California Energy Commission
STAFF REPORT

INITIAL STUDY / PROPOSED NEGATIVE DECLARATION FOR THE 2016 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

CALIFORNIA
ENERGY COMMISSION
Edmund G. Brown Jr., Governor

FEBRUARY 2015
CEC-400-2015-012

CALIFORNIA ENERGY COMMISSION

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ABSTRACT

Public Resources Code Sections 25402 was enacted in 1974 as part of the enabling legislation establishing the California Energy Commission and its basic mandates. The statute requires the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings to ensure that building construction, system design, and installation achieve energy efficiency and preserve outdoor and indoor environmental quality. The Commission first adopted building standards in 1975. The most recent version was adopted in 2012 and became effective in 2014.

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

The building standards cover both brand-new construction as well as major modifications. They must be cost-effective, based on the life cycle of the building, must include performance and prescriptive compliance approaches, and must be periodically updated to account for technological improvements in efficiency technology. The bulk of the standards (codified in portions of Part 1, Chapter 10, and as Part 6, of Title 24 of the California Code of Regulations) establish a minimum level of building energy efficiency for various types of buildings (e.g., one- or two-story houses, large hotels, commercial office buildings, etc.); the standards vary somewhat depending on where, in one of 16 "climate zones" within the state, a building is be constructed. (A building may be designed to a higher efficiency level than required by these standards, resulting in additional energy savings.)

The 2016 Standards focus on three key areas in Parts 1 (in chapter 10) and 6 of Title 24: updating requirements for low-rise residential buildings to move those buildings closer to California's goal that all new residential buildings will be "zero net energy" starting in 2020, updating nonresidential and high-rise residential requirements to better align those requirements with the national standards adopted by the American Society of Heating, Air Conditioning, and Refrigerating Engineers (ASHRAE 90.1), and updating the entirety of the existing Standards to improve clarity and consistency, correct errors, streamline requirements, or make adjustments to provisions in the regulations to accommodate impacts that were unanticipated when those provisions were adopted.

The Energy Commission staff estimates that the implementation of the 2016 Building Energy Efficiency Standards will reduce statewide annual electricity consumption by about 281 gigawatt-hours per year, and natural gas consumption by 16 million therms per year. In

addition, there will be a net reduction in the emissions of nitrous oxide by roughly 508 tons per year, sulfur oxides by 13 tons per year, carbon monoxide by 41 tons per year, and particulate matter less than 2.5 microns in diameter by 13.75 tons per year. Lastly, the standards will reduce statewide greenhouse gas emissions by an amount equivalent in effect to 160 thousand metric tons (tonnes) of carbon dioxide (CO_{2E}) annually.

In addition to air emissions, the Commission also analyzed the potential effects of the proposed building standards revisions on water use (both onsite in new construction and at California power plants), indoor air pollution, and changes in materials use (including the use of mercury, lead, copper, steel, plastic silicon, gold, aluminum, fiberglass, glass, and wood).

The Energy Commission has found in performing this Initial Study that there is no substantial evidence, in light of the whole record, that the proposed revisions may have a significant adverse effect on the environment.

Keywords: California Energy Commission, California Building Energy Efficiency Standards, Title 24, Part 6, 2016 Building Energy Efficiency Standards, negative declaration, residential, nonresidential, newly constructed, additions and alterations to existing buildings, mandatory, prescriptive, performance, windows, envelope insulation, HVAC, building commissioning, process load, commercial refrigeration, data center, kitchen exhaust, compressed air, acceptance testing, data collection, cool roof, standards, onsite renewable electricity generation, gigawatt hours, mega-watt, therms per year, nitrous oxides, sulfur oxides, carbon monoxide, carbon dioxide equivalent, NOx, SOx, CO, $PM_{2.5}$, CO2e, mercury, lead, copper, steel, plastic, silicon, gold, aluminum, fiber glass, glass, wood, time dependent valuation, TDV

Peter Strait., 2015. *Initial Study/Proposed Negative Declaration for the 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings*. California Energy Commission, Buildings Standards Office. CEC-400-2015-012

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EXECUTIVE SUMMARY

California Public Resources Code Section 25402 was enacted in 1974 as part of the enabling legislation establishing the California Energy Commission and its basic mandates. It requires the Energy Commission to adopt, implement, and periodically update energy efficiency standards for both residential and nonresidential buildings.

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

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

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

The Standards include a basic set of mandatory requirements that apply in all cases. In addition to the mandatory requirements, the performance standards establish energy budgets that depend on climate zone and building type, providing high levels of flexibility for compliance.

As an alternative to the performance standards, there are prescriptive requirements that are basically a "checklist" compliance approach that offers simplicity but less flexibility.

The Commission estimates that the implementation of the 2016 Building Energy Efficiency Standards (2016 Standards) will reduce statewide annual electricity consumption by about 281 gigawatt-hours per year, and natural gas consumption by 16 million therms per year. In addition, there will be a net reduction in the emissions of nitrous oxide by roughly 508 tons per year, sulfur oxides by 13 tons per year, carbon monoxide by 41 tons per year, and particulate matter less than 2.5 microns in diameter by 13.75 tons per year. Lastly, the 2016 Standards will reduce statewide greenhouse gas emissions by an amount equivalent in effect to 160 thousand metric tons (tonnes) of carbon dioxide (CO_{2E}) annually.

In addition to air emissions, the Commission also analyzed the potential effects of the proposed 2016 Standards revisions on water use (both onsite in new construction and at California power plants), indoor air pollution, and changes in materials use (including the use of mercury, lead, copper, steel, plastic silicon, gold, aluminum, fiberglass, glass, and wood).

The Commission has found in performing this Initial Study that there is no substantial evidence, in light of the whole record, that the proposed revisions may have a significant adverse effect on the environment.

Summary of Proposed Changes

The 2016 Standards focus on several key areas to improve the energy efficiency of newly constructed buildings and additions and alterations to existing buildings, and include requirements that will enable both demand reductions during critical peak periods and future solar electric and thermal system installations. The most significant efficiency improvements to the residential standards propose increased thermal performance in exterior walls and attics, tighter ducts located is areas less prone to extreme temperatures than current vented attics, increased installation of high efficacy lighting, and providing a prescriptive option for installation of tankless water heaters. Nonresidential improvements primarily mirror the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 90.1 updates, and include a handful of improvements beyond ASHRAE.

The 2016 Standards updates are also intended to improve the clarity and organization of these performance-based advanced energy efficiency standards. More detailed information on the proposed changes can be found in Chapter 4.

Environmental Impacts

Potential Increase in Material Uses Is Less Than Significant

The implementation of the proposed changes to the Standards may cause increases in material uses. Such material uses include additional electronic equipment, lighting fixtures, heating and air-conditioning equipment, insulation, water heating equipment, plumbing and wiring, and other building and equipment elements. The Commission has evaluated the proposed changes

to the Standards for their potential for environmental impacts. The Commission evaluated the potential increases in material uses for each of the following materials: mercury, lead, copper, steel, plastic, silicon, gold, aluminum, fiberglass, glass, and wood. The Commission estimates that the contribution of each energy efficiency measure to the potential increases in material use is a small fraction of the material use in the current market. In each case, the Commission determined that the existing regulations governing the production, processing, handling, transportation, storage, use, and disposal are adequate to protect the public health and to restrict the potential environmental impacts such that they are less than significant.

