation of the irrigation system outside the normal watering window is allowed for auditing and system maintenance. Observe irrigation cycles and if water is running off, adjust irrigation timers to run for less time, but more frequently (as allowed). Establish a water budget for the landscape based on the plants, landscape area and local climate,

[5] Refer to latest version of the California Department of Water Resource's model water efficiency landscape ordinance, section 490.1(e) for exceptions.

and schedule irrigation based on the weather, soil type and to meet the water budget. (Click here for cycle and soak methods.)

Sustainable Grounds and Landscape Maintenance Practices: Sustainable landscaping practices produce significant economic and environmental benefits. Savings include reduced labor, water and fertilizer cost, lower hauling expenses and disposal fees. Standard landscaping practices include grass- cycling, lawn aeration, mulching, and composting practices that enhance the soil. These practices increase the water-holding capacity of soil, reduce erosion, and conserve water. Where appropriate, choose plants that are native or of low water use and are non-invasive to the area; consider mature plant size as it relates to available planting space to reduce pruning needs.

Erosion, Sedimentation Control and Storm Water Retention: Follow recommendations for prevention of erosion, storm water pollution and reducing peak runoff found in 5.106.1 Storm Water Pollution Prevention (p.31), 5.106.10 Grading and Paving (p.34) in the 2013 California Green Building Standards Code (or current edition). Where possible, incorporate A5.106.2 Storm Water Design (page 100) and A5.106.3 Low Impact Development (LID)(page100).

Drought Moratorium

The Emergency Drought Proclamation dated January 17, 2014, placed a moratorium on new, non-essential landscaping projects at state facilities and on state highways and roads. Projects that were not needed to protect existing trees and shrubs, or were not necessary for erosion or dust control were considered non-essential. On April 7, 2017, the governor declared an end to the historic drought and lifted emergency orders, while encouraging California to continue water conservation measures. During the drought, any exemptions to the landscaping moratorium required approval by the governor's office. During the xemption requests were submitted to sustainability@dgs.ca.gov.

Maintenance of Building Exteriors, Roofs, Hardscape and Exterior Painting

To reduce the harmful effects of chemicals and air pollution on the local environment and to promote water and energy conservation during exterior maintenance activities, departments are required to develop a maintenance program consistent with the guidelines outlined in Sustainable Site Credit 2: Building Exterior and Hardscape Management Plan of LEED 2009 or the Sustainable Sites Prerequisite of LEED v4 for Existing Buildings Operations and Maintenance and in accordance with the additions and modifications described in this policy. Departments are required to amend service contract documents as necessary to support the policy requirements. Use this link for more comprehensive details:

http://www.usgbc.org/Docs/Archive/General/Docs5545.pdf

Chemicals: The use of harsh chemicals is not usually necessary for most building exterior maintenance activities. The strength of the cleaning solutions should approximate the level sufficient to obtain satisfactory results. Do not use cleaning solutions stronger than necessary for the particular task. Cleaning solutions for exterior maintenance should be Green Seal certified or equivalent and should conform to Environmentally Preferable Purchasing (EPP) guidelines as stated in SAM 1850.

Exterior Maintenance: Sweeping or raking are the preferred method of exterior cleaning; blowing is allowed when appropriate and when authorized by facilities management. When using a blower, electric or battery powered equipment should be used. Engine powered blowers

may be utilized in compelling circumstances and with the authorization of facilities management. Departments are to adopt building exterior maintenance programs that conserve water. These programs include using manual cleaning methods over those that require high volume water spraying equipment. Water use, while sometimes necessary to carry out certain cleaning activities, should be carefully monitored to avoid excessive waste and runoff. If pressurized washing equipment is necessary, use equipment at the lowest output settings necessary to achieve satisfactory results. When power washing equipment is needed, use electric powered or battery-powered equipment to reduce air and noise pollution. Gasoline powered equipment should only be used in unusual or compelling circumstances and only with the authorization of the building maintenance supervisor. Departments are to replace gasoline-powered equipment (including pruning equipment) with electric, battery powered or manual equipment and zero-emission strategies as equipment replacement schedules allow.

Hardscape: Water should never be used for general sweeping of hardscape although pressurized water use for purposes of specific removal of stains or grime from pavement, or for hygienic reasons, is considered reasonable use. State facility childcare centers with playgrounds and patios where food can be consumed should also be hygienically and routinely maintained. The monitored use of pressurized water would be appropriate for these areas as well.

Landscape: Landscaping tasks should be done with manual equipment whenever possible. For tasks that require power equipment, electric or battery powered equipment should be used first. Equipment in this category includes, but is not limited to, mowers, leaf blowers, string trimmers, hedge trimmers, chainsaws, pole saws, and tillers. Electric equipment should be charged with grid electricity and never with a portable generator. Engine powered lawn and garden equipment may only be used in compelling circumstances with the authorization of facilities management. Departments are to replace gasoline-powered equipment (including pruning equipment) with electric, battery powered or manual equipment and zero-emission strategies as equipment replacement schedules allow.

Roofing Cleaning: Roofs should be maintained on a periodic basis consistent with the roof type (built-up, single-ply, metal, cool roof, etc.); manufacturers' warranty requirements; location environment (coastal, urban, desert, mountain, etc.); and other external factors that affect roof performance, reflectivity and longevity. Department maintenance programs should establish roof cleaning methods and frequencies specific to the needs of each building roof to avoid unnecessary cleaning and overuse of water and cleaning solvents. Simple hand removal of debris from roofs, drains, gutters, downspouts, and overflows is often sufficient. Unwarranted frequent cleaning with powered equipment can reduce the lifespan of the roof by wearing down protective coatings and roofing materials. When powered roof cleaning equipment is necessary, equipment with a water recovery/recycle system should be considered in the maintenance program for the appropriate roof type. Refer to local municipalities for additional requirements.

Exterior Painting: Building maintenance often requires the repainting of exterior walls. Paints should either be no or low volatile organic compound (VOC) or contain recycled content when obtainable, meeting industry performance standards (see Green Seal GS-43 Standard). Use water-based paints over those containing oils. When spray equipment is used, ensure that care

is exercised to prevent overspray and runoff, particularly near people, vegetation, waterways, and storm drains.

Training: Departments are responsible for providing training and instruction to maintenance personnel and contractors on the proper use, handling, and disposal of all solvents and paint products. Personnel should be directed to use manual methods of cleaning and painting whenever possible and to avoid the risk of excessive discharge with powered equipment.

Case Studies

Capitol Park Grounds Study

The California Air and Resources Board conducted studies on the exposure and health impact for operators of lawn equipment. The study estimated exposure and health risks from air toxics, particles, CO, and noise. The devices tests included new and used gasoline devices compared to new electric devices. The devices were chainsaws, leaf blowers, string trimmers, hedge trimmers, push bowers, and riding mowers.

The study found elevated exposures to two carcinogens for all gasoline-powered devices in addition to an increased potential cancer risk. According to the study, chainsaws produce the highest risk to the user due to the fact that the user operates in the toxic plume.

The move to zero-emission equipment (ZEE) reduces health risks in addition to increasing the hours of operation for workers. The ZEE has lower exposures to toxic air pollutants, decreased cancer risks, lower exposure to CO and noise, and reduced health risks. With the decreased noise, the users also found that they could operate equipment near tour groups to complete work without disturbing the group.

