

**CALIFORNIA ENERGY COMMISSION**

1516 Ninth Street Sacramento, California 95814

Main website: [www.energy.ca.gov](http://www.energy.ca.gov)**NOTICE OF PROPOSED ACTION****PROPOSED AMENDMENTS TO APPLIANCE  
EFFICIENCY REGULATIONS****California Code of Regulations, Title 20,  
Sections 1601 through 1607****CALIFORNIA ENERGY COMMISSION  
Docket Number 11-AAER-2****October 7, 2011****INTRODUCTION**

The California Energy Commission proposes to amend its Appliance Efficiency Regulations in Sections 1601–1608 of Title 20 of the California Code of Regulations (CCR). The purpose of this rulemaking is to adopt efficiency standards, certification, and marking requirements for large and small battery charger systems, and to adopt self-contained lighting control standards from Title 24 of the CCR to ensure that only self-contained lighting controls that comply with applicable standards are sold or offered for sale in California.

A battery charger system includes the charge control circuitry, batteries, and power supply. The following types of battery charger systems are excluded from the proposed regulations:

- (1) battery charger systems used to charge electrically-powered motor vehicles, other than certain sub-groups of motor vehicles;
- (2) battery charger systems that are classified as Class II or Class III devices for human use under the Federal Food, Drug, and Cosmetic Act and require U.S. Food and Drug Administration listing and approval as a medical device;
- (3) battery charger systems used to charge a battery or batteries in an illuminated exit sign, as defined in Section 1602(l);
- (4) battery charger systems with input that is three phase of line-to-line 300 volts root mean square or more and is designed for a stationary power application;
- (5) battery charger systems that are battery analyzers; and

(6) battery charger systems that are voltage independent or voltage and frequency independent uninterruptible power supplies as defined by International Electrotechnical Commission (IEC) 62040-3 ed.2.0 (2011)

The proposed regulations include four categories of battery charger systems:

- (1) Small Battery Charger Systems – A battery charger system with a rated output power of 2 kilowatts (kW) or less, including golf cart chargers regardless of the output power.
- (2) Large Battery Charger Systems – A battery charger system with a rated output of more than 2kW.
- (3) Inductive Charger Systems – A small battery charger system that transfers power to the charger through magnetic or electric induction.
- (4) Battery Backup Chargers – A small battery charger system designed to provide power to an end use product in the event of a power outage.

The proposed small battery charger system standards, including inductive chargers, specify maximum energy and power usage levels during a 24-hour test, maintenance, and no battery mode. The battery backup regulations apply only to the maintenance mode of the covered products.

The 24-hour test measures the energy consumption of a battery charger system over the course of a day, or in the case of a very slow charger more than a day. This test captures the energy used by the system while it charges the battery.

In maintenance mode, the battery charger system is connected to the main electric supply and the battery charger may or may not be providing power to maintain a fully charged battery.

In no battery mode, the battery charger system is connected to the main electricity supply and no battery is connected to the charger.

Large battery charger system standards measure power conversion efficiency and charge return factor instead of measuring 24-hour energy. Charge return factor is the ratio of ampere-hours (Ah) returned to the battery over the Ah delivered by the battery during discharge. Power conversion efficiency is the instantaneous DC output power of the charger over the instantaneous AC input power. In addition, large battery charger systems must meet minimum power factor requirements.

The proposed regulations are based on an analysis of test data collected by Ecos Consulting<sup>1</sup>, data obtained from the U.S. Department of Energy's (DOE) Preliminary

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<sup>1</sup> <http://www.ecosconsulting.com/>

Technical Support Document (TSD)<sup>2</sup>, the final Energy Commission Staff Report for battery charger systems, and information received from various stakeholders during the pre-rulemaking process, which included multiple workshops and written comment periods.

