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CALIFORNIA ENERGY COMMISSION

STAFF REPORT

for the 2008 BUILDING ENERGY EFFICIENCY STANDARDS

FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

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ABSTRACT

Public Resources Code Section 25402 and 25402.1 enabled establishment of the State Energy Resources Conservation and Development Commission (Energy Commission), and its mandates. Among the mandates is the development of the California's Building Energy Efficiency Standards (Energy Standards) which apply to residential and nonresidential buildings, and outdoor lighting. Measures include mandatory and minimal performance requirements for building envelop, lighting, mechanical systems, and outdoor lighting.

As the lead public agency the Energy Commission under the California Environmental Quality Act ("CEQA") Public Resources Code Sections 21000, et seq. required to identify and consider the potential environmental effects of their "projects," as that term is defined, and when feasible to mitigate any related adverse environmental consequences. The Energy Commission has prepared this Initial Study to assess the potential significant effects of the proposed Energy Standards on the environment. Findings of the Initial Study determined that no significant negative impacts will result, and in fact the implementation of the energy regulations will result in significant benefits to the environment.

The 2008 Energy Standards focus on several key areas to improve the energy efficiency of new buildings, additions and alterations. The most significant efficiency improvements to the residential building sector are proposed for windows and roof systems. A requirement for mechanical ventilation in new homes is also proposed. Efficiency improvements in insulation and lighting levels, as well as lighting and water heating controls, are proposed for the nonresidential standards. The 2008 Energy Standards also include expanded criteria for acceptance testing of mechanical and lighting systems.

Estimated energy savings to the state will be an annual reduction of electricity consumption by 549 gigawatt-hours per year (GWh/yr) and in electrical peak demand by 129 megawatts (MW). Natural gas consumption will be reduced by 18 million tons per years. The resulting net effects of these energy saving to air quality will be 118 tons of nitrogen oxide (NOx), 305 tons of sulfur dioxide (SOx), and 11 tons of particulate matter (PM_{10}).

KEYWORDS

Public Resources Code Section 25402, State Energy Resources Conservation and Development Commission, Energy Commission, Building Energy Efficiency Regulations, Energy Regulations, California Environmental Quality.

EXECUTIVE SUMMARY

Public Resources Code Sections 25402 and 25402.1 were enacted in 1974 as part of the enabling legislation establishing the Energy Commission and its basic mandates. These sections require the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings. Assembly Bill 32 (Nuñez, Chapter 488, Statutes of 2006), the Global Warming Solutions Act of 2006, mandated that California must reduce its greenhouse gas emissions to 2000 levels by 2010 and to 1990 levels by 2020. Increasing the stringency of the Building Energy Efficiency Standards has been identified as an early response to this climate change policy directive.

In response to these mandates, the 2008 Standards focus on several key areas to improve the energy efficiency of new buildings. The most significant efficiency improvements to the 2008 Standards for residential buildings are proposed for windows and cool roofs. Other changes include a requirement for mechanical ventilation in new homes. Proposed efficiency improvements for nonresidential buildings include increases in insulation requirements, extending skylight requirements to smaller buildings, and adding requirements for central water heating systems. The 2008 Standards also include expanded criteria for acceptance testing of mechanical and lighting systems.

For nonresidential buildings with energy management systems (EMS), a new requirement is proposed to ensure that the EMS is capable of issuing a global setpoint adjustment. This will enable automatic demand response in new large commercial buildings.

In addition to the measures outlined above, the 2008 Building Energy Efficiency Standards include substantial changes intended to clarify or expand existing requirements for building energy efficiency for residential buildings and nonresidential buildings and add requirements for refrigerated warehouses. The 2008 Standards are available on the Energy Commission's website at: [http://www.energy.ca.gov/2007publications/CEC-400-2007-017/CEC-400-2007-017-45DAY.PDF].

In response to AB 32, the Energy Commission has quantified the greenhouse gas emission reductions expected as a result of the 2008 Standards. The annual reduction in carbon dioxide gas is estimated at 396 thousand tons per year, every year.

A. Changes That Apply to All Building Types Covered by the Standards

A summary of the changes included in the 2008 Standards that apply to all building types is listed below and are described more fully in Chapter 4 of this report.

Scope and Definition Changes: (§100-101) A number of changes were made to clarify scope of the Standards as they pertain to buildings covered, including the Historic Building Exception, Mixed Occupancy, and Floors and Habitable Stories.

Modified Time Dependent Valuation (TDV): (§102) These values were updated to reflect the most recent electricity, natural gas, and propane prices.

Appliance Efficiency: (§112, Table 112-A) Changed the minimum efficiency values for air conditioner, heat pumps, packaged terminal air conditioners, and heat rejection equipment.

Added Requirements for Water Heating Recirculation Loops Serving Multiple Dwelling Units, High-Rise Residential, and Hotel/Motel Occupancies: (§113(c)5) Added requirements to assure proper installation and include features to allow for optimized performance and reasonable access if performance problems occur.

Fenestration Acceptance Requirements: (§116) Established new acceptance requirements to ensure site-built fenestration meets Standards requirements; included new default U-factor and Solar Heat Gain Coefficients.

Insulation and Cool Roof Material Requirements: (§118) Edited to require aged values for solar reflectance as they become available through Cool Roof Rating Council (CRRC) testing. Specified default reflectance and emittance for products that do not have CRRC certification. Added Solar Reflectance Index (SRI) as an alternative to meeting separate thermal emittance and solar reflectance requirements.

Lighting Controls: (§118) Added the requirements for a variety of lighting controls, including, indicator lights, automatic time switch control, occupancy sensors, daylighting controls, dimmers, and astronomical time clocks.

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

Nonresidential buildings will have changes in control requirements for mechanical systems, and demand control ventilation requirements will be redefined. Building envelope insulation requirements will be increased. Skylight requirements have been expanded to include smaller buildings and daylighting and lighting control requirements will be modified. A limited number of occupancy types will have revisions to their allowable lighting wattage. The prescriptive cool roof requirements will be expanded to include steep slope, and the specification used to define the requirement for cool roof performance will be changed to use an aged value.

List of Standards Changes for Nonresidential Buildings – New Construction

Demand Control Ventilation: (§121(c) 3) Added Demand Control Ventilation requirements for multizone systems with Direct Digital Controls (DDC).

Automatic Demand Shed Controls: (§122(h)) Added requirements for automatic demand shed controls for remote adjustment of set points for direct digital control systems in buildings equipped with energy management control systems.

Refrigerated Warehouses: (§126) Established requirements for the building shell insulation levels, evaporator fan controls, condenser fan power and control strategies, compressor plant controls, and interior lighting levels for refrigerated warehouses.

Cool Roofs: (§143(a)) Eliminated requirement that nonresidential buildings with low-slope roofs have cool roofs in Climate Zones 1 and 16 and added exception for the cool roof requirements for nonresidential buildings in Climate Zones 3 and 5.

Overall Envelope Calculation: (§ 143(b)) Revised to improve the prescriptive method for making envelope tradeoffs by combining heat loss and heat gain into a single tradeoff equation based on annual TDV energy of space cooling and heating resulting from the envelope characteristics.

Skylight Requirements: (§ 143(c)) Expanded scope of the requirements to include buildings over 8,000 square feet.

Mechanical System Requirements: (§144(d)) Changed to clarify and include hydronic heat pump systems, variable air volume for single zone systems, and Economizer tradeoffs.

Indoor Lighting: (§146) A significant number of changes were made to indoor lighting requirements associated with the calculation of lighting power densities, control requirements, and changes to how the whole building area and tailored method are calculated.

List of Changes for Nonresidential Additions, Alterations, and Repairs

Alterations and Additions: (§149) Edited the requirements for alterations to include new requirements for adding fenestration area, and clarified the application of the general requirements of the Standards to alterations. Added cool roof requirements that apply to roof replacement alterations.

C. Changes to Outdoor Lighting

The requirements for outdoor lighting underwent significant restructuring to clarify the requirements. The general site allowances now apply only to hardscape applications. Lighting power densities were lowered for most applications as a result of using pulse start metal halide, consistent with recent changes in Title 20 for metal halide luminaire regulations, rather than the less efficient probe start metal halide lighting technology that was used in the 2005 Standards. Also, security lighting power allowances were limited to be consistent with a variety of Illuminating Engineering Society of North America design guidelines. Outdoor lighting control strategies have been added to the requirement of acceptance testing of those controls.

D. Changes to Standards for Low-Rise Residential Buildings

The prescriptive package requirements for residential buildings will include more stringent requirements for window thermal conductivity in all climate zones as well as higher solar reflectance in some climate zones, pipe insulation to kitchens will be expanded, and new requirements have been introduced for piping installed below grade. A summarized list of all the residential measures follows. Expanded descriptions can be found in Chapter 4 of this report.

