California Energy Commission
STAFF REPORT

INITIAL STUDY/PROPOSED NEGATIVE DECLARATION FOR THE 2013 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

CALIFORNIA
ENERGY COMMISSION
Edmund G. Brown Jr., Governor

MARCH 2012
CEC-400-2012-002

CALIFORNIA ENERGY COMMISSION

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ABSTRACT

Public Resources Code Sections 25402 was enacted in 1975 as part of the enabling legislation establishing the California Energy Commission and its basic mandates. The statute requires the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings to ensure that building construction, system design, and installation achieve energy efficiency and preserve outdoor and indoor environmental quality.

The standards must be cost-effective based on the life cycle of the building, must include performance and prescriptive compliance approaches, and must be periodically updated to account for technological improvements in efficiency technology. The standards (codified in Title 24, in portions of Part 1, and in Parts 6 and 11 of the California Code of Regulations) establish a minimum level of building energy efficiency. A building may be designed to a higher efficiency level, resulting in additional energy savings.

The 2013 Building Energy Efficiency Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings. They also include requirements that will enable demand reductions during critical peak periods, as well as future solar electric and thermal system installations. The most significant efficiency improvements to the residential standards are proposed for windows, envelope insulation, and heating, ventilating, and air-conditioning (HVAC) systems. The most significant efficiency improvements to the nonresidential standards are proposed for lighting controls, windows, HVAC equipment, and building commissioning. New efficiency requirements for process loads such as commercial refrigeration, data centers, kitchen exhaust systems, and compressed air systems are included in the nonresidential standards. The 2013 Standards include expanded criteria for acceptance testing of mechanical and lighting systems, as well as new requirements for code compliance data to be collected in an Energy Commission-managed repository.

The 2013 Standards also include updates to the energy efficiency divisions of the California Green Building Standards Code (Title 24, Part 11). Energy efficiency is a major characteristic of "green buildings." A set of prerequisites has been established for both the residential and nonresidential "reach" standards, in addition to efficiency levels that should be installed in any building project striving to be considered "green buildings." The residential reach standards have also been updated to require additional energy efficiency or onsite renewable electricity generation for buildings that exceed a specific threshold of expected electricity use. Both the residential and nonresidential reach standards include requirements for additions and alterations to existing buildings.

Energy Commission staff estimates that the implementation of the 2013 Building Energy Efficiency Standards will reduce statewide annual electricity consumption by about 470 gigawatt-hours per year, electrical peak demand by 150 megawatts, and natural gas consumption by 12 million therms per year. The expected effect of these energy savings to air quality will be a net reduction in the emissions of nitrous oxide by roughly 66 tons per year,

sulfur oxides by 2 tons per year, carbon monoxide by 40 tons per year, and particulate matter less than 2.5 microns in diameter by 12 tons per year. Additionally, Energy Commission staff estimates that the implementation of the 2013 Standards is expected to reduce statewide carbon dioxide equivalent emissions by 190 thousand metric tonnes per year.

Energy Commission staff analyzed an analysis of the environmental impacts of the proposed 2013 Building Energy Efficiency Standards for residential and nonresidential buildings. In addition to air emissions, issues of water savings (both onsite and at California power plants), indoor air pollution and changes in materials use were considered, including the use of: mercury, lead, copper, steel, plastic silicon, gold, aluminum, fiberglass, titanium, glass, and wood. Energy Commission staff believes that the potential environmental impacts associated with the implementation of the 2013 Building Energy Efficiency Standards are less than significant. Therefore, Energy Commission staff recommends the adoption of a Negative Declaration for the 2013 Building Energy Efficiency Standards.

Keywords: California Energy Commission, California Building Energy Efficiency Standards, Title 24, Part 6, 2013 Building Energy Efficiency Standards, California Green Building Standards Code, Title 24, Part 11, negative declaration, residential, nonresidential, newly constructed, additions and alterations to existing buildings, mandatory, prescriptive, performance, windows, envelope insulation, HVAC, building commissioning, process load, commercial refrigeration, data center, kitchen exhaust, compressed air, acceptance testing, data collection, cool roof, reach standards, onsite renewable electricity generation, giga-watt hours, mega-watt, therms per year, nitrous oxides, sulfur oxides, carbon monoxide, carbone dioxide equivalent, NOx, SOx, CO, PM2.5, CO2e, mercury, lead, copper, steel, plastic, silicon, gold, aluminum, fiber glass, titanium, glass, wood, time dependent valuation, TDV

Loyer, Joseph M., 2012. *Initial Study/Proposed Negative Declaration for the 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings*. California Energy Commission, High Performance Buildings and Standards Development Office. CEC-400-2012-002

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EXECUTIVE SUMMARY

California Public Resources Code Section 25402 was enacted in 1975 as part of the enabling legislation establishing the California Energy Commission and its basic mandates. It requires the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings.

The Building Energy Efficiency Standards were first adopted in 1976 and have been updated periodically since then as directed by statute. In 1975 the Department of Housing and Community Development adopted initial insulation standards, under its State Housing Law authority, that were a precursor to the first generation of the Building Energy Efficiency Standards. The Warren-Alquist Act was passed that year with explicit direction to the Energy Commission to adopt and implement the Building Energy Efficiency Standards. The Energy Commission's statute granted consolidated energy authority and provided specific direction to the Energy Commission regarding what the standards are to address, what criteria are to be met in developing standards, and what implementation tools, aids, and technical assistance are to be provided. The standards contain energy efficiency and indoor air quality requirements for newly constructed buildings, additions to existing buildings, alterations to existing buildings, and, in the case of nonresidential buildings, repairs to existing buildings. The standards have contained requirements for alterations to existing buildings for both nonresidential buildings and residential buildings since 1977.

The enabling statute stressed the importance of building design and construction flexibility by requiring the Energy Commission to establish performance standards, in the form of an "energy budget" of the energy consumption per square foot of floor space, and to support the performance standards with compliance software to do the necessary energy calculations. The Energy Commission establishes specific requirements for input, output, and calculation uniformity, enabling private firms to develop compliance software to be approved by the Energy Commission, as long as the software programs meet the specific requirements in the Alternative Calculation Method (ACM) Approval Manuals adopted by regulation in support of the standards. The Energy Commission also provides reference appendices that contain data and other information that serve as reference information for compliance with the standards.

The standards include a basic set of mandatory requirements that apply in all cases. In addition to the mandatory requirements, the performance standards establish energy budgets that depend on climate zone and building type, providing high levels of flexibility for compliance. As an alternative to the performance standards, there are prescriptive requirements that are basically a "checklist" compliance approach that offers simplicity but less flexibility.

The standards are divided into several parts, some of which apply to all buildings and all types of construction, and some of which apply to specified features of either residential or nonresidential buildings.

The administrative regulations for the standards are codified in Part 1 of Title 24, and the substantive building energy regulations in Part 6 of Title 24. The former establishes procedural

requirements, such as what information must be on building permit applications; the latter prescribes how buildings must be constructed to be energy-efficient. In addition, there are voluntary, or "reach," Green Building Standards in Part 11 of Title 24.

Mandatory requirements that apply to all building types are in Part 6, Sections 110.0 – 110.9. The requirements for "nonresidential" buildings, including high-rise residential buildings and hotels/motels, are in Sections 120.0 to 141.0 with mandatory requirements for nonresidential buildings in Sections 120.0 to 120.9, the performance compliance approach in Section 140.1, nonresidential prescriptive requirements in Sections 140.2 to 140.9, and requirements for additions, alterations, and repairs to existing nonresidential buildings in Section 141.

The requirements for low-rise residential buildings are in Sections 150.0 to 150.2, with mandatory requirements for residential buildings in Section 150.0, the performance compliance approach in Sections 150.1, prescriptive requirements in Section 150.1, and requirements for additions and alterations to existing buildings in Section 150.2. The administrative regulations for the standards are in Part I, Chapter 10.

The California Building Standards Code (Title 24) includes Part 11, the California Green Building Standards Code. In 2010, Part 11 went into effect as a mandatory part of the state's building standards code. Part 11 also includes voluntary appendices that contain advanced green building measures that may be adopted by local jurisdictions or considered voluntarily for specific building projects. For 2013 the Energy Commission is adopting the energy efficiency sections of Title 24, Part 11, including the voluntary appendices. The Energy Commission uses the term "reach standards" to describe the advanced levels of energy efficiency specified in the voluntary appendices of these Green Building Standards.

Summary of Changes

The 2013 Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings and include requirements that will enable both demand reductions during critical peak periods and future solar electric and thermal system installations. The most significant efficiency improvements to the residential standards are proposed for windows, envelope insulation, and HVAC systems. For the first time, HVAC duct sealing will be mandatory for all residential building projects. The most significant efficiency improvements to the nonresidential standards are proposed for lighting controls, windows, HVAC equipment, and building commissioning. Building commissioning is a systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements. New efficiency requirements for process loads, such as commercial refrigeration, data centers, kitchen exhaust systems, and compressed air systems are included in the nonresidential standards. The 2013 Standards also include expanded criteria for acceptance testing of mechanical and lighting systems, as well as new requirements for code compliance data to be collected in an Energy Commission-managed repository.

Enabling residential and small commercial buildings to respond to critical electricity peak demand events by reducing air-conditioning loads at critical peak periods is an expanded aspect of the 2013 Standards. Capabilities to enable remote utility communication of critical events and automatic demand response to reduce critical peak air-conditioning loads are proposed as requirements for all thermostats controlling unitary heating and air-conditioning systems. Making future solar electric and solar thermal system installations easier is another new element of the 2013 Standards.

The 2013 Standards also include updates to the energy efficiency divisions of the California Green Building Standards (Title 24, Part 11). These "reach" standards provide a model for local jurisdictions that wish to adopt requirements that are more environmentally protective than the minimum requirements in Part 6 as mandatory requirements in local building codes. The standards updates also are intended to improve the clarity and organization of these performance-based advanced energy efficiency standards. The changes establish a set of prerequisites for the residential reach standards, in addition to efficiency levels that should be installed in any building project striving to be considered "green buildings." The residential reach standards have also been updated to require additional energy efficiency or onsite renewable electricity generation for buildings that exceed a specific threshold of expected electricity use. Both the residential and nonresidential reach standards include requirements for building additions and alterations.

Environmental Impacts

Potential Increase in Material Uses Is Less Than Significant

The implementation of the proposed changes to the Building Energy Efficiency Standards may cause increases in material uses. Such material uses include additional electronic equipment, lighting fixtures, heating and air-conditioning equipment, insulation, water heating equipment, plumbing and wiring, and other building and equipment elements. The Energy Commission has evaluated the proposed changes to the Building Energy Efficiency Standards for their potential for environmental impacts. The Energy Commission evaluated the potential increases in material uses for each of the following materials: mercury, lead, copper, steel, plastic, silicon, gold, aluminum, fiberglass, titanium, glass, and wood. The Energy Commission estimates that the contribution of each energy efficiency measure to the potential increases in material use is a small fraction of the material use in the current market. In each case, the Energy Commission determined that the existing regulations governing the production, processing, handling, transportation, storage, use, and disposal are adequate to protect the public health and to restrict the potential environmental impacts such that they are less than significant.

Reduction of Water Consumption

The implementation of the proposed changes to the Building Energy Efficiency Standards is expected to decrease statewide water consumption. These savings come from onsite sources such as building cooling towers and single-family water heating distribution system improvements, as well as at California power plants from the overall reduction in electric power

demand from the proposed energy efficiency improvements. The Energy Commission estimates that there will be an overall decrease of more than 330 million gallons (roughly 1,000 acre-feet) per year of water consumption from the implementation of the proposed changes to the Building Energy Efficiency Standards.

Improved Indoor Air Quality

The proposed changes to the Building Energy Efficiency Standards do not include the adoption of the ASHRAE ventilation requirements (ASHRAE Std. 62.1). Instead, the standards keep the current Title 24, Part 6 ventilation requirements, which generally provide higher ventilation rates than does ASHRAE Std. 62.1. The proposed changes include stricter field test criteria for the occupancy sensors that govern the temporary reduction in ventilation rates during unoccupied periods in specific building space types, such as in multipurpose and conference rooms. These proposals will improve the indoor air quality in these building spaces by making the ventilation control systems more reliable. No other proposed changes to the mandatory sections of the Building Energy Efficiency Standards will affect indoor air quality. Thus, there are no potential impacts to the degradation of indoor air quality as a result of the implementing the proposed changes to the Building Energy Efficiency Standards.

Energy and Emission Benefits

This initial study concludes that the 2013 Building Energy Efficiency Standards will not have a significant negative effect on the environment and provides the basis for that conclusion. No mitigation measures are proposed.

The implementation of the 2013 Standards will reduce statewide annual electricity consumption by about 470 gigawatt-hours per year (GWh/yr), electrical peak demand by 150 megawatts (MW), and natural gas consumption by 12 million therms per year. The potential effect of these energy savings to air quality are a net reduction in the emission of nitric oxides (NOx) by roughly 66 tons per year, sulfur oxides (SOx) by 2 tons/year, carbon monoxide (CO) by 40 tons/year and particulate matter less than 2.5 microns in diameter (PM2.5) by 12 tons per year. Additionally, the implementation of the 2013 Standards will reduce statewide carbon dioxide equivalent (CO2e) emissions by 190 thousand metric tonnes per year. Table 1 lists each sector and the estimated related energy and emission savings.

Table 1: Total Energy and Emission Reductions of the 2013 Energy Efficiency Standards

	GWhr/yr	Million Therms/yr	NOx tons/yr	SOx tons/yr	CO tons/yr	PM2.5 tons/yr	CO_{2e}-metric tonnes/yr	MW
Residential Newly Constructed Single-family	16.31	1.45	6.91	0.10	3.36	0.70	14,641	25.93
Residential Newly Constructed Multifamily	4.35	0.21	1.06	0.02	0.56	0.12	2,999	6.11
Nonresidential Newly Constructed	168.25	7.57	38.16	0.81	20.55	4.59	112,714	25.29
Residential Additions and Alterations Single-family	7.01	0.62	2.97	0.04	1.44	0.30	6,296	11.15
Residential Additions and Alterations Multifamily	1.87	0.09	0.45	0.01	0.24	0.05	1,289	2.63
Nonresidential Additions and Alterations	272.54	2.15	16.55	1.02	14.03	3.77	130,169	78.49
Statewide	**470.3**	**12.09**	**66.10**	**1.99**	**40.19**	**9.55**	**268,108**	**149.60**

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

The values listed in Table 1 are the total estimated benefits from the implementation of the 2013 Standards. They include the potential emission benefits for all reductions in natural gas and electricity use that are expected to occur from the implementation of the 2013 Standards. The emission estimates associated with the reduction of natural gas use are expected to occur at the location of each building and are based on the emission factors for residential and commercial space heating and domestic hot water equipment.

On the other hand, the emission estimates associated with the reduction in electricity use (in terms of gigawatt-hours per year) are associated with generation throughout the Western United States, Western Canada, and Mexico, which is generally coordinated by the Western Electricity Coordinating Council (WECC). California imports about 20 to 40 percent of its electricity from out-of-state sources through the Western Interconnection (western regional electric grid) in any given hour. That electricity is generated by a combination of sources that may include nuclear, hydroelectric, natural gas, coal, and renewable energy power plants. Table 1 reports the total estimated emissions reductions, including those associated with out-of-state generation, which are expected to occur from the implementation of the 2013 Standards.

The estimated reduction of greenhouse gas emissions, reported as CO2E in Table 1, includes the emission reductions of carbon dioxide (CO2) as well as other associated greenhouse gas, such as nitrous oxide (N2O), methane (CH4), hydrofluoric carbons, halogen-alkenes, and sulfur hexafluoride.

Conclusions

The Energy Commission has analyzed the environmental impacts of the proposed 2013 Building Energy Efficiency Standards for residential and nonresidential buildings. Air emissions, water savings (both onsite and at California power plants), indoor air pollution, and increased materials use were considered. The initial study concludes that the potential environmental impacts associated with the implementation of the 2013 Building Energy Efficiency Standards are less than significant. A detailed description of all potential impacts is included in this report. Therefore, a negative declaration for the 2013 Building Energy Efficiency Standards should be adopted.

