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# INITIAL STATEMENT OF REASONS (ISOR) PROPOSED AMENDMENTS TO APPLIANCE EFFICIENCY REGULATIONS

## CALIFORNIA CODE OF REGULATIONS, TITLE 20:

## SECTIONS 1601-1609: APPLIANCE EFFICIENCY REGULATIONS

## CALIFORNIA ENERGY COMMISSION

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California Energy Commission
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# California Energy Commission

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# INTRODUCTION

This Initial Statement of Reasons ("ISOR") describes the purposes, rationales, and necessity of the California Energy Commission's proposed amendments to its appliance energy efficiency regulations, Title 20 Sections 1601 through 1607. The amendments cover two distinct areas: standards for Small Diameter Directional Lamps) and standards for general service Light Emitting Diode (LED) Lamps. An assessment of the costs and benefits of each of these proposed regulations is discussed below.

Since 1975, California's building and appliance energy efficiency standards have saved Californians an estimated $75 billion in reduced electricity bills. The state's appliance efficiency regulations saved an estimated 22,923 gigawatt hours (GWh) of electricity and 1,626 million therms of natural gas in 2012 alone, resulting in about $5.24 billion in savings to California consumers from these regulations. The proposed standards represent the next step in California's long history of resource efficiency and economic savings.

The proposed small diameter directional lamp and LED standards will provide electricity savings of 32,418 gigawatt-hours (GWh) over the first 10 years of implementation and monetary savings of $4.2 billion to California consumers over that period. Estimated job years will increase by an average of 4,161 under the proposed regulations. In addition, the proposed standards yield an estimated $5.69 billion increase in real disposable personal income between 2017 through 2029, which is beneficial for the California economy.

## A. Scope of this Rulemaking, Problem the Agency Intends to Address and Anticipated Benefits (Gov Code section 11346.2(b)(1))

The Appliance Efficiency Regulations (Title 20, Sections 1601-1609 of the California Code of Regulations (CCR)) contain definitions, test procedures, labeling requirements, and efficiency standards for state- and federally regulated appliances. Appliance manufacturers are required to certify to the California Energy Commission that their products meet all applicable state and federal regulations pertaining to efficiency before their products can be included in the Commission's database of approved appliances to be sold or offered for sale within California.

Appliance energy efficiency is identified as a key to achieving the greenhouse gas (GHG) emission reduction goals of Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006) (AB 32), as well as the recommendations contained in the California Air Resources Board's Climate Change Scoping Plan. Energy efficiency regulations are also identified as key components in reducing electrical energy consumption in the Energy Commission's 2013 Integrated Energy Policy Report (IEPR) and the California Public Utilities Commission's (CPUC) 2011 update to its Energy Efficiency Strategic Plan. Finally, Governor Brown identified reduced energy consumption through efficiency standards as a key strategy for achieving his 2030 GHG reduction goals.

### Energy Efficiency Standards: Small Diameter Directional Lamps

Small diameter directional lamps are often used in retail, hospitality, residential, and museum applications. More recently their popularity in residential applications has grown and it is expected to continue to grow. The installed stock, and most common replacement product for small diameter directional lamps in California is comprised largely of poor efficiency incandescent, halogen, and HIR lamps which have an average efficiency of 8 lumens per watt (LPW). In addition these lamps only last 2000 to 4000 hours. Small diameter directional lamp

LED lamps are relative newcomers to the lighting market, but can be used as replacements and provide large energy savings. LED small diameter directional lamps can last 25,000 hours or more and have efficiencies that can exceed 80 LPW. The staff's proposed standard would transform the market to more cost-effective and energy efficient small diameter directional lamps saving energy and consumers money. For a detailed discussion on the economic and environmental benefits of energy efficiency lighting and the proposed standards, see Harinder Singh, Ken Rider, 2015. Analysis of Small Diameter Directional Lamp and General Service Light-Emitting Diode Lamp Efficiency Opportunities, California Energy Commission. Publication Number: CEC-400-2015-034.