Reduction of Water Consumption

The implementation of the proposed changes to the Standards is expected to decrease statewide water consumption. These savings come from California power plants as a result of the overall reduction in electric power demand from the proposed energy efficiency improvements. The Commission estimates that there will be an overall decrease of approximately 106.2 million gallons (roughly 326 acre-feet) per year of water consumption from the implementation of the proposed changes to the Standards.

Impact to Indoor Air Quality Is Less Than Significant

The proposed changes to the Standards do not include the adoption of the ASHRAE ventilation requirements (ASHRAE Std. 62.1). Instead, the Standards keep the current Title 24, Part 6, ventilation requirements, which generally provide higher ventilation rates than does ASHRAE Std. 62.1. Thus, there are no potential impacts to the degradation of indoor air quality as a result of the implementing the proposed changes to the Standards.

Energy and Emission Benefits

This Initial Study concludes that the 2016 Standards will not have a significant negative effect on the environment, and provides the basis for that conclusion. No mitigation measures are proposed.

The implementation of the 2016 Standards will reduce statewide annual electricity consumption by about 281 gigawatt-hours per year (GWh/yr), and natural gas consumption by 16 million therms per year. The potential effect of these energy savings to air quality are a net reduction in the emission of nitric oxides (NOx) by roughly 508 tons per year, sulfur oxides (SOx) by 13 tons/year, carbon monoxide (CO) by 41 tons/year and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) by 13.75 tons per year. Additionally, the implementation of the 2016 Standards will reduce statewide carbon dioxide equivalent (CO_2e) emissions by 160 thousand metric tons per year.

The values described above are the total estimated benefits from the implementation of the 2016 Standards. They include the potential emission benefits for all reductions in natural gas and electricity use that are expected to occur from the implementation of the 2016 Standards. The emission estimates associated with the reduction of natural gas use are expected to occur at the location of each building and are based on the emission factors for residential and commercial space heating and domestic hot water equipment.

On the other hand, the emission estimates associated with the reduction in electricity use (in terms of gigawatt-hours per year) are associated with generation throughout the western United States, Western Canada, and Mexico, which is generally coordinated by the Western Electricity Coordinating Council (WECC). California imports about 20 to 40 percent of its electricity from out-of-state sources through the Western Interconnection (western regional electric grid) in any given hour. That electricity is generated by a combination of sources that may include nuclear, hydroelectric, natural gas, coal, and renewable energy power plants. The total estimated emissions reductions described above, including those associated with out-of-state generation, are expected to occur from the implementation of the 2016 Standards.

The estimated reduction of greenhouse gas emissions, reported as CO2e described above, includes the emission reductions of carbon dioxide (CO2) as well as other associated greenhouse gas, such as nitrous oxide (N2O), methane (CH4), hydrofluoric carbons, halogen-alkenes, and sulfur hexafluoride.

Conclusions

The Energy Commission has analyzed the environmental impacts of the proposed 2016 Building Standards for residential and nonresidential buildings. Air emissions, water savings at California power plants, indoor air pollution, and increased materials use were considered. The initial study concludes that the potential environmental impacts associated with the implementation of the 2016 Standards are less than significant. A detailed description of all potential impacts is included in this report. Therefore, a negative declaration for the 2016 Standards should be adopted.

CHAPTER 1:
Project History, Description, and Environmental Setting

History and Summary of Basic Statutory Authority for the Energy Commission's Building Standards

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

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

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

Additional Laws and Policies Affecting the Standards

Enacted in 1974, Public Resources Code Section 25910 directed the Commission to adopt standards for the minimum amount of additional insulation installed (as an alteration) in existing buildings. Senate Bill (SB) 639 (Rosenthal, Chapter 1067, Statutes of 1993) added Section 25402.5, which expressly directed the Commission to consider both new and replacement (as an alteration to an existing building), as well as interior and exterior lighting devices as subject to

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

The Global Warming Solutions Act (Assembly Bill 32, Núñez, Chapter 488, Statutes of 2006) has been the foundation of California's efforts over the past nine years to reduce greenhouse gas emissions to the state's 1990 level by 2020. Improving the energy efficiency of existing residential and commercial buildings is the single most important activity to reduce greenhouse gas emissions that result from the production and use of electricity and natural gas. Expanding and strengthening existing energy efficiency programs as well as building and appliance standards are a key recommendation of the California Air Resources Board's (CARB) *AB 32 Scoping Plan*. Climate change is the most important environmental and economic challenge of this century; greenhouse gas emissions are the largest contributors to global warming; and California's ability to slow the rate of greenhouse gas emissions will depend first on energy efficiency.

Senate Bill 1 (SB1) (Murray, Chapter 132, Statutes of 2006) enacted Governor Schwarzenegger's Million Solar Roofs Initiative. The statute added sections to the Public Resources Code that require building projects applying for ratepayer-funded incentives for photovoltaic (PV) systems to meet minimum energy efficiency levels and PV system components and installations meet rating standards and specific performance requirements. SB 1 required the Commission to determine how and to what extent PV systems should be required in the Standards. The Commission has responded by including PV installation as an intermediate trade-off for certain limited efficiency measures.

The Commission's *Energy Action Plan* (updated February 2008; available at http://www.energy.ca.gov/energy_action_plan/) guides California's Energy Policy and establishes California's "Loading Order" policy, the latter of which calls for load growth to be met first by cost-effective energy efficiency improvements and demand response, followed by renewable resources

The California Long-Term Energy Efficiency Strategic Plan (2008), developed by the California Public Utilities Commission (CPUC) in collaboration with the Energy Commission, establishes the importance of the Standards in reaching the State's policy goal of zero net energy homes by 2020 and zero net energy buildings by 2030. The strategic plan also explains the Energy Commission's development of voluntary "reach standards"—now codified in Part 11 of Title 24 – as a critical component of the Standards. In each update cycle the reach standards establish a "market pull strategy" to encourage the industry to anticipate that additional standards improvements will be coming in the following cycle, and for a substantial portion of newly constructed buildings to build to meet higher levels of efficiency than just what the mandatory standards require. Building to meet the reach standards is further encouraged by the minimum installation requirements to qualify for PV incentives under the New Solar Homes Partnership (California Energy Commission *New Solar Homes Partnership Guidebook, Eighth Edition* Publication No. CEC-300-2014-001-ED8-CMF), as well as incentives provided by utility programs

and other governmental agencies, such as the Tax Credit Allocation Committee incorporating efficiency into their Low-Income Housing Tax Credit Programs (http://www.treasurer.ca.gov/ctcac/).

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

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

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

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

Environmental Setting

The Standards are a set of regulations that require energy efficient designs, features, equipment, and practices in new construction occurring within the State of California. As these regulations are statewide, the environmental setting of this update to the Standards is the entire State of California.