CHAPTER 1:
Project History, Description, and Environmental Setting

History of the Standards

In 1974, the Legislature enacted statutes creating the California Energy Commission and requiring it to, among other things, adopt Building Energy Efficiency Standards. (Stats. 1974, ch. 276.) The standards must be cost-effective based on the lifecycle of the building, must include performance and prescriptive compliance approaches, and must be periodically updated to account for technological improvements in efficiency technology. (Pub. Res. Code § 25402.) Accordingly, the Energy Commission has adopted and periodically updated the standards (codified in Title 24, in portions of Part 1 and in Part 6 of the California Code of Regulations) to ensure that building construction, system design, and installation achieve energy efficiency and preserve outdoor and indoor environmental quality. The standards establish a minimum level of building energy efficiency. A building may be designed to a higher efficiency level, resulting in additional energy savings.

The Building Energy Efficiency Standards are aimed at the building components that affect energy use in newly constructed residential and nonresidential buildings, and additions and alterations to existing buildings, including lighting, water heating, and space conditioning systems, process energy occurring in the building, and the building envelope. The standards are fundamentally performance standards requiring buildings to meet specified energy budgets while providing flexibility in selecting the features to meet those energy budgets. The standards also include prescriptive alternatives to the performance standards, as well as mandatory requirements. Compliance with the standards must be demonstrated to the local enforcement agency, a city or county building department or a state agency that has responsibility for assuring compliance with building codes, before an occupancy permit is issued.

The Energy Commission must amend the standards periodically to incorporate improvements in energy efficiency technologies, accounting for changes in the cost of fuels and energy-conserving strategies, improved building science research, and better understanding of California building energy performance. The Energy Commission must determine that the standards and amendments are cost-effective. The Energy Commission makes amendments in alignment with statutory direction that building codes be updated on a three-year cycle.

Summary of Existing Laws and Policies

Public Resources Code Sections 25402 was enacted in 1975 as part of the enabling legislation establishing the Energy Commission and its basic mandates. It requires the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings. Enacted at that same time, Section 25910 directed the Energy Commission to adopt standards for the minimum amount of additional insulation installed (as an alteration) in existing buildings. Senate Bill (SB) 639 (Rosenthal, Chapter 1067, Statutes of

1993) added Section 25402.5, which expressly directed the Energy Commission to consider both new and replacement (as an alteration to an existing building), as well as interior and exterior lighting devices as subject to Energy Commission authority. SB 639 also clarified that the Energy Commission's authority relating to exterior lighting and to alterations to existing buildings was included in the Legislature's original intent in enacting Section 25402. Senate Bill 5X (Sher, Chapter 7, Statutes of 2001, 1st Extra Session) added Subsection (c) to Section 25402.5 to clarify and expand the Energy Commission's authority to adopt standards for outdoor lighting (defined as all electrical lighting not subject to the Energy Commission's existing and prior standards).

The Global Warming Solutions Act (Assembly Bill 32, Núñez, Chapter 488, Statutes of 2006) has been the foundation of California's efforts over the past five years to reduce greenhouse gas emissions to the state's 1990 level by 2020. Improving the energy efficiency of existing residential and commercial buildings is the single most important activity to reduce greenhouse gas emissions in the electricity and natural gas sectors. Expanding and strengthening existing energy efficiency programs as well as building and appliance standards are a key recommendation of the adopted *AB 32 Scoping Plan*. The *2007 Integrated Energy Policy Report* (*IEPR*) concluded that climate change is the most important environmental and economic challenge of the century; greenhouse gas emissions are the largest contributors to global warming; and California's ability to slow the rate of greenhouse gas emissions will depend first on energy efficiency.

Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) enacted Governor Schwarzenegger's Million Solar Roofs Initiative. The statute added sections to the Public Resources Code that require building projects applying for ratepayer-funded incentives for photovoltaic (PV) systems to meet minimum energy efficiency levels and PV system components and installations meet rating standards and specific performance requirements. SB 1 required the Commission to determine how and to what extent PV systems should be required in the Building Energy Efficiency Standards.

The Energy Action Plan (most recently updated in 2008), which has guided California Energy Policy since the California Energy Crisis of 2000-2001, established California's "Loading Order" policy, which calls for load growth to be met first by cost-effective energy efficiency improvements and demand response, followed by renewable resources.

The California Long-Term Energy Efficiency Strategic Plan (2008), developed by the California Public Utilities Commission in collaboration with the Energy Commission, establishes the importance of the Building Energy Efficiency Standards in reaching the State's policy goal of zero net energy homes by 2020 and zero net energy buildings by 2030. The strategic plan also explains the Energy Commission's development of voluntary "reach standards" as a critical component of the Building Energy Efficiency Standards. In each update cycle the reach standards establish a "market pull strategy" to encourage the industry to anticipate that additional standards improvements will be coming in the following cycle, and for a substantial portion of newly constructed buildings to build to meet higher levels of efficiency than just what the mandatory standards require. Building to meet the reach standards is encouraged by the minimum requirements to qualify for PV incentives under the New Solar Homes Partnership, and incentives provided by the utility new construction programs. It also is achieved by

incorporation of the reach standards as voluntary in the California Green Building Standards Code (Title 24, Part 11) and by other governmental agencies, such as the Tax Credit Allocation Committee for federal and state tax credits for affordable housing, incorporating the reach standards in their regulations and programs.

Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009) requires the Energy Commission to develop and implement a comprehensive program to achieve greater energy savings in California's existing residential and nonresidential building stock. The program would consist of a complimentary portfolio of techniques, applications, and practices to achieve greater energy efficiency in existing residential and nonresidential structures, especially those structures that fall significantly below the efficiency required by the current California Building Energy Efficiency Standards. One important means for achieving energy efficiency in existing buildings is ongoing improvement of the standards requirements for alterations to existing buildings.

The California's Clean Energy Futures Initiative (2010) is a collaboration effort of the California Energy Commission, California Public Utilities Commission (CPUC), California Air Resources Board, California Environmental Protection Agency, and the California Independent System Operator to advance carbon-cutting innovation and green job creation. It points the way toward new investments in energy efficiency, transmission, smart grid applications, and increased use of renewable resources. The Energy Futures Initiative calls for achievement of California's zero net energy goals through updates of the Building Energy Efficiency Standards.

Governor Brown's *Clean Energy Jobs Plan* (2010) combines existing state energy policy with economic recovery and growth goals by focusing on developing renewable energy and energy efficiency technologies and creating more than half a million green jobs. The Governor's *Clean Energy Jobs Plan* calls for:

- Creating new efficiency standards for new buildings.
- Increasing public education and enforcement efforts so that the gains promised by California's efficiency standards are realized.
- Actively pursuing the achievement of "zero-net-energy" buildings.

The Energy Commission's *2011 Integrated Energy Policy Report* includes an energy efficiency chapter that emphasizes the zero net energy policy goals for the state's residential and nonresidential buildings, articulating how the Building Energy Efficiency Standards, including reach standards, will be updated periodically to attain the aggressive levels of energy efficiency required to achieve zero net energy buildings in combination with onsite renewable energy.

Environmental Setting: Reasons for This Project

Approximately one-third of the energy consumed in California is consumed by buildings. The energy consumed is primarily natural gas and electricity. Every year, hundreds of thousands of new buildings are constructed, added on to, or remodeled , adding onto this energy use. This new construction provides an important opportunity to require significant energy efficiency strategies that cannot be as effectively and economically realized on a retrofit basis. The Building Energy Efficiency Standards adopted by the Energy Commission provide a performance-based approach to making new buildings much more energy efficient than they would be were there no such standards.

The standards make buildings more efficient, resulting in reduced consumption of both natural gas and electricity. These reductions in turn result in lower emissions from natural gas combustion at the building site, and lower emissions from the generation of electricity that powers buildings. For this reason, this project to update the Building Energy Efficiency Standards to require greater efficiencies will reduce the harmful criteria air pollutants that threaten public health. Because the standards will reduce fuel consumption at the building site and at the power plant, they will also reduce greenhouse gas emissions that contribute directly to global warming. The standards also target the reduction of "peak" electricity use. Since "peak" electricity use relies heavily on generation from less efficient power plants, and peak periods coincide with hot, summer periods when air pollution is at its worst, reduction in electricity peak loads have an even greater beneficial effect on air quality. Lower peak electricity use also dramatically lowers the utility costs associated with electricity use.

Proposed Project

The Building Energy Efficiency Standards will require more efficient use of natural gas, electricity and water in newly constructed buildings, as well as in additions and alterations to existing buildings. They help create more comfortable, healthy, and well-lit buildings using cost-effective measures.

With input from numerous outside stakeholders, the Energy Commission identified a number of measures for consideration as changes to Title 24, Part 6, for 2013. After review and analysis and with assistance from outside energy consultants and the extensive input of many project stakeholders, the Energy Commission proposes the specific changes identified in this report.

Implementation of the standards applies to the entire state of California. Figure 1 shows the boundaries of the 16 climate zones within the state. The energy efficiency measures for buildings in each climate zone are justified by computer simulation and life cycle cost analysis.

Methodology

The development of this initial study started with an energy use analysis and cost-effectiveness analysis for the proposed new standards. Energy Commission contractors modeled prototype buildings with a set of assumptions matching the 2008 Standards, then again with the proposed

changes for the 2013 Standards, to estimate the expected natural gas and electricity savings. Annual Time Dependent Valuation (TDV) energy savings were derived by applying hourly multipliers (which depend on the hour of the day and season of the year, and account for the energy used to generate, transmit and distribute electricity and the energy used to distribute natural gas) to the expected natural gas and electricity savings, then summing these TDV energy values for all hours of the year. The Energy Commission's determination of cost-effectiveness was based on a life cycle cost analysis using the Energy Commission defined life expectancies for buildings: 30 years for residential buildings and nonresidential building envelopes, and 15 years for nonresidential lighting and mechanical systems. Each measure was also assigned an incremental cost (the added cost of the newly proposed measure compared to the cost of the measure that were specified in the 2008 Standards). The final cost-effectiveness of a measure was based on the total cost of the measure versus the amount of energy savings for that measure over the life of the building. The environmental analysis used data generated in the prototypical building energy analysis (comparing the total energy use between the 2008 and 2013 Standards) and the individual analysis of each proposed measure regarding material uses. These data were converted into emissions values based on industry standard assumptions for onsite combustion appliances (furnaces and water heaters). Potential emissions reductions from electricity reductions from generation sources were calculated separately. Beyond the emissions impacts, the environmental analysis considered specific impacts such as materials use that might result from the proposed changes to the standards.

Organization of the Standards

The Building Energy Efficiency Standards are organized into three basic components: mandatory features, requirements for the prescriptive compliance approach, and requirements for the performance compliance approach. Mandatory features are always required unless a specific exception exists for a particular building application. The prescriptive requirements are a list of energy features that comprise a "prescription" for how to construct a building using specific practices and technologies. To establish the performance standards, the prescriptive requirements establish a "standard design" building model within the software program that is the basis for the energy budget for a proposed building. A number of modeling assumptions, including expected climate characteristics, are built into the software and are applied to both the proposed design and the standard design case. The energy estimated for the "proposed design" is compared to the energy estimated for the "standard design" to determine if the building meets the energy budget.

So, for a particular proposed building project in California, after demonstrating compliance with mandatory requirements, the energy-budget for the building design is determined (by Energy Commission approved building simulation software) using the prescriptive requirements as a compliance guide. The builder, under the performance requirements, may then modify the design, but must demonstrate (using the simulation software) that the performance energy-use is less than or equal to the prescribed energy-budget (while still complying with the mandatory requirements).

Another regulatory element that is adopted by reference into the Building Energy Efficiency Standards is the energy efficiency of appliances. Federal and state appliance standards dictate the testing procedures and minimal efficiency requirements for most major appliances, including central air-conditioning and space heating systems, and water heaters that are included in buildings. (See 20 Cal. Code Regs., Div. 2, Ch. 4, Art. 4, § 1601 et seq.)

CHAPTER 2:
List of Agencies That Will Use The Decision or Comments

The Energy Commission is the lead agency for this rulemaking proceeding to consider adopting the proposed 2013 Building Energy Efficiency Standards. The Energy Commission will solicit public comment on this Initial Study to fulfill the CEQA requirements. The Energy Commission will consider adoption of the 2013 Standards by May 9, 2012, with implementation expected in January 2014. Following the adoption, the standards must be reviewed and approved by the California Building Standards Commission, which will have access to this initial study and all other documents related to the rulemaking proceeding. There will be no other responsible agency other than the California Building Standards Commission.

CHAPTER 3:
List of Permits and Other Approvals Required to Implement The Project

No permits are applicable for this project. The Energy Commission and the California Building Standards Commission are the only agencies that must approve changes to the Building Energy Efficiency Standards.

CHAPTER 4:
Descriptions of 2013 Proposed Changes to Building Energy Efficiency Standards

The following describes the proposed changes to the Building Energy Efficiency Standards (Title 24, Part 6), as well as to the Energy Commission's Administrative Regulations (Title 24, Part 1), Alternative Calculation Method Approval Manuals and Reference Appendices (which are adopted by reference), and to the California Green Building Standards Code (Title 24, Part 11).

All numbering of Part 6 sections has been modified to accommodate additions to the standards language. For example, Section 100 has been changed to Section 100.0 and Section 102 has been changed to Section 100.2. Due to this renumbering, it is no longer necessary to reserve code sections for future use, since the new numbering scheme accommodates a vast number of section and subsection divisions. Several reserved code sections are removed in these proposed regulations.

Changes That Apply to All Building Types Covered by the Standards

Scope (§100.0): Added requirements for covered processes. Added an exception for the mixed occupancy lighting requirements. Clarified the certification requirements for manufactured devices.

Application of Standards (§100.0, Table 100.0-A): Edited table to be consistent with proposed changes to Part 6.

Definitions (§101): Added new definitions, deleted obsolete definitions, and modified existing definitions to reflect the updated standards language.

Mandatory Requirements for Appliances (§110.1): Edited for clarity.

Mandatory Requirements for Space Conditioning Equipment (§110.2): Updated the requirements for chillers to match the federal efficiency standards (ASHRAE 90.1). Added requirements for programmable setback thermostats to be upgradeable to communicating setback thermostats. Added requirements for evaporative or open cooling towers to include water saving features.

Mandatory Requirements for Service Water Heating Systems (§110.3): Removed an exception for hot water distribution system controls on water heating systems serving single dwelling units. Added shower plumbing requirements for each shower head to be controlled by a dedicated mixing valve and to set minimum limits on shower head spacing.

Mandatory Requirements for Fenestration Products (§110.6): Added an exception stating that neither fenestration products (basically, windows and skylights) nor exterior doors are subject to air leakage requirements if they are field-fabricated (constructed at the building site rather than

in a manufacturer's factory). Reduced the building floor area threshold for when NFRC ratings are required for field-fabricated fenestration products. Added a provision to the existing requirement that fenestration products be rated according to NFRC procedures; the new provision requires that visual transmittance be included among the product characteristics that must be tested and labeled.

Mandatory Requirements to Limit Air Leakage (§110.7): Added air barrier design and construction requirements and included specifications for materials deemed to comply as air barriers.

Mandatory Requirements for Insulation, Roofing Products and Radiant Barriers (§110.8): Edited for clarity. Added a prohibition of insulation placement on top of suspended ceilings. Added an emittance requirement for radiant barriers.

Mandatory Requirements for Lighting Control Devices and Systems, Ballasts and Luminaires (§110.9): Edited for clarity and to reflect changes to the prescriptive lighting requirements. This subsection was updated for consistency with recent changes to the Title 20 Appliance Efficiency Regulations. Self-contained lighting controls are now regulated by Title 20 and lighting controls systems continue to be regulated by this subsection. Added lighting control acceptance requirements. Moved requirements for supplementary overcurrent protection panels from the prescriptive code section to this mandatory subsection.

Mandatory Requirements for Solar-Ready Buildings (§110.10): Added requirements for building designs to provide for the future installation of solar electric or solar thermal systems.

Changes to Nonresidential, High-Rise Residential, and Hotel/Motel Buildings

Mandatory Requirements

General (§120.0): Modified Subchapter and Section headings to include all mandatory requirements for nonresidential buildings other than the lighting requirements that remain in Section 130.0.

Ventilation (§120.1): Edited for clarity. Added ventilation control by an occupant sensor ventilation control device (a device that senses human occupancy based on motion detection technology, then controls ventilation air flow rates accordingly) as an acceptable approach to meet the outdoor air control requirements. Added a requirement for ventilation air to be measured and controlled within 10% of the required airflow rates.