Saving energy through a shift away from incandescent and halogen products will help California meet a number of important policy goals including the reduction of wasteful and inefficient consumption of energy, meeting the loading order, reduction in greenhouse gas emissions and air pollution from electricity generation and meeting the state's requirements for zero-net-energy residential and commercial buildings.

### Energy Efficiency Standards: Light Emitting Diodes

Existing federal and state regulations require that general service lamps meet a standard of 45 LPW by January 1, 2018 to be sold or offered for sale in California. There are no halogens or incandescent lamps that meet this level of efficiency. Therefore, the standard is expected to cause a large market shift from the incumbent technology to LEDs and compact fluorescent lamps (CFLs).

Average baseline efficacy for medium screw-base omnidirectional LED lamps is 81.3 LPW, for medium screw-base directional LED lamps is 69 LPW, and for candelabra-base LED lamps is 72.3 LPW. Because of the expected shift to LED based technology it is important to establish minimal efficiency standards that are appropriate to LED technology to ensure products offered for sale in California save the state and consumers energy and money. This is especially important given the low turnover rate of LED lamps which can last 20 years or more. If inefficient LED products are installed, they may not be replaced for decades. For a detailed discussion on the economic and environmental benefits of energy efficiency lighting and the proposed standards, see Harinder Singh, Ken Rider, 2015. Analysis of Small Diameter Directional Lamp and General Service Light-Emitting Diode Lamp Efficiency Opportunities, California Energy Commission. Publication Number: CEC-400-2015-034.

## B. The Specific Purpose, Rationale, and Necessity of Each Section of the Proposed Amendments (Gov Code section 11346.2(b)(1) and section 11349(a))

### See Attachment A for the specific purpose, rationale and necessity for each proposed regulatory change.

Section 25402(c)(1) of the California Public Resources Code mandates that the Energy Commission reduce the inefficient consumption of energy and water by prescribing efficiency standards and other cost-effective measures for appliances that require a significant amount of energy and water to operate on a statewide basis. Such standards must be technologically feasible and attainable and must not result in any added total cost to the consumer over the designed life of the appliance.

In determining cost-effectiveness, the Energy Commission considers the value of the energy saved, the effect on product efficacy for the consumer, and the life-cycle cost to the consumer

of complying with the standard. The Energy Commission also considers other relevant factors, including but not limited to the effect on housing costs, the total statewide costs and benefits of the standard over the lifetime of the standard, the economic impact on California businesses, and alternative approaches and the associated costs.

In addition, the California Lighting Efficiency and Toxics Reductions Act of 2007 requires the Energy Commission to adopt minimum energy efficiency standards for general purpose lighting. These standards, in combination with other programs and activities, must be structured to reduce average statewide electrical energy consumption by not less than 50 percent from 2007 levels for indoor home lighting and not less than 25 percent from the 2007 levels for indoor commercial and outdoor lighting by 2018.

The proposed regulation is necessary in carrying out the Commission's energy efficiency mandates.

# C. Economic Impact: Standardized Regulatory Impact Analysis (SRIA) (Gov Code section 11346.3(c)(1)(A) through (F))

## Small Diameter Directional Lamps and LEDs

The following summarizes the contents of the Standardized Regulatory Impact Analysis which contains a detailed assessment of the aggregate economic impacts from the proposed regulations. (See Rider, Ken, Pierre duVair, Harinder Singh, Jared Babula, Michael Murza. 2015. *Standardized Regulatory Impact Assessment of 2015 Proposed Appliance Efficiency Regulations*. California Energy Commission. CEC-400-2015-028.)

## (A) The creation or elimination of jobs within the state.

Energy Commission staff evaluated the impact on jobs from implementation of the proposed SDDL and LED efficiency standards between 2017 and 2029. Total job-years over period will increase by 54,098 under the proposed standards. Estimated job-years rise from 3,547 in 2018 to 3,812 by the year 2029. The average annual job growth is 4,161 over the period of analysis.

Results from the macroeconomic modeling show that the proposed energy efficiency standards lead to job creation. This job creation makes sense given the amount of savings that consumers receive on their electricity bills as a result of the efficiency standards. These savings are reallocated from consumer spending on electricity to other goods and services within the California economy, which translates into jobs.