As of 2018, ZEE is available for all landscaping applications with more than 45 brands on the market. There are 12 ZEE brands that target landscaping professionals. The ZEE have enough power to complete the required work in addition to being useful for high tourist traffic.

As seen in the Capitol Park Grounds study, the use of ZEE has increased due to demos with the crew purchasing over 10 pieces of ZEE. This has led to CARB working with the local universities to increase ZEE use. To increase the use of ZEE, CARB has developed the 'ZEE Roadshow' which contains five brands of commercial grade ZEE and will leave the equipment for one to two weeks with the crew. This allows the crew to work with the equipment and find out which tools they prefer.

With the updated SAM language, ZEE is required first for exterior maintenance and landscaping. CARB has also launched a ZEE website with a list of available ZEE in addition to a directory of ZEE landscapers.

The ZEE prove to be cost effective in the long-run. With the high cost of gas, electricity, if charged during off-peak hours, will be lower in cost while providing the same amount of power and use time. CARB found the break-even point to be under three years for most equipment without incentives. With incentives, the break-even point will be lower for the equipment and small landscaping businesses will see an increase in assistance.

Resources

CARB ZEE Website: https://ww2.arb.ca.gov/our-work/programs/zero-emission-landscaping-equipment
November 15 CARB presentation by Dorothy Fibiger

Information and Directories:

CalRecycle Compost and Mulch: Starting point to learn about the uses and benefits of compost and mulch. (http://www.calrecycle.ca.gov/Organics/CompostMulch/default.htm)

CalRecycle Compost and Mulch Producers: A list of permitted compost and mulch producers, searchable by county. (http://www.calrecycle.ca.gov/Organics/SupplierList/default.asp)

Seal of Testing Assurance: Program run by U.S. Composting Council to assure high-quality finished products, includes listing of approved composters and laboratories. (http://compostingcouncil.org/seal-of-testing-assurance/)

Guidelines and Resources:

State Landscaping and Irrigation Guidelines (http://www.dgs.ca.gov/dgs/Home/water.aspx)

Bay-Friendly & River-Friendly Landscape Guidelines: Provides a whole systems approach to the design, construction, and maintenance of landscapes to support the integrity of the Sacramento River and San Francisco Bay watersheds, but applicable elsewhere as well.

- **Bay-Friendly Landscape Guidelines:** (http://www.bayfriendlycoalition.org/bflguidedetail.shtml)
- **River-Friendly Landscape Guidelines:** (https://www.waterboards.ca.gov/academy/courses/eco_landscape.pdf)

Caltrans Compost Specifications: Guidelines for purchase and use of compost along California roadways, developed by California Department of Transportation (Caltrans). Other resources on erosion control, infiltration and plant establishment. (http://buy-compost.com/admin/wp-content/uploads/2013/09/CalTrans.pdf)

Compost Use for Landscape and Environmental Enhancement Manual: CalRecycle manual with information on compost use in landscape plantings and environmental applications. (http://www.calrecycle.ca.gov/Publications/Detail.aspx?PublicationID=1248)

Grasscycling: The natural recycling of grass by leaving clippings on the lawn when mowing. (http://www.calrecycle.ca.gov/organics/GrassCycling/default.htm)

Xeriscaping: Developing landscapes specifically designed to use little or no water. (http://www.calrecycle.ca.gov/organics/xeriscaping/)

Landscape Plants for California Gardens, Robert C. Perry 2010. (http://www.landdesignpublishing.com/)

California Invasive Plant Council (Cal-IPC): List of invasive plants. (http://www.cal-ipc.org/ip/management/plant_profiles/index.php)

Essential Landscaping Guidelines for State of California-owned Facilities and Application for Exemption from Drought Landscaping Moratorium (http://www.documents.dgs.ca.gov/dgs/application.docx)

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Indoor Environmental Quality

Introduction

Indoor Environmental Quality (IEQ) is most simply described as the conditions inside the building. It includes air quality, but also access to daylight and views, pleasant acoustic conditions, and occupant control over lighting and thermal comfort. It may also include the functional aspects of space such as whether the layout provides easy access to tools and people when needed and whether there is sufficient space for occupants. Building managers and operators can increase the satisfaction of building occupants by considering all of the aspects of IEQ rather than narrowly focusing on temperature or air quality alone. Americans spend the majority of their time indoors; not surprisingly, studies have shown an increase in worker productivity when improvements are made to a space's IEQ.

Policy

State agencies that build, lease and operate state buildings shall implement measures to ensure a healthful indoor environment for their building occupants. State agencies shall implement as follows:

New/Renovated State Buildings

State agencies shall implement mandatory measures and relevant and feasible voluntary measures of the California Green Building Standards Code (CALGreen), Part 11, related to indoor environmental quality (IEQ) that are in effect at the time of new construction or alteration. The information is available at http://www.bsc.ca.gov/home/calgreen.aspx.

Existing State Buildings

When accomplishing Alterations, Modifications, and Maintenance Repairs and when relevant and feasible, state agencies shall implement the mandatory and voluntary measures of the California Green Building Standards Code (CALGreen), Part 11, related to indoor environmental quality.

New and Renegotiated State Leased Buildings

The Department of General Services (DGS) will encourage Lessors to implement measures of the California Green Building Standards Code (CALGreen) related to indoor environmental quality, where economically feasible, for all new or renegotiated leases.

For the comprehensive policy see Management Memo 14-05: Indoor Environmental Quality: New, Renovated, And Existing Buildings, and the State Administrative Manual (SAM) chapter 1825.

Definitions

- **Alterations**- Any construction or renovation to an existing structure, other than repair, for the purpose of maintenance or addition
- **Modifications and Maintenance Repairs**- Making alterations to an existing structure such that it will be better suited to current needs. This type of work may involve changing the use of interior space by repositioning walls, replacing fixtures, or other such modifications under the $200,000 threshold triggering CALGreen compliance.

Requirements for Ensuring a Healthy Indoor Environment

There are major steps agencies can take to ensure a healthful indoor environment:

1. Use indoor products and materials that emit little or no harmful chemicals;
2. Provide appropriate ventilation, filtration and proper Heating, Ventilating, and Air Conditioning (HVAC) equipment maintenance;
3. Prevent water intrusion and the growth of mold;
4. Implement line of sight and "daylighting" for new buildings; and
5. Solicit feedback from tenants every two years.

Resources for implementing these steps

Use Indoor Products and Materials That Emit Little or No Harmful Chemicals

Building Materials

Use adhesives, sealants, caulks, paints, coatings, and aerosol paints and coatings that meet the volatile organic chemical (VOC) content limits specified in CALGreen (Sections 4.504.2.1 through 4.504.2.4, and 5.504.4.1 through 5.504.4.3.1).

Use carpet systems, carpet cushions, composite wood products, resilient (e.g., vinyl) flooring systems, and thermal insulation, acoustical ceilings and wall panels that meet the VOC emission limits specified in CALGreen (Sections 4.504.3 through 4.504.5, 5.504.4.4 through 5.504.4.6, A4.504.1 through A4.504.3, and A5.504.4.5.1 through A5.504.4.9.1).

Furnishings and Seating

Use office furniture and seating that complies with either:

The DGS' Purchasing Standard and Specifications (Technical Environmental Bid Specification 1-09-71-52, Section 4.7 or

The American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) Standard 189.1-2011 (Section 8.4.2.5).