California currently consumes roughly 300,000 gigawatt-hours (GWh) of electricity on an annual basis[1], and the primary sources of electricity generation remain the burning of natural gas and coal. In addition, natural gas is consumed on-site in buildings for space heating, water heating, and for other uses such as cooking. Approximately one-third of the energy consumed in California is consumed by buildings, either via consumption of electricity or burning of natural gas.

[1] http://energyalmanac.ca.gov/electricity/electricity_generation.html.

As California's population grows, every year hundreds of thousands of new buildings are constructed, added on to, or remodeled, adding onto this energy use. The Energy Commission's Forecasting unit estimates 108,000 new residential homes will be built in 2017 along with 189 million square feet of new nonresidential buildings.

The Standards make buildings more efficient, resulting in reduced consumption of both natural gas and electricity. These reductions in turn result in lower emissions from natural gas combustion at the building site, and lower emissions from the generation of electricity that powers buildings.

The proposed project is a regular, triennial update to the Standards expected to enhance their benefits. Updating the Standards to require greater efficiencies will reduce the emissions of harmful air pollutants that threaten public health. Because the Standards will reduce fuel consumption, they will also reduce greenhouse gas emissions that contribute directly to global warming. The Standards also target the reduction of "peak" electricity use: since "peak" electricity use relies heavily on generation from less efficient power plants, and peak periods coincide with hot, summer periods when air pollution is at its worst, reduction in electricity peak loads have an even greater beneficial effect on air quality.

Proposed Project

The proposed project is a triennial update to the Standards found within California's Building Code. The proposed updates to the Standards will ensure more efficient use of natural gas, electricity and water in newly constructed buildings, as well as in additions and alterations to existing buildings. These updates are described in greater detail in Chapter 4.

Methodology

The potential environmental impacts of specific, proposed increases in the efficiency requirements of the Standards are analyzed and documented in the Codes and Standards Enhancement (CASE) reports submitted to the Energy Commission and available here: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/dru_title24_parts_01_06/.

Staff has relied on these measure-based analyses in determining the potential environmental impacts of the proposed Standards relating to materials use.

To determine the total, cumulative effect of the proposed Standards on energy production, the Commission used its public domain building modeling software[2] to model prototype buildings

[2] California Building Energy Code Compliance (CBECC) software for residential and commercial buildings (CBECC-Res and CBECC-Com). More information on this software is available at http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html.

with a set of assumptions matching the 2013 Standards, then again with the proposed changes for the 2016 Standards, to estimate the expected natural gas and electricity savings. Annual Time Dependent Valuation (TDV) energy savings were derived by applying hourly multipliers (which depend on the hour of the day and season of the year, and account for the energy used to generate, transmit and distribute electricity and the energy used to distribute natural gas) to the expected natural gas and electricity savings, then summing these TDV energy values for all hours of the year. These values were then multiplied by the estimated amount of new construction within the State; more information can be found in the Economic and Fiscal Impact Statement (Form 399) prepared for this rulemaking action[3].

[3] Available at: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/.

CHAPTER 2:
List of Agencies That Will Use or Comment on This Initial Study

The Energy Commission is the lead agency for this rulemaking proceeding. Following adoption by the Commission, the standards must be reviewed and approved by the California Building Standards Commission, which will have access to this Initial Study and all other documents related to the rulemaking proceeding. There will be no responsible agencies other than the California Building Standards Commission. However, the Commission will make the Initial Study, and all other documents in the proceeding, available to all potentially interested federal, state, and local agencies, and those agencies will be invited to comment.

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

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

CHAPTER 4:
Descriptions of 2016 Proposed Changes to Building Energy Efficiency Standards

Overview

The 2016 Standards focus on three key areas: updating requirements for low-rise residential buildings to move closer to California's zero net energy goal, updating nonresidential and high-rise residential requirements to better align with the national ASHRAE 90.1 standards, and updating the entirety of the existing Standards to improve clarity and consistency, correct errors, streamline requirements, and make adjustments to provisions in the regulations that were found to have unanticipated impacts.

Residential

The proposed changes to the Standards affecting residential construction are as follows:

- Current practice is to place most heating, ventilation and air conditioning (HVAC) ducting in uninsulated attic spaces, which can get quite hot in the summer and quite cold in the winter. This, in turn, leads to significant energy losses through unwanted warming or cooling of conditioned air in the ducts, even when the ducts themselves are insulated. The proposed 2016 Standards require builders to reduce such losses, by:

  (a) installing ducts so that they have no more than five percent air leakage (the current Standards allow up to six percent); and
  (b) reducing the exposure of ducts to extreme heat and cold. This can be accomplished in a number of ways, such as:
    (i) placing the HVAC equipment and ducts in conditioned spaces;
    (ii) attaching attic insulation to the underside of the roof (rather than laying it on top of the ceiling);
    (iii) installing insulating or heat-rejecting roofing materials; or
    (iv) sealing and insulating the attic in a manner similar to the conditioned rooms in the house.

- For walls, builders must use one or more of several new cost-effective practices or insulation products to reduce heat transfer through exterior walls.

- For lighting, the current Standards designate certain types of residential lighting as "high efficacy lighting", and require a certain amount of high efficacy lighting within the home. The proposed Standards take the next step of requiring all of the lighting in newly constructed residential buildings to be high efficacy, while also expanding the types of lighting that qualify as high efficacy lighting.

- For water heating, the proposed Standards add a prescriptive option for installation of a gas instantaneous (or tankless) water heater. In addition, the prescriptive option for installing a gas storage water heater requires the installation of (i) a compact hot water distribution system; or (ii) Home Energy Rating System (HERS) verified insulation on all hot water piping.

Nonresidential

The proposed changes are in two basic categories. The first category is incorporation of recent changes in ASHRAE 90.1 (2013). These include:

- Strengthening requirements for heat-flow resistance (more effective insulation) in nonresidential (and high-rise residential) buildings, when builders use the prescriptive approach for compliance. (Note that these requirements establish the performance baseline when using the performance approach.)

- Requiring higher efficiencies in space conditioning equipment.

- Revising the lighting control requirements to be more specific and consistent.

- Adding requirements for elevators to shut off the lights and fans while the cab is empty.

- Adding requirements for escalators and moving walkways in airports, bus stations, and the like to run at a lower, less-energy-consuming speed when not in use.

- Adding requirements that any directly-conditioned space with doors to unconditioned space must be equipped with interlock switches to turn off the space conditioning equipment serving that space while the doors are open.

- Making the requirements for electrical power distribution systems relating to service metering, voltage drop, and disaggregation more energy-conserving.

The second category of proposed changes to the nonresidential Standards align with, but also go beyond, ASHRAE 90.1:

- Lowering Lighting Power Allowances.

- Adding efficiency requirements for Elevator Cab Lighting.

- Adding an interlock requirement for windows and skylights similar to the one for doors.

- The current Standards require that direct digital controls for HVAC equipment must have specified features if they are installed. The proposed Standards require

installation of direct digital controls, and add efficiency-supporting requirements for the features and operation of those controls.