Utility sector jobs are expected to decrease due to lower electricity retail sales. However, increases in personal disposable income and reduction in commercial operating costs of businesses more than offset this loss and yield positive job growth numbers described above.

In terms of the California economy, the impact on jobs of the proposed standards is minor. The changes in jobs represent just two hundredths of one percent change from baseline employment levels.

The increases in job growth lead to corresponding increases in personal income. The proposed standards yield an estimated $5.65 billion increase in real disposable personal income between 2017 through 2029.

## (B) The creation of new businesses or the elimination of existing businesses within the state.

The proposed regulations will not lead to the specific creation or elimination of any specific California business. While the small-diameter directional lamp will lead to a technology change from filament incandescence to LED, staff could find no small-diameter directional lamp manufacturing in California. In fact, the only lamp manufacturing that staff could find within the state is the manufacture of some LED chips, a key component to LED lamps. These parts do not themselves comply or not comply with the regulations, but the regulations may increase demand for these chips by increasing demand for LEDs lamps. However, the proposed regulations do not create the need for a new good or service. Instead, it requires the improvement of existing goods in the market. Therefore no specific business is estimated to be directly created by the regulation, although secondary businesses may be created from expanded jobs and disposable income within the state.

The proposed regulations will reduce overall costs to California businesses by lowering monthly utility bills for electricity due to installation of more efficient small diameter directional lamp and LED lamps. The incremental cost to produce these more efficient lamps is small compared to the lifetime energy savings gained from use of them in lighting appliances. This is especially the case for small diameter directional lamps which will be going from approximately 8 lumens per watt to 80 or more lumens per watt.

Staff estimates commercial businesses will save approximately $227 million on electricity bills annually between 2017 and 2029 with the proposed standards. Total utility bill savings to California businesses between 2017 and 2029 through use of more energy efficient lamps is $2.75 billion.

LED small diameter directional lamps that replace halogen or incandescent lamps also provide a net savings in business expenses, as one LED lamp lasts the equivalent of six non-LED lamps. The LED lamps have higher initial purchase prices. Staff estimates that LED lamps cost $10 while the bulbs being replaced cost $6. The estimate of net reduction in light bulb business expenses equals $506 million between 2017 and 2029. These savings will accrue primarily to the commercial retail sector, where these lamps are typically found.

## (C) The competitive advantages or disadvantages for businesses currently doing business within the state.

The proposed regulations present both advantages and disadvantages to utilities, manufacturers, and retailers in the state. Electric utilities will see a decrease in demand for electricity relative to a baseline forecast. Because investor-owned energy utilities' revenue is decoupled from energy sales, these utilities will see minimal impacts from the proposed regulations.

The proposed regulations will, by design, give an advantage to manufacturers of more efficient products. The proposed performance standards are not based on any particular patent or technology and therefore give a broad advantage rather than a specific advantage. The distribution of compliant products is spread among many manufacturers. Assembly of LED lamps does not occur in significant volume within the state – most are instead assembled in China. However, there are California based LED corporations, particularly research and design facilities such as Cree, Soraa, and Philips Lumileds. These companies will benefit from the diminishing halogen and incandescent small diameter directional lamp market, which will drive up LED sales. There are no manufacturers of halogen/incandescent small diameter directional lamps in California.

Retailers will sell fewer lamps overall as incandescent and halogen small diameter directional lamps are replaced with longer lasting technologies. Overall, small diameter directional lamps make up a small portion of both volume and retail space in a hardware or big box store's lighting section. However, while the retail sector may have fewer sales of lamps, the majority of small-diameter lamps are used in retail spaces. Therefore the retail sector will reap direct savings through fewer lamp purchases and lower operating costs.

The decrease in overall energy prices estimated with the macroeconomic model would create a slight competitive advantage for California businesses.