List of Standards Changes for Low-Rise Residential Buildings – New Construction

Minimum Insulation: (§150(c)) Added a provision that roofs and floors of bay windows must meet the wall insulation requirements of Package D to clarify that those components need not meet the higher insulation requirements for roofs and floors in the Standards.

Residential Lighting: (§150(k)) Added requirements for residential lighting related to luminaries wattage, night lights, kitchen lighting internal to cabinets, and recessed luminaries.

Minimum Outside Air: (§150(o)) Added a new requirement that all dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2004 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings and stipulated that window operation is not a permissible method of meeting that Standard.

Swimming Pools: (§150(p)) Added reference to clarify that residential pools must comply with the requirements in §114 and added requirements for pump sizing, plumbing design, and demand response shutoff controls.

Fenestration Efficiency Levels: (§151(f)3) Changed the fenestration U-factors and Solar Heat Gain Coefficients (SHGCs) in the Component Packages in Tables 151-B and 151-C to require more efficient windows.

Prescriptive Packages: (§151) Created a new prescriptive package based on metal-framed fenestration in Table 151-D (Component Package E).

Prescriptive Packages: (§151) Added exception so that small amounts of glass in doors and tubular skylights need not meet the prescriptive fenestration requirements (§151(f) 3A).

Prescriptive Packages: (§151) Changed the prescriptive requirements related to refrigerant charge, airflow, and fan watt draw for low-rise residential air conditioners and heat pumps (§151(f) 7).

Prescriptive Packages: (§151) Added requirements for residential buildings with low-slope or steep-slope roofs to have cool roofs in specific Climate Zones (§151(f) 11).

List of Changes for Low Rise Residential Additions, Alterations, and Repairs

Additions and Alterations: (§152) Edited to clarify the rules to improve compliance and enforcement of the Standards related to total fenestration area, and restriction associated with west-facing glass.

E. Energy and Emission Effects of Changes

This initial study concludes that the 2008 Standards will not have a significant negative effect on the environment, and provides the basis for that conclusion. No mitigation measures are therefore being proposed.

The expected overall consequences of implementing these standards will be positive for the environment. Staff has estimated a reduction in statewide annual electricity consumption by 549 gigawatt-hours per year (GWh/yr) and in electrical peak demand by 129 megawatts (MW). Natural gas consumption will be reduced by 18 million therms per year. The resulting net effects of these energy savings to air quality are a net reduction in emissions of 118 tons of nitrogen oxide (NOx), 305 tons of sulfur dioxide (SOx), and 11 tons of particulate matter (PM_{10}).

Table 1[1] Lists Each Sector And The Estimated Related Energy And Emission Savings.

Table 1

Total Energy and Emission Impacts of the 2008 Energy Efficiency Standards

		GWhr /yr	millions therms/ yr.	NOx - tons/ yr.	SOx- tons/ yr.	CO - tons/ yr	CO_2- tons./yr .	PM_{10} - tons/ yr	MW
Residential Total New		85	6	35	61	19	83,835	4	30
Nonresidential Total New		151	3	17	75	19	93,114	1	48
Outdoor Lighting		22	0	na	na	na	na	na	0
Refrigerated Warehouses		3	0	na	na	na	na	na	0
Residential Alterations		17	1	7	13	4	17,171	1	6
Nonresidential Alterations		271	8	59	156	43	202,400	5	45
Statewide		549	18	118	305	85	396,520	11	129
na - Emissions for refrigerated warehouses and outdoor lighting are included in new construction values.									

The values listed in Table 1 are the total impacts from the 2008 Standards. They include the potential emission impacts for all reductions in natural gas and electricity use that will occur as a result of the Standards. While the impacts of natural gas use are confined to California and are addressed in detail by air basin in Chapter 7 of this report, the impacts to electricity are associated with generation throughout the western states. California obtains 22 to 32[2] percent of its electricity from other western states.

[1] Values reference in this report and listed on Table 1 where taken from the *2008 Impact Analysis Report* prepared by Architectural Energy Corporation, see reference.
[2] Values obtained from Energy Commission report "*Revised Methodology to estimate the generation resources mix of California Electricity imports*" Publication number 700-2007-007, March 2007.

That electricity is generated by a combination of sources including gas and coal powerplants as well as hydroelectric and nuclear systems. For out of state generation, the Standards will reduce the need for increased generation but will not reduce the operation of these powerplants. Instead, the 2008 Standards will limit the need for new generation facilities, or more importantly, the operation of less efficient powerplants in the state. The emission reduction impacts due to electricity savings by the 2008 Standards account for only that portion supplied by California powerplants. Table 2 includes the estimated values for in-state emission reductions from the 2008 Standards.

Table 2

Emission Reduction Impacts Resulting from the 2008 Energy Efficiency Standards within California

		NOx - tons/yr.	SOx- tons/yr.	CO - tons/yr	CO_2- tons./yr.	PM_{10} - tons/yr
Residential Total New		34	53	17	73,519	3
Nonresidential Total New		14	60	15	74,732	1
Outdoor Lighting		na	na	na	na	na
Refrigerated Warehouses		na	na	na	na	na
Residential Alterations		7	11	3	15,058	1
Nonresidential Alterations		55	129	37	169,508	5
Statewide		110	253	72	332,817	10
na - Emissions for refrigerated warehouses and outdoor lighting are included in new construction values.						

One of the most significant air emission benefits from the standards is the reduction in carbon dioxide (CO_2). While CO_2 is not considered a criteria pollutant, it is a significant contributor to global warming. The benefits that 2008 Standards will have in reducing this greenhouse gas are important to California.

F. Staff Conclusions

Energy Commission staff have completed an analysis of the environmental impacts of the proposed 2008 Building Energy Efficiency Standards for residential and nonresidential buildings and outdoor lighting. Issues of air emissions, noise, volatile organic compounds, and materials use were considered. Staff found no significant impacts associated with any of issues noted above. A detailed description of all impacts is included in Chapter 4 of this report. Therefore, staff recommends adoption of a Negative Declaration.

CHAPTER 1: Project History, Description, and Environmental Setting

A. History of the Standards

In 1974, the Legislature enacted statutes creating the Energy Commission and requiring it to, among other things, adopt energy efficiency standards for buildings. The standards must be cost effective based on the life-cycle of the building, must include performance and prescriptive compliance approaches. The Energy Commission has adopted and periodically updated energy efficiency standards (codified in Title 24, Part 6 of the California Code of Regulations) to ensure that building construction and system design and installation achieve energy efficiency while preserving outdoor and indoor environmental quality. These standards establish a minimum level of building energy efficiency. A building can be designed to a higher efficiency level, resulting in additional energy savings.

The energy efficiency standards are aimed at the major building components that affect energy use in newly constructed residential and nonresidential buildings, additions and alterations to existing buildings: lighting, water heating, and space conditioning systems, and the building envelope. These standards are fundamentally performance standards requiring buildings to meet allowable energy budgets and providing flexibility in selecting features. The standards also include prescriptive alternatives and some mandatory requirements. Compliance with energy standards must be demonstrated to the enforcement agency, usually a city or county Building Department, before final approval.

The Energy Commission must amend the Building Standards periodically to account for improvements in energy efficiency technologies, changes in the cost of fuels and energy-conserving strategies, improved building science research findings, and better understanding of California building energy performance. The Energy Commission generally makes such amendments every three years. The Energy Commission must determine that the standards and any changes thereto are cost-effective before adoption.

B. Environmental Setting: Reasons for This Project

Approximately one-third[3] of the energy consumed in California is consumed by its buildings. The energy consumed is both natural gas and electricity. Every year, hundreds of thousands of

[3] Staff estimate obtained from Commission's Energy Forecast data.

buildings are newly constructed, added on to, or remodeled that add to this energy use. All of this new construction provides an important opportunity to require significant energy efficiency strategies, many of which cannot be as effectively realized on a retrofit basis. The energy efficiency standards adopted by the Energy Commission provide a performance-based approach to making buildings much more energy efficient than they would be were there no such standards.

The energy standards make buildings more efficient, and thus result in reduced consumption of both natural gas and electricity. Such reductions in turn result in lower emissions from natural gas combustion and lower emissions from the generation of electricity that powers our buildings. For this reason, this project to update the energy efficiency standards to require greater efficiencies will reduce air pollutants that harm public health. Because the project will reduce fuel consumption, it will also reduce carbon dioxide emissions that contribute directly to global warming. One project goal is to reduce "peak" period electricity use. Since "peak" electricity use is typically met in part through operation of less efficient powerplants or even backup diesel generators, reduction in electricity peak loads will have an even greater salutary effect on air quality. Lower peak electricity use also dramatically lowers the costs associated with electricity use.

C. Proposed Project

The objective of the energy efficiency standards is to increase the efficiency of natural gas and electricity used in newly constructed buildings and additions and alterations to existing buildings and to create comfortable, healthy, and well-lit buildings using cost-effective measures.