CALPIA manufacturing and associated products are compliant with the DGS' Purchasing Standard and Specifications (Technical Environmental Bid Specification 1-09-71-52)

Cleaning Products

Use cleaning products that are low emitting and meet Green Seal (GS) Standard GS-37, Cleaning Products for Industrial and Institutional Use. CALPIA offers GS certified cleaning products at: http://catalog.pia.ca.gov

For relevant building types/uses, consider:

- GS-53, Specialty Cleaning Products for Industrial/Institutional Use
- GS-8, Cleaning Products for Household Use, and
- GS-52, Specialty Cleaning Products for Household Use

All GS standards can be found at: http://www.greenseal.org/GreenBusiness/Standards.aspx

Cleaning Procedures

Specify, use and properly maintain effective vacuum cleaners that meet the Carpet and Rug Institute's TM 113 – 110901, Laboratory Test Procedure for Quantifying Respirable Particulate

from Vacuuming Carpet. Information can be found at: http://www.carpetrug.org/documents/technical_bulletins/test_method_113.pdf

Maintain entryways as specified in CALGreen (Section A5.504.5.1)

Use non-chemical cleaning methods where feasible. Minimize the use of chemicals when cleaning floor surfaces.

Follow the cleaning procedures of GS-42, Commercial and Institutional Cleaning Services.

Follow the Carpet and Rug Institute's Carpet Maintenance Guidelines for Commercial Applications. See: http://www.carpet-rug.org/Carpet-for-Business/Cleaning-andMaintenance.aspx

Provide Appropriate Ventilation, Filtration, and HVAC Equipment Maintenance

Existing Buildings – Maintenance and Operation

Operate HVAC systems continuously during work hours and provide no less than the required minimum outdoor air requirements in effect when the building permit was issued, or if no building permit was issued, when the building was designed, constructed or renovated. Please refer to Cal- OSHA's Title 8 regulations, Section §5142: Mechanically Driven Heating, Ventilating and Air Conditioning (HVAC) Systems to Provide Minimum Building Ventilation, at http://www.dir.ca.gov/title8/5142.html

Inspect HVAC systems at least annually; all HVAC inspections and maintenance shall be documented in writing (as required by Title 8, Section 5142). Annual inspections shall also include:

- Verification of minimum outdoor airflows using properly calibrated handheld airflow measuring instruments.
- Confirmation that air filters are clean and replaced according to the manufacturer's specified interval or more frequently as needed based on specific local or seasonal conditions. Use high Minimum Efficiency Reporting Value (MERV) filters as specified below.
- Verify that outdoor dampers, actuators, and associated linkages operate properly.
- Check the condition of all accessible heat exchanger surfaces for fouling and microbial growth, and take action as needed.
- Check condensate drain pans for proper drainage and possible microbial growth, and take action as needed to correct and to prevent future drain blockages and microbial growth.
- To the extent accessible, inspect the first 20 feet of all lined ductwork downstream of cooling coils for visible microbial growth. If microbial growth is found, correct and take action to prevent future growth.
- Ensure that cooling towers are properly maintained and records of chemical treatment of cooling tower water are kept. Cooling tower plume discharges closer than 25 feet to any building intake shall be retrofitted where possible to meet the 25 foot requirement.
- Building managers shall develop a comprehensive HVAC preventative maintenance program.

Where feasible, use filters with a MERV rating of no less than 11, as specified in Section A5.504.5.3.1 of CALGreen. Existing HVAC systems incapable of accommodating increased pressure drops associated with the 11 MERV rating shall use the highest MERV rating that their fan(s) can accommodate while providing the design airflows. To the extent possible, all fan change-outs shall be sized to accommodate MERV 13 filters.

Provide ongoing factory training for stationary engineers on proper operation and maintenance of all new and existing equipment, as well as all building management systems.

Initiate a computer-based preventive maintenance program for all HVAC equipment (see DGS' California Best Practices Manual, Section 2.3.5 for a description of the computerized maintenance management system).

Provide specialized air treatment for buildings in areas where air quality standards are routinely exceeded. Consider using:

- Particulate matter air filters with a minimum MERV rating of 13 or higher (if feasible) for buildings in areas where the Environmental Protection Agency (US EPA) standards for PM10 (particulate matter) or PM2.5 are routinely exceeded.
- Ozone-removing air cleaning devices with a minimum volumetric ozone removal efficiency of 40 percent in areas where the US EPA 8- hour average ambient ozone standard is routinely exceeded. These devices should be operated continuously during times that the relevant air quality standard is exceeded and the building is occupied. See http://www.arb.ca.gov/adam/index.html or contact your local air quality management district to determine whether a specific site falls into this category.
- Purge buildings prior to daily occupancy with outdoor air, with either the minimum ventilation rate for one hour, or three complete air changes as required for non-residential buildings (Section 120.1(c)2 of the 2013 California Code of Regulations, Title 24, Part 6.)

New and Renovated Building

Commission new buildings to ensure proper installation and operation of all building systems, including the proper delivery of the required amount of outdoor air (Title 24, Part 6, Section 120.8).

Implement relevant mandatory measures and relevant and feasible voluntary measures from CALGreen (Division 5.5 and Appendix section A5.5).

Provide specialized air treatment for buildings in areas where air quality standards are routinely exceeded.

- Use particulate matter air filters with a minimum MERV rating of 13. MERV 16 or HEPA (high efficiency particulate arrestance) filters should be considered where feasible for institutional residential buildings that house sensitive groups such as the elderly or infirm, and buildings used by children.
- Consider using ozone-removing air cleaning devices with a minimum volumetric ozone removal efficiency of 40 percent in areas where the US EPA 8-hour average ambient ozone standard is routinely exceeded. These devices should be operated continuously

during times that the relevant air quality standard is exceeded and the building is occupied. See http://www.arb.ca.gov/adam/index.html to determine whether a specific site falls into this category.

Specify that all HVAC systems above 2,000 cubic feet per minute (cfm) be equipped with outdoor airflow measuring stations and be connected to a building energy management system. Building management systems shall be programmed to provide audible and visible alarms when minimum outdoor airflow rates are not met. If feasible, HVAC systems smaller than 2,000 cfm shall also be equipped with such airflow measuring stations.

Specify that all HVAC systems above 2,000 cubic feet per minute (cfm) be equipped with outdoor airflow measuring stations and be connected to a building energy management system. Building management systems shall be programmed to provide audible and visible alarms when minimum outdoor airflow rates are not met. If feasible, HVAC systems smaller than 2,000 cfm shall also be equipped with such airflow measuring stations.

Develop an IEQ Construction Management Plan that incorporates measures in CALGreen Sections A5.504.1 through A5.504.2 for actions during and after construction to ensure healthful IEQ.

Prevent Water Intrusion and Growth of Mold

Keep all buildings clean and sanitary as required by Title 8 Section 3362 http://www.dir.ca.gov/Title8/3362.html. When exterior water intrusion, leakage from interior water sources, or other uncontrolled accumulation of water occurs, the intrusion, leakage or accumulation shall be corrected, typically within 24-48 hours because these conditions may cause the growth of mold.