## (D) The increase or decrease of investment in the state.

Energy Commission staff used estimates of direct energy savings (electricity) to model the macroeconomic impacts of the proposed small diameter directional lamp and LED efficiency standards to the overall California economy. The impacts were modeled over a 13-year period (2017-2029), although staff anticipates that future federal general service LED appliance efficiency regulations could supersede the proposed standards before 2029. If new federal general service LED standards are proposed in less than 13 years, then the resulting economic impacts would be for a short period and less than those analyzed and reported within the SRIA.

The overall result of conserving electricity with the proposed lamp efficiency standards is an increase in gross domestic product (GDP) and private domestic fixed investment. As noted earlier, the jobs impact is positive due to residential and commercial savings on utility costs being reallocated to other spending categories. In addition, real disposable personal income increases from $392 million in 2018 to $436 million in 2029 with the implementation of the proposed standards.

The proposed regulations are estimated to increase GDP by $145 million in 2018 and $256 million in 2029. This modeled increase in GDP is the result of lower annual electricity bills and reallocation of spending by businesses and residences on other goods and services within the California economy.

Staff estimates that gross private domestic fixed investment increases and falls between 2017 and 2029. In aggregate, gross private domestic fixed investment increases by $128 million over the period of analysis. The average annual change in private fixed investment between 2017 and 2029 for the proposed standards is a $10 million increase. The levels of increased and reduced private fixed investment are very small compared to the whole California economy and represent up to a 0.01 percent change from the baseline in either direction. Staff finds the overall effect of the regulations on investment in California to be small compared to benefits of reduced electricity consumption, increased jobs, increased personal income, improved air quality, and reduced greenhouse gas emissions.

## (E) The incentives for innovation in products, materials, or processes.

The technologies necessary to meet the proposed and alternative standards are widely available as a result of past and ongoing investments in research and development. There are many product models across multiple manufacturers that currently comply with the proposed standards. The proposed standards will cause the spread of existing efficient technologies into products that may not currently contain them, increasing the total number of products that would comply with the proposed standards.

Future innovations in the products proposed to be regulated can be organized into three types: innovations that would decrease energy use, innovations that are neutral to energy use, and innovations that increase energy use. The proposed standards clearly provide incentives for

technologies and innovations that can reduce the energy use of small diameter directional lamp and LED lamps. The proposed regulations put pressure on manufacturers of existing products to adjust from status quo designs that would have difficulty meeting the performance standards. These changes lead to increased industry investment in technology that forms the core of innovation. This investment also generates expertise and fuels secondary innovation. In addition the proposed reporting and labeling regulations would make lamp performance more transparent. Access to this data will encourage competition, inform consumers, and drive further innovation.

In some cases, innovation does not come with any change in energy use. For example, the shape of a lamp's optics may not change its efficiency but may lead to more pleasing light output. Generally, these types of innovations are neither promoted nor hindered by energy performance standards.

Some innovations incorporate features that might require additional energy consumption in regulated products. The regulations mandate lower energy consumption resulting in an upper limit for innovations that would otherwise increase the consumption of energy in general. The result of the innovation can be positive, neutral, or negative with regard to energy consumption. The proposed regulations have a neutral effect on innovations that would increase consumption, but not in excess of the performance standard. The proposed regulations would have a negative impact on innovations that would cause energy consumption to exceed the performance standard. This means that manufacturers will have to either modify the innovation to conform to the performance standard or forgo the innovation. The regulations have a positive effect on innovation where the energy consuming innovation drives the demand for energy saving innovations to comply with the proposed standards.

The economic analysis of the proposed regulations shows an increase in personal disposable income. This type of income is the feedstock of innovation because it is disposable income that can be used to buy products that are "new" and beyond what consumers would consider baseline. Further, the utility bills of California businesses would decrease from the proposed cost-effective regulations. Reduced spending on utilities frees additional capital for those companies to invest in research and development for other forms of innovation.

## (F) The benefits of the regulations, including, but not limited to, benefits to the health, safety, and welfare of California residents, worker safety, and the state's environment and quality of life, among any other benefits identified by the agency. (Gov Code 11346.2(b)(1))

The proposed regulations provide a wide range of benefits to California households and commercial businesses. The benefits that were quantified in the staff's standardized regulatory impact assessment include electricity conservation and utility bill savings, reduced light bulb replacement costs, jobs impact, changes in personal income, reduced air pollution, and reduced greenhouse gas emissions. Estimates were made for annual incremental costs to residential and commercial consumers of small diameter directional lamps and general service LED lamps.