Starting with a list of possible changes carried over from the 2005 Standards proceedings, and with input from numerous outside stakeholders, Energy Commission staff identified a number of measures for consideration as changes to Title 24, Part 6, for 2008. After review and analysis and with assistance from outside energy consultants, Energy Commission staff proposes the specific changes listed in Chapter 4 of this report.

Implementation of Title 24, Part 6 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 energy use simulation and life cycle cost analysis.

FIGURE 1 – California Climate Zone Map

D. Method

This initial study started with an energy use analysis and cost-effectiveness analysis for the proposed new Standards. Energy Commission subcontractors completed computer modeling with energy use software, called MICROPAS for the residential sector and DOE 2.2 for the nonresidential sector. The subcontractors modeled energy use for the standard design (based on the 2005 Standards) and a series of sample proposed buildings (based on the 2008 Standards).

Energy use was calculated based on Time Dependent Valuation (TDV), which assigns multipliers to the energy use for each hour of the year to account for the differential value of saving energy at different times of the day and seasons. The cost-effectiveness of individual measures was based on a life cycle cost analysis using the defined life expectancies for buildings: 30 years for residential buildings and 15 years for nonresidential. Each measure was also assigned a life expectancy and a cost. The final cost-effectiveness of a measure was based on the total cost of the measure versus the amount of savings for that measure over the life of the building. The environmental analysis used data generated in the energy analysis. These energy use data were converted into emissions values based on industry standard emission factor assumptions for site-specific appliances (furnaces and water heaters). Potential emissions reductions from generation sources were calculated separately. Beyond the emissions impacts, the environmental analysis considered specific impacts such as materials use, noise pollution, and lighting impacts that might result from the proposed standards changes. In addition, the environmental analysis looked at the emission impacts if the proposed standards were not adopted.

E. Organization of the Standards

The Building Energy Efficiency Standards are organized into three basic components: mandatory features, prescriptive package requirements, and performance compliance guidelines. Mandatory features are, as the name suggests, required unless a specific exception exists. The prescriptive package requirements are a list of energy features that comprise a "prescription" for how to construct a building following the precise "prescription" results in a building that complies. In the third component of the standards, Performance Compliance, the prescriptive requirements are used to create a "standard design" building model within the software program to determine the energy budget for a proposed building; a number of modeling assumptions, including weather data, are built into the software and are applied to both the proposed building and the standard design case.

Another element related to building energy efficiency 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 new buildings. Appliance standards are referenced in the building standards for California as appropriate.

CHAPTER 2: List of Agencies That Will Use the Environmental Impact Report in Decisions or Comments

The intended use of this initial study is as follows: the California Energy Commission is the lead agency on this and any rulemaking regarding the California Building Energy Efficiency Standards. The Energy Commission will use this document in its public process as part of the documentation package used in the standards approval process. The Energy Commission will solicit public comment on this initial study and may make appropriate modifications to the proposed standards to respond. The Energy Commission expects to consider adoption of the 2008 Standards by January 2008, with implementation by April 2009. Following the adoption, the Standards must be reviewed and approved by the California Building Standards Commission, who will have access to this Environmental Impact Report and all other documents related to the rulemaking.

CHAPTER 3: List of Permits and Other Approvals Required To Implement the Project

No permits are needed for this project. The California Energy Commission and the California Building Standards Commission are the only agencies that must approve changes to Title 24, Part 6 of the California Code of Regulations.

CHAPTER 4: Descriptions of 2008 Proposed Changes to Building Energy Efficiency Standards

A. Standards Changes for All Building Types

The 2008 Standards include a significant number of changes in all sectors (residential, nonresidential and outdoor lighting). For the residential sector the major changes include increases in the efficiency requirements of fenestration and the introduction of a minimal outside air requirement. For the nonresidential sector the most significant changes are increases in opaque surface insulation levels, expanded application of skylights to smaller buildings, and significant changes to requirements related to lighting and daylighting controls. In addition, the nonresidential standards now have requirements for refrigerated warehouses. Both the residential and nonresidential sectors include an expansion of the cool roof requirements, as well as clarification for the outdoor lighting requirements.

Descriptions of the all the significant changes follow (section numbers from the Standards are included). Note that many of the actual changes to the standards are clarifications or modifications of existing requirements. Any of the changes which had no environmental impact have been omitted and those changes which resulted in energy savings but no other impacts have been summarized or grouped together: An example of these is lighting controls which will use the same equipment, but will use different modes of operation or monitoring - which will ensure more energy savings.

Time Dependent Valuation: (TDV): (§102) A new set of TDV values has been developed for the 2008 Standards. The 2008 values are based upon updated information on electricity and natural gas supplies. These new values will more accurately map the demand and associated value of energy over each hour of the year. The specific purpose and rationale for this change is that it updates the regional energy costs in California, and it is necessary to meet an objective of the regulations, which is to minimize energy costs of new buildings.

Appliance Efficiency Changes: (§110-112) The minimal efficiency values for air conditioner, heat pumps, packaged terminal air conditioners, and heat rejection equipment in (§112, Table 112-A) have been updated to reflect ASHRAE 90.1 recommended values. The specific purpose and rationale for this change is that it ensures that the mechanical equipment efficiencies in the standards equal national codes, and it is necessary for consistency with federal regulations.

Added Requirements that Water Heating Recirculation Loops Serving Multiple Dwelling Units, High-Rise Residential and Hotel/Motel Occupancies: (§113) This action assures that central water heating systems will be properly installed and will include features to allow for optimized performance and reasonable access if performance problems occur. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of central water heating systems, and it is necessary to achieve cost-effective improvements in this area of the Standards.

Mandatory Requirements for Pool and Spa Systems and Equipment: (§114(b)) New requirements related to pool covers and the use of controls to reduce peak demand. The specific purpose and rationale for this change is that it clarifies the requirements for pool and spa energy use and demand response, and it is necessary to improve compliance with the regulations.

Fenestration Acceptance Requirements: (§116(a)5) Established new acceptance requirements to ensure site-built fenestration meets standards requirements, including requirements that a matching National Fenestration Rating Council (NFRC) Label Certificate for each product is installed and readily accessible at the project location. The specific purpose and rationale for this change is that it clarifies the requirements for fenestration acceptance testing, and it is necessary to improve compliance with the regulations.

Default Fenestration Product U-Factors and Solar Heat Gain Coefficients: (§116) Clarified language in Table 116-A and Table-B to add glass block, and notes that allowed for additional adjustments to the U-factors are removed to simplify use of the tables. The specific purpose and rationale for this change is that it updates and simplifies default fenestration default values, and it is necessary to improve compliance with the regulations.

Insulation and Roofing Products: (§118(i)) Edited to require aged values for solar reflectance as they become available through Cool Roof Rating Council (CRRC) testing. Specified default reflectance and emittance for products that do not have CRRC certification. Added Solar Reflectance Index (SRI) as an alternative to meeting separate thermal emittance and solar reflectance requirements. The specific purpose and rationale for this change is that it clarifies the cool roof requirements of the Standards, and it is necessary to improve compliance with the regulations.

B. Standards Changes for Nonresidential Buildings

Mandatory Requirements

Mandatory Requirements for Lighting Controls: (§119) Edited to include requirements for ballasts and luminaires, and to reorganize and renumber sub sections. Edited for clarity, includes modifications for automatic time switch controls, occupancy sensors, multi-level occupant sensors, automatic daylighting controls, multi level daylighting and astronomical time switch controls, dimmers and track light controls. The modification also included changes to sections in 119 that apply to high efficacy light emitting diodes (LED) lighting systems, and fluorescent ballasts. All of these changes were included to clarify the Standards and to update the sections where additional energy savings could be obtained cost effectively.

Operation and Control Requirements for Minimum Quantities of Outdoor Air: (§121(c) 3) Added Demand Control Ventilation requirements for multizone systems with Direct Digital Controls (DDC). Excepted call centers from these requirements. The specific purpose and rationale for this change is that it reduced the energy consumption in buildings with

multizone systems, and it is necessary to include all cost-effective energy efficient technologies in the Standards.

Demand Control Ventilation (DCV) Devices: (§121(c) 4) Edited to specify the DCV maximum coverage area and the height of the sensor in the space. The specific purpose and rationale for this change is that it specifies the criteria for installing DCV devices, and it is necessary to ensure adequate indoor air quality while reducing ventilation energy usage.

Automatic Demand Shed Controls: (§122(h)) Added requirements for automatic demand shed controls for remote adjustment of set points for direct digital control systems in buildings equipped with energy management control systems. This is a requirement for the software within the energy management control system. The specific purpose and rationale for this change is that it enables buildings to respond to peak demand events by reducing mechanical equipment usage, and it is necessary to reduce the societal costs of energy use during peak periods.

California Mechanical Code Compliance: (§124(a)) Clarified that ducts buried in concrete slab shall be insulated to a minimum installed level of R-4.2. The specific purpose and rationale for this change is that it clarifies the criteria for duct insulation in slabs, and it is necessary to improve compliance with the regulations.