Line of Sight and Daylighting – New Buildings

Toplighting and sidelighting are recommended per CALGreen (Section A5.507.2); recommended are the use of light shelves, reflective room surfaces, means to eliminate glare, photosensor controls and not using diffuse daylighting glazing where views are desired. See http://newbuildings.org/lighting and http://www.wbdg.org/resources/daylighting.php?r=dd_lightingdsgn for additional information.

Direct line of sight to the outdoor environment via vision glazing between 2.5 and 7.5 feet above the finished floor in 90 percent of all regularly occupied areas is required. (CALGreen Section A5.507.3).

Input from Occupants – Existing Buildings

Input from building occupants should be solicited every two years to obtain feedback on any IEQ and/or comfort concerns. One of the following methods should be used:

- Occupant surveys to collect information on IEQ, as well as on other sustainability issues, such as the need or desirability for electric vehicle charging stations, commute alternatives, etc.
- Maintenance and regular review of an occupant complaint database documenting complaints related to IEQ and response to the complaints.

Best Practices/Case Studies

Choose low-emitting products that have been third-party certified and labeled by reputable organizations such as GREENGUARD and Green Seal. Be wary of manufacturer claims of “no VOC”, “natural” or “alternative.”

Minimize the use of harsh cleaners, solvent-based cleaners or cleaners with strong fragrances.

Ensure the placement of walk off mats at all entrances of the building.

Prefer the use of high efficiency particulate air (HEPA) vacuum cleaners with disposable bags and microfiber cloths for surface dust removal.

Control Moisture

- Control relative humidity levels to less than 60 percent.
- Repair all leaks promptly.
- If there has been a flood or water damage, take immediate action and remove the water and wet materials. Dry all porous materials and furnishings within 48 hours. If mold grows on any porous materials, such as drywall, ceiling tiles or wood, discard and replace.

Ensure Proper Ventilation

- Open doors and windows when temperature and humidity levels permit. However, be mindful of outdoor allergens during spring and fall seasons.
- Make sure that mechanical filters are in place, that they fit well and that they are changed periodically according to manufacturer’s instructions.
- Use of home mechanical air systems, with good filtration, can control dust levels. Some additional air cleaners, such as electrostatic systems or ion generators, may be stand alone or part of the home system. If these additional air cleaners are used, make sure they are certified to UL 867 and are certified by the state of California for minimal ozone release
- Make sure that fuel burning furnaces, fireplaces, heaters, range tops, exhaust fans and other appliances are vented to the outside well away from windows and heating ventilation and air conditioning (HVAC) intakes.

Employ the strategy of daylighting. Daylighting uses natural daylight as a substitute for electrical lighting. While it will likely be counterproductive to eliminate electrical lighting completely, the best proven strategy is to employ layers of light - using daylight for basic ambient light levels while providing occupants with additional lighting options to meet their needs.

Additional tips and practices

http://greenguard.org/en/consumers/consumers_tips.aspx

https://sftool.gov/learn/about/1/indoor-environmental-quality-ieq

https://iaqscience.lbl.gov

Resources

1. VOC emission limits for building materials established by CDPH (http://www.cal-iaq.org/separator/voc/standard-method);

2. Architectural coatings guidelines and composite wood rules from CARB (see CALGreen, http://www.arb.ca.gov/coatings/arch/docs.htm
3. Green Seal guidelines for cleaning products and processes http://www.greenseal.org/GreenBusiness/Standards
4. Ventilation, filtration, and daylighting regulations from the Energy Commission (see current building efficiency standards at http://www.energy.ca.gov/title24/
5. Cal-OSHArequirements (http://www.dir.ca.gov/title8/5142.html, http://www.dir.ca.gov/title8/3362.html, and others);
6. Measures included in criteria from green building organizations such as those in the US Green Building Council's Leadership in Energy & Environmental Design program (http://www.usgbc.org/leed);
7. ASHRAE (consensus) standards for ventilation and filtration: https://www.ashrae.org/
8. California Best Practices Manual: Better Building Management for a Better Tomorrow (https://www.dgs.ca.gov/green/GreenBuildings/BBBTManual.aspx);
9. California Buying Green website for Environmentally Preferable Purchases (http://www.dgs.ca.gov/buyinggreen/Home.aspx); and
10. Building Standards Commission Guidebooks (http://www.bsc.ca.gov/pubs/guides.aspx).

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Waste Prevention and Recycling of Non-Hazardous Waste

Introduction

As a part of California's continued commitment to reduce the amount of solid waste entering landfills, state agencies and facilities are required to meet waste diversion goals. Below is the legislation and requirements driving this effort for state agencies, as well as guidance and resources.

Policies

AB 75 (Strom-Martin, Chapter 764, 1999) The act mandated that state agencies develop and implement an integrated waste management plan which outlines the steps to be taken to achieve the required waste diversion goals.

AB341 Chesbro, Chapter 476, Public Resources Code Section 42926(a)) changed the due date of the state agency waste management annual report to May 1 beginning in 2012. The bill makes a legislative declaration that it is the policy goal, of the state of California, that not less than **75 percent** of solid waste generated be source reduced, recycled, or composted by the year 2020.

AB 1826 (Chesbro, Chapter 727, 2014) All state agencies shall achieve targets and timelines for recycling organic waste established for their state facilities and operations.

AB 2812 (Gordon, Chapter 530, 2016) Solid waste recycling at state agencies and large state facilities

SB 1016 (Wiggins, Chapter 343, 2016) Changed the way state agencies and local governments measure their progress toward meeting the statutory waste diversion mandates. State agencies and large state facilities now use per capita disposal as an indicator of their compliance with the 50 percent waste diversion requirement. Compliance is also determined by diversion program implementation.

AB 2396 (McCarty, Chapter 466, Statutes of 2016) each state agency is required to include in its existing annual report to CalRecycle specified information on the state agency's compliance with mandatory commercial recycling requirements, pursuant to AB 341, and mandatory commercial organics recycling requirements, pursuant to AB 1826.

AB 2812 (Gordon, Chapter 530, Statutes of 2016) each state agency is required to provide adequate receptacles, signage, education, and staffing, and arrange for recycling services consistent with existing recycling requirements for each office building of the state agency or large state facility. The bill requires, at least once per year, each covered state agency and large state facility to review the adequacy and condition of receptacles for recyclable material and of associated signage, education, and staffing. Additionally, the bill requires

each state agency to include in its existing annual report to CalRecycle a summary of the state agency's compliance with the act.

SB 1335 (Allen, Chapter 610, Statutes of 2018) Sustainable Packaging for the State of California Act of 2018. This law prohibits foodservice facilities located in a state-owned facility, operating on or acting as a concessionaire on state-owned property, or under contract to provide food service to a state agency from dispensing prepared food using food service packaging unless it is either recyclable, reusable, or compostable. SB 1335 is codified in Public Resources Code sections 42370–42370.7.

CalRecycle must adopt regulations by January 1, 2021 that clarify terms, specify criteria, and outline a process for determining the types of food service packaging that are reusable, recyclable, or compostable. CalRecycle will publish a list of approved food service packaging types on its website by March 2021 (within 90 days of the regulations being adopted).

CalRecycle will develop the regulations in consultation with the Department of General Services, the Department of Rehabilitation, the Department of Parks and Recreation, the Ocean Protection Council, the Department of Toxic Substances Control, and other interested agencies and stakeholders.