### Electricity and Replacement Savings

The proposed standards would yield significant electricity savings within California. Electricity is conserved directly through installation of more energy-efficient LED lamps. The proposed lamp efficiency standards yield total annual electricity savings estimated at 21 gigawatt-hours (GWh) in 2017, an implementation jump to 2,040 GWh in 2018 and by 2029 reach 3,144 GWh electricity savings. Total cumulative electricity savings over the 13-year period of analysis is

32.8 terawatt-hours (TWh). This cumulative quantity of electricity savings is equivalent to the annual output of fifteen 500-megawatt power plants.

The net present value of annual residential electricity bill savings under the proposed efficiency standards is estimated to be $44.28 million in 2018 and up to $133 million by 2029. Commercial and industrial sector electricity bill savings over the same period range from a low of $239 million to a high of $250 million. Staff estimates the air quality and greenhouse gas (GHG) benefits of conserving this amount of electricity (see below) but did not attempt to estimate a wider range of potential benefits to California such as those associated with improved grid reliability or avoided power plant or transmission line construction costs. California consumers will save about $694 million over the first 13 years of the regulation just from avoided lamp replacements because of the longer life of LEDs.

## Job Effects

Job effects of the proposed standards were estimated using the REMI PI+ model for California as a single region (Version 1.7.2). The cumulative 13-year jobs impact is positive for all levels of standards analyzed with job growth increasing as the lamp efficiency standards increase in stringency. The reduced spending by households and businesses on utility bills is reallocated to spending on other goods and services within the economy. The reallocation of spending more than offsets reduced economic activity within the electric utilities sector of the California economy.

From 2017-2029, the standards will result in an increase of 54,098 total job-years. Estimated job-years rise by 3,547 in 2018 and the average annual increase is 4,161 over the period analyzed. These levels of jobs impact are small in comparison to the full California economy, which has a baseline employment level in 2017 of approximately 22.87 million jobs. The jobs impacts represent two one-hundredths of one percent change in California's employment levels. While the employment impact is small, it is nonetheless positive and good for the California economy.

## Personal Income

In addition to the utility bill savings described above, the proposed standards will increase real disposable personal income by $392 million in 2018 and $436 million in 2029 as a result of higher employment levels with implementation of the lamp efficiency standards. The net present value of cumulative increases in disposable income with the proposed standards is $5.65 billion, which is certainly beneficial for the California economy. This increase in personal disposable income results from consumers and commercial businesses saving money on utilities and spending it on other goods and services, leading to a gain in employment levels within the state.

## Air Quality

Air quality benefits of proposed lamp energy efficiency regulations are significant as a result of avoided electricity generation, but difficult to quantify given uncertainty in the mix of generation resources over the next fifteen years. Staff used the emissions factors shown in Table 1 for low and high criteria emissions reductions associated with electricity savings.

**Table 1: Criteria Pollutant Emissions Factors for Avoided Electricity Generation**

| | Particulate Matter 2.5 microns (lbs/MWh) | Oxides of Nitrogen (lbs/MWh) | Sulfur Dioxide (lbs/MWh) | Proposed Standards Cumulative Reductions (2017-2029) |
|---|---|---|---|---|
| **Low Emission Factor** | 0.03 | 0.05 | 0.004 | $PM_{2.5}$: 492 tons<br>NOx: 820 tons<br>$SO_2$: 66 tons |
| **High Emission Factor** | 0.07 | 0.40 | 0.007 | $PM_{2.5}$: 1,148 tons<br>NOx: 6,558 tons<br>$SO_2$: 115 tons |

Sources: D. McCubbin and B. Sovacool - Energy Policy 53 (2013) page 433; California Energy Commission Staff – Appliance Efficiency Office.