Mandatory Requirements for Refrigerated Warehouses: (§126) Added to establish requirements for the building shell insulation levels, evaporator fan controls, condenser fan power and control strategies, compressor plant controls and interior lighting levels for refrigerated warehouses. The specific purpose and rationale for this change is that it increases the energy efficiency requirements for refrigerated warehouses, and it is necessary to minimize the energy costs of these buildings.

Indoor Lighting in High-Rise Residential Dwelling Units: (§130(b)) Removed EXCEPTION, which allowed up to 10 percent of the guest rooms in a hotel/motel to not comply. The specific purpose and rationale for this change is that it removes an exception to the indoor lighting efficiency requirements for high-rise residential buildings, and it is necessary to minimize the energy costs of these buildings.

Outdoor Lighting High Rise Residential Dwelling Units and Hotel/Motel Guest Rooms: (§130(c)) Added requirement for outdoor lighting on High-rise Residential Dwelling Units and Hotel/Motel Guest Rooms, which is permanently attached to the building and is separately controlled from the inside of the building, to comply with §150(k)13. The specific purpose and rationale for this change is that it specifies the requirements of outdoor lighting for high-rise residential buildings, and it is necessary to minimize the energy costs of these buildings.

Luminaire Power for Line Voltage Lamp Holders: (§130(d)1) Expanded scope from addressing only medium screw-base sockets to addressing all line-voltage sockets; established additional labeling requirement; established wattage caps for recessed luminaries; established method for luminaries allowing conversion between screw-based and pin-based sockets without changing the luminaries housing or wiring. The specific purpose and rationale for this

change is that it specifies luminaire power requirements for line voltage lamp holders, and it is necessary to minimize the energy costs of these lighting components.

Luminaire Power for Ballasts: (§130(d) 2) Established method for determining wattage for specific luminaries that accommodates a range of wattages. The specific purpose and rationale for this change is that it provides useful information for determining luminaire wattage, and it is necessary to improve compliance with the regulations.

Luminaire Power for Line-Voltage Track: (§130(d) 3) Established additional methods for determining luminaire power for line-voltage tracks. The specific purpose and rationale for this change is that it provides useful information for determining luminaire wattage, and it is necessary to improve compliance with the regulations.

Luminaire Power for Transformers: (§130(d) 4) Established additional methods for determining luminaire power for luminaires with transformers. The specific purpose and rationale for this change is that it provides useful information for determining luminaire wattage, and it is necessary to improve compliance with the regulations.

Luminaire Power for Light Emitting Diode (LED) Lighting: (§130(d) 5) Established methods for determining luminaire power for LED lighting systems. The specific purpose and rationale for this change is that it provides useful information for determining luminaire wattage, and it is necessary to improve compliance with the regulations.

Luminaire Power for Miscellaneous Lighting: (§130(d) 6) Added requirement for pre-printed factory installed label. The specific purpose and rationale for this change is that it ensures lighting power information is available for miscellaneous lighting products, and it is necessary to improve compliance with the regulations.

GU-24 Socket, Lamps and Adapters: (§130(e)) Added requirements for lamps, luminaires, and adaptors utilizing GU-24 sockets. This change is also necessary to ensure that only high efficacy GU-24 products are installed in California. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Area Lighting Controls: (§131(a)) Reduced the exception in any area within a building that must be continuously illuminated from 0.5 to 0.3 watts per square foot. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Shut-off Controls: (§131(d)) Reduced the exception in any area within a building that must be continuously illuminated from 0.5 to 0.3 watts per square foot; added requirement for offices less than or equal to 250 square feet, multipurpose rooms less than 1000 square feet, and classrooms and conference rooms of any size to be equipped with occupant sensors. The specific purpose and rationale for this change is that it increases the lighting shut-off control requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Automatic Controls Required for Tailored Method: (§131(f)) Added requirement for general lighting to be controlled separately from display, ornamental, and display case lighting.

The specific purpose and rationale for this change is that it improves the automatic control requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Demand Responsive Lighting Controls: (§131(g)) Added requirement that demand responsive automatic lighting controls to reduce lighting power by minimum 15 percent be installed in retail buildings with sales floor areas greater than 50,000 square feet. The specific purpose and rationale for this change is that it enables new buildings to respond to peak demand events by reducing lighting usage, and it is necessary to reduce the societal costs of energy use during peak periods.

Sign Lighting Controls: (§133) Added new requirements for the application of automatic time switch controls, photo controls, outdoor astronomical time switch controls, dimming controls, and demand responsive electronic message center controls. The specific purpose and rationale for this change is that it increases the lighting shut-off control requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Lighting Control Acceptance: (§134) Added new requirements for lighting control acceptance for outdoor lighting controls. The specific purpose and rationale for this change is that it clarifies the requirements for lighting control acceptance testing, and it is necessary to improve compliance with the regulations.

Nonresidential Prescriptive Standards

Envelope Component Approach: (§143(a)) Eliminated requirement that nonresidential buildings with low-slope roofs have cool roofs in Climate Zone 1 and added exception for the cool roof requirements for nonresidential buildings in Climate Zones 3 and 5. Added requirement that nonresidential buildings with steep-slope roofs have cool roofs in specified Climate Zones. The cool roof requirements for steep-slope roofs depend on the roofing material unit weight per square foot. Also increased the prescriptive insulation requirements for nonresidential and high-rise residential buildings, which are contained in Tables 143-A, 143-B, and 143-C as specified by climate zone and building material. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the building envelope, and it is necessary to minimize the energy costs of nonresidential buildings.

Overall Envelope Approach: (§ 143 (b)) Revised to improve the prescriptive method for making envelope tradeoffs by combining heat loss and heat gain into a single tradeoff equation based on annual TDV energy of space cooling and heating resulting from the envelope characteristics. The specific purpose and rationale for this change is that it improves the methods used to comply with the prescriptive approach in the standards, and it is necessary to promulgate effective regulations.

Minimum Skylight Area: (§ 143(c)) Expanded scope of the requirements, for skylights in spaces with ceiling heights greater than 15 feet when ceiling plan not provided and general lighting power density greater than 0.5 watts per square foot, to apply to spaces greater than 8,000 square feet (current Standards requirements are for spaces greater than 25,000 square feet). Replaced Table 143-F with a single minimum skylight area to skylit area ratio of at least

3.3 percent or minimum skylight effective aperture of at least 1.1 percent. Added exception for churches. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the Standards, and it is necessary to minimize the energy costs of buildings.

Hydronic Heat Pump (WLHP) Controls: (§144(j)7) This new section sets forth the requirements for hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition. The specific purpose and rationale for this change is that it specifies the criteria for hydronic systems, and it is necessary to promulgate effective regulations.

Variable Air Volume Control for Single Zone Systems: (§144(l)) Added requirement that effective January 1, 2012, all unitary air conditioning equipment and air-handling units with mechanical cooling capacity at ARI conditions greater than or equal to 110,000 Btu/hr that serve single zones shall be designed for variable supply air volume with their supply fans controlled by two-speed motors, variable speed drives, or other equipment. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of single zone systems, and it is necessary to minimize the energy costs of these systems.

Economizer Tradeoff Table for Electrically Operated Unitary Air Conditioners: (§144 - Table 144-A) Energy Efficiency Ratio (EER) requirement for 2010 changed by increasing the tradeoff EER by the same percentage that the minimum efficiency is increased in ASHRAE 90.1 Addendum G. The specific purpose and rationale for this change is that it ensures that the mechanical equipment efficiencies equal ASHRAE 90.1.

Multiple Interlocked Lighting Systems: (§146(a) 1) Changed to restrict the provision that excludes from consideration any spaces other than the space with the highest wattage when a multiple interlocked lighting system is installed in specified types of spaces. Added the requirement that to qualify for this exclusion, requires lighting systems to be interlocked with a non-programmable double throw switch. Removed the option for systems controlled by a preset dimming system to qualify for the exclusion. The specific purpose and rationale for this change is that it clarifies the criteria for determining an exception to the standards, and it is necessary to improve compliance with the regulations.

Reduction of Wattage through Controls: (§146(a) 2) Changed the percentage of power that the first stage of a multi-level occupancy sensor must be activated. Established Power Adjustment Factors for daylighting controls for primary sidelight, secondary sidelight, and skylight daylight areas, and changed the equation for calculating the effective aperture for skylights and added new equations for calculating the effective aperture for primary and secondary sidelight areas. Deleted Figure 146-A, Well Efficiency Nomograph, and replaced it with Tables 146-A and 146-B. The specific purpose and rationale for this change is that it improves the methods used to comply with the prescriptive approach in the standards, and it is necessary to promulgate effective regulations.

Lighting Wattage Excluded: (§146(a) 3) Required specific separate lighting controls for some exceptions. Added a separate exception for lighting in a video conferencing studio. Added exceptions for theatrical lighting used for religious worship and for lighting for automatic teller

machines that are located inside parking garages. The specific purpose and rationale for this change is that it clarifies the criteria for determining an exception to the lighting wattage requirements, and it is necessary to improve compliance with the regulations.