Standards Cleanup

The proposed changes to the Standards also include changes throughout the regulations to clarify, simplify, and streamline the existing language and requirements. The most significant of these changes are:

- Acceptance Test Training and Certification – The changes to Title 24 Part 1, Section 10-103A and10-103B clarify and streamline the approval process for Acceptance Test Training and Certification Providers. Of note, new provisions have been added to allow for amendment of a submitted application, meaning that changes to a submitted or approved application may be made without requiring a complete resubmittal.

- Commissioning – The changes to Title 24, Part 6, Section 120.8, clarify the applicability of building commissioning and correct the use of terms to be consistent with Title 24, Part 1, Section 0-103(a). Importantly, these changes also remove language that incorrectly implied that commissioning was required for alterations, or applied to covered processes. Matching corrections have been made where this Section is referenced in Section 100.0 Table 100-A, and Section 141.0.

- Nonresidential Lighting Alterations – The changes to Part 6, Section 141.0(b)2I simplify and streamline the requirements for lighting alterations. The terms "lighting alteration", "lighting wiring alteration", and "luminaire modification" are now clearly separated in what actions each term applies to. For luminaire modifications, the control requirements are being relaxed to require that existing multi-level or automatic shutoff controls remain operable in controlling the luminaires after they are modified, rather than requiring the installation of new multi-level or automatic controls.

- Alternative Calculation Method manuals – The changes to the Alternative Calculation Method manuals adopted as appendices to the Standards combine what was previously two largely identical manuals (for residential and nonresidential building modeling software) into a single manual. This manual provides more explicit and better organized requirements for the approval of compliance software. The requirements that apply to the Compliance Manager software developed by the Energy Commission are now clearly separated from the requirements for approval of vendor software and the requirements for vendor software user manuals. Two appendices have been added to the manual containing the evaluation criteria specific to residential and nonresidential software.

- Charge Indicator Displays – For residential HVAC equipment, the language relating to installation of Charge Indicator Displays has been updated to use the broader term Fault Indicator Displays, recognizing that a display may treat an incorrect charge as a fault while also being able to display other fault conditions or other information.

- Pipe Insulation – For hot water piping, the value for the required level of residential insulation was erroneously removed when the tables were merged in the 2013 update to the Standards. This separate value has been returned to Table 120.3-A.

- Economizers – The requirements for testing and certification of economizer damper leakage to the Energy Commission in order to be installed as part of the prescriptive performance approach of Section 140.4(e)4 have been clarified, and the language expanded to explicitly state who is expected to certify and what information must be provided. In addition, the specification that an economizer is required for each air handler was clarified to be more explicit in where it's applied.

- Electrical Power Distribution System – Circuit controls for 120v receptacles were clarified and moved to a separate section in 130.5 relating to electrical power distribution systems.

- Fault Detection and Diagnostics – References to pressure sensors were removed, and the word "unitary" removed as an unneeded term.

CHAPTER 5: Estimated Environmental Impacts

The Energy Commission has evaluated the proposed changes to the Standards for their potential for environmental impacts, as described in the Methodology section of Chapter 1.

While the Standards relate to new construction, they do not cause new construction to occur within the State: the Standards do not regulate where or when construction occurs, but rather apply to how new buildings and other types of new construction are designed and built. The environmental impacts of the proposed changes are thus limited to the anticipated benefits of reduced energy consumption, and any increase in material use necessary to comply with the updated Standards.

Estimated Increased Materials Use

The Standards ensure that a minimum level of technically feasible and cost effective energy efficiency measures are incorporated into new construction in California. Examples include mandatory requirements for minimum levels of insulation in exterior walls, for installation of energy efficient lights and automatic lighting controls, for sealing of HVAC ducts, and for third-party verification of installation of certain building systems. In addition to mandatory requirements, the Standards offer a prescriptive and a performance-based compliance path, allowing builders to either incorporate additional measures directly from a list of known, effective options or model the overall performance of their building design, respectively. The performance option provides freedom to designers and builders provided their building performs at or above the level achievable through the use of the prescriptive options applicable to the building, and is used for the vast majority of new construction within California. Thus, it is important to understand that there is not a direct correlation between materials use and energy efficiency: there are many paths toward creating a more efficient building, some of which may use more materials and some of which may use less.

As the proposed updates to the Standards improve and build upon existing law, the impacts are limited to the marginal differences between existing and proposed efficiency standards, and the anticipated increase in materials use (if any). The increase in materials use anticipated for each proposed measure is as follows:

- Residential Ducts – Complying with this measure involves designing or insulating the attic space in such a way that heating and air conditioning ducts are protected from extreme temperatures, or alternatively locating ducts within the normally conditioned areas of the building. As noted in Chapter 4, there are many different methods of meeting this requirement, and builders may follow the performance approach and instead make other energy improvements within the building.

- Residential Walls – Complying with this measure involves ensuring that exterior walls possess improved thermal properties. There are many different methods of meeting this requirement: buildings may use 2x6 studs at a wider (24" on center) spacing both to increase the size of the wall cavity and decrease the number of thermal bridges between

the exterior and interior space, they may use a continuous insulation product over the wall surface, they may use Structural Insulated Panels (SIPs), they may use more effective insulation products in a standard wall, or they may follow the performance approach and make other energy improvements within the building. While some of these methods would cause a decrease in materials use, others may cause an increase in materials use[4].

- Residential Lighting – Complying with this measure requires installing energy efficient lighting meeting certain criteria, and installing dimmer or vacancy sensor controls for certain types of light fixtures. This measure does not involve installing any additional lighting that would not otherwise be installed, but potentially requires the installation of additional dimmers or vacancy sensors if certain types of fixtures are installed.

- Residential Water Heating – Complying with this measure involves installing either a gas storage water heater along with inspected pipe insulation and short hot water distribution runs, installing a gas instantaneous water heater, or using the performance modeling approach for the building. The measure does not involve installing any additional water heating equipment that would not otherwise be installed, and ensuring short distribution runs will potentially lead to less piping used to distribute water throughout the building. Thus, this measure will not result in any increased materials use.

- Nonresidential Walls – Complying with this measure involves ensuring that exterior walls possess improved thermal properties. There are many different methods of meeting this requirement: buildings may use 2x6 studs at a wider (24" on center) spacing both to increase the size of the wall cavity and decrease the number of thermal bridges between the exterior and interior space, they may use a continuous insulation product over the wall surface, they may use Structural Insulated Panels (SIPs), they may use more effective insulation products in a standard wall, or they may follow the performance approach and make other energy improvements within the building. While some of these methods would cause a decrease in materials use, others may cause an increase in materials use.

- Nonresidential Space Conditioning Equipment – Complying with these measures involves installing equipment meeting higher efficiency targets and installing digital controls for that equipment. The measure does not involve installing any additional space conditioning equipment that would not otherwise be installed, but potentially requires the installation of additional electronic controls.