Controls for Space Conditioning Systems (§120.2): Edited for clarity. Added shut-off and reset control requirements for multipurpose rooms, classrooms and conference rooms to be equipped with occupant sensors and automatically setup cooling temperature setpoints, setback heating temperature setpoints and reduce ventilation rates during unoccupied periods. Added a

requirement for air-cooled unitary direct-expansion equipment to include an economizer fault detection and diagnostics system.

Pipe Insulation (§120.3): Edited for clarity. Increased required levels of pipe insulation summarized in Table 120.3-A.

Mechanical System Acceptance (§120.5): Edited for clarity. Added system acceptance requirements for supply air temperature reset controls, condenser water temperature reset controls, and energy management control systems.

Covered Processes (§120.6): Renamed section to include all covered processes. Added subsections for commercial refrigeration, enclosed parking garages, process boilers, and compressed air systems.

Refrigerated Warehouses (§120.6(a)): Edited for clarity. Added an exception to exclude quick chilling and quick freezing compressors and condensers from meeting the requirements of this subsection. Increased the refrigerated warehouse insulation requirements. Modified the exception for variable speed evaporators to accommodate long term storage facilities that are designed for constant airflow. Removed the requirement for condensers utilizing ammonia to be evaporatively cooled. Added condensing temperature reset control requirements. Added fan-powered condenser efficiency requirements. Added requirements for infiltration barriers. Added system acceptance requirements for electric resistance underslab heating systems, evaporators, evaporative condensers, air-cooled condensers and variable speed compressors.

Commercial Refrigeration (§120.6(b)): Added entire subsection. New requirements for condenser speed controls, fan-powered condenser efficiency, compressor system controls, display case lighting controls and refrigeration heat recovery.

Enclosed Parking Garages (§120.6(c)): Added entire subsection. New requirements for mechanical ventilation systems to modulate ventilation rates in response to the automatic detection of contaminant levels.

Process Boilers (§120.6(d)): Added entire subsection. New requirements for boilers to be equipped with a combustion air positive shut-off device, for fan motors to be variable speed or limit demand based on airflow rate and to limit the amount of excess oxygen used in the combustion process.

Compressed Air Systems (§120.6(e)): Added entire subsection. New requirements for trim compressors and compressed air storage, compressed air system controls and acceptance testing.

Insulation (§120.7): Added entire subsection. New minimum requirements for roof, wall, and floor insulation.

Building Commissioning (§120.8): Added entire subsection. New requirements for design-phase commissioning. Relocated current building commissioning requirements in Title 24, Part 11, that pertain to energy systems covered in Part 6 to this subsection.

Commercial Boilers (§120.9): Added entire subsection. New requirements for boilers to be equipped with a combustion air positive shut-off device, for fan motors to be variable speed or limit demand based on airflow rate and limit the amount of excess oxygen used in the combustion process.

Lighting Controls and Building Power (§130.0 to 130.5): Added building power into the scope of Subchapter 4.

Lighting Controls and Equipment (§130.0): Edited for clarity and to improve the organization of the lighting standards. Added fire station dwelling accommodations as a residential building space type that must meet the residential lighting requirements. Simplified the criteria used to determine luminaire power and added a new scheme to classify luminaires. Added a requirement for installation inspections of track lighting integral current limiters (current limiters that are built directly into the track lighting fixture). Modified the test requirement for LED lamps, such that LEDs must now adhere to a nationally recognized test standard.

Indoor Lighting Controls (§130.1): Edited for clarity, removed redundant code language and improved the organization of the lighting standards. Reduced the amount of lighting allowed to be installed in a building area without controls. Reduced the general lighting threshold (measured in watts per square foot), which means that the multilevel lighting control requirements of this subsection now apply to more spaces in more buildings. Modified the requirements for multi-level control steps and light uniformity to be appropriate to specific lighting technologies. Added a requirement for multilevel lighting controls to meet at least one of the five listed control types. Added a requirement for daylighting controls in parking garages. Reduced the building size threshold (measured in square feet) for when demand responsive lighting controls are required.

Outdoor Lighting Controls and Equipment (§130.2): Edited for clarity. Removed exceptions to the outdoor lighting equipment and control requirements in this section. Replaced the cutoff requirements with requirements for backlight (light applied to the back of a subject being lit), uplight (light applied from below a subject being lit), and glare (BUG) ratings. Reduced the threshold luminaire wattage for when the light distribution requirements apply. Added requirements for outdoor lighting to be switched independently from other electrical loads, and for certain outdoor luminaires to be controlled by multi-level motion sensors (where light fixtures have a low light level for periods when no motion is detected, and a higher light level for when motion is detected), part-night lighting control devices (controls that reduce or turn off outdoor lighting for a portion of the night) or centralized time-based zone lighting controls (where lighting in multiple zones can be scheduled to turn on and off from a central location).

Sign Lighting Controls (§130.3): Edited for clarity.

Lighting Control Acceptance (§130.4): Edited for clarity. Added lighting control certification requirements.

Electrical Power Distribution Systems (§130.5): Added entire subsection. New requirements for service metering, disaggregation of electrical circuits, maximum voltage drop, receptacle circuit controls, demand response signals and energy management control systems. Introduces Table 130.5-A to summarize the minimum requirements for metering electrical loads.

Performance and Prescriptive Compliance Approaches

Performance and Prescriptive Compliance Approaches (§140.0): Edited for clarity. Modified the basis of all climate zone descriptions from metes and bounds to ZIP codes.

Performance Compliance Approach: Energy Budgets (§140.1): Edited for clarity. Added the explanation that the requirements for compliance software certification by the Energy Commission are documented in the *Nonresidential ACM Approval Manual*.

Prescriptive Approach (§140.2): Added a list item for buildings to be designed, constructed and installed to meet the new prescriptive requirements for covered processes.

Prescriptive Standards

Building Envelopes (§140.3): Edited for clarity. Updated the prescriptive envelope criteria in Table 140.3-A to reflect the revised cool roof requirements and to revise and simplify the fenestration requirements.

Exterior Roofs and Ceilings (§140.3(a)1): Removed climate zone specific exceptions to roof reflectance and emittance requirements. Increased the minimum roof reflectance requirements. Added steep-sloped roof reflectance and emittance requirements for high-rise residential and hotel/motel occupancies.

Fenestration (§140.3(a)5): Revised fenestration heat transfer criteria and added new requirements for visual transmittance and use of area-weighted performance ratings for U-factors, relative solar heat gain coefficients, and visual transmittance.

Air Barrier (§140.3(a)9): Added air barrier requirements for building projects in climate zones 10-16.

Other Envelope Trade-Off Approaches (§140.3(b)): Eliminated the Overall Envelope Energy Approach as a prescriptive compliance option.

Daylighting (§140.3(c)): Modified the daylighting requirements for large enclosed spaces in low-rise buildings including increases in the percent of floor area that must be daylit.

Space Conditioning Systems (§140.4): Edited for clarity. In addition:

Fan Power (§140.4(c)): Replaced requirements for variable air volume capability in only large fans and motors with requirements for variable airflow capability in various sizes of multiple zone and single zone HVAC systems (See §140.4(m)). Added requirement for fractional fan and pump motors to be electronically commutated or have a minimum efficiency.

Zone Controls (§140.4(d)): Removed the variable air volume exception to the requirement for controls that prevent simultaneous heating and cooling. Added requirement for direct digital control systems to include two-stage heating controls. Removed an exception for the economizer requirements. Expanded the requirements for direct expansion systems to stage or modulate cooling capacity and use economized air to the greatest extent possible.

Economizers (§140.4(e)): Added requirements for air economizers and return air dampers in the areas of warranty, drive mechanism, damper reliability testing, damper leakage, adjustable setpoint controls, relief air system and damper control sensor location, accuracy, and calibration. Updated the economizer and efficiency trade-offs in Tables140.4(e)-A, B and air economizer high air shut-off control requirements in Table 140.4(e)-C. Added requirements for all space conditioning systems to use integrated economizer controls (economizer controls that are interlocked with mechanical cooling controls, such that the economizer is used to the greatest extent possible, when appropriate, before mechanical cooling is used). Added requirements for direct expansion systems to stage or modulate cooling capacity, such that reduced cooling capacity must be delivered with a corresponding reduction in electrical power demand.

Chillers (§140.4(i)): Added requirement for chillers to adhere to ASHRAE 90.1 Path B efficiency levels (See Section 110.2 for chilling equipment efficiency requirements, including Path B).

Limitation on Air-Chillers (§140.4(j)): The proposed regulations change the limitation on air-cooled chillers from 100 tons (when the chiller plant capacity exceeds 300 tons) to 300 tons (regardless of chiller plant capacity).

Fan Control (§140.4(m)): Added this subsection to describe the requirements for variable airflow capability in multiple-zone and single-zone HVAC systems.

Indoor Lighting (§140.6): Edited for clarity.

Actual Lighting Power Density (§140.6(a)): The threshold for exempt portable lighting was raised in conjunction with the lowering of allowable watts per square foot for office lighting. Removed Power Adjustment Factors (PAFs, used in the standards to provide prescriptive compliance credit for specific lighting controls within the calculation of allowable lighting power densities) for daylighting where controls have been changed from prescriptive to mandatory requirements. The applications of PAFs for other lighting controls have been simplified. Expanded the explanations of PAFs available in Table 140.6-A to articulate the available credits for all lighting control applications recognized in the standards. Because PAFs apply only to permanent lighting installations, criteria have been added for when furniture-mounted general lighting can be considered permanently installed. Added installation inspection requirements to

verify that the PAFs used in code compliance match the PAFs for the lighting controls actually installed. Revised the requirements for refrigerated cases to be consistent with the Title 20 Appliance Efficiency Regulations. Removed elevator lighting from the building lighting budget to be consistent with national standards.

Allowed Lighting Power Density (§140.6(c)): Reduced the allowed lighting power for specific building types and function areas. The additional power credit provided to display lighting has been modified to account for different light fixture mounting heights. More credit is now allowed for display lighting mounted high on a side wall rather than display lighting mounted low on a side wall, since a light fixture mounted high on a wall will also provide some general lighting to the space. The term used for the lighting parameter that is a measure of the light falling on a horizontal surface, which is used to determine the allowable lighting power in a prescriptive compliance option, has been updated from "illuminance" to "illuminance level," or "LUX". The parameter has not changed, just the term used for this parameter has changed, to be consistent with the new *10th Edition of the Illuminating Engineering Society's Lighting Handbook*. Added requirements for automatic daylight controls in secondary daylit zones.

Automatic Daylighting Controls (§140.6(d)): Added this subsection to describe a requirement for the installation of automatic daylight controls in secondary daylit zones. Automatic daylight controls have sensors that measure how much light is entering a building space from windows or skylights and reduce the amount of electrical lighting accordingly. The secondary daylit zone is the area of the building located a horizontal distance from the window equal to twice the vertical distance between the floor and the top of the window.

Outdoor Lighting (§140.7): Edited for clarity. All language specific to local ordinances has been removed, most notably the additional amount of outdoor lighting power that was allowable in local ordinances. Additional lighting power allowances for water feature lighting have been removed. Additional lighting power allowances for general hardscape (paved areas like streets and sidewalks) lighting power and other specific outdoor lighting applications (building entrances and exits, vehicle service station canopies, and outdoor dining areas) have been reduced.

Signs (§140.8): Edited for clarity. Added an electronic ballast option to the requirement that fluorescent lighting systems use lamps with a minimum color rendering index.

Covered Processes (§140.9): Added entire section. Added subsections for computer rooms, commercial kitchens, and laboratory exhaust systems.

Computer Rooms (§140.9(a)): Added entire subsection. New requirements for economizers, prevention of reheat, humidification, fan power consumption, fan control, and air containment.

Commercial Kitchens (§140.9(b)): Added entire subsection. New requirements for replacement air, exhaust airflow rates, kitchen ventilation, and kitchen exhaust system acceptance.

Laboratory Exhaust Systems (§140.9(c)): Added entire subsection. New requirement for spaces with laboratory exhaust hoods to be capable of reducing zone exhaust and makeup airflow rates to regulated minimums when the exhaust hoods are not operating.

Additions, Alterations and Repairs

Additions (§141.0): Edited for clarity and includes new explanations of when new solar zone requirements (see Section 110.10) apply.

Alterations (§141.0): Edited for clarity, and includes new explanations of when new solar zone requirements in Section 110.10 apply, and a simplification of the fenestration prescriptive requirements. Updated roof reflectance criteria and added a reflectance and insulation trade-off option. Removed an exception to replacement roof requirements for specific roof and recoating types. Added a requirement for space-conditioning systems with economizers to have control systems that integrate economizer and cooling operations. Updated indoor lighting requirements, including two new tables that summarize luminaire alteration and modifications-in-place requirements (Table 141.0-C, D). Reduced the percentage of altered luminaires per space threshold for when lighting alterations must comply with these requirements. Added requirements for outdoor lighting systems to meet the applicable prescriptive requirements of outdoor lighting systems for new construction depending on connected lighting load and percent of replacement luminaires.

Changes to Standards for Low-Rise Residential Buildings

Mandatory Requirements

Insulation (§150.0(a-d)): Edited for clarity. Increased minimum ceiling, wall, and floor insulation levels.

Hotel and Motel Guest Rooms (§150.0(g)): Removed language for air retarder wraps in this subsection because it is duplicative of the revised subsection (§150.0(g)) for vapor retarders. This section is now used to explain new requirements for hotel and motel guest room lighting and space-conditioning system controls. These system controls must be capable of turning off luminaires and half of the plug-in receptacles when the hotel room is not occupied. The space conditioning controls must be capable of resetting the room thermostat setpoint temperature either up (during cooling) or down (during heating) when the room is not occupied.

Vapor Retarders (§150.0(g)): Clarified the requirements for vapor retarders in exterior walls by adding specific references to Class I and Class II vapor retarders. Each vapor retarder "class" refers to a specific level of vapor resistance; these class differentiations are used in the California Building Code, as well as other national and international building codes.

Space Conditioning Equipment (§150.0(h)): Added requirements for the location of outdoor condensing units and the installation of central forced-air furnaces to ensure proper operations. Condensing units must now be located five feet or more from a dryer vent and forced-air

furnaces must be designed and installed to meet the manufacturer's maximum temperature rise (the temperature increase from the furnace inlet to the furnace outlet) specifications.

Hot Water Piping (§150.0(j)): Edited for clarity. Added requirement for all nonrecirculating piping ¾ inch in diameter or larger to be thermally insulated. Increased maximum length of 1 inch pipe allowed for nonrecirculating piping. Added requirements for all below grade hot water piping to be insulated.

Residential Lighting (§150.0(k)): Edited for clarity. Modified the method used to classify a luminaire as high efficacy. Energy management controls systems (EMCS) and multiscene programmable controllers must now be capable of complying with the dimming lighting control requirements. EMCS must also be capable of complying with the vacancy sensing lighting control requirements. Added requirements for one high-efficacy luminaire to be installed in each bathroom and for vacancy sensors to be installed in garages. Installation requirements for exhaust fans have been moved to Section 110. These requirements belong in the section of the standards that explains the mandatory features of all mechanical equipment, regardless of building type. Added new lighting control installation verification requirements.

HVAC Ducts, Plenums and Fans (§150.0(m)): Edited for clarity. Added requirement for all conditioned air ducts to be sealed and field tested for duct leakage compliance. Added requirements for the configuration, efficiency, pressure drop and product labeling of air filtration devices. Added requirements for duct system and air filter grille sizing, with an option to meet airflow and fan watt draw test requirements instead of meeting these sizing requirements. Added a prohibition on the use of bypass ducts to deliver conditioned supply air directly to the return air duct system. Changed the criteria that zonally controlled forced air systems meet minimum airflow and maximum fan watt draw requirements in every zonal control mode from a prescriptive to a mandatory requirement. The current option of putting space conditioning ducts within the living space of a house (instead of insulating and sealing ducts typically located in the attic) now requires field verification.

Water Heating Systems (§150.0(n)): Edited for clarity. Added requirement for gas or propane water heating systems serving individual dwelling units to be designed to allow for future installations of high efficiency water heaters. Specific requirements were added for electrical receptacle proximity, venting, drainage and fuel supply pipe sizing.

Ventilation for Indoor Air Quality (§150.0(o)): Edited for clarity. Added requirement for ventilation system performance to be field verified.

Fenestration Products (§150.0(q)): New subsection that places a maximum conductive heat transfer (U-factor) requirement on all fenestration products separating conditioned space from unconditioned space.

Solar Ready (§150.0(r)): Added subsection to communicate mandatory requirements for solar ready buildings that are documented in Section 110.10.