Battery charger system test data used in this analysis includes various types of battery chemistries, capacities, power supplies, and battery charger technologies. The proposed regulations are technology-neutral across all battery charger types included in the scope. Staff analysis found that manufacturers of products with rechargeable batteries can comply with the proposed regulations without altering the way existing products use their batteries or the battery chemistry. Batteries used in products currently available on the market can be divided into two categories: batteries that require low maintenance charge after the batteries are fully charged and batteries that require periodic maintenance charge to maintain full charge. There are many technologies available to manufacturers for improving the active, maintenance, and no battery mode efficiency of battery charger systems.

The proposed regulations also include certification and marking requirements. These requirements are proposed as proof of compliance with the proposed standards and as a way for retailers, consumers, and the regulatory agencies to determine such compliance.

The small battery charger system standard shall become effective for consumer products manufactured on or after January 1, 2013, and for non-consumer products manufactured on or after January 1, 2017. The large battery charger system standard shall become effective for products manufactured on or after January 1, 2014.

#### Self-Contained Lighting Controls:

Self-contained lighting controls are currently regulated under Title 24 of the CCR. As such, self-contained lighting controls that do not meet the standards in Title 24 may be lawfully sold or offered for sale in California but are not allowed to be installed in California buildings. Moving self-contained lighting control standards from Title 24 to Title 20 will help to ensure that only compliant controls are sold or offered for sale in California.

The Energy Commission has prepared this Notice of Proposed Action (NOPA) and an Initial Statement of Reasons (ISOR) as part of the supporting documents needed to adopt the proposed regulations. The Energy Commission has also published the Express Terms (45-Day Language) of the proposed regulations. These documents can be obtained from the contact persons designated below or from the Energy Commission website at: [http://www.energy.ca.gov/appliances/battery\\_chargers/documents](http://www.energy.ca.gov/appliances/battery_chargers/documents).

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<sup>2</sup>[http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/pdfs/bceps\\_prealanalysis\\_ts\\_d.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/bceps_prealanalysis_ts_d.pdf)

## **PUBLIC HEARING**

The Energy Commission's Efficiency Committee (Committee) will hold a public hearing on the following date and time to receive public comment on the Express Terms:

October 24, 2011  
1 p.m.  
CALIFORNIA ENERGY COMMISSION  
1516 Ninth Street  
First Floor, Hearing Room A  
Sacramento, California  
(Wheelchair Accessible)

Audio for the October 24, 2011, Committee hearing will be broadcast over the Internet. Details regarding the Energy Commission's webcast can be found at: [www.energy.ca.gov/webcast](http://www.energy.ca.gov/webcast).

At this hearing, any person may present oral and written statements or arguments relevant to the proposed action. Interested persons may also submit written comments (see below). If possible, please provide written comments to be considered at the Committee hearing by October 19, 2011. The Energy Commission appreciates receiving written comments at the earliest possible date.

## **PROPOSED ADOPTION DATE**

The Energy Commission will hold a public hearing for consideration and possible adoption of the 45-Day Language on the following date and time unless the Energy Commission decides to modify the Express Terms through issuance of 15-Day Language. The hearing will be held on:

November 30, 2011  
10 a.m.  
California Energy Commission  
1516 Ninth Street  
First Floor, Hearing Room A  
Sacramento, California  
(Wheelchair accessible)

Audio for the November 30, 2011, adoption hearing will be broadcast over the internet.

If you have a disability and require assistance to participate in these hearings, please contact Lou Quiroz at (916) 654-5146 at least 5 days in advance.

At this hearing, any person may present oral or written statements or arguments relevant to the proposed action. Interested persons may also submit written comments (see below).

## **PUBLIC COMMENT PERIOD/WRITTEN COMMENTS**

The public comment period for this NOPA will be from and including **October 7, 2011** through and including **November 21, 2011**. Any interested person may submit written comments on the proposed amendments. Written comments will be accepted at the public Committee hearing. Written comments will also be accepted and considered for the Energy Commission adoption hearing if they are received by **10:00 a.m. on November 30, 2011**. Written comments shall be e-mailed to [Docket@energy.state.ca.us](mailto:Docket@energy.state.ca.us) and mailed or delivered to the following address:

California Energy Commission  
Docket No. 11-AAER-2  
Docket Unit  
1516 Ninth Street, Mail Station 4  
Sacramento, California 95814-5504

All written comments must indicate **Docket No. 11-AAER-2**. When comments are e-mailed on behalf of an organization, the comments should be a scanned copy of the original on the organization's letterhead and include a signature of an authorized representative. Please copy [hsingh@energy.state.ca.us](mailto:hsingh@energy.state.ca.us).