SB 1383 (Lara, Chapter 395, Statutes of 2016) SB 1383 establishes targets to achieve a 50 percent reduction in the level of the statewide disposal of organic waste from the 2014 level by 2020 and a 75 percent reduction by 2025. The law grants CalRecycle the regulatory authority required to achieve the organic waste disposal reduction targets and establishes an additional target that not less than 20 percent of currently disposed edible food is recovered for human consumption by 2025.

Requirements

State agencies and large state facilities are required to:

- Divert at least 25 percent of their solid waste from *landfills* or *transformation facilities* by Jan 1, 2002, and to divert at least 50 percent on and after Jan 1, 2004, through *source reduction*, *recycling*, and *composting* activities.
- Designate at least one solid waste reduction and recycling coordinator to oversee integrated waste management plan implementation.
- Ensure adequate receptacles, signage, education and staffing is provided.
- Submit an annual report on prior calendar year disposal amounts and diversion activities. Reports are due by May 1 of each year.

Waste Reduction

Waste reduction (or prevention) is the preferred approach to waste management because waste that never gets created doesn't have waste management costs.

Simple examples of waste reduction that are easy to implement for state agencies is printing on both sides of the sheet of paper or making electronic files versus paper files when possible,

encourage staff to use reusable coffee mugs, water bottles, dishes and utensils if there are kitchen areas, and purchasing items in bulk to reduce packaging. Waste reduction also helps conserve resources for future generations and contributes to a cleaner environment.

Recycling of Non Hazardous Waste

Construction and Demolition (C&D)

According to CalRecycle's 2014 Disposal Facility-Based Characterization of Solid Waste in California, construction and demolition (C&D) materials are estimated to account for between 21.7 to 25.5 percent of California's waste disposal.

Title 24, Part 11, Section 5.408, California Green Building Standards Code (CalGreen) requires all new construction and renovations to divert at least 65% of the nonhazardous construction and demolition waste generated as part of the project. Executive Order B-18-12 requires all State buildings greater than 50,000 square feet to meet the Leadership in Energy and Environmental Design (LEED) for Existing Buildings.

State agencies shall meet the following requirements, as they apply: Meet the construction and demolition waste diversion requirements of California Green Building Standards Code (CalGreen) for all applicable new and existing buildings; or for existing buildings greater than 50,000 feet, meet the C&D diversion credit requirements of LEED for Existing Buildings where feasible; or for building projects not covered under CalGreen, the agency should divert as much material from the project as is feasible and consistent with the requirements of Public Resources Code (PRC) sections 42920 et seq.

For more information on C&D recycling:

https://www.calrecycle.ca.gov/ConDemo/
For more information on CalGreen: https://www.dgs.ca.gov/BSC/Resources/Page-Content/Building-Standards-Commission-Resources-List-Folder/CALGreen

Carpet

Recycling is a preferred option over landfilling because it saves resources, reduces greenhouse gas emissions, and saves landfill space. When purchasing and installing new flooring that requires removal of old carpet, include carpet recycling and new recycable flooring in your work order or contract.

Reuse is a preferred method for managing carpet, if feasible, however it tends to be limited to carpet tiles. Some manufactures of the carpet tile take it back so check if this is feasible.

How to Prepare Carpet for Collection

Contamination is the primary reason why recyclable scrap carpet does not get recycled. Some contamination comes from careless handling of carpet during its removal, when other demolition debris ends up in the load. Carpet tack strips and nails are common and serious

contamination problems because a piece of metal will tear up recycling equipment. A magnet might help, but not for bits of stainless steel or aluminum.

Other contaminants that are not easily removed and can make carpet unrecyclable include paint and drywall mud. Carpet must not be contaminated with body fluids, chemical or pharmaceutical contaminants, and asbestos.

Excessive moisture also impedes carpet recycling. It makes carpet heavier and interferes with fiber-testing devices and other machinery not to mention the potential for moist carpet to contain mold or mildew. Collectors must protect old carpet and pads from rain and snow by using closed containers and overhangs.

Carpet rolled, with fiber side out, cut in 6 foot widths, is ideal for processing.

To locate a carpet collector and/or processor near you to recycle or dispose of old carpet, check the resources on this page: https://www.calrecycle.ca.gov/ConDemo/Carpet/Facilities

Paint

Existing law prohibits the disposal of paint in landfills or waters of the state and authorizes certain entities to accept latex paint for recycling. Paint represents almost one-third of the material collected at local household hazardous waste facilities and costs local government millions of dollars to manage. The California Architectural Paint Recovery Program, established by AB 1343 (2010), requires manufacturers of architectural paint to develop and implement a recovery program to manage the reuse, recycling, and proper disposal of leftover paint. This program allows state agencies to return leftover paint to drop-off locations at certain paint retailers, hardware stores, transfer stations, and household hazardous waste facilities throughout the state at no charge. If a state agency generates over 300 gallons of leftover paint, direct pick-ups may also be arranged.

In order to reduce the generation of leftover paint, only buy an appropriate amount of paint for each project. If paint is purchased in greater quantities than needed, it can be reused or reprocessed to make a high-quality, economical, recycled paint for use in place of standard latex paint. Leftover paint should be taken to a drop-off site for reuse, recycling, or proper management.

Completely empty aerosol containers and empty paint containers may often be recycled along with other materials such as paper, bottles and cans. To inquire if you may dispose of empty paint or aerosol containers with your regular recycling service, contact your solid waste service provider.

For more information on paint product management, including recycling leftover paint: https://www.calrecycle.ca.gov/Paint/

Scrap Metal

Scrap metal recycling is common and has a mature, extensive infrastructure. Depending on the quantity and quality of scrap metal generated, state agencies may receive revenue from

recycling ferrous (sticks to a magnet, like steel & iron) and nonferrous (aluminum, copper, brass, etc.) metal. Types of common scrap metal include: used wire, pipes, signs, posts, appliances, tin (steel) cans, empty aerosol and paint cans, rails and fencing, and some types of furniture. Agencies that generate significant amounts of scrap metal may choose to either sort out the most valuable types, or to commingle all types into one bin before sale to a scrap metal recycler. Metals are among the most valuable recycled commodities and they should be protected from theft.

When it is recycled, scrap metal is generally exempt from hazardous waste regulations under both federal and state law. Scrap metal is not exempt from regulations under either federal or State Law when disposed, especially if it exhibits a characteristic of hazardous waste or is contaminated with a listed hazardous waste. Such situations may include metals covered with old, leaded paint, or motor parts covered with oil and grease. In these cases, metal may need to be managed as a hazardous waste under federal law 40 CFR 261.6(a)(3)(ii) and state law 22 CCR 66261.6(a)(3)(B).

Other metal

Most metal containers found around the workplace can be recycled. Beverage containers and many canned goods containers are manufactured of aluminum and are easy to recycle. Steel food cans, and even empty aerosol containers, are recyclable, too. Clean aluminum food packaging--pie tins, frozen dinner trays, sheets of foil--can be added to recycling bins. Check with your service provided to see what they accept.

Beverage Containers

Recycled beverage containers, like aluminum cans or plastic and glass bottles, can be recycled by your service provider or redeemed for California Refund Value (CRV) at a local buyback center. Learn more about the CRV program, or find nearby recycling centers.

Mattresses and Box Springs

Click here to a link to CalRecycle's Mattress Stewardship Program.