- Nonresidential Lighting – Complying with this measure involves installing lighting that does not exceed specific thresholds for power consumption. This measure does not involve installing any additional lighting that would not otherwise be installed, and may result either in the installation of fewer light fixtures or installation of more efficient

[4] For example, framed exterior walls are commonly made using 2x4 wood studs 16" on center. Moving to 2x6 studs 24" on center represents a 50% increase in the material in any single stud, but an identical increase in the distance between studs, leading to fewer studs being needed for a given length of exterior wall and an equivalent (if not identical) amount of wood used in both scenarios.

lighting, such as LEDs or high-efficiency fluorescents, in place of less efficient lighting. Thus, this measure will not result in increased materials use.

- Nonresidential Lighting Controls – Complying with this measure involves matching the lighting controls to appropriate lighting: the primary effect of the measure is to ensure that multi-level controls are only required where there is multi-level lighting. In addition, the measure adds specificity to the expected behavior of certain controls. The measure does not involve installing any additional controls beyond what is required in the current regulations, and thus will not result in any increased materials use.

- Nonresidential Electrical Power Distribution – Complying with this measure involves disaggregating[5] the metering of electrical circuits at the switchboard, control board, or panel board level, and clarifying requirements for voltage drop and service metering. While this does not affect the general configuration of wiring within a building, the measure may result in the installation of more or larger boards or panel boxes to allow for separate metering of the electrical circuits.

- Elevators – Complying with these measures involves integrating electronic controls for fans and lighting, and is likely to encourage installation of LED-based lighting within elevator cabs. Thus, while this measure does not involve installing any additional fans or lighting that would not otherwise be installed, it may result in additional installation of occupant sensing controls and therefore an increase in materials use.

- Escalators – Complying with this measure involves ensuring that escalator motors are designed to operate at two or more speeds, and that the controls are able to operate the escalator at a low speed without a passenger, and at regular speed when a passenger is detected. As escalators are not normally designed with the ability to detect a passenger, this measure potentially requires the installation of additional sensors similar to those used by occupant sensing lighting controls.

- Door and Window Interlocks – Complying with this measure involves installing small electronic sensors on doors and windows able to detect whether the door or window is open. Although most common security sensors perform this function, installation of security sensors is not mandatory, and this measure may therefore result in installation of additional sensors in new construction.

- The Standards Cleanup changes clarify and streamline existing requirements but do not impose new requirements. As such, they do not result in any increase in materials use.

For the measures that potentially increase materials use in new construction, the potential increases fall into two categories: changes in fenestration design, and installation of additional small electronics such as sensors and controls. Fenestration is potentially comprised of

[5] "Disaggregation" means ensuring that the energy use of specific circuits is measurable, as opposed to only having the ability to measure the aggregate energy use of the building.

aluminum, vinyl, wood or steel framing, concrete structural elements, glass windows, and insulation products comprised of varying materials such as polystyrene and fiberglass. The manufacturing of electronics potentially includes the use of plastics, silicon, copper, lead, gold, and mercury.

The Codes and Standards Enhancement (CASE) reports submitted for the proposed measures include estimates of the cost of compliance with each measure[6]. Staff incorporated these estimates into the Economic and Fiscal Impact Statement prepared for the 2016 Standards[7], which produced the following measure cost numbers. Staff then relied on RSMeans CostWorks construction data for 2015[8] to provide estimated current, total costs of materials in new construction in California.

This analysis assumes that the entirety of the estimated increase in materials cost represents a greater quantity of materials, rather than the use of materials that are merely more expensive. In electronics, more advanced devices are often smaller and use less raw materials, but do so at a price premium. Similarly, a smaller quantity of more effective, more expensive insulation materials may represent an increase in materials cost but a decrease in the amount of material installed to comply with the Standards. This Initial Study is intentionally assuming a "worst case" relationship between estimated increased costs and increased materials use.

For residential construction, the average cost per square foot of implementing the attic and wall measures was found to be $0.60. This would mean, for example, that a 2,000 square foot house built to the new requirements would cost an additional $1,200 compared to an otherwise identical house built to the current standards. Assuming that the total cost includes an equal amount of materials costs and labor costs[9], the marginal cost of materials needed to comply with these measures is $0.30 per square foot of the building, or $600 worth of additional materials for an example 2,000 square foot house. The cost of implementing the lighting measure was found to be $0.15 per square foot, and thus to have a marginal cost of materials of $0.08 per square foot (rounded) or $160 worth of additional electronics for an example 2,000 foot building.

For comparison, the RSMeans CostWorks construction cost data for 2015 provides estimates of materials costs for new buildings. An average 2-story, 2000 square foot stucco on wood frame home[10] is estimated to have a materials cost of $48.41 per square foot, or $96,820 total. Using this value, the proposed measures affecting fenestration potentially increase materials costs by 0.6%

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[6] A complete list of CASE reports is provided in the References section at the end of this document, including a link where they can be downloaded for free from the Energy Commission's website.

[7] Available at http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/EFIS_2016_title24_parts_01_06/

[8] RSMeans is a leading supplier of construction cost data, and their CostWorks product is commonly used by builders to estimate construction costs of both residential and nonresidential buildings.

[9] While the CASE reports did not separate materials costs from labor costs, and instead used overall market costs, CostWorks estimates for materials and labor costs in construction vary between a 40/60 and 50/50 division. Staff has chosen the latter, higher proportion of materials cost for this analysis.

[10] This configuration was found to have the lowest materials cost per square foot among "average" houses of the same size in the CostWorks data.

(six-tenths of one percent), and the proposed measures that affect the installation of electronics potentially increase materials cost by 0.16% (roughly a sixth of one percent).

For nonresidential construction, the cost of implementing the fenestration measures was found to be $1.11 per square foot, and thus to have a marginal materials cost of $0.56 per square foot. The cost of implementing the interlock and digital controls measures was found to be $0.15 per square foot, and thus to have a marginal materials cost of $0.08 per square foot. The RSMeans CostWorks 2015 construction cost data provided median cost estimates for several different types and sizes of commercial buildings, and two representative materials costs are as follows:

For a 16,000 square foot, 3-story office building: $91.02 per square foot in materials costs, or $1,456,320 total.
For a 19,000 square foot, 3-story apartment: $75.69 per square foot in materials costs, or $1,438,110 total.

High rises and more specialized commercial spaces had higher materials costs than these examples, while simpler spaces such as retail stores and warehouses had less; staff found these two examples to be a good representative center for the wide variety of commercial spaces. With these examples, the percent increase in materials cost for the proposed measures affecting fenestration is between 0.6% - 0.7%, and the percent increase in materials cost for the proposed measures that affect the installation of electronics is between 0.09% - 0.11%

For elevators, the CASE report found that "Elevators that meet the proposed code requirements are common and available from multiple manufacturers, including Kone, Otis, Thyssenkrupp, and Schindler. These manufacturers are already familiar with and produce this technology. This technology is now industry standard practice for new construction elevators." The CASE report determined that the proposed measure would not result in any added materials or manufacturing costs, relative to current elevator designs.