## **AUTHORITY AND REFERENCE**

The Energy Commission proposes to adopt the amendments under the authority of Public Resources Code sections 25213, 25218(e), 25402(c)(1), and 25402.5. The proposed amendments implement, interpret, and make specific Public Resources Code section 25402(c)(1).

## **INFORMATIVE DIGEST/POLICY STATEMENT OVERVIEW**

Public Resources Code section 25402(c)(1) mandates that the Energy Commission reduce wasteful, uneconomic, inefficient, or unnecessary energy use by prescribing, by regulation, standards for minimum levels of operating efficiency for appliances. The Energy Commission first adopted appliance efficiency regulations in 1976 and has periodically revised those, and adopted new, regulations since then. The current regulations include provisions relating to the testing of appliances to determine their efficiency, certification and reporting of data by manufacturers, standards establishing mandatory efficiency levels, and general provisions regarding the scope of the regulations and applicable definitions.

Pursuant to this NOPA, the Energy Commission is proposing to open a rulemaking proceeding to amend the Appliance Efficiency Regulations to adopt efficiency standards for small and large battery charger systems in active charge mode, maintenance charge mode, and no battery mode. Efficiency standards for large battery charger systems include an additional requirement of a minimum standard for power factor. Also, the proposed scope of this rulemaking includes adding self-contained lighting control

regulations for certain devices currently regulated under Title 24 to the Appliance Efficiency Regulations in Title 20 of the CCR.

#### Battery Charger Systems:

To capture the range of battery chargers and battery charger-equipped products that are sold in California, the following definition for a battery charger system (BCS) is found in Section 1602(l) of the existing Appliance Efficiency Regulations.

“BCS covers all rechargeable batteries or devices incorporating a rechargeable battery and the power supplies and charger controls used with them. Battery charger systems include, but are not limited to:

- (1) electronic devices with batteries that are normally charged from AC line voltage or DC input voltage through an internal or external power supply and a dedicated battery charger;
- (2) the battery and battery charger components of devices that are designed to run on battery power during part or all of their operations;
- (3) dedicated battery systems primarily designed for electrical or emergency backup;
- (4) devices whose primary function is to charge batteries, along with the batteries they are designed to charge. These units include chargers for power tool batteries and chargers for automotive, rechargeable AA, AAA, C, D, or 9 V batteries, as well as chargers for batteries used in larger industrial motive equipment; and
- (5) the charging circuitry of battery charger systems may or may not be located within the housing of the end-use device itself. In many cases, the battery may be charged with a dedicated external charger and power supply combination that is separate from the device that runs on power from the battery.”

The battery charger system definition in the proposed regulations covers both internal and external power supply-driven products that have rechargeable batteries.

The proposed regulations include battery-scaling factors for small and large battery charger systems that provide power and energy allowances based on the battery capacity. This scaling factor applies both to the 24-hour and standby consumption equations. The formula to calculate additional allowance is necessary, as large battery capacities require additional energy both to charge and to maintain charge.

The standards for large battery charger systems are as follows:

<b><u>Performance Parameter</u></b>		<b><u>Standard</u></b>
<b><u>Charge Return Factor (CRF)</u></b>	<b><u>100 percent, 80 percent Depth of discharge</u></b>	<b><u>CRF ≤ 1.10</u></b>
	<b><u>40 percent Depth of discharge</u></b>	<b><u>CRF ≤ 1.15</u></b>
<b><u>Power Conversion Efficiency</u></b>		<b><u>Greater than or equal to: 89 percent</u></b>
<b><u>Power Factor</u></b>		<b><u>Greater than or equal to: 0.90</u></b>
<b><u>Maintenance Mode Power (<math>E_b</math> = battery capacity of tested battery)</u></b>		<b><u>Less than or equal to: <math>10 + 0.0012E_b</math> W</u></b>
<b><u>No Battery Mode Power</u></b>		<b><u>Less than or equal to: 10 W</u></b>