Lighting Power Adjustment Factors: (Table 146-C) Added a condition that to qualify for the Power Adjustment Factors, all dimming ballasts for linear fluorescent lamps shall be electronic and certified to the Energy Commission with a minimum Relative System Efficiency in accordance with Table 146-D. Changed the power adjustment factors for daylighting controls credits to be consistent with the new definitions of daylighting areas. The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Relative System Efficiency Table: (Table 146-D) Added to establish relative system efficacy requirements for dimmable electronic ballasts to qualify for the power adjustment factor in Table 146-C. The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Area Category Method - Lighting Power Density Values: (Table 146-F) Added Primary Function Areas to include refrigerated commercial and industrial storage, telephone rooms, scientific laboratories, offices greater than 250 square feet, parking areas, and parking ramps and entries. Reduced the allowed lighting power for specific Primary Function Areas. The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Tailored Method Special Lighting Power Allowances: (Table 146-G) Made changes to specific illumination categories, wall display power, allowed floor display power, and ornamental/special effects lighting. Eliminated allowances from the table for very valuable display power, which are covered by new provisions in §146(c). The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Adjustments for Mounting Height above Floor: (Table 146-H) Changed the adjustments to allowed power allowances due to luminaire mounting heights. Established separate columns for floor display and wall display adjustments. The specific purpose and rationale for this change is that it provides consistency with various sections of the standards, and it is necessary to promulgate effective regulations.

Additional Lighting Power Allowance for Specific Applications: (Table 147-B) Restructured as follows: For specified applications established a wattage allowance per application, a wattage allowance per unit length, a wattage allowance per hardscape area, a wattage allowance per specific area; and a special security lighting allowance for retail parking and pedestrian hardscape. In developing these restructured allowances, the overall allowed lighting power allowance have been slightly reduced compared to the 2005 Standards. The specific purpose and rationale for this change is that it updates the outdoor lighting requirements of the standards, and it is necessary to minimize the energy costs of outdoor lighting.

Requirements for Signs: (§148) Changed to add minimum efficacies to specific alternative lighting sources. The specific purpose and rationale for this change is that it updates the outdoor lighting requirements of the standards, and it is necessary to minimize the energy costs of outdoor lighting.

Additions, Alterations and Repairs

Alterations: (§149(b) 1B) Added cool roof requirements for altered roofs, including emittance and reflectance or alternatively SRI requirements for specific types of roofs. Added insulation requirements when roofs are altered with specific conditions. Clarified the Overall Envelope Approach option, which is available for altered roofs. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of altered buildings.

Standards Changes for Low-Rise Residential Buildings

Night Lights: (§150(k) 5) Added a requirement that permanently installed night lights and night lights integral to a permanently installed luminaire or exhaust fan must meet minimum efficacies or maximum power requirements. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Lighting Internal to Cabinets: (§150(k) 9) Added a provision that allots a specific, separate power allowance for illuminated cabinets. The specific purpose and rationale for this change is that it clarifies the criteria for cabinet lighting, and it is necessary to improve compliance with the regulations.

Recessed Luminaire in Insulated Ceilings: (§150(k) 12) Added requirements to guard against short ballast life by requiring manufacturer certification to comply with §119(n) and to require luminaires that make ballast maintenance and replacement to be readily accessible to building occupants from below the ceiling without requiring the cutting of holes in the ceiling. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Internally Illuminated Address Signs: (§150(k) 14) Added a requirement that internally illuminated address signs either comply with §148, or not contain a screw-base socket and consume no more than five watts of power. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of buildings.

Water Heating Recirculation Loops Serving Multiple Dwelling Units: (§150(n) Added reference to clarify that residential buildings with central water heating systems must comply with the requirements of § 113. The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Ventilation for Indoor Air Quality: (§150(o)) Added a new requirement that all dwelling units shall meet the requirements of ANSI/ASHRAE Standard 62.2-2004 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings and that window operation is not a permissible method of meeting that Standard. The specific purpose and rationale for this change is that mechanical ventilation is required to provide air change rates in homes at safe levels, and it is necessary because the scope of the standards includes the provision of adequate indoor air quality.

Pool Systems and Equipment Installation: (§150(p)) Added reference to clarify that residential pools must comply with the requirements in §114 and added requirements for pump sizing, and plumbing design. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of residential pool systems, and it is necessary to minimize the energy costs of buildings.

High Efficacy Luminaire Requirements: (Table 150-C) Added a separate efficacy requirement for luminaires that use 5 watts or less of power and established approaches for complying with this requirement for both LED and non-LED lighting. The specific purpose and rationale for this change is that it provides consistency with related sections of the standards, and it is necessary to promulgate effective regulations.

Fenestration: (§151(f) 3) Changed the fenestration U-factors and Solar Heat Gain Coefficients (SHGCs) in the Component Packages in Tables 151-B, and 151-C to require more efficient windows. Added reference to Table 151-D (Component Package E) to allow for a prescriptive option for the combination of less efficient windows and higher furnace or heat pump efficiency. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of residential building envelopes, and it is necessary to minimize the energy costs of residential buildings.

Fenestration: (Tables 151-B, 151-C, 151-D and Notes 8 and 9 to the Tables) Changed the fenestration U-factors and Solar Heat Gain Coefficients in the Component Packages in Tables 151-B and 151-C to require more efficient windows. Added Table 151-D (Component Package E) to allow for a prescriptive option for the combination of less efficient windows and higher furnace or heat pump efficiency. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of residential building envelopes, and it is necessary to minimize the energy costs of residential buildings.

Space Heating and Space Cooling: (§151(f) 7) Changed the prescriptive requirements related to refrigerant charge, airflow and fan watt draw for low-rise residential air conditioners and heat pumps: a) eliminated the existence of a thermostatic expansion valve as an alternative to the prescriptive standard for refrigerant charge verification, and provided a new alternative for equipment with a charge indicator display as specified; to facilitate refrigerant charge verification added the installation of temperature measurement access holes; b) added a prescriptive requirement for minimum airflow at 350 cfm per ton and a requirement for installation of a hole in the supply plenum for placement of a static pressure probe or a permanently installed static pressure probe; c) added a prescriptive requirement for maximum watt draw as function of airflow (watt/cfm). The specific purpose and rationale for this change

is that it increases the energy efficiency requirements of residential heating and cooling equipment, and it is necessary to minimize the energy costs of residential buildings.

Roofing Products: (§151(f) 11) Added requirements for residential buildings with low-slope or steep-slope roofs to have cool roofs in specific Climate Zones. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the residential building envelope, and it is necessary to minimize the energy costs of residential buildings.

Multiple Heating Systems: (§151 (b) 3) Added a section to clarify performance compliance for multiple heating systems and supplemental heating systems in spaces served by a primary heating system and added an exception for a supplemental heating system smaller than a specified size that is controlled by a timer. The specific purpose and rationale for this change is that it clarifies the performance compliance approach for multiple heating systems, and it is necessary to improve compliance with the regulations.

Alterations - Prescriptive Approach: (§152(b) 1H) Added requirements for residential roofing alterations to meet the specific cool roof reflectance and emittance or SRI criteria. Provided alternatives which allowed the use of other measures, instead of meeting the cool roof requirement. The specific purpose and rationale for this change is that it increases the energy efficiency requirements of the standards, and it is necessary to minimize the energy costs of altered buildings.

Part 1, Chapter 10 Administrative Regulations Changes

All changes to the Administrative regulations were for clarification, or acceptability. None of the changes will have any measurable impact to the overall positive effect of the standards.

Changes to the Alternative Calculation Method Approval Manuals

The Residential and Nonresidential Alternative Calculation Method Approval (ACM) Manuals are adopted by regulation to support the Standards in Part 6. The ACM Manuals contain detailed requirements that developers of computer software must meet for the Energy Commission to approve their software for showing compliance with the standards. They also contain detailed information regarding compliance options, including specific calculation algorithms that have been approved for assessing the compliance credit or penalty due to installation of the compliance option.

The ACMs include information from the appendices that detail building material characteristics data, weather data, and other information necessary for completing calculations for showing compliance with the standards. The ACM Manuals are extensively revised to improve their clarity and organization and incorporate new efficiency measures initially introduced through compliance options, and improve the data needed for standards calculations. The ACMs also are revised to include more accurate modeling assumptions for attics, slab perimeter losses and water heating systems.

Residential Alternative Calculation Methods Approval Manual

Approved compliance software will be required to produce a revised Certificate of Compliance form (CF-1R). In addition, updated procedures and values for implementing Time Dependent Valuation (TDV) will be incorporated. A number of modeling algorithm and assumptions changes will be made, including new modeling rules for attics, slab perimeter losses, and water heating distribution systems. The modeling and compliance procedures for air conditioner refrigerant charge and air flow will be revised to match recent research findings on the energy consequences of these measures and to update air flow diagnostic testing protocols.