Performance and Prescriptive Compliance Approaches

Performance and Prescriptive Compliance Approaches (§150.1(a)): Edited for clarity. Modified the basis of all climate zone descriptions from metes and bounds to ZIP codes.

Performance Standards (§150.1(b)): Edited for clarity. Added the explanation that the requirements for compliance software certification by the Energy Commission are documented in the *Nonresidential ACM Approval Manual*.

Prescriptive Standards

Component Packages (§150.1(c)): Removed alternative prescriptive component packages. Package A is now the only component package contained in the residential prescriptive standard. Updated footnotes in Table 150.1-C.

Insulation (§150.1(c)1): Edited for clarity. Added requirement for roof deck insulation. Increased the insulation requirements in Table 150.1-C. Removed exception to perimeter insulation for slab edges between conditioned space and concrete slabs of unconditioned spaces.

Radiant Barrier (§150.1(c)2): Added exception to radiant barrier requirement when roof deck insulation is installed below the roof deck.

Fenestration (§150.1(c)3): Edited for clarity. Reduced the maximum conductive heat transfer and relative solar heat gain requirements of vertical fenestration products.

Shading (§150.1(c)4): Edited for clarity.

Thermal Mass (§150.1(c)5): Removed interior mass capacity requirements that were specific to a prescriptive component package that has been eliminated.

Space Heating and Cooling (§150.1(c)7): Edited for clarity. The installation of whole house fans (a fan, typically installed in the attic, that pulls cooler outside air through open windows, into the house, and forces warmer air out through attic vents), inspecting the quality of the insulation installation, verifying the proper refrigerant charge within the space conditioning system, and verifying the mechanical ventilation system performance are all added to the list of measures required in the prescriptive compliance approach.

Water Heating Systems (§150.1(c)8): Added requirements for water heating systems serving multiple dwelling units to be equipped with a demand control system, split the recirculation system into two loops, and provide a specific percentage of the annual water heating energy with a solar thermal system, depending on climate zone. Added requirements for electric resistance water heating systems serving single dwelling units to be installed only if gas service is unavailable, to be installed within the building envelope and for half of the annual water heating energy to be provided by a solar thermal system.

Thermostats (§150.1(c)10): Removed this subsection to clarify that all thermostat requirements are now mandatory and contained in Section 110.2.

Space Conditioning Ducts (§150.1(c)10): Edited to be consistent with the new mandatory requirements for duct sealing.

Central Fan Integrated Ventilation Systems (§150.1(c)11): Added requirement for ventilation system performance to be field verified.

Roofing Products (§150.1(c)12): Increased the minimum aged solar reflectance requirements for low-sloped roofs in specific climate zones.

Quality Insulation Installation (§150.1(c)13): New subsection that requires field verification of proper insulation installation procedures.

Additions and Alterations

Additions (§150.2(a)): Relocated the exception for indoor air quality ventilation and clarified that only the whole-building ventilation component of the indoor air quality ventilation requirements of 150.0(o) do not need to be met by additions. Added exceptions to the mandatory ceiling insulation and solar zone requirements for additions.

Prescriptive Compliance Approach (§150.2(a)1): Edited for clarity. Increased the minimum wall insulation level for additions 1000 square feet or less.

Performance Compliance Approach (§150.2(a)2): Edited for clarity. Increased the minimum wall insulation level required in existing structures to meet the exception for prescriptive wall insulation requirements. Modified the water heating exception to require electric resistance water heaters to comply with the Appliance Regulations in Title 20.

Alterations

Prescriptive Compliance Approach (§150.2(b)1): Edited for clarity. Added an exception to the solar ready requirements.

Fenestration (§150.2(b)1.A): Added an exception to the replacement fenestration requirements, such that if an alteration project has a limited amount of glazing area with acceptable thermal and solar gain performance, then the alteration project does not need to meet the replacement fenestration requirements.

Duct Replacement (§150.2(b)1.D): Edited to clarify that the requirements specified for duct systems in 150.0(m) also apply to duct replacements.

Duct Sealing (§150.2(b)1.E): Edited for clarity. Modified subsection to require duct sealing in all climate zones.

Space Conditioning System (§150.2(b)1.F): Edited for clarity. Added language that explains how nonstandard space conditioning systems (systems other than ducted split system central air conditioners and ducted split system heat pumps) can comply with the refrigerant verification requirements, given that the verification tests included in the reference appendix will not work for nonstandard systems.

Roofs (§150.2(b)1.H): Edited for clarity. Increased the minimum aged solar reflectance for steep-sloped roofs in specific climate zones. Increased the minimum aged solar reflectance and thermal emittance requirements for low-sloped roofs in specific climate zones. Added an exception that allows solar reflectance and insulation trade-offs.

Performance Compliance Approach (§150.2(b)2): Edited for clarity. Added an exception to the solar-ready requirements. Modified the criteria for when the performance approach can be used for alteration projects. Modified the criteria for when the performance approach uses the building project existing conditions rather than the prescriptive requirements to generate the standard design used to generate the energy budget that the proposed alteration must meet.

Changes to Standards for Administrative Regulations, Alternative Calculation Method Approval Manuals, and Green Buildings Standards Code

Changes to the Administrative Regulations

Definitions (§10-102): Added new definitions, deleted obsolete definitions, and modified existing definitions for clarification and to support changes to the standards language.

Compliance Documentation (§10-103(a,b)): Added documentation requirements for nonresidential building commissioning. Clarified the format, content, informational order and signature authority for the Certificate of Compliance. Added documentation requirements for nonresidential building commissioning Added requirements for submission of compliance documentation to the Commission Compliance Data repository. Clarified the building permit application processes and enforcement agency authority relevant to the California Energy Code. Clarified the content, signature authority, and submission requirements for the Installation Certificate, Certificate of Acceptance, and Certificate of Field Verification and Diagnostic Testing. Clarified the requirement for builders to provide compliance documentation to building owners.

Enforcement Agency Requirements (§10-103(d)): Edited for clarity.

Locally Adopted Energy Standards (§10-106): Edited for clarity.

Compliance Software, Alternative Component Packages, Exceptional Methods, and Data Registries (§10-109): Edited for clarity and reorganized into subsections.

Certification and Labeling of Fenestration Products (§10-111): Edited for clarity. Added the requirement to include visual transmittance data on all fenestration labels.

Certification and Labeling of Roofing Products (§10-113): Edited for clarity.

Outdoor Lighting Zones (§10-114): Removed all standards language pertaining to local outdoor lighting ordinances.

Data Registries and Repositories (§10-115): Added this section on the submittal requirements for data registries and explains how data registries and electronic data repositories will be approved by the Energy Commission. A "data registry" is a Web service hosted by a HERS provider or other entity approved by the Energy Commission. This Web service receives and stores the official versions of standards compliance documents. A data repository is an electronic database that stores code compliance documentation at the Energy Commission.

Changes to the Alternative Calculation Method Approval Manuals

The *Residential and Nonresidential Alternative Calculation Method (ACM) Approval Manuals* are adopted by regulation to support the standards in Part 6. The *ACM Approval Manuals* contain requirements that developers of computer software must meet for the Energy Commission to approve their software for showing compliance with the standards.

The *ACM Approval Manuals* are extensively revised to improve their clarity and organization. The *ACM Approval Manuals* include the information needed by the computer software vendors to understand how their software will be tested, what compliance reports need to be generated by the software, how compliance software programs are certified and decertified by the Energy Commission and what needs to be included in the application package provided to the Energy Commission for software certification. The detailed descriptions of the algorithms and modeling procedures used by the Energy Commission in the reference methods that are the basis of comparison in the compliance software certification process are now documented in new ACM Reference Manuals. The *Residential and Nonresidential ACM Reference Manuals* are not adopted by regulation. Rather, they are developed after the adoption of the standards and approved by the Energy Commission for use as reference material for compliance software vendors and other interested parties. These *ACM Reference Manuals* act as guidance documents for the performance compliance approach, similar to the way that the Energy Commission's *Residential and Nonresidential Compliance Manuals* are guidance documents for the prescriptive compliance approach. (See Pub. Res. Code § 25402.1, subd. (e).)

Residential Alternative Calculation Methods Approval Manual

The most significant change for the *Residential ACM Approval Manual* is the new requirement for all compliance software to include the Compliance Manager, a software developed by the Energy Commission to perform the performance compliance calculations and produce the compliance reports. The Compliance Manager develops the standard building design and the proposed building design based on the proposed building project, computes annual energy budgets for both designs and generates the compliance reports. Vendors interested in incorporating the Compliance Manager into third-party compliance software must meet the criteria documented in the *Residential ACM Approval Manual*.

The other significant change to the *Residential ACM Approval Manual* is the elimination of all the accuracy tests previously required for third-party compliance software certification. Since the Compliance Manager will be tested separately by the Energy Commission during the development process, the accuracy of the Compliance Manager does not need to be retested

when it is included in each third-party compliance software program. The remaining tests are required to ensure that the compliance software being certified correctly generate the standard building design and proposed building design based on the inputs from the third-party tools. These tests verify that the software interfaces between each third-party tool and the Compliance Manager function appropriately.

Nonresidential Alternative Calculation Methods Approval Manual

The most significant changes to the *Nonresidential ACM Approval Manual* are those indicated above, where the certification processes and vendor requirements are organized into the *ACM Approval Manual* and the detailed modeling procedures of the reference method are documented in the *ACM Reference Manual*. The certification tests that all compliance software must pass have also been significantly changed.

Changes to the Reference Appendices

The Reference Appendices are organized into three sections, the Joint Appendices, Residential Appendices, and the Nonresidential Appendices. The changes proposed by the 2013 Standards to the Reference Appendices are summarized below:

Joint Appendices

JA1 – Glossary: Added, modified, and deleted terms to reflect the updated standards language.

JA2 - Reference Weather/Climate Data: Replaced the city and county climate zone lookup table with a city, county and ZIP code climate zone lookup table. Removed an explanation of a weather data format no longer used in the standards.

JA3 - Time Dependent Valuation (TDV) Data: Updated all Time Dependent energy Valuation (TDV) data. TDV data is used in the performance compliance approach to incorporate the time-dependent costs of energy into the energy budgets.

JA4 - U-factor, C-factor, and Thermal Mass Data: Added, modified, and deleted data to reflect the updated standards language. JA4 is no longer used by either the residential or nonresidential compliance software, so many of the existing entries are eliminated. Only the heat transfer data for assemblies relevant to the prescriptive compliance approach are now included in this appendix.

JA5 – Reference Design For Upgradeable Setback Thermostats: Added this appendix to support the new mandatory requirements for thermostats.

JA6 – HVAC Fault Detection and Diagnostic Technology: Expanded this appendix to include both charge indicator display and saturation pressure measurement sensor specifications. The new title of this appendix reflects this scope expansion. The specifications for the Saturation Pressure Measurement Sensors (SPMS) are provided as a substitution for the existing refrigerant

pressure diagnostic technology, such that a nonintrusive procedure for a HERS rater to access the refrigerant pressure measurements during the refrigerant charge verification procedure is available.

JA7 – Data Registry Requirements: Added this appendix to reflect updates to the standards language. This appendix covers the roles and responsibilities of authorized registry users, document registration requirements, electronic and digital signature requirements, data exchange requirements, and data registry approval. This appendix provides explicit requirements for functional and technical features for HERS provider Data Registries and other data registries that provide document registration services to the public. The Data Registry Requirements Manual is introduced, which is a reference manual approved by the Energy Commission to support the implementation of the data registry requirements.

JA8 – Qualification Requirements for Residential Luminaires Using LED Light Sources: Modified this appendix to reflect the changes to the lighting standards. This appendix title is changed to be consistent with nationally recognized terminology. Existing test protocols are replaced with references to nationally recognized test standards. Existing language from the mandatory and prescriptive code sections for residential lighting are relocated here to organize all qualification requirements into one reference appendix.

JA9 – Qualification Requirements for Low Leakage Air Handling Units: Added this appendix to reflect updates to the standards language and to national test standards for low leakage air handlers.

Residential Appendices

RA1 – Special Case Residential Field Verification and Diagnostic Test Protocols: Replaced the existing RA1 appendix with explanations of residential field test protocols to reflect updates to the standards language. The HVAC sizing methodology is removed because it is relevant only as documentation of the residential ACM reference method and will therefore be documented in the Energy Commission's *Residential ACM Reference Manual*. A new process for special case test protocol approval is documented. Field verification and diagnostic test protocols are added for measuring HVAC system refrigerant charge.

RA2 – Residential HERS Verification, Testing, and Documentation Procedures: Modified this appendix for clarity and to reflect updates to the standards language. References are added to the Compliance new JA7 for data registry requirements and the revised RA1 for special case verification protocols. Roles are explained for the documentation author, installing contractor, and HERS rater in the document registration procedures.

RA3 – Residential Field Verification and Diagnostic Test Protocols: Modified this appendix to clarify existing test protocols and reflect updates to the standards language. Significant revisions are made to the refrigerant charge and quality insulation installation test protocols. The verified duct design compliance description, and the duct surface area, R-value, and leakage verification protocols are reorganized and rewritten for clarity. A reference to the new JA9 appendix is

added for low-leakage air handler testing. New field verification protocols are added for duct designs, air filter devices, zonally controlled HVAC systems, and mechanical ventilation. Specifications are updated or added for sensor accuracy and response times, flow capture hood airflow measurements, digital revenue meter measurements, and charge indicator display devices.
RA4 – Eligibility Criteria for Energy Efficiency Measures: Modified this appendix for clarity and the solar water heating system eligibility criteria are expanded.

RA5 – Interior Mass Capacity: Removed this entire appendix. Interior mass capacity is no longer used in the standards as a performance metric that requirements are based on.

Nonresidential Appendices

NA1 – Nonresidential HERS Required Verification, Testing and Documentation Procedures: Modified this appendix to reflect updates to the standards language. The document registration procedures are updated and references to new appendices JA7 for registry requirements and RA1 for special case verification protocols are added.

NA2 – Nonresidential Field Verification and Diagnostic Test Procedures: Modified the duct leakage protocols in this appendix to improve clarity and enforceability.

NA3 - Fan Motor Efficiencies: Updated the efficiency data in this appendix to reflect updates to the standards language.

NA4 - Compliance Procedures for Relocatable Public School Buildings: The proposed regulations make no substantive changes to this appendix.

NA5 - Envelope Tradeoff Procedure: Removed this entire appendix to reflect updates to the standards language. The envelope tradeoff procedure is not longer specified as a prescriptive compliance option for nonresidential buildings.

NA6 - Alternate Default Fenestration Procedure to Calculate Thermal Performance: Modified this appendix, including a new calculation for the default visual transmittance.

NA7 – Acceptance Requirements for Nonresidential Buildings: Modified this appendix to reflect updates to the standards language. Construction inspection and functional testing requirements are added and expanded for HVAC, lighting and covered process equipment and controls.

NA8 - Luminaire Power: This appendix and the title are changed to accurately represent the content. Many legacy technologies are deleted because they are no longer commonly used. Updates are made to the description of several technologies to reflect changes to these lamp and ballast combinations.

NA9 – Nonresidential Fault Detection and Diagnostics: Added this new appendix to reflect updates to the standards language. This appendix describes the system requirements of air-cooled unitary direct-expansion equipment related to unit controls, including the fault detection capabilities required for this equipment type.

NA10 – Nonresidential Documentation procedures: Added this new appendix to reflect updates to the standards language.

Changes to the California Green Building Standards Code (Title 24, Part 11)

The California Energy Commission is proposing to adopt new voluntary "reach code" provisions that will entirely replace the existing provisions in the energy efficiency divisions of the Title 24, Part 11 Green Building Standards voluntary appendices. The proposed language includes two-tiered performance standards and a limited number of prerequisites. The prerequisites are intended to be implemented for every building meeting the advanced levels of energy efficiency specified in the voluntary performance standards. The proposed language also introduces new provisions for residential additions and alterations.

The residential and nonresidential performance standards each include two levels (specified as "Tier I" and "Tier II") of advanced energy efficiency compared to the requirements in Title 24, Part 6. The Tier I level will result in residential buildings that are 15 percent more energy-efficient and nonresidential buildings that are 10 percent more energy efficient than buildings that minimally comply with the Part 6 Energy Code requirements. The Tier II level will result in residential buildings that are 30 percent more energy-efficient, and nonresidential buildings that are 20 percent more energy-efficient than buildings that minimally comply with the Part 6 energy code requirements.