Paper

Paper products are made from organic materials that can be recycled. Recyclable paper items include newspapers, magazines, catalogs, junk mail, printer paper, envelopes, cardboard and even paper egg cartons. Some recycling programs also accept telephone books (check with your waste hauler for specific information).

Plastic

Plastic bottles and containers that bear the 1 or 2 plastic resin codes, also called SPI codes, can be recycled. (SPI stands for Society of the Plastics Industry). Some local recycling programs also accept plastic products with resin codes 3-7 (check with your waste hauler for specific information). Most plastic beverage containers with resin codes 3-7 can be returned to recycling centers for California Refund Value—just check the label for CRV, CA Cash Refund, or similar wording to determine if you are eligible for a refund.

Glass

Glass can be melted repeatedly to produce the same product and is 100 percent recyclable. Materials that should not be mixed into typical recycling bins:

- Drinking or wine glasses and plates
- Ceramics, Pyrex or other heat resistant glass
- Light bulbs
- Computer monitors, phone screens
- Plate glass: windows, sliding doors (can be recycled separately)
- Safety glass, car windshields
- Art glass and leaded crystal
- Mirrors

Organic Waste Recycling

State agencies are required to arrange for recycling services for the following types of organic material:

- Food waste
- Green waste
- Landscape and pruning waste
- Nonhazardous wood waste
- Food-soiled paper

Definitions

"Organic waste" means food waste, green waste, landscape and pruning waste, non-hazardous wood waste, and food-soiled paper waste that is mixed with food waste."

- "Green waste" and "landscape and pruning waste" are used interchangeably.
- "Non-hazardous wood waste" includes any wood products that do not contain hazardous chemicals or additives.
- "Food waste" includes solid, semi-solid, or liquid food products or bi-products including, but not limited to fruits and vegetables, meat, fats, oils, grease, natural and processed foods.

"Commercial solid waste" includes any garbage, discarded or abandoned materials in solid, semi-solid, liquid or containerized gaseous material form, resulting from commercial operations.

Organic Waste Recycling Requirements

State agencies must recycle organic material on or by the following dates based on amount of materials generated:

April 1, 2016: State facilities or operations that generate 8 cubic yards of organic waste per week shall arrange for organic waste recycling services.
January 1, 2017: State facilities or operations that generate 4 cubic yards of organic waste per week shall arrange for organic waste recycling services.
January 1, 2019: State facilities or operations that generate 4 cubic yards or more of commercial solid waste per week shall arrange for organic waste recycling services.
January 1, 2020: If CalRecycle determines that statewide disposal of organic waste has not been reduced by 50 percent from 2014, then State facilities or operations that generate 2 cubic yards more of commercial solid waste per week shall arrange for organic waste recycling services thereafter.

State agencies may select one or any combination of the following actions to recycle organic wastes (all actions must comply with local ordinances and codes):

1. Source-separate organic waste from other waste and subscribe to an organic waste recycling service that specifically includes collection and recycling of organic waste.
    a. Separating organic waste from the remaining waste stream may be a requirement of organic waste services, and also improves the recyclability of the remaining waste stream.
2. Recycle organic waste onsite, or self-haul to organic waste recycling facility.
    a. Some organic waste (i.e. green waste or landscape and pruning waste) may be processed, stored, and reused onsite as mulch, which also reduces irrigation water use.
3. Subscribe to an organic waste recycling service that includes mixed-waste processing that specifically recycles organic waste.
4. Sell or donate the organic waste generated.
    a. Food banks and food rescue programs
5. Recycle the material onsite using processes such as composting, anaerobic digestion (converting bio-degradable materials into biogas fuel) or vermicomposting (earthworms converting organic waste into high quality compost).

    To learn about composting using worms, download the CalRecycle publication *The Worm Guide*.

    For state agencies with lawns for landscape, grasscycling is an economical option. Grasscycling is the natural recycling of grass by leaving clippings on the lawn when mowing, allows cut grass to quickly decompose, returning valuable nutrients to the soil. Grasscycling saves time and money, protects the environment, and, by adding beneficial organic matter to the soil, provides free fertilizer to produce healthy, green lawns. Visit CalRecycle's grasscycling page for more information.

Contracts for Landscaping Services

Contracts or work agreements between state agencies and a gardening or landscaping service must require that organic waste generated by those services comply with these requirements.

Recyclable materials contracts

In July 2017, the Legislature changed the Public Contract Code Sections 12165 – 12167.1 to provide State agencies with the authority to make their own decisions regarding their recycling programs. As a result of these changes State agencies can do the following:

- **Recycling Contracts:** State agencies have the ability to contract for recycling services without seeking prior approval from CalRecycle.
- **Recycling Revenues:** State agencies have the ability to retain all revenues generated by recycling activities for reinvestment into recycling and composting programs
- Click here for contract resources for recycling services in office buildings.

Reporting Requirements

Each state agency and large facility must submit an annual report to CalRecycle summarizing its yearly progress in meeting the 50 percent waste diversion mandate.

Due Date: The State Agency Waste Management Annual Report is due by May 1 annually.

Specific to organics, in October 2014 Governor Brown signed AB 1826 Chesbro (Chapter 727, Statutes of 2014), requiring businesses, including State Agencies, to recycle their organic waste on and after April 1, 2016, depending on the amount of organic waste they generate per week. This law also requires that on and after January 1, 2016, local jurisdictions across the state implement an organic waste recycling program to divert organic waste generated by businesses, including State Agencies that meet the progressive thresholds.

1. For questions about State Agency Waste Management Annual Report, contact the CalRecycle representative assigned to each department.
2. Each department shall amend the department's integrated waste management plan to include methods and processes they use to recycle organic waste from their facilities and operations. Updates shall be submitted in their State Agency Waste Management Annual Report, by May 1st annually.

State Agency Case Studies

Waste Management and Buy Recycled Case Studies

Additional Resources

1. CalRecycle's State Agency Resources and Tools

https://www.calrecycle.ca.gov/StateAgency/Links

2. Mandatory Commercial Organics Recycling (MORe): https://www.calrecycle.ca.gov/recycle/commercial/organics/
3. Waste Management Annual Report: https://www.calrecycle.ca.gov/stateAgency/WMReport/
4. State Agency Integrated Waste Management Plans: https://www.calrecycle.ca.gov/StateAgency/IWMPlans/
5. Organic Materials Management Conversion Technologies: https://www.calrecycle.ca.gov/Organics/Conversion/

Contact Information

For more information about State Agency requirements and reporting, contact your CalRecycle representative

CalRecycle contacts for organics in specific recycling functional areas: https://www.calrecycle.ca.gov/Organics/Contacts/

Environmentally Preferable Purchasing (EPP)

Environmentally Preferable Purchasing

Introduction

Environmentally preferable purchasing considers measures that reduce impacts on human health and the environment resulting with less embodied energy, energy and water use, reduced waste, less material used, durability and many factors. It includes looking at the life cycle of products to assess their impacts over and after the products' life cycles.

Definition

"Environmentally preferable purchasing" as defined in PCC section 12400 means the procurement or acquisition of goods and services that have a lesser or reduced effect on human health and the environment when compared with competing goods or services that serve the same purpose.

This comparison shall take into consideration, to the extent feasible, raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, disposal, energy efficiency, product performance, durability, safety, the needs of the purchaser, and cost.