New compliance options will be established for evaporative cooling, evaporatively cooled condensers, and distributed ice energy storage systems. New procedures will be required and new accuracy tests will be established for computer compliance software to match changes in the standards, modeling algorithms, assumptions, and rules.

Nonresidential Alternative Calculation Methods Approval Manual

The Nonresidential ACM Manual will be substantially re-written and reorganized to improve clarity and accuracy. Procedures for implementing Time Dependent Valuation will be updated. All U-factors for building envelope assemblies will be required to be determined using extensive look-up tables in Joint Appendix IV. U-factors for unique assemblies that diverge from the table values will be required to be approved by the Energy Commission. In addition, compliance rules which reference the prescriptive package requirements to generate the energy budget will be updated.

New compliance options will be established for distributed ice energy storage systems and thermal energy storage. New procedures will be required and new accuracy tests will be established for computer compliance software to match changes in the standards, modeling algorithms, assumptions, and rules.

Section 2.3.6 of the Nonresidential ACM Manual has been amended to incorporate a more accurate method of calculating the heat flows through portions of the building envelope that are in direct contact with soil, such as slab floors on grade, basement walls, and basement floors.

The changes update the criteria in the ACMs to implement the 2008 Standard compliance requirements, and necessary to promulgate effective regulations.

Reference Appendices

In 2005, the Energy Commission adopted the Joint Appendices, which are used as a common reference for all Standards documents. For the 2008 Standards, this document has been reorganized into three sections under the general heading of Reference Appendices. The three sections are the Joint Appendices, Residential Appendices, and the Nonresidential Appendices. The 2005 Residential and Nonresidential ACM Manuals included many appendices that were not directly related to software certification; these appendices have now been transferred to the new Reference Appendices.

CHAPTER 5: Energy and Environmental Effects

Energy Commission staff evaluated each proposed change to the building energy efficiency standards for its energy and environmental effects. Many of the measures listed in the changes section above will not be discussed related to environmental impacts. Those measure omitted in the following sections have no impact other than energy savings. These changes either modified the mode of operation of existing equipment or changed in a manner that added no materials or other impacts. For example, lighting controls are already required under the 2005 Standards and the 2008 Standard amendments only clarify or adjust the use of these devices. Therefore, the following discussion includes the overall energy impacts of the standards for each sector, but discusses in detail only those measures that have other environmental impacts. Staff has estimated the cumulative effects of all the proposed changes taken together (Chapter 6 of this initial study), and as well, has reported below the energy and environmental effects of the proposed changes by sector: nonresidential, high-rise residential, and hotel/motel buildings; outdoor lighting, and low-rise residential buildings.

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

Energy Effects

The projected total annual savings from the nonresidential sector under the proposed 2008 Standards is about 11 million therms of natural gas, 447 GWh of electricity, and 93 MW of reduced demand. Table 3[4] shows the breakdown by sector.

Table 3

Nonresidential Energy Savings and Peak Demand Reduction

		GWhr/yr	millions therms/yr.	MW
Nonresidential Total New		151	3	48
Outdoor Lighting		22	0	0
Refrigerated Warehouses		3	0	0
Nonresidential Alterations		271	8	45
Nonresidential Total		447	11	93

[4] Values reference in this report and listed on Table 1 where taken from the 2008 Impact Analysis Report prepared by Architectural Energy Corporation.

Environmental Effects

Emissions. The annual reductions in emissions from implementing the 2008 nonresidential energy standards are estimated at 76 tons of NOx, 231 tons of SOx, 6 tons of PM_{10}, and 295 thousand tons of CO_2. The breakdown by sector and other emission are shown in Table 4.

Table 4

Nonresidential Air Emission Reductions

		NOx - tons/yr.	SOx- tons/yr.	CO - tons/yr	CO_2- tons./yr.	PM_{10} - tons/yr
Nonresidential New		17	75	19	93,114	1
Nonresidential Alterations		59	156	43	202,400	5
Refrigerated Warehouses		na	na	na	na	na
Outdoor Lighting		na	na	na	na	na
Nonresidential Total		76	231	62	295,514	6

na - Emissions for refrigerated warehouses and outdoor lighting where included in new construction values.

Other Environmental Effects by Measure

Cool roofs: The installation of a cool roof can have significant energy and comfort impacts. The surface of many traditional roofs can reach temperatures of 150-170 degrees F during a hot summer day. Cool roofs can lower the temperature by 50-60 degrees F, thus reducing the conduction of heat into a building and lowering the amount of air conditioning needed to remove that heat.

Two changes are being made to cool roofs in the 2008 Standards. The cooler climates of the mountains and north coast provided very limited savings and new cost data has demonstrated that cool roofs in these areas are not cost effective. Based on these findings the low slope cool roof requirement will be removed for climate zones 1 and 16. The other change is that for those climate zones with significant cooling loads, cool roofs will be required for steep sloped roofs.

Low slope cool roof coatings are available in several forms, and one example is liquid roof coatings. Two main types of liquid cool roof coatings are cementations and elastomeric. Cementacious coatings — as the name implies — contain cement particles. Elastomeric coatings have added polymers that make the coatings pliable and improve their adhesion. Some coatings contain both cement particles and polymers. Steep slope roofing comes in the form of composition roofing or tiles. Composition roofing is installed as either roll or singles. The material composition of either form used for cool roofs is identical to that used in standard

composition roofing. The only difference is the lighter color of the coating material. Tiles are available in metal or ceramic bases. As with the composition shingles the composition of the tile itself does not vary. The only variation is the lightness in color of the tile which reflects more light.

The net effect of the proposed 2008 Standards will result in a small decrease in the use of polymers and cement particles associated with low slope roofs. This position is based on the following analysis. Based on the estimated 180 million square feet per year of new construction that will be added, 22.5 million square feet of new roof area will be added (the average number of stories per building is eight). With the elimination of the low slope cool roof requirement in climate zones 1 and 16 which makes up 0.03 percent of the statewide building population an estimated reduction in reflective roof coat emission of volatile organic compounds (VOC) will be approximately 57 tons per year. The steep slope roofs will use a combination of composition roof or tiles to meet the requirement. Composition and tiles roof products that meet the cool roof requirements as noted earlier will have the same material composition as standard products. Therefore the estimated 3 million square feet of steep sloped roofing will have no effect on emissions.[5]

No other environmental impacts are expected as a result of the changes to the cool roof requirements.

Opaque Building Insulation: Wall and ceiling insulation thermal performance and insulation levels are increased by the 2008 Standards. For walls the majority of the change is associated with changing insulating practices. Installing a continuous layer of rigid insulation on the inside or outside of a wall rather than filling the cavity will result in a wall with a much higher thermal performance. This approach is particularly effective when used with metal framing which is the predominate framing type used for nonresidential buildings. The 2008 Standards include small changes to the amount of wall insulation required. Ceiling insulation requirement changes resulted in most climate zones having higher insulation requirements.

The annual increase in the amount of insulation due to this change in the standards is estimated at 2600 tons for nonresidential buildings. In comparison, approximately 102,410 tons of insulation is currently used each year for nonresidential buildings in California. Manufacturing the added insulation may add up to 129 tons of VOC nationally, compared to California's total emissions of VOC of 1.052 million tons. Based on these findings VOC emission may be increased by as much as 0.0122 percent if all of the insulation is manufactured in California.[6]

No other environmental impacts are expected as a result of the changes nonresidential building insulation requirements.

Skylights/vertical glazing: The 2008 Standards will mandate that under the prescriptive approach, nonresidential buildings of greater than 8,000 square feet and with ceilings 15 feet or

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[5] Data for comments based on Code Change Proposal, Inclusion of Solar Reflectance and Thermal Emittance Prescriptive Requirements for Steep-Sloped Nonresidential Roofs in Title 2.

[6] Values derived from Calculation based on information provided in Codes and Standards Enhancement Initiative Case Final Report Insulation Requirements. March 20, 2007.

higher must have at least one-half of the floor area illuminated with natural light from skylights or vertical glazing. In comparison the 2005 mandate applied to buildings of 25,000 square feet or more. Daylighting reduces the need for electrical lighting, and also since electrical lighting emits heat inside the building, the load on air conditioning equipment to remove that heat is lessened. Since nonresidential buildings are almost always cooling-load dominant, effects on heat loss from buildings are minimal.

Determining the environmental and materials effects of this measure is complicated and cannot be accomplished with precision. Determining the ratio of the square footage to the ceiling area is one area of significant uncertainty. A rough estimate based on an 8,000 square foot building with a ceiling height of 15 feet that meets the fifty percent daylighting requirement using only skylights, would require less than 100 square feet of additional glazing. In comparison based on current building practices the same building may have up to 3,200 square feet of vertical glazing, depending on the configuration of the building.[7] The additional glazing area required for daylighting is therefore deemed insignificant, compared to typical practice for vertical glazing in nonresidential buildings.