Proposed lamp efficiency regulations over the next 13 years are estimated to reduce small particulate matter of 2.5 microns or less ($PM_{2.5}$) emissions by between 492 tons and 1,148 tons. Oxides of nitrogen emissions ($NO_x$) reductions are estimated to be a low of 820 tons and a high of 6,558 tons. Sulfur dioxide ($SO_2$) emissions have reduction estimates of 66 tons to 115 tons. Additional benefits of reducing carbon monoxide and volatile organic compounds (VOCs) were not estimated.

Benefits of reducing these criteria emissions were estimated using the U.S. Environmental Protection Agency's COBRA Model. The COBRA Model provides a high and low estimate of avoided public health impacts due to reductions in criteria emissions. The proposed standards are estimated to avoid annually between $3.3 million and $22.2 million in health impacts as a result of reduced natural gas-fired electricity generation.

## Greenhouse Gas Emissions

The proposed regulations are estimated to avoid 10.3 million tons of carbon dioxide ($CO_2$) between 2017 and 2029. As with reductions in criteria emissions, there is significant uncertainty about the long-term electricity generation resources that will be displaced by the significant electricity demand reductions that result from implementation of the regulations. For purposes of this SRIA, staff estimated that efficiency impacts result in reduction of 690 pounds of carbon dioxide per megawatt-hour of electricity generation avoided.

The U.S. Environmental Protection Agency provides a range of estimates for avoided global damages due to emissions of fossil $CO_2$. The total GHG benefit for proposed lamp efficiency standards, using a mid-point value for social cost of carbon at $47 per ton of $CO_2$ is approximately $373 million. Similar to the public health benefits of criteria emission reductions, GHG emission reduction benefit estimates also contain significant uncertainties.

## Methods and details by which the agency sought public input regarding alternatives? (1 CCR 2001(d))

On March 25, 2013, the Energy Commission released an "Invitation to Participate" to provide interested parties the opportunity to inform the Energy Commission about the product, market, and industry characteristics of the appliances identified in the OIR. The Energy Commission reviewed the information and data received in the docket and hosted staff workshops on May 28 through 31, 2013, to vet this information publicly.

On June 13, 2013, the Energy Commission released an "Invitation to Submit Proposals" to seek proposals for standards, test procedures, labeling requirements, and other measures to improve the efficiency and reduce the energy or water consumption of the appliances identified in the OIR.

On September 19, 2014 the Energy Commission released a notice of a staff workshop accompanied by a draft staff report containing draft efficiency regulations for small-diameter directional and general service light-emitting diode (LED) lamps. The staff report also contained an analysis of energy savings, technological feasibility, and cost-effectiveness of the proposal. Comments were submitted by stakeholders by November 14, 2014.

Energy Commission Staff sought input on alternatives though these public workshops and meetings with stakeholders and by discussing alternative standards in the staff reports and Standardized Regulatory Impact Assessment. Specifically, staff compared the cost and benefits of the proposed energy efficiency standards to the cost and benefits of less efficient and more efficient standards. Staff also considered phasing of standards and whether a combination of standards and other incentives would result in the State achieving additional cost-effective energy savings.

Based on the information presented by stakeholders and staff's independent research staff puts forth the proposed standards as the most effective way for the California to maximize energy savings goals and for the people of California to save money through the reduction in energy consumption. In addition energy savings also results in pollution reductions.

# D. Technical, Theoretical, and Empirical Studies, Reports, and Similar Documents Relied Upon (Gov Code 11346.2(b)(3))

### Small Diameter Directional Lamps and LEDs

Harinder Singh, Ken Rider, 2015. *Analysis of Small Diameter Directional Lamp and General Service Light-Emitting Diode Lamp Efficiency Opportunities,* California Energy Commission. Publication Number: CEC-400-2015-034

Rider, Ken, Pierre duVair, Harinder Singh, Jared Babula, Michael Murza. 2015. *Standardized Regulatory Impact Assessment of 2015 Proposed Appliance Efficiency Regulations*. California Energy Commission. CEC-400-2015-028.)