California Law

California Public Contract Code (PCC), Division 2, General Provisions, Part 6. Environmental Preferable Purchasing (12400-12404)

Policy

State Departments are to consider the health and environmental impacts of goods and services in all their procurements and acquisitions and, comply with the Environmentally Preferable Purchasing (EPP) Act as mandated by PCC sections 12400-12404.

When purchasing IT equipment, departments shall follow the Low Power Office Computing policy outlined in Technology Letter (TL) 12-3. Click here to access Technology Letter TL 12-3.

Requirements

The State of California promotes the procurement of sustainable products that are designed to reduce adverse impacts to the environment and human health. Departments shall consider all health and environmental factors as early as possible in their acquisition planning and decision-making processes.

Pursuant to Executive Order B-18-12, departments shall purchase and use environmentally preferable products when compared with competing goods that serve the same purpose, whenever applicable, perform well, and are cost-effective. When available, departments are required to purchase commodities that meet DGS Purchasing Standards on the DGS Buying Green website.

Nothing contained in any policy regarding environmentally preferable purchasing may be construed as requiring the acquisition of goods or services that do not perform adequately for their intended use, exclude adequate competition, or are not available at a reasonable price in a reasonable period of time.

Required Purchasing Contracts

Departments are required to purchase the following commodities in accordance with current DGS statewide contract EPP specifications:

1. Remanufactured toner and ink cartridges
    a. Remanufactured toner cartridges are rebuilt to meet original equipment manufacturer (OEM) standards, and available state contracts can save state agencies considerably.
2. Recycled paint
    a. Recycled exterior latex paint meeting MPI and GS-43 standards performs as well as virgin paint, but can often be purchased around half the cost.
3. SABRC-compliant printing and writing paper products
4. Energy Star products (e.g., PC goods and multi-functional devices), when available, in accordance with current DGS statewide contract EPP specifications.
    a. When purchasing IT equipment, departments shall follow the Low Power Office Computing policy outlined in Technology Letter (TL) 12-3. Click here to access TL 12-3.

Definitions

- **"Environmentally preferable purchasing" (EPP)** means the procurement or acquisition of goods and services that have a lesser or reduced effect on human health and the environment when compared with competing goods or services that serve the same purpose. This comparison shall take into consideration, to the extent feasible, raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, disposal, energy efficiency, product performance, durability, safety, the needs of the purchaser, and cost.
- **Post-consumer Content (PC)**: Post-consumer is defined as material that comes from products that were bought by consumers, used, and then diverted from the waste stream through a collection program or effort to prevent materials from being landfilled. For example, a newspaper that has been purchased and read, and recycled, and used to make another product would be considered post-consumer material.
- **Recycled Content (RC)**: Recycled content is defined as fragments of finished products of a manufacturing or agricultural process. Recycled material is also referred to as postindustrial, pre-consumer, and/or secondary material. It does not include post-consumer material. Examples of recycled material include paper trimmed for an oversized roll in the printing plant and a rough edge trimmed from a molded plastic product. These excess materials are recycled prior to the finished product reaching a consumer. Therefore, that material would be considered recycled material.
- **Recyclable Material**: Recyclable material is defined as a product that can be used as an ingredient in another manufactured process to create another product. Examples of recyclable materials include aluminum, corrugated cardboard, plastics, paper, and glass.
- **Reuse / Reusable Material**: Reuse / reusable material is defined as a product that is used again for the same original purpose or other purpose without alteration to the product. Examples of reuse / reusable material is the use of original packaging materials repeatedly to repackage goods for shipping and/or refilling a container to store the same or alternative material.
- **Fiberglass**: Post-consumer glass cullet content (within the fiberglass) is defined as a glass container that has been filled with a beverage or food product, sold to the public, and returned by the consumer as recycled glass.
- **Primary Components**: Primary components are the work surface, panels, panel covering and Storage Units.
- **Work surface**: The top working surface of the furniture, including core materials, keyboard pullout and/or edging.

- **Panels**: Furniture enclosure including frames, panel core, and insulation, excluding panel covering.
- **Panel Covering**: Material covering panels including fabrics and/or other materials.
- **Storage Units**: Include drawers, shelves, cabinets, and files.

Bidders Requirements

Specifications and standards referenced in this document in effect on the opening of the request for proposal form a part of this specification.

Bidder shall comply with requirements of following standards and codes as they apply:

- California Health and Safety Code §108920 – Limits presence of "penta BDE" or "octaBDE" Air Toxics Hot Spots Information and Assessment Act – AB 2588, Connelly, as amended by SB 1731, Calderon.
- California Code of Regulations, Title 17 §93120.2 – Air Toxic Control Measure to Reduce Formaldehyde Emission from Composite Wood Products.
- American National Standards Institute / Business and Institution Furniture Manufacturer's Association (ANSI/BIFMA) Standards M7.1-2007 & X7.1-2007 (adopted September 26, 2007) http://www.bifma.org/standards/index.html.
    - National Fire Protection Association (NFPA) Standard No. 701
- American Society for Testing and Materials (ASTM) Standard E-84, Standard Method of Test for Surface Burning Characteristics Building Materials.
    - ASTM Standard C423-90, Noise Reduction Coefficient (NRC) or Speech Frequency Sound Absorption Average

Resources

- DGS Environmentally Preferable Purchasing (EPP) web page
- The DGS EPP Buying Green Guide provides best practices, guidelines and specifications including third party certification requirements and procedures for the comparison of the overall values of goods or services. Departments should use the EPP Buying Green Guide to assist procurement staff in making environmentally preferable purchases. https://www.dgs.ca.gov/PD/Resources/Find-EPP-Goods-and-Services
- The State Contracting Manual (SCM) Volumes 2 & 3, Chapter 3, Topic 11
- DGS third-party environmental certification matrix

Contact

Environmentally Preferable Purchasing Program
Department of General Services
Procurement Division

707 Third Street, Second Floor
West Sacramento, California 95605
Email: buygreen@dgs.ca.gov

State Agency Buy Recycled Campaign (SABRC) Program

Introduction

The State Agency Buy Recycled Campaign (SABRC) is a joint effort between the California Department of Resources Recycling and Recovery (CalRecycle) and the Department of General Services (DGS) to implement state law requiring state agencies and the legislature to purchase recycled-content products (RCP) and track those purchases. It complements the efforts of the Integrated Waste Management Act (Public Resources Code 4000 et al), which was enacted to reduce the amount of waste going to California's landfills. **An Annual Report detailing state agencies' annual RCP purchase is due to CalRecycle by October 31 of each year.**

Policy

Public Contract Code (PCC) section 12203 requires departments to utilize RCP. A minimum of 50 percent of funds expended in each of the targeted categories must be products meeting the requirements of an RCP. The required post-consumer recycled content varies by SABRC product category.

Changes to SABRC requirements starting January 1, 2020

Public Contract Code sections 12203 and 12211 requires each state agency to ensure that at least 75 percent of reportable purchases are recycled products on and after January 1, 2020, except for paint, antifreeze, and tires, which would remain at the 50 percent requirement.

Existing law requires a state agency, except the Department of Forestry and Fire Protection, to annually report its progress in meeting recycled product purchasing requirements, as specified, but after January 1, 2020, the exception pertaining to the Department of Forestry and Fire Protection is removed.