No other environmental impacts are expected as a result of the changes to skylight/vertical glazing requirements for daylighting.

Refrigerated Warehouses: Under the proposed 2008 Standards, the new energy requirements will be introduced for refrigerated warehouses. The new requirements will include measures associated with building shell insulation, evaporator fan controls, evaporative condensers, and compressor controls.

Based on current statistics, about 3,000 new units are built each year for use in California, typically 24 by 40 feet. The environmental impacts of the envelope insulation requirements will result in an addition of 4,700 tons of additional insulation per 3,000 units which will result in an increase of 236 tons of VOC emissions. Compared to California's total emissions of VOC of 1.052 million tons this measure will result in an increase of 0.022 percent VOC emissions assuming all of the insulation is manufactured in California.[8]

No other environmental impacts are expected as a result of the changes to refrigerated warehouses.

Water Heating Recirculation Loops Serving Multiple Dwelling Units, High-Rise Residential and Hotel/Motel Occupancies: The proposed amendment in the 2008 Standards will require that hotels and motels meet the same efficiency requirements for water heating as high-rise residential buildings. In addition new requirements have been added to include air release valves and check valves in recirculation loops to assure proper operation of the distribution system. Installation of an air release valve will assure that the recirculation system is void of air – which can cause cavitation in the pump (running but not moving the full volume of water).

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[7] Comments based on information in *Draft Report for Sidelighting – Daylighting Requirements for Sidelit Areas near Windows,* July 6, 2006.
[8] Values generated based on data in Final Report, *Refrigerated Warehouses*.

Installation of check valves will assure that back flow or crossover between the hot and cold water lines does not occur.

In determining the material impacts staff has determined that there will be an added use of copper or steel piping, brass and steel for the air release valve, and steel for the check valve. When compared to the amount of these materials that are already used in central water heating systems, the added amounts are insignificant.[9]

No other environmental impacts are expected as a result of the changes to water heating recirculation loops.

Alterations and Additions added fenestration allowances:

Changes to the additions and alterations requirements will have a mixed impact. Changes included stricter rules for meeting requirements for envelope, lighting and mechanical alterations or additions. Those changes made for window alterations relaxed the requirements to allow for small additions of glass. The overall impact from the changes to the additions and alterations will result in significant energy savings and negligible impacts to materials or other environmental factors.

B. Outdoor Lighting

Energy Effects

The projected energy savings for outdoor lighting standards is 22 GWh/yr. Energy savings for outdoor lighting are listed in Table 3.

Environmental Effects

The requirements for outdoor lighting underwent significant restructuring to clarify the requirements. The general site allowances now apply only to hardscape applications. Lighting power densities were lowered for most applications as a result of using pulse start metal halide, consistent with recent changes in Title 20 for metal halide luminaire regulations, rather than the less efficient probe start metal halide lighting technology that was used in the 2005 Standards. Also, security lighting power allowances were limited to be consistent with Illuminating Engineering Society of North America design guidelines. Outdoor lighting control strategies have been added to the requirement of acceptance testing of those controls. The emission reductions resulting from the energy savings from outdoor lighting are reported under nonresidential buildings.

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[9]Comments based on information from Central Hot Water Distribution Systems in Multifamily Buildings and Modeling Rules for Boilers and Water Heaters Report.

C. Low-Rise Residential Buildings

Energy Effects

The cumulative effects of the 2008 Standards changes for low-rise residential buildings (compared to not adopting these changes) will result in statewide annual energy savings of 102 GWh in electricity and 7 million therms of natural gas, and peak demand will decrease by 37 MW. Energy savings contributions from each of the residential sectors are included in Table 5.[10]

Table 5

Residential Energy Savings and Peak Demand Reduction

		GWhr/yr	millions therms/yr.	MW
Residential Single Family		81	5	27
Residential Multi-Family		4	1	3
Residential Alterations		17	1	6
Residential Total		102	7	36

Environmental Effects

Emissions. The annual combined emissions savings from the construction of single family homes and apartment units are listed in Table 6 by residential sector.

Table 6

Residential Air Emission Reductions

		NOx - tons/yr.	SOx- tons/yr.	CO - tons/yr	CO_2- tons./yr.	PM_{10} - tons/yr
Residential Single Family		31	56	17	76,566	3
Residential Multi-Family		3	5	2	7,270	0
Residential Alterations./Additions		7	13	4	17,171	1
Residential Total		41	74	23	101,007	4

[10] Values referenced in this report and listed on Table 1 were taken from the *2008 Impact Analysis Report* prepared by Architectural Energy Corporation.

Other Environmental Effects by Measure

Water Heating Recirculation: The proposed amendment in the 2008 Standards will require that low-rise, multi-family buildings include air release valves and check valves in recirculation loops to assure proper operation of the distribution system. Installation of an air release valve will assure that the recirculation system is void of air – which can cause cavitation in the pump. Installation of check valves will assure that back flow or crossover between the hot and cold water lines does not occur.

In determining the material impacts staff has determined that there will be an added use of copper or steel piping, brass and steel for the air release valve, and steel for the check valve. When compared to the amount of these materials that are already used in central water heating systems the added amounts are insignificant.[11]

No other environmental impacts are expected as a result of the changes to water heating recirculation loops.

Ventilation Indoor Air Quality: The adoption of ASHRAE 62.2 indoor air quality guidelines for residential buildings the 2008 Standards will require that all residences provide some means of providing outside air to conditioned space. While a number of methods can be used, the most likely manner of meeting this requirement will be the use of a small constant running exhaust fan in the bathroom.

The sound level requirement for these fans is set at 1 sone, which is considered a comfortable zone free of noise. In comparison, existing bathroom fans have sone ratings between 3 and 7. At 3 sones the sound level would be equal to what would occur during a normal conversation. The new requirement is for the fan to run continuously, but since the noise level is at a level considered free of noise, no negative consequences are expected.[12]

To attain the required sound level of one sone, exhaust fans use a variety of measures. These include better motors, added sound insulation, and better design. The material impact of all of these improvements is negligible compared to the materials already used.

No other environmental impacts are expected as a result of the addition of ventilation for indoor air quality.

Pool System Equipment and Installation: Pools use relatively large pumps and motors to circulate the volume of water required to keep a swimming pool clean and warm. In pumping this large volume of water, significant flow resistance can be created in the piping, especially at elbows where the lines turn, and in the filtration system. To eliminate piping resistance the 2008 standards require proper sizing of piping and the installation of long elbows instead of the tight 90 degree turns. Proper sizing of the filtration system to reduce resistance is also required. In addition, the 2008 Standards will require that pumps are sized based on a performance

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[11] Comments based on information from *Central Hot Water Distribution Systems in Multifamily Buildings and Modeling Rules for Boilers and Water Heaters Report*.

[12] Comments based on information from report on *Applicability of Residential Ventilation Standards in California* and other comments made in the 2008 standards adoption proceedings.

calculation. Finally, control requirements have been added to provide the ability to turn off swimming pool circulation systems during peak demand periods.

The increase in materials created by the requirements for residential pool will be very limited. Increased sizing of piping and sweep elbows may increase the amount of materials in the plumbing system by five to ten percent. The size of filtration systems may increase slightly. Pumps sizes are expected to be reduced.[13]

No other environmental impacts are expected as a result of the addition of the requirements for swimming pools.

Fenestrations: The vast majority of builders in California already choose vinyl-framed fenestration because these products generally are more energy efficient than metal-framed products. Vinyl-framed fenestration is also one of the most cost-effective ways to gain energy compliance credit. The changes made in the 2008 Standards increased the thermal performance of windows significantly. While this change will reduce the compliance credit that was available, the efficiency of currently available stock exceeds the standards requirement by at least 15 percent. This difference in available product versus the Standards requirements will allow builders to continue using fenestration as a source of compliance credit. The Energy Commission has taken action to assure that some construction may still rely on the use of metal framed windows. To accomplish this, the 2008 Standards include a special prescriptive package based on metal framed windows. The lower performance of these windows has been compensated for in the special prescriptive package by requiring higher efficiency mechanical systems.[14]

Energy Commission staff finds that this measure will have significant energy savings but will have no other environmental impacts since this measure will not change the type of fenestration currently used by the building industry.