These changes improve the clarity and organization of the performance-based advanced energy efficiency standards. Local governments that wish to adopt local green building standards that are more energy efficient than the mandatory requirements contained in Title 24, Part 6 are encouraged to adopt these voluntary measures as mandatory requirements in local building codes.

Adoption of Part 11 standards by the Energy Commission creates no obligation for anyone. If these voluntary measures are made mandatory by local governments, they are subject to approval by the Energy Commission pursuant to Title 24, Part 1, Section 10-106. The Green Building Standards Code measures proposed for adoption are completely voluntary, and it is not reasonably foreseeable that their adoption by the Energy Commission would cause a direct or indirect physical change in the environment. However, any subsequent adoption process by local jurisdictions to make them mandatory is subject to the California Environmental Quality Act, with the local jurisdiction as the lead agency and the Energy Commission as a responsible agency.

These voluntary standards call for the design and installation of building energy efficiency measures beyond the mandatory standards in Part 6. Adoption of the mandatory Part 6

Standards are found to not cause a significant impact on the environment. Adoption of the voluntary standards by the Energy Commission has no potential to cause a significant effect on the environment.

CHAPTER 5:
Estimated Environmental Impacts

The Energy Commission has evaluated the proposed changes to the Building Energy Efficiency Standards for their potential for environmental impacts. Staff relied primarily on the analysis provided by the technical experts that developed the justification for each of the proposed measures within the Codes and Standards Enhancement Initiative (CASE) reports, and on other resources for these evaluations. Staff evaluated the changes to the mandatory and prescriptive portions of the Building Energy Efficiency Standards. However, since a large majority of residential buildings and a large percentage of nonresidential buildings use the performance approach for compliance, and prescriptive requirements, such as lighting power densities, sometimes offer considerable flexibility in choices of measures, changes to the prescriptive portions of the Building Energy Efficiency Standards can be too speculative to accurately evaluate for their potential environmental impacts. All estimated increases in the use of materials are increases in comparison to the requirements of the 2008 Building Energy Efficiency Standards.

The Energy Commission evaluated the contribution of each CASE report to the following potential increases in material uses: mercury, lead, copper, steel, plastic silicon, gold, aluminum, fiberglass, titanium, glass and wood. The Energy Commission also evaluated the potential impacts for water consumption (both onsite and at California power plants) and indoor air quality.

Mercury

Environmental Setting

People in the United States are mainly exposed to mercury as an organic compound (methylmercury). The United States Environmental Protection Agency (EPA) recommends an exposure limit of 0.1 micrograms of methylmercury per kilogram of body weight per day. That is the limit at which EPA determined that a person can be exposed on a daily basis without serious health consequences. However, further guidelines recommend that sensitive individuals, such as pregnant or nursing women, abstain from or significantly reduce their consumption of fish and shellfish, as this is the primary route of exposure to methylmercury for people in the United States. The EPA exposure limit is the basis for determining the risk-management decisions and regulatory policies ranging from fish-consumption advisories to air-emission permits. In California there were fish consumption advisories for mercury in 13 water bodies, including the San Francisco Bay and Delta Region and several areas in the Coast Ranges (USGS Mercury 2000-2). According to the EPA, the typical person in the United States consumes less than a third of an ounce of fish per day, resulting in an exposure considerably less than the limit. Almost all people have at least trace amounts of methylmercury in their tissue, reflecting methylmercury's widespread presence in the environment and people's exposure through the consumption of fish and shellfish (USGS Mercury 2000).

The primary sources of mercury emissions into the environment (primarily air, land and water) are coal-burning power plants, cement kilns, chlor-alkali plants (which produce plastics, lye and detergents), trash incinerators and gold mining. Secondary sources that may result in mercury emissions include mercury production (primary and secondary), transportation, storage and manufacturing leakages or accidental spills. However, the proposed changes in the standards do not result in any specific increase or greater exposure from these secondary sources. Further, they are already significantly regulated. Therefore, the Energy Commission considers any increase from these possible secondary impacts to be too speculative to consider.

California does not have a large number of industrial facilities that use mercury for the purposes of industrial production. The main sources of mercury emissions to land, water or air in California are most often reported to be abandoned mines (gold, silver or mercury), active gold mines, cement production, refineries and geothermal power plants.

World Wide Mercury Production

There are nonmercury alternatives for industrial processes that have resulted in a secondary source for mercury, as opposed to the mining of new raw material. Most notably, chlor-alkali plants have been switching to a nonmercury process since the early 1990s. Since these facilities would customarily store approximately 200 tons of mercury onsite, the transition to the non-mercury processes represents a substantial increase in available mercury as a resource (USGS Mercury 2000). Primary (mining) mercury production in the United States annually has dwindled from 562 metric tonnes in 1990 to zero in 1993 through today. The United States relies on imports and secondary sources (as discussed above) and existing stocks for internal uses (approximately 200 metric tonnes per year) and exports (approximately 200-400 metric tonnes per year). Primary worldwide production has fallen from 4,100 metric tonnes in 1990 to 1,920 metric tonnes in 2009 (USGS Mercury 2010).

Regulatory Setting

The United States has a moratorium on the primary production of mercury and significant regulations regarding the transportation, stockpiling and use of mercury. These regulations include the Mercury Export Ban Act of 2008, Mercury-Containing and Rechargeable Battery Management Act of 1996, and other federal laws that limit mercury exposures (Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Clean Air Interstate Rule and the Safe Drinking Water Act). U.S. laws and regulations concerning mercury cover air emissions and toxic substance controls, including those that apply to transportation, water emissions, waste handling and product end uses.

California adds to the federal regulations with end-use reduction requirements (Mercury Reduction Act of 2001 and the California Lighting Efficiency and Toxics Reduction Act), as well as toxic waste controls (Electronic Waste Recycling Act of 2003, Mercury Thermostat Collection Act of 2008, and the California Code of Regulations Title 22, Division 4.5, Chapter 11, Section 66261.50). These regulations fall under the authority of the Department of Toxic Substances Control (DTSC) to regulate hazardous waste by providing the highest level of safety, and to

protect public health and the environment from toxic harm. DTSC designated all mercury-containing lamps as listed Universal Wastes that must be diverted from municipal landfills. DTSC has determined that, currently, about 20 percent of the spent fluorescent lamps in the state are properly recycled, with the remaining 80 percent disposed of in municipal landfills. This is an improvement from 10 percent recycling rate in 2008, a direct result of the Legislature-enacted AB 1109 (Stats, 2007, Ch. 534), which required DTSC to convene a task force to consider and make recommendations for improvement by September 1, 2008. These recommendations will continue to improve the recycling rate in the future. Additionally, the proposed changes to the Building Energy Efficiency Standards are expected to lead to lighting lamps containing significantly less mercury becoming the prevailing choice for retail lighting needs. Thus, when these lamps are disposed of, they will represent a substantial reduction in mercury emissions at municipal landfills than would have otherwise occurred without the standards. Thus, the reduction in municipal landfill mercury emissions is being aggressively addressed by California state regulations and will be aided by the proposed changes to the Building Energy Efficiency Standards.

Worldwide regulations on the control and use of mercury vary considerably, but regulations within the European Union are consistent with, if not exceeding, those of the United States and California (USGS Mercury 2000).

Potential Changes in Mercury End Use

As discussed previously in this report, the Building Energy Efficiency Standards are organized into mandatory, as well as prescriptive and performance requirements for newly constructed residential and nonresidential buildings and additions and alterations to existing residential and nonresidential buildings. As the title implies, mandatory requirements are specific direction to the builder of what energy efficiency measures must be included in all buildings within California. The prescriptive and performance requirements also must be met but provide alternatives to allow for compliance flexibility and innovation. Thus, estimated increases in material end-uses from the proposed changes to the mandatory requirements of the standards are more likely to occur than from the proposed changes to the prescriptive or performance requirements, in most cases.

The proposed changes to the Building Energy Efficiency Standards that may increase mercury end-use are those to the nonresidential mandatory Sections 110.9 and 120.2; the nonresidential prescriptive (which, in this analysis, are presumed to occur to be conservative) Sections 130, 130.5, 130.1, 130.2, 140.3, 140.6, 140.7 and 149; and the residential mandatory Section 150.0. The potential increase in the end-use of mercury from the implementation of the proposed changes to the Building Energy Efficiency Standards will generally be from increased production of new or additional electronic components necessary to comply with the added requirements for lighting controls and occupancy sensors, which are generally more stringent than the requirements of the 2008 Standards. This increase will be no more than 850 pounds per year based on data provided in the CASE reports (CASE Report Nos.: 1, 5, 27, 34, 37, 38, 40, 41, 42, 45, 46, 47 and 49).

The changes in the lighting power density allowances in the nonresidential performance requirements for retail stores in Section 149, take into consideration the increased use of lighting fixtures based on ceramic metal halide (CMH) lamps , which contain smaller amounts of mercury than the fluorescent lamps they replace, and of light emitting diode (LED) lamps that contain no mercury. These changes are expected to cause a potential decrease of 7,904 pounds per year in mercury end use, based on data provided in the CASE report (CASE Report No. 48).

The installation of the CMH or LED lamps is not mandatory but is likely to be used to meet the proposed lighting power density provisions under the prescriptive requirements. While it is not possible to predict the wide spread use of CMH or LED bulbs, the Energy Commission expects approximately one third of retail lighting projects to use these lamps in the prescriptive method for compliance (CASE Report No. 48). The estimated potential reduction in mercury end use from retail lighting will be approximately 2,700 pounds per year. Thus, the implementation of the proposed changes to the Building Energy Efficiency Standards is expected to result in an overall reduction of mercury end use of approximately 1,800 pounds per year (0.81 metric tonnes per year). This reduction also is expected to aid in the reduction of mercury emissions from municipal waste landfills in California.

Potential Impacts From Increases in Mercury End Use

The mercury used in the lighting controls and lighting lamps addressed by the standards is an end use. Such use should not result in a direct impact to the environment. The primary mechanism to enter the environment would be from disposal of lighting lamps and e-waste in trash incineration, which is not permitted in the United States (40 CFR 273.13(c)), or municipal waste landfills, which is also restricted as previously discussed (DTSC 2007). The current recycling or diversion rate for e-waste and mercury containing lighting lamps is approximately 20 percent and is expected to improve over time. The introduction and prescriptive requirement to use low-mercury lighting lamps (or no-mercury options) will tend to reduce the amount of mercury emissions from landfills over time, enhancing the expected improvements in the diversion rate. Therefore, there are no direct impacts from the potential increased end use of mercury from the implementation of the proposed changes to the Building Energy Efficiency standards, and that these changes will likely improve any existing mercury emission impacts from California landfills in the future.

Mercury Impact Findings

While some portions of the proposed changes to the Building Energy Efficiency Standards may cause an increase in the end use of mercury, when taken in total these changes will likely result in an overall decrease in the end use of mercury. Additionally, there are sufficient federal and California regulations to ensure that all reasonable precautions are taken regarding the production, refining, sale, transportation, storage and end use of mercury to safeguard the public health from potential mercury exposures. Therefore, the potential impacts from the possible increase of mercury as an end use from the implementation of the proposed changes to the Building Energy Efficiency Standards are less than significant.

Lead

Environmental Setting

Lead can harm the nervous system, kidneys, liver, and other organs. It may cause neurological impairments such as seizures, mental retardation and behavioral disorders. Even at low doses, lead is associated with damage to the nervous systems of fetuses and young children, resulting in lowered IQ and learning problems (USEPA Lead).

In the past, motor vehicle emissions were the biggest source of lead exposure to the greater public. However, since leaded gasoline was phased out in the 1980s, lead air emissions have decreased by about 98 percent. Today, metal processing is the biggest source of atmospheric lead (USEPA Lead). However, most modern lead poisoning cases are detected in children and are associated with lead-based paints in the home, home folk remedies, and in rare cases contaminated candies or food. Secondary sources that may result in lead emissions include lead production (primary and secondary), transportation, storage and manufacturing leakages or accidental spills. However, the proposed changes in the standards do not require any particular changes in these practices and thus do not cause any specific increase or greater exposure from these secondary sources. Further, these activities are already significantly regulated to control emissions and releases, as described further below. Therefore, these possible secondary impacts to be too speculative to consider.

WorldWide Lead Production

Primary annual lead production (mining) in the United States has declined from 404,000 metric tonnes in 1990 to 103,000 metric tonnes in 2009. At the same time, secondary lead recovery (such as from lead-acid batteries) has increased from 874,000 to 1,110,000 metric tonnes per year. The apparent use of lead within the United States is estimated to be 1.4 million metric tonnes in 2010. Worldwide primary production of lead (mining) has increased from 3,370,000 metric tonnes in 1990 to 3,860,000 metric tonnes in 2009 (USGS Lead).

Regulatory Setting

The United States has substantial regulations regarding the mining, production, transportation, storage, use and waste control for lead. These regulations include, but are not limited to the Toxic Substance Control Act of 1976 and the Lead Based Paint Exposure Hazard Reduction Act of 1992. California adds to those requirements with the California Code of Regulations, Title 17, Sections 37000 to 37100, which contain the standard of care for healthcare providers; Section 35001 (et seq), which addresses lead hazard evaluations and abatement related to construction; and Title 8, Section 1532.1 (et seq), which are worker protections for construction activities.

Potential Changes in Lead End Use

As discussed previously in this report, the Building Energy Efficiency Standards are organized into mandatory and alternative prescriptive-performance requirements for newly constructed

and additions and alterations to existing residential and nonresidential buildings. The proposed changes to the Building Energy Efficiency Standards that may affect lead end use are those to the all-buildings mandatory Section 110.3, the nonresidential mandatory Sections 110.9 and 120.2; the nonresidential prescriptive Sections 130.0, 130.5, 130.1, 130.2, 140.1, 140.3, 140.6, 140.7 and 141.0; the residential mandatory Section 150.0; and the residential prescriptive Section 150.1. The potential increase in the end use of lead from the implementation of these proposed changes to the Building Energy Efficiency Standards will generally come from the production of electronic components necessary for daylighting and lighting controls as well as occupancy sensors. This increase will be no more than 1,575 pounds per year. This estimate is based on data provided in the CASE reports (CASE Report Nos.: 1, 5, 7, 27, 34, 38, 40, 41, 42, 45, 46, 47, 48 and 49).

The changes in the lighting power density allowances in the nonresidential performance requirements for retail stores in Section 140.1 takes into consideration the increased use of lighting fixtures based on ceramic metal halide (CMH) lamps and light emitting diode (LED) lamps that contain very little lead. These changes are expected to cause a potential decrease of 2,832 pounds per year in lead end use, based on data provided in the CASE report (CASE Report No. 48).

However, the installation of the CMH or LED lamps is not mandatory but is likely to be used to meet the proposed lighting power density provisions under the prescriptive requirements. While it is not possible to accurately predict the widespread use of CMH or LED bulbs, the Energy Commission expects approximately one third of retail lighting projects to use these bulbs in the prescriptive method for compliance (CASE Report No. 48). The estimated potential reduction in lead end use from retail lighting will be approximately 970 pounds per year. Thus, the implementation of the proposed changes to the Building Energy Efficiency Standards is expected to result in an overall increase of lead end use of approximately 600 pounds per year (0.30 metric tonnes per year).

Potential Impacts From Increases in Lead End Use

The potential increases in lead end use from the implementation of the changes to the Building Energy Efficiency Standards are not associated with the primary mode of modern lead poisoning cases (paint, folk remedies, and foods) and thus do not represent a reasonable expectation of increased risk to public health. Additional, as discussed with mercury, the lighting lamps that are expected to be used increasingly for future retail compliance strategies represent a decrease in lead at municipal waste landfills in California.

Lead Impact Findings

Some portions of the proposed changes to the Building Energy Efficiency Standards may cause an increase in the end use of lead. However, there is no expected exposure to the public from the proposed end uses. There are sufficient federal and California regulations to ensure that all reasonable precautions are taken regarding the production, refining, sale, transportation, storage and end use of lead to safeguard the public health from potential lead exposures. Therefore, the

potential impacts from the possible increase of lead as an end use from the implementation of the proposed changes to the Building Energy Efficiency Standards are less than significant.

Copper

Environmental and Regulatory Setting

Copper has little known direct deleterious effects on the environment or people, so long as exposures are not extreme or chronic. However, the ore extraction and refinement process (including smelting) has the potential to cause or contribute to an environmental impact. The likely mechanisms of these impacts would be from ground contamination, water fouling, water borne pollution, air emissions and the production of toxic waste. However, these potential impacts are secondary impacts that are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. Therefore, The Energy Commission considers these potential secondary impacts to be too speculative to attempt to estimate.