# E. Consideration of Reasonable Alternatives, Including Those That Would Lessen Any Adverse Impact on Small Business (Gov Code Section 11346.2(b)(4)(A) and (B))

The Energy Commission is proposing new minimum efficiency standards and amendments to the existing Appliance Efficiency Regulations. Before it adopts the proposed regulations, the Energy Commission must determine that no reasonable alternative it considered, or that has otherwise been identified and brought to its attention, would be more effective in carrying out the purpose for which the amendments are proposed, would be as effective as and less burdensome to affected private persons than the proposed amendments, or would be more cost effective to affected private persons and equally effective in implementing the underlying statutory policy. The Energy Commission must also consider alternatives that would lessen any adverse impact on small business.

## small Diameter Directional Lamps

During the public participation that led up to this rulemaking, the Energy Commission did receive several comments that resulted in changes to what was originally proposed in the draft staff report. These changes were intended to improve the effectiveness of the standards or decrease the burden on the affected industry.

To date, the Energy Commission has found no additional alternatives to the proposed action that would be more effective, or as effective and less burdensome. Commission staff closely considered various lumens per watt efficiency standards coupled with different color rendering index (CRI) values suggested by stakeholders. Because stakeholder offered different numbers, staff had to ultimately choose a level of efficiency that, based on the best available information, was feasible and maximized energy savings while minimizing costs.

Based on the information available to staff and identified by stakeholders, staff has not received or identified an alternative that would be more effective, as effective and less burdensome, or more cost-effective and equally effective at reducing energy consumption through energy efficiency as required under Public Resources Code, section 25402(c)(1). Staff has also not been presented with any alternative that would lessen any adverse impact on small business (the regulation is anticipated to benefit small businesses).

## LEDs

During the public participation that led up to this rulemaking, the Energy Commission received several comments that resulted in changes to what was originally proposed in the draft staff report. These changes were intended to improve the effectiveness of the standards or decrease the burden on the affected industry.

To date, the Energy Commission has found no alternatives to the proposed action that would be more effective, or as effective and less burdensome. Commission staff closely considered various lumens per watt efficiency standards coupled with different color rendition indexes suggested by stakeholders. Because stakeholder offered different numbers, staff had to ultimately choose a level of efficiency that, based on the best available information, was feasible and maximized energy savings while minimizing costs.

Based on the information available to staff and identified by stakeholders, staff has not received or identified an alternative that would be more effective, as effective and less burdensome, or more cost-effective and equally effective at reducing energy consumption through energy efficiency as required under Public Resources Code, section 25402(c)(1). Staff has also not been presented with any alternative that would lessen any adverse impact on small business (the regulation is anticipated to benefit small businesses).

# F. Mandate of Specific Technology (Gov Code Sections 11340.1(a); 11346.2(b)(1); 11346.2(b)(4)(A)

### SMALL DIAMETER DIRECTIONAL LAMPs

The proposed standards do not mandate a specific technology but set performance requirements related to small diameter directional lamps.

### LEDs

The proposed standards do not mandate a specific technology but set performance requirements related to small diameter directional lamp general service LED lamps.

# G. Facts, Evidence, Documents, Testimony, or Other Evidence of No Significant Adverse Impact on Business (Gov Code Section 11346.2(b)(5))

The Energy Commission determined that the proposed regulation action will not have a significant adverse economic impact on business and the basis for this determination is supported by the findings in the documents titled:

Harinder Singh, Ken Rider, 2015. *Analysis of Small Diameter Directional Lamp and General Service Light-Emitting Diode Lamp Efficiency Opportunities,* California Energy Commission. Publication Number: CEC-400-2015-034-
Rider, Ken, Pierre duVair, Harinder Singh, Jared Babula, Michael Murza. 2015. *Standardized Regulatory Impact Assessment of 2015 Proposed Appliance Efficiency Regulations*. California Energy Commission. CEC-400-2015-028.)

# H. Duplication or Conflicts With Federal Regulations (Gov Code Section 11346.2(b)(6)

### SMALL DIAMETER DIRECTIONAL Lamps

The proposed changes to the state regulations do not duplicate or conflict with federal regulations.

### LEDs

The proposed changes to the state regulations do not duplicate or conflict with federal regulations.