Roofing Products: The 2008 Standards will introduce a prescriptive requirement for reflective roofs in those climate zones with substantial cooling loads. Residential roofing comes in the form of composition roofing or tiles. Composition roofing is installed as either roll or singles. The material composition of either form used for cool roofs is identical to that used in standard composition roofing. The only difference is the lighter color of the coating material. Tiles are available in metal or ceramic bases. As with the composition shingles, the composition of the tile itself does not vary. The only variation is the lightness in color of the tile which reflects more light. Therefore the cool roof requirement for residential buildings will have no material effects.[15]

Pipe Insulation: The 2008 Standards increased the requirements for pipe insulation. New kitchen plumbing will be required to be insulated regardless of diameter in comparison to the 2005 requirements which applied the insulation requirements only for kitchen piping equal to

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[13] Comments based on information in *Draft Report Residential Swimming Pools.*
[14] Data based on information in *Case Study for Residential Windows*, 2006.
[15] Comments based on information from report Inclusion of *Solar Reflectance and Thermal Emittance Prescriptive Requirements for Residential Roofs* in Title 24.

or greater than ¾ inch in diameter. The 2008 Standards also introduced a new requirement that hot water pipes installed below grade must be insulated and protected from moisture and crushing. The later requirement applies to kitchens with island sinks when plumbing must be run underground to supply the sink.

Based on these changes, an estimated 263 thousand feet of additional pipe insulation and protective sleeve will be used annually. Pipe insulation is typically made from polyethylene, a product of coal or other fossil fuels. The polyethylene manufacturing process results in volatile organic compounds (VOC) emissions. Data from polyethylene manufacturers list emissions at 0.1 gram per kilogram of insulation materials. The increased insulation will add approximately 19.5 tons of additional insulation. VOC emissions from the additional pipe insulation will be approximately 0.91 tons per year. In comparison, total annual VOC emissions in California are 1.052 million tons.

CHAPTER 6: Cumulative Effects

A. Energy

The estimated cumulative energy effects of implementing the proposed 2008 Standards will be to reduce annual energy consumption of electricity by 549 gigawatt-hours per year (GWh/yr) and to reduce demand by 130 megawatts (MW). Natural gas consumption will be reduced by 19 million therms.

The proposed efficiency changes were selected based on the life cycle cost analysis requirement of the Warren-Alquist Act. In response to this mandate, the 2008 Standards include measures that will "ensure the maximum feasible reductions in wasteful, uneconomic, inefficient, or unnecessary consumption of electricity." Efficiency improvements included in the 2008 Standards will affect an estimated 207,000 homes or apartment units and 180 million square feet of nonresidential construction in the first year alone.[16]

B. Environmental

The Effects of Air Quality

Reducing natural gas and electricity use will result in emissions reductions both at individual buildings and at powerplants in California and other western states. There is, however, no way of mapping by air basin the exact amount of emission reductions from electric generation. In fact, most air basins supply a very small portion of their total electricity. Therefore, this analysis does not include estimated reduction in emissions due to reduction in electricity generation in specific air basins. The estimate of emissions in air basins are restricted to the natural gas used for space heating and water heating. The Energy Commission staff evaluated emissions impacts of the changes by climate zone and by air basin (see Figure 2 for a map of air basins and Figure 1 on page 10 for a map of climate zones). Staff then multiplied the energy use from each air basin by the emissions factors in Table B-1 (in Appendix B) to determine emissions shown in Table 7 for each air basin.

[16]Residential values supplied from Residential Housing Starts and prototypes Report, Nonresidential values supplied by Impact Report.

Figure 2 - California Air Basins Map

Volatile Organic Compounds (VOCs)

The changes to cool roof requirements in the 2008 Standards will result in a reduction in VOCs, the increase in nonresidential building insulation requirements, and residential pipe insulation requirements will increase VOCs. The net effect will be an increase of 302 tons of VOCs per year. This increase will contribute approximately 0.02 percent of California's total emissions of VOC of 1.052 million tons.

Materials

While the standards will increase the use of insulation, some metals, electrical component materials, and glass, the amount of increase compared to the total use of each material in the state is relatively small and deemed to be insignificant.

California Environmental Quality Act (CEQA) Issues

Energy Commission staff completed an environmental checklist to address CEQA issues for this project. See Appendix A.

Table 7

Emission Reductions by Air Basin

		tons per year				
		NO_X	SO_X	CO	CO_2	PM_{10}
North Coast		1.84	1.34	0.60	2,232.17	0.20
Northeast Plateau		0.72	0.53	0.24	876.99	0.08
Sacramento Valley		7.46	5.45	2.43	9,051.37	0.81
Lake County		0.49	0.35	0.16	588.42	0.05
San Francisco Bay		14.55	10.63	4.75	17,655.73	1.58
Mountain Counties		7.47	5.45	2.43	9,055.96	0.81
Lake Tahoe		0.71	0.52	0.23	857.62	0.08
Great Basin Valleys		1.52	1.11	0.50	1,849.00	0.17
San Joaquin Valley		10.93	7.99	3.56	13,260.97	1.19
North Central Coast		3.74	2.73	1.22	4,535.32	0.41
South Central Coast		9.47	6.92	3.09	11,490.00	1.03
South Coast		10.05	7.34	3.28	12,193.22	1.09
San Diego		3.24	2.37	1.06	3,931.35	0.35
Salton Sea		1.79	1.31	0.58	2,168.43	0.19
Mojave Desert		2.82	2.06	0.92	3,424.04	0.31
Statewide		76.81	56.10	25.05	93,170.60	8.35

* 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 are included in the overall state impacts.

CHAPTER 7: Staff Recommendations

Staff's analysis for the proposed amendments to the energy efficiency standards concludes that there will be no significant impact on the environment. Staff recommends that the Energy Commission adopt a Negative Declaration for the 2008 Building Energy Efficiency Standards for residential and nonresidential buildings and outdoor lighting.

APPENDIX A - California Environmental Quality Act (CEQA) Checklist

Project title:	2008 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	Rob Hudler, Efficiency Standards CEQA Project Manager, Efficiency and Renewable Energy Division, (916) 654-4072
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 Significant 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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on aesthetics.				
II. **AGRICULTURE RESOURCES** -- In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department 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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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
Energy Commission staff has determined that the proposed 2008 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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
The building standards changes taken cumulatively will result in reduced powerplant operation (in California and the Western United States) and also reduce natural gas consumption, and will therefore result in reduced emissions. Staff expects that overall California will experience a net environmental benefit and net reductions of emissions for air conditioning resulting from the proposed 2008 Standards. Staff estimates that increased emissions of VOCs from projected increases in cool roof coatings, water pipe and insulation manufacturing, in and outside California, will be less than significant.				
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
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				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
wildlife corridors, or impede the use of native wildlife nursery sites?				
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
Energy Commission staff has determined that the proposed 2008 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
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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on cultural resources.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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:				
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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X
Energy Commission staff has determined that the proposed 2008 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 2008 Standards is to reduce energy use in California. Staff has determined that the proposed tandards 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				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
one-quarter mile of an existing or proposed school?				
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 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?				X
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
Energy Commission staff deems that the proposed 2008 Standards will have no effects on hazards and hazardous materials.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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, which would result in substantial erosion or siltation on- or off-site?				X
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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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
Energy Commission staff has determined that the proposed 2008 Standards 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 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?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X
Energy Commission staff has determined that the proposed 2008 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
Energy Commission staff has determined that the proposed 2008 Standards will have no 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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on natural resources.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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 ground borne noise levels?				X
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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on noise.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on population and housing.				
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:				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
Fire protection?				X
Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X
Energy Commission staff has determined that the proposed 2008 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
Energy Commission staff has determined that the proposed 2008 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 increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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 result 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
Energy Commission staff has determined that the proposed 2008 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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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 effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
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
Energy Commission staff has determined that the proposed 2008 Standards will have no impacts on utilities and service systems.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Significant Impact	No Impact
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 effects that will cause substantial adverse effects on human beings, either directly or indirectly?				X
Energy Commission staff has determined that improvements in the energy efficiency of residential and nonresidential buildings will have insignificant impact to the concerns listed in this matrix. The 2008 Building Standards taken cumulatively will result in **reduced** powerplant operation and **reduced** natural gas consumption in California and the Western States with associated 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.

TONY RYGG Date

Buildings and Appliances Office
Efficiency and Renewable Energy Division
California Energy Commission

APPENDIX B - Glossary of Terms

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 151(f) and Tables 1-Z1 through 1-Z16 of the Standards (Chapter 3) 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 a major city in each climate zone:

CZ01:	Arcata	CZ07:	San Diego	CZ12:	Sacramento
CZ02:	Santa Rosa	CZ08:	El Toro	CZ13:	Fresno
CZ03:	Oakland	CZ09:	Pasadena	CZ14:	China Lake

CZ04: Sunnyvale	CZ10: Riverside	CZ15: El Centro
CZ05: Santa Maria	CZ11: Red Bluff	CZ16: Mount Shasta
CZ06: Los Angeles		

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 primary pollutant.

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). 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 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 to a varying extent.

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 standards use various measures of equipment efficiency defined according to the type of 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 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 per square foot of lighting 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 draw 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.

NOx

Oxides of nitrogen, usually NO and NO2, 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.

PM_{10}

Solid particulate matter that is 10 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]

SOx

Sulfur dioxide, a chief components of air pollution and produced by the combustion of fossil fuels.

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 varying demand conditions; 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 ft2 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.

Watt-hour (Wh)

One watt of power expended for one hour.

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