The primary production of copper (mining) in the United States annually has declined slightly from 1990 to 2009, going from 1,580,000 to 1,110,000 metric tonnes. Secondary production (from scrap) has decreased from 1,752,000 to 869,400 metric tonnes in the same period. Consumption within the United States of copper has fluctuated from a high of approximately 3 million metric tonnes to its current low of 1.6 million metric tonnes. However, worldwide primary production has increased from 9.2 million to 15.9 million metric tonnes over the same period (USGS Copper).

Potential Increase in Copper Use

The potential increase in the use of copper is a result of the implementation of the proposed changes to the all-buildings mandatory Section 110.3, the nonresidential mandatory Sections 110.9 , 120.1, 120.2, 120.5, and 120.6; the nonresidential prescriptive Sections 130.0, 130.5, 130.1, 130.2, 130.5, 140.1, 140.3, 140.4, 140.6, 140.7 and 141.0; the residential mandatory Section 150.0; and the residential prescriptive Section 150.1. These increases will generally be from the production of electric wiring, plumbing, electronic components necessary for lighting, or HVAC controls, including occupancy sensors. The Energy Commission estimates that the increase in copper use will be no more than 1,010 metric tonnes per year (less than 0.007 percent of current worldwide production). This estimate is based on data provided by the CASE reports (CASE Report Nos.: 1, 4, 5, 7, 8, 20, 21, 27, 34, 37, 38, 40, 41, 42, 45, 46, 47, 48, 49 and 56) and reasonable assumptions to convert them to consistent units of measure.

Copper Impact Findings

Given that there are ample regulations both within the United States and generally throughout the world for the mining, refining, transportation, storage, and use of copper, the potential adverse environmental impacts in copper use from the implementation of the proposed changes to the Building Energy Efficiency Standards will be less than significant.

Steel

Environmental and Regulatory Settings

Steel is manufactured by the chemical reduction of iron ore, using an integrated steel manufacturing process or a direct reduction process. In the conventional integrated steel manufacturing process, the iron from the blast furnace is converted to steel in an oxygen furnace. Steel can also be made in an electric arc furnace from scrap steel and, in some cases, from direct reduced iron. The production of steel has the potential to cause or contribute to environmental impacts. However, these potential impacts are secondary impacts that are affected by a wide range of variables substantially regulated by federal, state and local laws in the United States. Therefore, these potential impacts are too speculative to attempt to estimate.

The annual production of steel in the United States has stayed relatively consistent, with some variation between 1990 and 2007 when it was at 98.1 million metric tonnes. However, by 2009 production dropped to 59.4 million metric tonnes. In the same period, worldwide production of steel increased from 771 million metric tonnes to a high of 1,350 million metric tonnes in 2007, with a slight reduction to 1,240 million metric tonnes in 2009 (USGS Steel).

Potential Increased Steel Use

The potential increase in the use of steel is a result of the implementation of the proposed changes to the all-buildings mandatory Section 110.3, the nonresidential mandatory Sections 110.9, 120.1, 120.2, 120.5, and 120.6; the nonresidential prescriptive Sections 130.0, 130.5, 130.1, 130.2, 130.5, 140.1, 140.3, 140.4, 140.6, 140.7 and 141.0; the residential mandatory Section 150.0; and the residential prescriptive Sections 150.1 and 150.2. These increases will generally be from the production of ducting and sheet metal components necessary for lighting or HVAC equipment. The Energy Commission estimates that the increase in steel use will be no more than 380 metric tonnes per year (less than 0.00003 percent of current worldwide production). This estimate is based on data provided by the CASE reports (CASE Report Nos.: 1, 4, 5, 7, 8, 20, 21, 27, 32, 34, 37, 38, 40, 41, 42, 45, 46, 47, 48, 49 and 56) and reasonable assumptions to convert them to consistent units of measure.

Steel Impact Findings

There are no significant adverse environmental impacts from the estimated increase in steel.

Plastic

Environmental Setting

The specific plastic used by the electronic industry is polycarbonate and polyvinyl chloride (PVC). PVC is a thermoplastic polymer used in domestic and industrial applications (*PVC Handbook*). There is no evidence to suggest that polycarbonate has a direct impact on human health or the environment. However, there is ongoing research and debate regarding the

possibility of degradation of polycarbonate resulting in release of hazardous materials when in contact with water or food. For the purposes of the proposed changes to the Building Energy Efficiency Standards, it is irrelevant whether polycarbonate contaminates water or food because the standards do not cause any polycarbonate to be exposed to food or water that is to be consumed.

Vinyl chloride, which is used to make PVC plastic and vinyl products, does have direct environmental and human health impacts. Acute (short-term) exposure to high levels of vinyl chloride in the air has resulted in central nervous system effects, such as dizziness, drowsiness, and headaches in humans. Chronic (long-term) exposure to vinyl chloride through inhalation and oral exposure in humans has resulted in liver damage. Cancer is a major concern from exposure to vinyl chloride via inhalation, as vinyl chloride exposure has been shown to increase the risk of a rare form of liver cancer in humans. The EPA has classified vinyl chloride as a Group A, human carcinogen. Therefore, PVC is most dangerous to the workers within PVC factories and the communities where these factories exist (USEPA PVC).

Additionally, PVC is known to release toxic vapors when engulfed in flames or exposed to high heat during a structure fire. However, existing precautions taken by firefighters have been found to be sufficient to control unnecessary exposure. Moreover, the amounts of PVC as a result of the proposed changes to the building standard represents a de minimis increase in risk to either the public or firefighters (HCD 2007).

In 2003, the worldwide generating capacity for PVC annually was approximately 32 million metric tonnes per year. Eleven companies own and operate 100 PVC factories throughout the world, in addition to 50 factories operated by China (*PVC Handbook*).

Regulatory Setting

United States

The EPA is actively pursuing enforcement actions against PVC manufacturers under the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and the Emergency Planning and Community Right-to-Know Act. These enforcement activities in the PVC manufacturing sector focus on achieving compliance with environmental laws and on reducing the total amount of vinyl chloride entering the environment, regardless of the environmental pathway. Civil enforcement settlements within the United States demonstrate the substantial reductions that can be achieved by PVC manufacturers. These settlements have reduced vinyl chloride air emissions by approximately 140,000 pounds per year and resolved alleged violations under existing environmental laws (USEPA PVC).

Potential Changes in Plastic Use

The potential increase in the use of PVC or Polycarbonate is a result of the implementation of the proposed changes to the all-buildings mandatory Section 110.3, the nonresidential mandatory Sections 110.9 120.1, 120.2, 120.5, and 120.6; the nonresidential prescriptive Sections 130.0, 130.5,

130.1, 130.2, 130.5, 140.1, 140.3, 140.4, 140.6, 140.7 and 141.0; the residential mandatory Section 150.0; and the residential prescriptive Sections 150.1 and 150.2. These increases will, generally be from the production of electronic cases for lighting or HVAC controls and the production of other component housings. The Energy Commission estimates that the increase in PVC or polycarbonate end use will be no more than 730 metric tonnes per year (less than 0.002 percent of current worldwide production). This estimate is based on data provided by the CASE reports (CASE Report Nos.: 1, 4, 5, 7, 8, 12, 20, 21, 27, 32, 34, 37, 38, 40, 41, 42, 45, 46, 47, 49 and 56).

Plastic Impact Findings

The proposed changes to the Building Energy Efficiency Standards may result in an increase in the end use of plastic, including PVC. While there exists a potential for environmental damage and human health impacts from this potential increase in material use, existing and actively enforced regulations in the United States adequately safeguard human health from exposure and the environmental release of PVC. Additionally, the increased risk of release of toxic vapors from exposure to fire or high heat is de minimis as the amount of expected PVC applications is small. Therefore, the potential adverse environmental impacts from the estimated increase in the use of plastic, including PVC, are less than significant.

Silicon

Environmental and Regulatory Setting

Silicon is widely used in many types of electronics, as well as in photovoltaic solar panels. The main material for silicon is sand. Silicon itself is inert and not known to cause any environmental impacts. However, the processing, manufacture and handling of electronic-grade silicon have associated secondary environmental impacts, as well as impacts from the inhalation and ingestion of silicon dust. The potential impacts are addressed by worker safety measures that implement state and federal workplace safety laws. Silicon is otherwise not normally an environmental hazard, and there are no potential secondary impacts from any increased use that would result from the building standards amendments.

The annual worldwide production of silicon has increased from 4.13 million metric tonnes in 1990 to 6.31 million metric tonnes in 2009 (USGS Silicon).

Potential Changes in Silicon End Use

The potential increase in the end use of silicon is a result of the implementation of the proposed changes to the nonresidential mandatory Section 110.9 and the nonresidential prescriptive Section 130.1. These increases will generally be from the production of electronic components for lighting or ventilation controls as well as carbon dioxide sensors. The Energy Commission estimates that the increase in silicon end use will be no more than 731 pounds per year (0.33 metric tonnes per year), which is less than 0.00001 percent of current worldwide production. This estimate is based on data provided by the CASE reports (CASE Report Nos. 34 and 38) and reasonable assumptions to convert them to consistent units of measure.

Silicon Impact Findings

Given that there are ample regulations both within the United States and generally throughout the world for processing, manufacture and handling of electronic-grade silicon, the potential adverse environmental impacts from the estimated increase in silicon end use will be less than significant.

Gold

Environmental and Regulatory Setting

Gold is widely used in bullion, jewelry, glass and electronics. Gold itself is inert and not known to cause any environmental or serious human health impacts. However, the mining, processing, storing and handling of gold have associated secondary environmental impacts. These potential impacts are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. The use of gold that would result from the new building standards is estimated to be barely more than two pounds. Therefore, the Energy Commission considers these potential secondary impacts to be minor and speculative, and that they are not cumulatively considerable.

The annual worldwide production of gold has increased from 2,180 metric tonnes in 1990 to 2,450 metric tonnes in 2009 (USGS Gold).

Potential Changes in Gold End Use

The potential increase in the end use of gold is a result of the implementation of the proposed changes to the nonresidential mandatory Section 110.9 and the nonresidential prescriptive Section 130.1. These increases will be generally from the production of electronic components for lighting or ventilation controls as well as carbon dioxide sensors. The Energy Commission estimates that the increase in gold end use will be no more than 2.34 pounds per year (0.001 metric tonnes per year), which is less than 0.00004 percent of current worldwide production. This estimate is based on data provided by the CASE reports (CASE Report Nos. 34 and 38) and reasonable assumptions to convert them to consistent units of measure.

Gold Impact Findings

With ample regulations both within the United States and generally throughout the world for the mining, processing, storing and handling of gold, the potential adverse environmental impacts from the estimated increase in gold end use will be less than significant.

Aluminum

Environmental and Regulatory Setting

Aluminum is used in many industries to make millions of products and is very important to the world economy. Structural components made from aluminum are vital to the aerospace industry and very important in other areas such as for transportation and building in which lightweight, durability, and strength are needed.

Large amounts of aluminum can be toxic to humans, but high exposure levels are typically limited to miners, aluminum production workers, and dialysis patients. While there is some evidence linking aluminum to Alzheimer's disease, increased aluminum intake has yet to be a proven cause of the onset of Alzheimer's. Otherwise, aluminum is not shown to be significantly able to be absorbed in plants and animals (OSHA Aluminum). However, the mining, processing, storing and handling of aluminum have associated secondary environmental impacts. These potential impacts are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. Therefore, the Energy Commission considers these potential impacts too speculative to attempt to estimate.

The annual worldwide production of aluminum has increased from 19.3 million metric tonnes in 1990 to 37.3 million metric tonnes in 2009 (USGS Aluminum).

Potential Changes in Aluminum End-Use

The potential increase in the end use of aluminum is a result of the implementation of the proposed changes to the all-buildings mandatory Section 110.3, the nonresidential mandatory Sections 120.1, 120.2, 120.5 and 120.6; the nonresidential prescriptive Sections 140.4 and 141.0; the residential mandatory Section 150.0; and the residential prescriptive Section 150.1. These increases will be generally from the production of building components and devices, such as exhaust fans and water heaters. The Energy Commission estimates that the increase in aluminum end use will be no more than 126 metric tonnes per year, which is less than 0.0007 percent of current worldwide production. This estimate is based on data provided by the CASE reports (CASE Report Nos.: 5, 7, 21 and 56) and reasonable assumptions to convert them to consistent units of measure.

Aluminum Impact Findings

The increased use of aluminum resulting from the standards results in no harmful end-use exposures. Any potential impact would occur from increased aluminum production. However, with ample regulations both within the United States and generally throughout the world for the mining, processing, storing and end use of aluminum, the potential adverse environmental impacts from the estimated increase in aluminum end use will be less than significant.

Fiberglass

Environmental and Regulatory Setting

Fiberglass is a man-made material consisting of synthetic vitreous fiber and resin used in many consumer and industrial products such as furnace filters, loose insulation, insulation in appliances and roofing materials. Exposure to fiberglass can irritate the skin, eyes, nose, and throat. However, there are no known long-term health effects from fiberglass exposure (JEC Fiberglass). The manufacturing, storing and handling of fiberglass have associated secondary environmental impacts. These potential impacts are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. Therefore, these potential impacts too speculative to attempt to estimate.

The annual worldwide production capacity of fiberglass is approximately 3.84 million metric tonnes as of 2010 (JEC Fiberglass).

Potential Changes in Fiberglass End Use

The potential increase in the end use of fiberglass is a result of the implementation of the proposed changes to the nonresidential mandatory Section 120.3 and the residential prescriptive Sections 150.1 and 150.2. These increases will generally be from the production of insulation. The Energy Commission estimates that the increase in fiberglass end use will be no more than 209 metric tonnes per year, which is less than 0.006 percent of current worldwide production capacity. This estimate is based on data provided by the CASE reports (CASE Report Nos.: 9.5 and 32) and reasonable assumptions to convert them to consistent units of measure.

Fiberglass Impact Findings

Given that there are ample regulations both within the United States and generally throughout the world for the manufacturing, storing and handling of fiberglass, the potential adverse environmental impacts from the estimated increase in fiberglass use will be less than significant.

Titanium

Environmental and Regulatory Setting

Titanium dioxide is extensively used as a white pigment in outside paintings and shingles for its opacity to UV light damage and its self-cleaning capacity as well as many other applications. It has no known human health impacts; it is in fact used in hip replacements. Titanium has no known direct environmental impact; however, in a metallic powdered form, titanium metal poses a significant fire hazard and, when heated in air, an explosive hazard.

Titanium is never found in its pure form and must be extracted and purified from the raw mined materials, then processed into alloy prior to final forming and shaping. This entire process is energy intensive, thus even though titanium is abundant in the earth's crust, it continues to be a relatively expensive metal. The energy intensive manufacturing process has associated secondary environmental impacts. These potential impacts are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. Therefore, these potential impacts are too speculative to attempt to estimate.

The annual production of titanium in the United States has increased from 979,000 metric tonnes in 1990 to 1.23 million metric tonnes in 2009 (USGS Titanium).

Potential Changes in Titanium End-Use

The potential increase in the use of titanium is a result of the proposed changes to the cool roof requirements in the Building Energy Efficiency Standards. Based on the CASE report (CASE Report No. 2), the Energy Commission estimates that the increase in titanium use will be no more than 529 metric tonnes per year, which is less than 0.04 percent of current production in the United States.

Titanium Impact Findings

With ample regulations both within the United States and generally throughout the world for the mining, processing, storing and handling of titanium, the potential adverse environmental impacts from the estimated increase in titanium use will be less than significant.

Glass

Environmental and Regulatory Setting

Modern glass factories are three-part operations: the batch house, the hot end, and the cold end. The batch house handles the raw materials; the hot end handles the manufacturing process and contains the furnaces, annealing ovens, and forming machines; and the cold end handles the product inspection and packaging equipment (AGC Glass). Glass has no known direct environmental or human health impacts.

The manufacturing, storing and handling of glass have associated secondary environmental impacts. However, these potential impacts are affected by a wide range of variables and are substantially regulated by federal, state and local laws in the United States. Therefore, the Energy Commission considers these potential impacts too speculative to attempt to estimate.

The current worldwide production capacity of flat glass is approximately 44 million metric tonnes per year (AGC Glass).