For escalators, given that the proposed measure only applies to escalators and moving walkways installed in transit areas (e.g., bus stations, airport terminals, etc.), the CASE report estimated that 15 covered escalators are installed annually within the State of California. The additional materials used to install some number of small sensors at 15 estimated sites within the State is de minimis and does not have the potential to adversely affect the environment.

It should be noted that the Standards establish the *minimum* level of efficiency expected in new construction. Builders may, and often do, incorporate measures that go beyond these baseline requirements as many efficiency-improving measures, such as LED lighting, are desirable/marketable components of a modern building in their own right. Builders may also seek to achieve a specific status for the building, such as LEED certification, that includes requirements that go far beyond minimum code requirements. Thus, some percentage of buildings will be built at or above the levels being proposed for the updated Standards regardless of whether the Standards are adopted, reducing (to a small extent) the impacts that can be attributed directly to the proposed update (i.e., that would not have occurred but for this project).

Thus, the proposed residential fenestration measures in the 2016 Standards are estimated to potentially cause an increase in the annual demand and use of materials in new residential construction of 0.6%, distributed between various fenestration products, and the proposed sensor and control measures are estimated to potentially cause an increase in the annual demand and use of materials in new residential construction of 0.16%, distributed between various small electronic components. The proposed commercial fenestration measures are estimated to potentially cause an increase in the annual demand and use of materials in new commercial construction of 0.7%, distributed between various fenestration products, and the proposed commercial sensor and control measures are estimates to potentially cause an increase in the annual demand and use of materials in new commercial construction of 0.11%, distributed between various small electronic components.

Therefore, where the estimated materials cost of constructing a new, 2,000 square foot home would be $96,820 under the current Standards, the proposed measures would increase this cost by $760 to $97,580. Where the estimated materials cost of a new 16,000 square foot office building would be $1,456,320 under the current Standards, the proposed measures would increase this cost by $10,240 to $1,466,560. Where the estimated materials cost of a new 19,000 square foot apartment building would be $1,438,110 under the current Standards, the proposed measures would increase this cost by $12,160 to $1,459,270. In all of these cases the difference is less than one percent, and is diluted among the various types of fenestration materials and various materials composing small electronics. As new construction itself represents only a fraction of the market for fenestration materials or for small electronic sensors and controls, staff find that this de minimis increase in potential demand and use will not result in an adverse effect on the environment.

Savings in Water Consumption

Estimated Onsite Water Savings

The proposed changes to the prescriptive residential requirements in Section 150.1 of the Standards are expected to result in modest but less than significant savings in onsite water use in residential homes. These savings are the result of increased hot water pipe insulation and hot water piping design requirements.

Single-family Water Heating Distribution System Improvements

The suggested changes to Section 150.0 and 150.1 include new prescriptive options for water heaters. Under these options, builders may install a gas instantaneous water heater, or a gas storage water heater over 55 gallons if Quality Insulation Installation (QII) is performed. Gas storage water heaters less than 55 gallons may also be used if QII is performed, and if either the hot water pipes are insulated and inspected, or if the hot water distribution system is a compact distribution design. (Other water heating technologies may be installed by using the performance modeling option rather than the prescriptive option.)

Insulating the hot water piping and keeping the length of piping as compact as is practical for the locations of the fixtures results in a small savings in water due to reducing the wait time for hot water to arrive at the fixture. However, the majority of new construction uses the

performance modeling approach rather than a prescriptive option, which allows the builder freedom in the design of their system provided its overall energy efficiency is equal to a standard design. Even among builders that use prescriptive options, a significant number are likely to install instantaneous gas water heaters rather than gas storage water heaters. This makes the amount of water saved attributable to this prescriptive option both very small and highly speculative. For this reason, the small potential onsite water savings resulting from the proposed regulations is found to be less than significant.

Estimated Statewide Power plant Water Savings

The implementation of the proposed changes to the Standards will result in electricity saving of approximately 281 gigawatt-hours per year. These savings will result in water savings at power plants that use evaporative water-cooling as their main source of heat rejection to the environment. By using available power plant data for the electricity grid in the western United States to the predicted electricity savings, an estimate of the water savings at California power plants was made. Water savings of an amount commensurate with these electricity savings is expected to result from the proposed changes to the Standards.

California Power Plant Water Consumption

Electricity generators in California submit data to the Commission through the Quarterly Fuel and Energy Report data collection. These collections include electricity generation and water use (for the purpose of electricity generation) at power plants. By using this data, the Commission estimates that modern combined cycle power plants[11] use an average of 522 gallons of water per megawatt-hour of electricity generation per year (CEC 2012). This is the average (weighted by the electricity generation at each power plant) of all existing combined cycle power plants greater than 20 megawatts in capacity within California.

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

Estimated Statewide Power Plant Water Savings

The Commission expects a savings of approximately 103 million gallons of water (314 acre-feet) per year from the electricity generation avoided at California power plants as a result of the implementation of the proposed changes.

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

Total Savings in Water Consumption

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

Indoor Air Quality

The Commission is not proposing the adoption of ASHRAE ventilation requirements (ASHRAE Std. 62.1). Instead, the Commission proposes to keep the current Title 24, Part 6, ventilation requirements, which generally provide higher ventilation rates than does ASHRAE Std. 62.1. It is the opinion of the Commission that there are no potential impacts to the degradation of indoor air quality as a result of the implementation of the proposed changes.

CHAPTER 6:
Energy and Environmental Benefits

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

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

Energy Savings

The projected annual savings from the nonresidential sector, including high-rise residential and hotel/motel buildings, under the proposed 2016 Standards is about 1.55 million therms of natural gas and 31.2 GWh of electricity.

Environmental Benefits

The estimated emissions benefits are based on energy savings and air pollution emission factors (including CO_{2E}) specifically tailored for energy savings realized in California (CEC 2012, CARB 2008, USEPA AP42). The annual reductions in emissions from implementing the 2016 nonresidential Standards are estimated at 20.6 tons of NO_x, 0.68 tons of SO_x, 0.73 tons of $PM_{2.5}$, and 13.7 thousand tons of CO_{2E}.

Low-Rise Residential Buildings

Energy Savings

The implementation of the proposed 2016 Standards for low-rise residential buildings are expected to result in a reduction of electricity use of approximately 241 GWh and natural gas use of approximately 14 million therms.

Environmental Benefits

The annual reductions in emissions from implementing the 2016 residential energy standards are estimated at 191.5 tons of NO_x, 6.14 tons of SO_x, 6.3 tons of $PM_{2.5}$, and 113 thousand tons of CO_{2E}.

Multi-family Buildings

Energy Savings

The implementation of the proposed 2016 Standards for multi-family buildings are expected to result in a reduction of electricity use of approximately 9.6 GWh and natural gas use of approximately .3 million therms.

Environmental Benefits

The annual reductions in emissions from implementing the 2016 residential Standards are estimated at 196 tons of NO_x, 6.36 tons of SO_x, 6.7 tons of $PM_{2.5}$, and 123 thousand tons of CO_{2E}.

CHAPTER 7: Cumulative Effects

Materials

As stated in Chapter 1, Commission staff estimates that 108,000 new residential homes will be constructed in 2017, with similar annual quantities in following years. At an estimated average size of 2,430 square feet, this represents an estimated 262 million square feet of annual new residential construction.