Requirements

Recycled content product purchasing requirements

California promotes the procurement of sustainable and RCP. Departments shall ensure that the responsibility for SABRC is shared among procurement personnel, managers, buyers, contract specialists, contractors, suppliers and all others who procure goods and services for the state.

Departments will consider RCP in conducting its purchasing activities. All departments are required to comply with the RCP requirements of SABRC contained in PCC Sections 12200-12217.

The 11 SABRC reportable categories and requirements are located on the CalRecycle website: https://www.calrecycle.ca.gov/BuyRecycled/StateAgency/

1. Paper Products
2. Printing and Writing Paper
3. Mulch, Compost and Co-Compost
4. Glass Products
5. Lubricating Oil Products

6. Plastic Products
7. Paint
8. Antifreeze
9. Tires
10. Tire-Derived Products
11. Metal Products

Recycled preference and competitive solicitations

Pursuant to PCC section 12203(d), to the maximum extent economically feasible in performance of the contract work, each department shall require the businesses with whom it contracts to use recycled content products. SABRC compliant products as a component of these contracts shall be reported (Refer to Chapter 12 – Reporting Requirements). Contact CalRecycle at (916) 341-6199 or SABRC@CalRecycle.ca.gov for information on qualifying SABRC reusable and RCP.

Non-compliant trash bag manufacturers and wholesalers

Pursuant to Public Resources Code section 42297(c)(1) and (2), any plastic trash bag supplier, manufacturer or wholesaler, or any of its divisions, subsidiaries, or successors, is ineligible for any state contract or subcontract or renewal, extension or modification of any state contract, if it is not in compliance with the certification requirements of the law. To be compliant, manufacturers must meet either one of the following options:

- Ensure that its plastic trash bags contain a quantity of recycled plastic post- consumer material (RPPCM) equal to at least 10 percent of the weight of the regulated bags.
- Ensure that at least 30 percent of the weight of material used in all of its plastic products intended for sale in California is RPPCM.
- Ensure that its plastic trash bag when labeled as biodegradable or compostable meets ASTM D6400 standard for Compostable Plastics.

Manufacturers and wholesalers who are non-compliant with the Plastic Trash Bag Law cannot contract with the state regardless of the product being provided in the contract (i.e. plastic trash bags, janitorial supplies or services, or any other products or services). Additional information, including a listing of compliant and noncompliant trash bag manufacturers and wholesalers is available on CalRecycle's website.

Supplier certification

Pursuant to PCC section 12205, all purchases of products in the targeted categories must include a written certification by the business/supplier, under penalty of perjury as to the recycled content percentage. The supplier may certify that the product or material contains zero recycled content.

The Post-Consumer Recycled Content Certification form can be found at: https://www.calrecycle.ca.gov/BuyRecycled/StateAgency/Certify/ (CalRecycle Form 74). This certification can be waived if the post-consumer recycled content can be verified by other written means such as product label, packaging, catalog, manufacturer/vendor website, product advertisement.

For additional information, contact CalRecycle at (916) 341-6199 or SABRC@CalRecycle.ca.gov

Tire recycle preference

A 5 percent (5%) recycle preference is available for recycled tire products (also known as tire-derived products). Recycled tire products are reportable for SABRC and purchases are SABRC compliant if they contain at least 50 percent recycled used tires.

Tire preference evaluation

When evaluating bids, application of the tire recycle preference is only applicable if both virgin products and recycled content products (RCP) are acceptable for a line item and the products bid are similar. Should only recycled content products be bid, then the preference is not calculated.

Should a solicitation include a mix of line items containing both qualified and non-qualified tire-derived RCPs, the preference shall only apply to qualified line items. If line item awards are made, the preference shall be applied, to the extent possible, so as to maximize award to bidders proposing recycled tire products (PRC section 42892).

Note: Virgin products refer to products not qualified as a recycled content product.

Tire Preference calculation

The following pertains to the recycled tire product preference for awards based on low price. Only responsive bids from responsible bidders are eligible for the preference.

1. The recycle preference is calculated subsequent to price adjustment for the small business preference and prior to application of the DVBE incentive.
2. The 5 percent preference is calculated against the net bid price of the lowest responsive bid proposing a virgin product and subtracted from eligible bids proposing recycle content products.
3. The preference amount cannot exceed $100,000.
4. The preference cannot exceed $50,000 if its application would preclude award to a small business.
5. Should a bidder be eligible for a recycle preference in addition to another preference(s) and/or the DVBE incentive, the cumulative adjustment is the lower of 15 percent or $100,000.

Tie Bids

Where the fitness and quality of proposed products in tie bids is equal, award shall be made to the bidder proposing the greater percentage of recycled tire content (PRC section 42894).

Example of utilizing recycled content products

A department is purchasing $20,000 of printing and writing papers for their copy machines. At least $10,000 of the paper must have 30% recycled content by weight. The other $10,000 may be any mix of recycled or non-recycled products.

Recycled product reporting

All departments must comply with PCC section 12211(a), which requires state agencies to report annually to CalRecycle the results of their RCP purchases within specific categories of material types.

Refer to Chapter 12- Reporting Requirements for further information on recycled product reporting.

Reportable purchases

The reportable product category applicable to IT goods would be plastics products including printer or duplication cartridges that:

- Plastic products that are 10 percent (10%) postconsumer, by weight
- Printer or duplication cartridges that:
  - Have 10 percent (10%) postconsumer material, or
  - Are purchased as remanufactured, or
  - Are backed by a vendor-offered program that will take back the printer cartridges after their useful life and ensure that the cartridges are recycled and comply with the definition of recycled as set forth in PCC section 12156

Note: Pursuant to PCC section 12156 no state department shall purchase any printer or duplication cartridge for which the manufacturer, wholesaler, distributor, retailer, or remanufacturer places restrictions on the recycling or remanufacturing of that cartridge by any other person. For purposes of this section, these restrictions include, but are not limited to, all of the following:

- Reducing the price of the cartridge in exchange for any agreement not to remanufacture the cartridge.
- A licensing agreement on the cartridge that forbids remanufacturing.
- Any contract that forbids the remanufacturing or recycling of the cartridge.

Notwithstanding the above a manufacturer, wholesaler, distributor, retailer, or remanufacturer who establishes a recycling or remanufacturing program that is available to its customers may enter into signed agreements with those customers consenting to the return of the used cartridge to the manufacturer, wholesaler, distributor, retailer, or remanufacturer, only for either of the following purposes:

- Recycling and remanufacturing, for purposes of making the remanufactured cartridge available for purchase.
- Recycling.

Reporting

All departments must comply with PCC section 12211(a), which requires state agencies to report annually to CalRecycle the results of their RCP purchases within specific categories of material types.

Refer to Chapter 12- Reporting Requirements for further information on reporting RCP.

Resources

- SABRC Home Website (CalRecycle)
- How to Record EPP/SABRC in FI$Cal
- How to Apply State Agency Buy Recycled Campaign (SABRC)

Contact

SABRC@calrecycle.ca.gov, (916) 341-6199

Acknowledgements

The following individuals and organizations compose a partial list of those who contributed to the development of the policies included, as well as the consolidation and development of this manual:

- **Dan Burgoyne**, DGS – Sustainability manager, principal author of manual
- **Denise Lewis**, coordinated development of numerous Management Memos
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