Potential Changes in Glass End Use

The potential increase in the end-use of glass is a result of the implementation of the proposed changes to the residential prescriptive Section 150.1. These increases will generally be from the production of energy efficient windows. The Energy Commission estimates that the increase in glass end use will be no more than 454 metric tonnes per year, which is less than 0.001 percent of current production in the United States. This estimate is based on data provided by the CASE reports (CASE Report Nos.: 5 and 7) and reasonable assumptions to convert them to consistent units of measure.

Glass Impact Findings

With ample regulations both within the United States and generally throughout the world for the manufacturing, processing, storing and handling of flat glass, the Energy Commission believes that the potential adverse environmental impacts from the estimated increase in flat glass use will be less than significant.

Wood

Proposed Changes to the Standards

The proposed changes to the Building Energy Efficiency Standards include improvements to the building envelope insulation of low-rise residential building performance and prescriptive requirements. (see Table 150.1A of the proposed revision.) These requirements are prescriptive (not mandatory) but may increase the likelihood that a builder will choose to increase the insulation of the building envelope.

Potential Changes in Wood Use

If a builder does choose to increase the insulation of the building envelope to the prescribed insulation requirements in Section 150.1, then it is a possibility that the builder will choose to use 2x6 studs over 2x4 studs. This will increase the depth of the wall cavity to allow for additional insulation material, which without other changes would increase the amount of wood used for the building.

However, the builder, especially for residential newly constructed buildings, has a large number of options for compliance through the performance standards. One option would be for the builder to choose to use 2x4 studs and insulation along with materials having a higher insulating value, such as dense pack cellulose or spray foam insulation within the wall cavities or installing structural insulated panels (SIPs)[1], and marginally increase other energy efficiency measures in the building. For example, the builder could add additional rigid foam insulation to the exterior of the walls or could choose to increase the efficiency of space conditioning or water heating equipment. Installation of spray foam or rigid insulation also potentially serves as an air barrier and allows the home to qualify for energy performance credit for building envelope sealing. Generally, these alternatives are expected to have environmental impacts similar to those for the materials discussed above including fiberglass, aluminum, steel, copper, glass and plastic. As such, these impacts are less than significant.

The builder also has many options for meeting prescriptive wall insulation requirements. If the choice is to use 2x6 studs, the builder could also choose to use advanced framing techniques. For example, the builder could choose to use 24-inch spacing between stud centers (aka 24 inch on

[1] SIPs, are a composite building material. They consist of an insulating layer of rigid polymer foam sandwiched between two layers of structural board. The board can be sheet metal, plywood, cement or oriented strand board (OSB) and the foam either expanded polystyrene foam (EPS), extruded polystyrene foam (XPS) or polyurethane foam.

center [24-inch OC]) as opposed to 16-inch (16-inch OC), which would lower the overall amount of wood in the wall and somewhat mitigate the potential increase that 2x6 studs represent, by increasing the width of the wall cavity.

If the choice is to use 2x4 studs, the builder could increase the insulating value of the 2x4 walls, through approaches such as those discussed above, and make marginal increases to the rigid insulation installed exterior to the wall.

Thus, even though the increased prescriptive insulation requirements could increase the possibility that the builder may choose to use 2x6 over 2x4 studs, it is far from a mandatory requirement. The builder has many options for not increasing the amount of wood use due to this prescriptive requirement.

Wood Impact Findings

Because of all of the variety of construction techniques that are available to builders, any potential impacts on wood use from the proposed the prescriptive requirements changes to Section 150.1 are speculative, and the potential adverse environmental impacts from this prescriptive requirement will be less than significant .

Savings in Water Consumption

Onsite Water Savings

The proposed changes to the mandatory nonresidential requirements in section 110.2, mandatory residential requirements in Section 150.0 and prescriptive residential requirements in Section 150.1 of the Building Energy Efficiency Standards are expected to result in a substantial savings in onsite water use. These savings are the result of increased hot water pipe insulation, hot water piping design requirements and blowdown and make-up water control requirements for buildings employing cooling towers.

Single-family Water Heating Distribution System Improvements

The suggested changes to Section 150.0 and 150.1, use new field information and more advanced evaluation tools to generate new mandatory and prescriptive requirements for single-family residential buildings. The mandatory requirements include insulating ¾-inch or larger hot water piping from the water heater to the use points (Section 150.0 (j)(2)) and limiting 1-inch hot water piping to a maximum length of 15 feet (Section 150.0 (j)(4)). The prescriptive requirements (Section 150.1) limit the prescribed length of hot water distribution systems between the water heater and the use points (CASE Report No. 6). The added insulation is expected to save 1,820 gallons per year of water for each new single-family residential building. The mandatory limit on the length of 1-inch piping is expected to save 730 gallons per year per building and the prescriptive requirement for a compact hot water distribution system is expected to save 2,550 gallons per year per application (CASE Report No. 6, page 7). Statewide, these requirements are

expected to save approximately 121 million gallons (370 acre-feet) of water per year (CASE Report No. 6, pages 17-26).

Cooling Tower Water Savings

The suggested changes to Section 110.2(e) would be mandatory requirements that apply to evaporative cooling towers 150 tons and larger, installed in newly constructed buildings and additions and alterations to existing building projects for nonresidential and industrial buildings covered under Title 24. Although the standards include mandatory requirements for heat rejection systems (specifically, fan speed control, tower flow turndown, and a limitation on centrifugal fan cooling towers), there is no existing requirement in the standards that directly addresses water use in cooling towers.

The proposed cooling tower water saving measures require the installation of controls that automate blowdown and chemical feed based on conductivity or flow rate, while maximizing cycles of concentration[2] based on local water quality conditions. Building HVAC system designers will be required to calculate and document the maximum cycles of concentration based on local water quality conditions. The measure also requires the installation of a flow meter on the makeup water line, an overflow alarm to prevent overflow of the sump in case of makeup water valve failure, and efficient drift eliminators (CASE Report No. 26).

The estimated onsite water savings for a typical building using a cool tower (i.e., 117,000 square feet, nonresidential building using a 350 ton cooling tower) would be approximately 86 thousand gallons per year per building (CASE Report No. 26, page 6) or 32.2 million gallons per year statewide (CASE Report No. 26, page 20).

Estimated Statewide Onsite Water Savings

There will be an expected decrease of approximately 153 million gallons (470 acre-feet) per year of onsite water consumption from the implementation of the proposed changes to the Building Energy Efficiency Standards.

Estimated Statewide Power Plant Water Savings

The implementation of the proposed changes to the Building Energy Efficiency Standards will result in electricity saving of approximately 470.3 gigawatt-hours per year (see Table 1). These

[2] Cycles of concentration is a measurement of the concentration of total dissolved solids (TDS) in tower water. Because evaporation of pure water leaves dissolved solids behind in the system water, TDS increases over time as the tower operates. The number of times the dissolved minerals are concentrated is relative to the TDS in the makeup water. For example, 5 cycles of concentration represents five times the concentration of solids in the tower system water relative to the TDS in the makeup water entering the tower.

savings will result in water savings at power plants that use evaporative water-cooling as their main source of heat rejection to the environment. By using available power plant data for the electricity grid in the Western United States to the predicted electricity savings, an estimate of the water savings at California power plants was made. Water savings of approximately this amount is expected to result due to implementation of the proposed changes to the Building Energy Efficiency Standards.

California Power Plant Water Consumption

Electricity generators in California submit data to the Energy Commission through the *Quarterly Fuel and Energy Report* (QFER) data collection. These data collections include electricity generation and water use (for the purpose of electricity generation) at power plants. By using this data, the Energy Commission estimates that modern combined cycle power plants[3], which are the likely source of water savings resulting from energy efficiency measures in California, use an average of 522 gallons of water per megawatt-hour of electricity generation per year (Energy Commission 2012). This is the average (weighted by the electricity generation at each power plant) of all existing combined cycle power plants greater than 20 megawatts in capacity within California.

Electricity generation in California is supplied by a complex system that requires a constant balance between electricity generators (power plants), delivery facilities, and energy consumers. This balance takes into consideration dispatch restrictions, the Renewables Portfolio Standard (RPS) requirements, electricity generation imported from outside California, and transmission and distribution losses. Thus, a megawatt-hour of electricity saved by the standards will not translate into a megawatt-hour of generation avoided strictly in California power plants. Considering this balance, the Energy Commission estimates that 377 gallons of water would be saved at power plants in California for each megawatt-hour of electricity saved through energy efficiency measures (Energy Commission 2012).

Estimated Statewide Power Plant Water Savings

The Energy Commission expects a savings of approximately 177 million gallons of water (540 acre-feet) per year from the electricity generation avoided at California power plants as a result of the implementation of the proposed changes to the Building Energy Efficiency Standards.

Total Savings in Water Consumption

[3] A combined cycle power plant is a power plant that uses a primary mover that requires cooling to generate electricity, such as a combustion turbine, and a heat recovery system, such as a heat recovery steam generator, to use that rejected heat to create steam for a steam turbine. In other words, a combined cycle power plant is a power plant that combines a combustion turbine and a steam turbine to produce electricity.

The total of both the expected statewide onsite water savings and the expected water savings at California power plants is approximately 330 million gallons per year, which is more than 1,000 acre-feet per year.

Indoor Air Quality

The Energy Commission is not proposing the adoption of the ASHRAE ventilation requirements (ASHRAE Std. 62.1). Instead, the Energy Commission proposes to keep the current Title 24, Part 6, ventilation requirements, which generally provide higher ventilation rates than does ASHRAE Std. 62.1. The Energy Commission is proposing stricter field test criteria for the occupancy sensors that control the temporary reduction in ventilation rates during unoccupied periods in specific building space types, such as multi-purpose and conference rooms. These proposals will improve the indoor air quality in these building spaces by making the ventilation control systems more robust. No other changes to the mandatory requirements of the standards will affect indoor air quality. Therefore, the Energy Commission believes that there are no potential impacts to the degradation of indoor air quality as a result of the implementation of the proposed changes to the standards.

CHAPTER 6:
Energy and Environmental Benefits

The Energy Commission evaluated each proposed change to the building energy efficiency standards for its energy and environmental benefits. The following discussion includes the overall potential energy emission benefits of the proposed changes to the Building Energy Efficiency Standards for each sector and specific measure that may not otherwise be characterized or are of special interest.

Nonresidential, High-Rise Residential, and Hotel/Motel Buildings

Energy Savings

The projected total annual savings from the nonresidential sector, including high-rise residential and hotel/motel buildings, under the proposed 2013 Standards is about 7 million therms of natural gas, 584 GWh of electricity, and 149 MW of reduced demand. Table 2 shows the breakdown by sector.

Table 2: NonResidential Energy Savings and Peak Demand

		GWhr/yr	Millions therms/yr.	MW
Newly Constructed Buildings		168.25	7.57	25.29
Additions and Alterations		272.54	2.15	78.49
NonResidential Total		**440.79**	**9.71**	**103.78**

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

Environmental Benefits

The estimated emissions benefits are based on the energy savings and the air pollution emission factors (including CO_{2E}) specifically tailored for energy savings realized in California (Energy Commission 2012, CRAB 2008, USEPA AP42). The annual reductions in emissions from implementing the 2013 nonresidential energy standards are estimated at 55 tons of NO_x, less than 2 tons of SO_x, 8 tons of PM2.5, and 243 thousand tons of CO_{2E}. The breakdown by sector and other emission are shown in Table 3.

Table 3: NonResidential Air Emission Reductions

		NOx - tons/yr.	SOx- tons/yr.	CO - tons/yr.	PM2.5 - tons/yr.	CO2- metric tonnes./yr.
Newly Constructed Buildings		38.16	0.81	20.55	4.59	112,714
Additions and Alterations		16.55	1.02	14.03	3.77	130,169
NonResidential Total		**54.71**	**1.82**	**34.59**	**8.36**	**242,883**

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

Low-Rise Residential Buildings

Energy Savings

The implementation of the proposed 2013 Standards for low-rise residential buildings are expected to result in a reduction of electricity use of approximately 29 GWh and natural gas use of approximately 2 million therms, as well as a reduction of peak demand of approximately 46 MW. Energy savings contributions from each of the residential sectors are shown in Table 4.

Table 4: Residential Energy Savings and Peak Demand Reduction

		GWhr/yr	Millions therms/yr.	MW
Newly Constructed Buildings Single-family		16.31	1.45	25.93
Newly Constructed Buildings Multifamily		4.35	0.21	6.11
Additions and Alterations Single-family		7.01	0.62	11.15
Additions and Alteration Multifamily		1.87	0.09	2.63
Residential Total		**29.55**	**2.38**	**45.82**

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

Environmental Benefits

The annual combined emissions savings from the construction of single and multifamily homes are listed in Table 5.

Table 5: Residential Air Emission Reductions

		NOx - tons/yr.	SOx- tons/yr.	CO - tons/yr	PM2.5 - tons/yr.	CO2- metric tonnes./yr.
Newly Constructed Buildings Single-family		6.91	0.10	3.36	0.70	14,641
Newly Constructed Buildings Multifamily		1.06	0.02	0.56	0.12	2,999
Additions and Alterations Single-family		2.97	0.04	1.44	0.30	6,296
Additions and Alteration Multifamily		0.45	0.01	0.24	0.05	1,289
Residential Total		**11.39**	**0.17**	**5.60**	**1.18**	**25,225**

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

CHAPTER 7:
Cumulative Effects

Energy

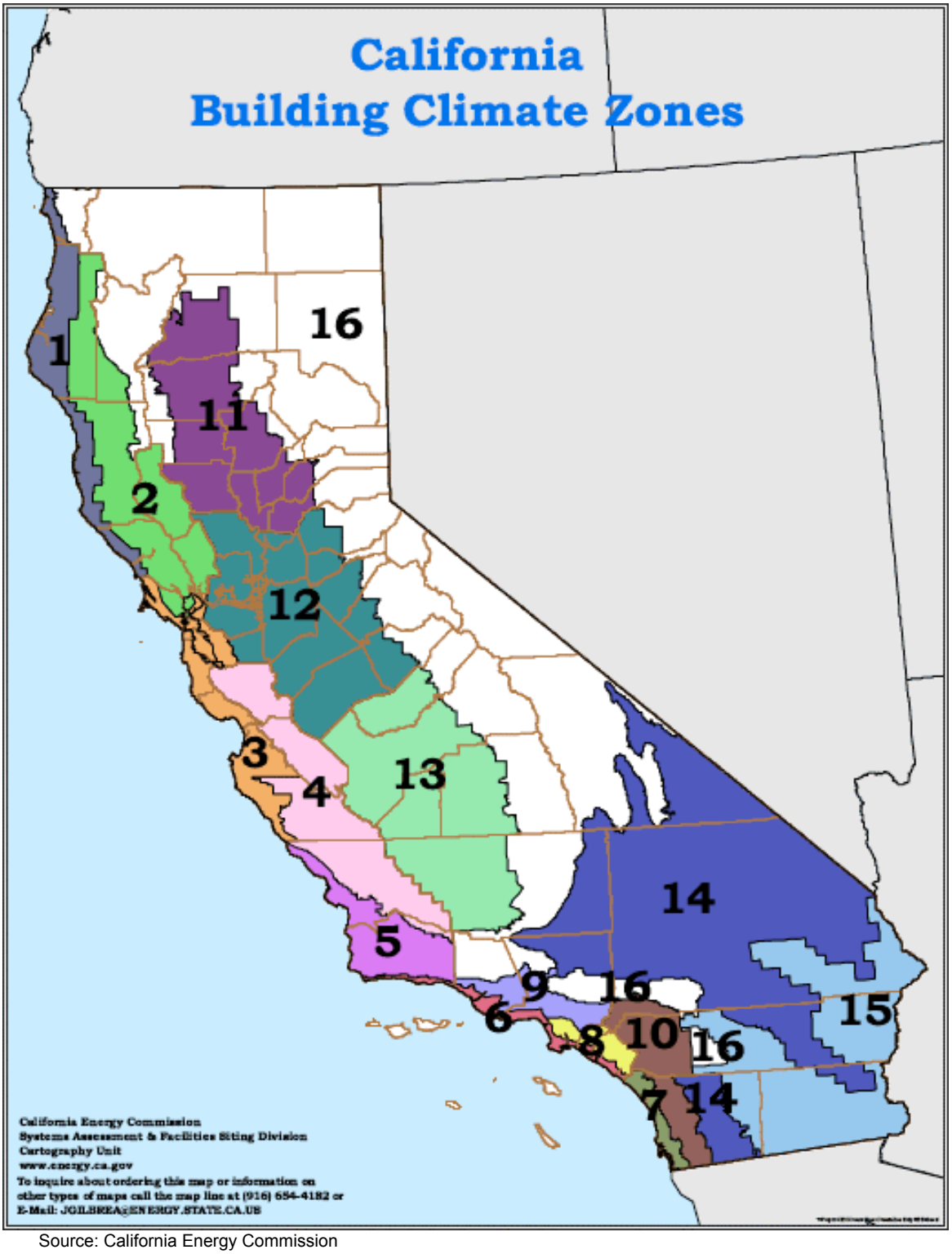
The estimated cumulative energy savings of implementing the proposed 2013 Standards will reduce annual energy consumption of electricity by 470 gigawatt-hours per year (GWh/yr) (see Table 1) and demand by 150 megawatts (MW) (see Table 1). Natural gas consumption will be cut by 12 million therms (see Table 1).