Staff therefore estimates that, at an average materials cost of $0.30 per square foot for fenestration and $0.08 for lighting and controls, the proposed residential measures are estimated to result in the annual use of $786,000 worth of fenestration materials and $209,600 worth of electronics.

Staff also estimates that 189 million square feet of new nonresidential buildings will be built in 2017, with similar annual quantities in following years. At an average materials cost of $0.56 per square foot for fenestration and $0.08 for lighting and controls, the proposed commercial measures are estimated to result in the annual use of $1,134,000 worth of fenestration materials and $151,200 worth of electronics.

Combined, the proposed measure is estimated to result in the annual statewide use of $1,920,000 worth of fenestration materials and $360,800 worth of electronics, distributed throughout the State and further diluted between various products and materials.

Energy

The estimated cumulative energy savings of implementing the proposed 2016 Standards will reduce annual energy consumption of electricity by 281 gigawatt-hours per year (GWh/yr). Natural gas consumption will be cut by 16 million therms.

The proposed changes were selected with full consideration of the life cycle cost analysis requirement of the Warren-Alquist Act. In response to this mandate, the 2016 Standards include measures that will "ensure the maximum feasible reductions in wasteful, uneconomic, inefficient, or unnecessary consumption of electricity" as required by the statute. Efficiency improvements in the 2016 Standards will affect more than 108,000 residential homes and 189 million square feet of nonresidential construction in the first year alone.

Environmental

Reducing natural gas and electricity use is expected to result in emission reductions both at individual buildings and at power plants both in California and in other western states. The estimated cumulative annual emissions reductions of implementing the proposed 2016 Standards are 508 tons of NOx, 13 tons of SOx, 41 tons of CO, 13.75 tons of $PM_{2.5}$, and 160 tons of CO_{2E}.

There is no way of mapping by air basin or climate zone the exact impact of emission reductions from reduced electric generation because electricity transmission and distribution does not correspond to air basins or climate zones. Similarly, predicting the distribution of future new construction in air basins or climate zones with sufficient precision to confidently allocate fractions of the estimated statewide reductions is highly speculative and not likely to show an environmental impact that differs significantly from the general statewide impact. Therefore, the cumulative environmental impacts of the proposed 2016 Standards are best understood as a general statewide reduction in the emissions of criteria pollutants and greenhouse gasses.

CHAPTER 8:
Energy Commission Recommendations

The analysis provided for the proposed changes to the Building Energy Efficiency Standards concludes that there will be no significant impact on the environment. A Negative Declaration is proposed to be adopted for the 2016 Building Energy Efficiency Standards.

CHAPTER 9:
Initial Study Preparers

This Initial Study was prepared by Peter Strait and Ron Yasny of the Efficiency Division's Building Standards Office, with contributions from Pippin Brehler and Jonathan Blees of the Office of the Chief Counsel.

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Air Emission Factors	Units	NOx	SOx	CO	$PM_{2.5}$
Electricity	lbs/MWh	0.051	0.007	0.072	0.022

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(USEPA AP42) United States Environmental Protection Agency, AP-42 Compilation of Air Pollution Emission Factors, DATE. *Uncontrolled Residential Furnaces* as defined by Chapter 1 External Combustion Sources, Section 1.4 Natural Gas Combustion, Page 1.4-1. Energy Commission staff assumed an energy content of 1,050 British thermal units per standard cubic foot (Btu/scf).

Emission Factors	**Units**	**NOx**	**SOx**	**CO**	**$PM_{2.5}$**	**CO2e**
Natural Gas	lbs/mmscf	94	0.6	40	7.6	120,000

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GLOSSARY

Alternative Calculation Method (ACM)	ACMs are defined in the 2013 Standards as "compliance softwares, or alternative component packages, or exceptional methods approved by the Commission under Section 10-109."
Alternative Component Packages	An alternative component package is one of the sets of prescriptive requirements contained in Section 150.1 which a building may meet to achieve compliance with the standards. These are often referred to as the "prescriptive packages" or "packages."
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
ASTM	American Society for Testing and Materials.
BEES	See Building Energy Efficiency Standards
Btu/hr (Btuh)	British thermal unit per hour. One Btu equals the amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit. Used for measuring heating and cooling equipment output.
Building Energy Efficiency Standards (Standards)	The California Building Energy Efficiency 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.
Cool Roofs	A roof that reflects significantly more solar energy than a traditional roof and therefore keeps the building's interior cooler. Cool roofs are usually light-colored and applied as a tile product (residential) or coating (nonresidential). An alliance called the Cool Roof Rating Council has been formed to establish criteria and rating systems for cool roofs.
CO	Carbon Monoxide (CO): A colorless, odorless gas resulting from the incomplete combustion of hydrocarbon fuels. CO is regulated as a criteria air

	pollutant under the Clean Air Act, 42 U.S.C., Section 7401 et seq.
CO_2	Carbon dioxide, a gas by-product of combustion that is known to behave as a greenhouse gas in the earth's atmosphere.
Demand Control Ventilation	Demand Control Ventilation is the ability to adjust the amount of ventilation air provided to a space based on the extent of occupancy (as measured by CO_2 sensors). For example, an assembly building that is occupied on an intermittent basis would use demand controls to change the ventilation rates based on the number of people in the space, thereby saving substantial energy when the space is sparsely occupied. Occupancy sensors, air quality sensors, or other devices may be used to accomplish this.
EER (Energy Efficiency Ratio)	The ratio of cooling capacity of an air-conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. Compare to SEER.
Emittance	The property of emitting radiation; possessed by all materials.
Energy Budget	Energy Budget is defined in the 2013 Standards as "the maximum amount of Time Dependent Valuation (TDV) energy that a proposed building, or portion of a building, can be designed to consume, calculated with the approved procedures specified in Part 6."
Fenestration Product	Fenestration Product is defined in the 2013 Standards as "any transparent or translucent material plus any sash, frame, mullions and dividers, in the facade of a building, including, but not limited to, windows, sliding glass doors, French doors, skylights, curtain walls, dynamic glazing, garden windows and glass block."
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 measures of equipment efficiency defined according to the type of HVAC equipment installed.
Kilowatt (kW)	One thousand watts of power. A kilowatt is a measure of demand, or how many thousand watts are being drawn at any instant.
Kilowatt-hour (kWh)	One thousand watt-hours (watts of energy provided or expended for the duration of one hour) of energy.
Lighting Power Density (LPD)	A measure of the amount of light in a room. For the purpose of this document, LPD represents the amount of watts used to produce light per square foot that can be installed for a specific task.
Low-e glazing	Glazing that has been coated with a low-emissivity medium that reduces heat transfer.
Low-Rise Residential	Any building of the residential occupancy group R (as defined in the Uniform Building Code), excluding all hotels, all motels and apartment buildings, with four or more habitable stories.
Megawatt (MW)	One million watts of power. A megawatt is a measure of demand or how many million watts are being drawn at any instant (see also kilowatt).
MBtu	One million Btus of energy.
NFRC	The National Fenestration Rating Council, a national organization of manufacturers of fenestration products, glazing and related materials, utilities, state energy offices, laboratories, homebuilders, architects and public interest groups. This organization is responsible for rating the U-factors and solar heat gain coefficient of manufactured fenestration product lines (i.e., windows, skylights, and glazed doors) that must be used in compliance calculations. In California, all manufactured fenestration products must be labeled with NFRC rated values or with approved default U-factors.

NO_x	Oxides of nitrogen, usually NO and NO_2, that are chief components of air pollution and produced by the combustion of fossil fuels.
Outdoor or Outside Air	Outdoor Air is defined in the 2013 Standards as "air taken from outdoors and not previously circulated in the building."
Proposed Design	The proposed building designs that must comply with the standards before receiving a building permit.
$PM_{2.5}$	Solid particulate matter that is 2.5 microns in size or smaller. Usually considered pollutants, particulates are released from combustion processes in exhaust gases at fossil fuel plants and from mobile and other fugitive particle sources.
SEER (Seasonal Energy Efficiency Ratio)	The total cooling output of a central air-conditioning system in Btus during its normal usage period for cooling divided by the total electrical input in watt-hours during the same period, as determined using specific test procedures.
Solar Heat Gain Coefficient (SHGC)	SHGC is defined in the 2013 Standards as "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."
Thermostatic Expansion Valve (TXV)	A refrigerant metering valve that controls the flow of liquid refrigerant entering the evaporator in response to the superheat of the gas leaving it. Its basic function is to keep the evaporator active without permitting liquid to be returned through the suction line to the compressor. TXVs compensate for common installation problems caused by incorrect refrigerant charge and incorrect airflow.
Time Dependent Valuation (TDV)	A method of valuing electricity and other building energy sources differently according to the time of day and season of electricity demand; for example, the cost of electricity in California rises at peak demand times in hot weather due to a much larger need to power air

	conditioning. TDV energy includes energy used at the building site as well as that consumed in producing and delivering energy to the site, including but not limited to generation, transmission, and distribution losses.
U-factor (formerly U-value)	U-factor is defined in the 2013 Standards as "the overall coefficient of thermal transmittance of a fenestration, wall, floor, or roof/ceiling component, in Btu/(hr x ft^2 x °F), including air film resistance at both surfaces."
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.
Watt (W)	A unit of measure of electric power at a point in time, as capacity or demand.

APPENDIX A: California Environmental Quality Act Checklist

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

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

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

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

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
I. **AESTHETICS --** Would the project:				
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?				X
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on aesthetics.				
II. **AGRICULTURE RESOURCES** -- In determining whether impacts to agricultural resources are significant environmental benefits, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
Commission staff has determined that the proposed 2016 Standards will have no impacts on agricultural resources.				
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?				X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?				X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?				X
d) Expose sensitive receptors to substantial pollutant concentrations?				X
e) Create objectionable odors affecting a substantial number of people?				X
The building standards may result in reduced power plant operation (in California and the Western United States) and reduce natural gas consumption and may therefore result in reduced emissions. Staff expects that overall, California will experience a net environmental benefit and net reductions of emissions resulting from the proposed 2016 Standards. Commission staff has therefore determined that the proposed 2016 Standards will have no adverse impacts on air quality.				
IV. **BIOLOGICAL RESOURCES** -- Would the project**:**				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on biological resources.				
V. **CULTURAL RESOURCES** -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on cultural resources.				
VI. **GEOLOGY AND SOILS** -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				X
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X
Commission staff has determined that the proposed 2016 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 2016 Standards is to reduce energy use in California. Staff has determined that the proposed standards will save energy statewide.				
VIII. **HAZARDS AND HAZARDOUS MATERIALS** -- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wild land fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?				X
Commission staff deems that the proposed 2016 Standards will have no potentially significant effects on hazards and hazardous materials.				
IX. **HYDROLOGY AND WATER QUALITY** -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?				X
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner,				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
which would result in substantial erosion or siltation on- or off-site?				
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?				X
f) Otherwise substantially degrade water quality?				X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X
j) Inundation by seiche, tsunami, or mudflow?				X
Commission staff has determined that the proposed 2016 Standards may reduce the amount of water used and thus will have no impacts on hydrology and water quality.				
X. **LAND USE AND PLANNING** -- Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on land use and planning.				
XI. **MINERAL RESOURCES** -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X
Commission staff has determined that the proposed 2016 Standards will have less than significant impacts on mineral resources.				
XII. **NATURAL RESOURCES** -- Would the project result in:				
a) Significant increase in the rate of use of any natural resources?				X
b) Significant depletion of any non-renewable natural resource?				X
Commission staff has determined that the proposed 2016 Standards will have less than significant impacts on natural resources.				
XIII. **NOISE** -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive ground borne vibration or				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
ground borne noise levels?				
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X
Commission staff has determined that the proposed 2016 Standards will have insignificant impacts on noise.				
XIV. **POPULATION AND HOUSING** -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on population and housing.				

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
XV. **PUBLIC SERVICES** -- Would the project:				
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				X
Fire protection?				X
Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on public services.				
XVI. **RECREATION** -- Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on recreation.				
XVII. **TRANSPORTATION AND TRAFFIC** -- Would the project:				
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				X
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on transportation and traffic.				
XVIII. **UTILITIES AND SERVICE SYSTEMS** -- Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental benefits?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
construction of which could cause significant environmental benefits?				
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the projects projected demand in addition to the providers' existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the projects solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X
Commission staff has determined that the proposed 2016 Standards will have no impacts on utilities and service systems.				
XIX. **MANDATORY FINDINGS OF SIGNIFICANCE**				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X
c) Does the project have environmental benefits that will cause substantial adverse effects on human beings, either directly or indirectly?				X

Issues	Potentially Significant Impact	Less Than Significant with Mitigation Incorporation	Less Than Signifi-cant Impact	No Impact
Improvements in the energy efficiency of residential and nonresidential buildings will have less than significant impacts to the concerns listed in this matrix. The 2016 Building Standards may result in **reduced** power plant operation and **reduced** natural gas consumption in California and the Western States with associated potential reductions in emissions. Staff has considered the effects on materials use, and other issues and deemed them to be insignificant.				

DETERMINATION:
On the basis of this evaluation:

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

Robert P. Oglesby Date
Executive Director
California Energy Commission

APPENDIX B: Proposed Text of Negative Declaration

Pursuant to the California Environmental Quality Act (CEQA), the Energy Commission approves the Initial Study analyzing the environmental impacts of the 2016 Standards.

Based on the Initial Study, the Energy Commission finds that:
(1) there is no substantial evidence, in light of the whole record, that adopting the 2016 Building Energy Efficiency Standards, in Parts 1 and 6 of Title 24 of the California Code of Regulations, will have a significant effect on the environment; and
(2) the Initial Study reflects the Energy Commission's independent judgment and analysis.

The Energy Commission therefore also adopts a Negative Declaration for the proposed 2016 Standards based on the approved Initial Study.