The proposed standards changes were selected with full consideration of the life-cycle cost analysis requirement of the Warren-Alquist Act. In response to this mandate, the 2013 Standards include measures that will "ensure the maximum feasible reductions in wasteful, uneconomic, inefficient, or unnecessary consumption of electricity" as required by the statute. Efficiency improvements included in the 2013 Standards will affect more than 41,000 residential homes and 151 million square feet of nonresidential construction in the first year alone.

Environmental

Reducing natural gas and electricity use is expected to result in emission reductions both at individual buildings and at power plants in California and other western states. There is, however, no way of mapping by air basin or climate zone the exact impact of emission reductions from reduced electric generation because electricity transmission and distribution does not correspond to air basins or climate zones. Therefore, the only estimate of emission reductions in air basins must be restricted to the natural gas used onsite for space heating and water heating. The Energy Commission evaluated potential emission reductions by climate zone and by air basin. (See Figure 2 for a map of air basins and Figure 1 for a map of climate zones.) Staff then multiplied the energy use from each air basin by the emissions factors (ARB 2008, USEPA AP42) to determine emissions shown in Table 6 for each air basin.

Figure 1: California Climate Zone Map



Source: California Energy Commission

Table 6: Emission Reductions by Air Basin From Natural Gas Use Reductions

		NO_X tons per year	SO_X tons per year	CO tons per year	PM2.5 tons per year	CO_{2e} metric tonnes per year
Great Basin Valleys		0.32	0.002	0.14	0.03	376
Lake County		0.31	0.002	0.13	0.02	357
Lake Tahoe		0.27	0.002	0.11	0.02	311
Mojave Desert		1.51	0.010	0.64	0.12	1,753
Mountain Counties		3.09	0.020	1.31	0.25	3,573
North Central Coast		2.94	0.019	1.25	0.24	3,408
North Coast		1.12	0.007	0.48	0.09	1,293
Northeast Plateau		0.21	0.001	0.09	0.02	239
Sacramento Valley		3.55	0.023	1.51	0.29	4,111
Salton Sea		0.59	0.004	0.25	0.05	680
San Diego		3.18	0.020	1.35	0.26	3,686
San Francisco Bay		6.24	0.040	2.66	0.50	7,226
San Joaquin Valley		4.34	0.028	1.85	0.35	5,024
South Central Coast		12.89	0.082	5.48	1.04	14,927
South Coast		13.55	0.086	5.77	1.10	15,694
Statewide		**54.10**	**0.345**	**23.02**	**4.37**	**62,659**

NOTE: Includes only emission from burning of natural gas for space heating and water heating. Electric generation emissions are not included in the air basin analysis but were included in the analysis of overall state environmental benefits.

Source: 2013 Std - Initial Study Calculations 2-29-12.xlsx

Figure 2: California Air Basins Map

Source: California Air Resources Board

CHAPTER 8:
Energy Commission Recommendations

The analysis provided for the proposed changes to the Building Energy Efficiency Standards concludes that there will be no significant impact on the environment. A Negative Declaration is proposed to be adopted for the 2013 Building Energy Efficiency Standards.

CHAPTER 9:
Initial Study Preparers

This Initial Study was prepared by California Energy Commission staff Joe Loyer of the Efficiency and Renewable Energy Division, High Performance Buildings and Standards Development Office, with contributions from Pippin Brehler and Dick Ratliff of the Office of the Chief Counsel.

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Air Emission Factors	Units	NOx	SOx	CO	PM2.5
Electricity	lbs/MWh	0.051	0.007	0.072	0.022

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Emission Factors	**Units**	**NOx**	**SOx**	**CO**	**PM2.5**	**CO2e**
Natural Gas	lbs/mmscf	94	0.6	40	7.6	120,000

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GLOSSARY

Alternative Calculation Method (ACM)	An alternative calculation method is one of "the Energy Commission's Public Domain Computer Programs, one of the Energy Commission's Simplified Calculation Methods, or any other calculation method approved by the Energy Commission."[BEES, Section 101]
Alternative Component Packages	An alternative component package is one of the sets of prescriptive requirements contained in Section 150.1 which a building may meet to achieve compliance with the standards. These are often referred to as the "prescriptive packages" or "packages."
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
ASTM	American Society for Testing and Materials.
BEES	See Building Energy Efficiency Standards
Btu/hr (Btuh)	British thermal unit per hour. One Btu equals the amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit. Used for measuring heating and cooling equipment output.
Building Energy Efficiency Standards (BEES)	The California State energy standards as set forth in the California Code of Regulations, Title 24, Part 6.
Climate Zone	The Energy Commission established 16 climate zones that represent a geographic area for which an energy budget is established. These energy budgets are the basis for the energy efficiency standards. Following is a list of climate zones with the major city within each: CZ01: Arcata CZ02: Santa Rosa CZ03: Oakland CZ04: Sunnyvale CZ05: Santa Maria CZ06: Los Angeles CZ07: San Diego CZ08: El Toro CZ09: Pasadena CZ10: Riverside CZ11: Red Bluff
Cool Roofs	A roof that reflects significantly more solar energy than a traditional roof and therefore keeps the building's

	interior cooler. Cool roofs are usually light-colored and applied as a tile product (residential) or coating (nonresidential). An alliance called the Cool Roof Rating Council has been formed to establish criteria and rating systems for cool roofs.
CO	Carbon Monoxide (CO): A colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. CO is regulated as a criteria air pollutant under the Clean Air Act, 42 U.S.C., section 7401 et seq.
CO_2	Carbon dioxide, A gas by-product of combustion that is known to behave as a greenhouse gas in the earth's atmosphere.
Demand Control Ventilation	Demand Control Ventilation is the ability to adjust the amount of ventilation air provided to a space based on the extent of occupancy (as measured by CO_2 sensors). For example, an assembly building that is occupied on an intermittent basis would use demand controls to change the ventilation rates based on the number of people in the space, thereby saving substantial energy when the space is sparsely occupied. Occupancy sensors, air quality sensors, or other devices may be used to accomplish this.
EER (Energy Efficiency Ratio)	The ratio of cooling capacity of an air-conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. Compare to SEER.
Emittance	The property of emitting radiation; possessed by all materials.
Energy Budget	"Energy budget is the maximum amount of source energy that a proposed building, or portion of a building, can be designed to consume, calculated with the approved procedures specified in Title 24, Part 6." [BEES, Section 101]
Fenestration Product	A fenestration product is "any transparent or translucent material plus any sash, frame, mullions, and dividers, in the envelope of a building, including, but not limited to: windows, sliding glass doors, French doors, skylights,

	curtain walls, garden windows, and other doors with a glazed area of more than one-half of the door area." [BEES, Section 101]
Gigawatt-hour (GWh)	One thousand megawatt-hours, one million kilowatt-hours, or one billion watt-hours of electrical energy.
Glazing	Transparent or translucent material (typically glass or plastic) used for admitting light.
Heating, Ventilating and Air Conditioning (HVAC)	The mechanical heating, ventilating and air-conditioning system of the building is also known as the HVAC system. The BEES use measures of equipment efficiency defined according to the type of HVAC equipment installed.
Kilowatt (kW)	One thousand watts of power. A kilowatt is a measure of demand, or how many thousand watts are being drawn at any instant.
Kilowatt-hour (kWh)	One thousand watt-hours (watts of energy provided or expended for the duration of one hour) of energy.
Lighting Power Density (LPD)	A measure of the amount of light in a room. For the purpose of this document, LPD represents the amount of watts used to produce light per square foot that can be installed for a specific task.
Low-e glazing	Glazing that has been coated with a low-emissivity medium that reduces heat transfer.
Low-Rise Residential	Any building of the residential occupancy group R (as defined in the Uniform Building Code), excluding all hotels, all motels and apartment buildings, with four or more habitable stories.
Megawatt (MW)	One million watts of power. A megawatt is a measure of demand or how many million watts are being drawn at any instant (see also kilowatt).
MBtu	One million Btus of energy.
NFRC	The National Fenestration Rating Council, a national organization of manufacturers of fenestration products, glazing and related materials, utilities, state energy

	offices, laboratories, homebuilders, architects and public interest groups. This organization is responsible for rating the U-factors and solar heat gain coefficient of manufactured fenestration product lines (i.e., windows, skylights, and glazed doors) that must be used in compliance calculations. In California, all manufactured fenestration products must be labeled with NFRC rated values or with approved default U-factors.
NO_x	Oxides of nitrogen, usually NO and NO_2, that are chief components of air pollution and produced by the combustion of fossil fuels.
Outside Air	"Outdoor air is air taken from outdoors and not previously circulated in the building." [BEES, Section 101]
Proposed Design	The proposed building designs that must comply with the standards before receiving a building permit.
PM2.5	Solid particulate matter that is 2.5 microns in size or smaller. Usually considered pollutants, particulates are released from combustion processes in exhaust gases at fossil fuel plants and from mobile and other fugitive particle sources.
SEER (Seasonal Energy Efficiency Ratio)	The total cooling output of a central air-conditioning system in Btus during its normal usage period for cooling divided by the total electrical input in watt-hours during the same period, as determined using specific test procedures.
Solar Heat Gain Coefficient (SHGC)	A measure of the effectiveness of a fenestration product or window covering to stop solar heat gain through the window. SHGC is the "ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space." [BEES, Section 101]
Standards	The California Building Energy Efficiency Standards as set forth in the California Code of Regulations, Title 24,

Part 6.

Thermostatic Expansion Valve (TXV)	A refrigerant metering valve that controls the flow of liquid refrigerant entering the evaporator in response to the superheat of the gas leaving it. Its basic function is to keep the evaporator active without permitting liquid to be returned through the suction line to the compressor. TXVs compensate for common installation problems caused by incorrect refrigerant charge and incorrect airflow.
Time Dependent Valuation (TDV)	A method of valuing electricity and other building energy sources differently according to the time of day and season of electricity demand; for example, the cost of electricity in California rises at peak demand times in hot weather due to a much larger need to power air conditioning. TDV energy includes energy used at the building site as well as that consumed in producing and delivering energy to the site, including but not limited to generation, transmission, and distribution losses.
U-factor (formerly U-value)	A measure of energy efficiency of a wall assembly or fenestration, defined as the "overall coefficient of thermal transmittance of a construction assembly, in Btu/(hr x ft^2 x ^oF), including air film resistances at both surfaces." [BEES, Section 101]
Ventilation Air	"Ventilation air is that portion of supply air which comes from outside plus any recirculated air that has been treated to maintain the desired quality of air within a designated space." [BEES (2001), Section 101]
Watt (W)	A unit of measure of electric power at a point in time, as capacity or demand.

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APPENDIX A

California Environmental Quality Act Checklist

Project title:	2013 Energy Efficiency Standards for Residential and Nonresidential Buildings
Lead agency name and address	California Energy Commission 1516 Ninth Street Sacramento, California 95814
Contact person and phone number:	Joe Loyer, Efficiency and Renewable Energy Division, (916) 654-4822
Project Description	The Energy Commission is proposing changes to the energy efficiency standards for residential and nonresidential buildings as mandated by the Warren-Alquist Act. A summarized list of the proposed changes is included in the Executive Summary of this Initial Study.
Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)	The California Building Standards Commission must approve the changes.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

	I. Aesthetics		II. Agriculture Resources		III. Air Quality
	IV. Biological Resources		V. Cultural Resources		VI. Geology /Soils
	VII. Energy		VIII. Hazards & Hazardous Materials		IX. Hydrology / Water Quality
	X. Land Use/ Planning		XI. Mineral Resources		XII. Natural Resources
	XIII. Noise		XIV. Population/ Housing		XV. Public Services
	XVI. Recreation		XVII. Transportation/ Traffic		XVIII. Utilities/ Service Systems
	XIX. Mandatory Findings of Significance				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
I. **AESTHETICS --** Would the project:				
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?				X
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on aesthetics.				
II. **AGRICULTURE RESOURCES** -- In determining whether impacts to agricultural resources are significant environmental benefits, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
Commission staff has determined that the proposed 2013 Standards will have no impacts on agricultural resources.				
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?				X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?				X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?				X
d) Expose sensitive receptors to substantial pollutant concentrations?				X
e) Create objectionable odors affecting a substantial number of people?				X
The building standards may result in reduced power plant operation (in California and the Western United States) and reduce natural gas consumption and may therefore result in reduced emissions. Staff expects that overall, California will experience a net environmental benefit and net reductions of emissions resulting from the proposed 2013 Standards. Commission staff has therefore determined that the proposed 2013 Standards will have no adverse impacts on air quality.				
IV. **BIOLOGICAL RESOURCES** -- Would the project**:**				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on biological resources.				
V. **CULTURAL RESOURCES** -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on cultural resources.				
VI. **GEOLOGY AND SOILS** -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				X
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on geology and soils.				
VII. **ENERGY --** Would the project:				
a) Use exceptional amounts of fuel or energy?				X
b) Increase demand upon existing sources of energy, or require the development of new sources of energy?				X
The objective of the 2013 Standards is to reduce energy use in California. Staff has determined that the proposed standards will save energy statewide.				
VIII. **HAZARDS AND HAZARDOUS MATERIALS** -- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wild land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?				X
Commission staff deems that the proposed 2013 Standards will have no potentially significant effects on hazards and hazardous materials.				
IX. **HYDROLOGY AND WATER QUALITY** -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?				X
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner,				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
which would result in substantial erosion or siltation on- or off-site?				
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?				X
f) Otherwise substantially degrade water quality?				X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
j) Inundation by seiche, tsunami, or mudflow?				X
Commission staff has determined that the proposed 2013 Standards may reduce the amount of water used and thus will have no impacts on hydrology and water quality.				
X. **LAND USE AND PLANNING** -- Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on land use and planning.				
XI. **MINERAL RESOURCES** -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X
Commission staff has determined that the proposed 2013 Standards will have less than significant impacts on mineral resources.				
XII. **NATURAL RESOURCES** -- Would the project result in:				
a) Significant increase in the rate of use of any natural resources?			X	
b) Significant depletion of any non-renewable natural resource?				X
Commission staff has determined that the proposed 2013 Standards will have less than significant impacts on natural resources.				
XIII. **NOISE** -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive ground borne vibration or				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
ground borne noise levels?				
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X
Commission staff has determined that the proposed 2013 Standards will have insignificant impacts on noise.				
XIV. **POPULATION AND HOUSING** -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on population and housing.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
XV. **PUBLIC SERVICES** -- Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				X
Fire protection?				X
Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on public services.				
XVI. **RECREATION** -- Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on recreation.				
XVII. **TRANSPORTATION AND TRAFFIC** -- Would the project:				
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				X
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on transportation and traffic.				
XVIII. **UTILITIES AND SERVICE SYSTEMS** -- Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental benefits?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
construction of which could cause significant environmental benefits?				
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the providers' existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X
Commission staff has determined that the proposed 2013 Standards will have no impacts on utilities and service systems.				
XIX. **MANDATORY FINDINGS OF SIGNIFICANCE**				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X
c) Does the project have environmental benefits that will cause substantial adverse effects on human beings, either directly or indirectly?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
Improvements in the energy efficiency of residential and nonresidential buildings will have less than significant impacts to the concerns listed in this matrix. The 2013 Building Standards may result in **reduced** power plant operation and **reduced** natural gas consumption in California and the Western States with associated potential reductions in emissions. Staff has considered the effects on materials use, and other issues and deemed them to be insignificant.				

DETERMINATION:
On the basis of this evaluation:

X	I find that the proposed project WILL NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
	I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
	I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
	I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Robert P. Oglesby Date
Executive Director
California Energy Commission