The standards for small battery charger systems are as follows:

<b><u>Performance Parameter</u></b>	<b><u>Standard</u></b>
<b><u>Maximum 24 hour charge and maintenance energy (Wh)</u></b>  <b><u>(<math>E_b</math> = capacity of all batteries in ports and N = number of charger ports)</u></b>	<b><u>For <math>E_b</math> of 2.5 Wh or less: <math>16 \times N</math></u></b>
	<b><u>For <math>E_b</math> greater than 2.5 Wh and less than or equal to 100 Wh: <math>12 \times N + 1.6E_b</math></u></b>
	<b><u>For <math>E_b</math> greater than 100 Wh and less than or equal to 1000 Wh: <math>22 \times N + 1.5E_b</math></u></b>
	<b><u>For <math>E_b</math> greater than 1000 Wh: <math>36.4 \times N + 1.486E_b</math></u></b>
<b><u>Maintenance Mode Power and No Battery Mode Power (W)</u></b> <b><u>(<math>E_b</math> = capacity of all batteries in ports and N = number of charger ports)</u></b>	<b><u>The sum of maintenance mode power and no battery mode power must be less than or equal to: <math>1 \times N + 0.0021 \times E_b</math> Watts</u></b>

The proposed regulations include an alternative compliance option for inductive charger systems, which applies to small inductive charger systems that would have difficulty meeting the standard in a cost-effective manner without significantly lowering product efficacy. The proposed alternative compliance option sets an average power limit that the battery charger system may not exceed. Inductive charger systems may either meet the small battery charger system requirements, or energy consumption in active charge mode must not exceed 1.0 watt an hour during a 24-hour test. For all inductive

charger systems, neither the maintenance power nor the no battery power mode shall exceed 1.0 watt.

The Energy Commission has developed a record that forms the basis of the justification for adopting the proposed standards for battery charger systems and self-contained lighting controls. The California investor-owned utilities (IOUs) – in conjunction with the IOUs' contractor, Ecos Consulting – submitted a Codes and Standards Enhancement (CASE) study<sup>3</sup> that provides data, information, and analysis that helped inform staff's development of the battery charger system regulations. Additional data and information has been obtained from the TSD issued by DOE and data collected through staff workshops held on October 11, 2010 and March 3, 2011, and the Efficiency Committee workshop conducted on May 19, 2011. Information was also collected through various meetings between Energy Commission staff and various stakeholders, including the Association of Home Appliance Manufacturers (AHAM), Power Tools Institute (PTI), Philips, Wahl Clipper, Motorola Solutions, Intel, Apple, and Lester Electrical. Information was also collected through specific written requests to the various stakeholders. As a result of the technical information provided by the stakeholders, the Energy Commission has established a record that supports the conclusion that the proposed efficiency standards are feasible and attainable.

The Energy Commission has prepared a staff report, entitled Proposed Efficiency Standards for Battery Charger Systems and Self-Contained Lighting Controls, Publication No. CEC-400-2011-001-SF<sup>4</sup>, as the supporting technical document for stakeholder review and comment, and to meet the requirements of Public Resources Code section 25402(c)(1). Based on analysis of available data and stakeholder input, Energy Commission staff has updated the staff report and has determined – based on the best available technical data, studies, reasonable assumptions, and expert opinion – that the proposed regulations are cost-effective, feasible, and will save significant amounts of energy on a statewide basis.

The Energy Commission has determined that battery charger systems currently consume an estimated 8,000 GWh/year of electricity (one GWh is equal to one million kilowatt-hours of electric power). Of this 8,000 GWh, only 2,900 GWh of usable electricity is delivered to the battery itself. The difference of 5,100 GWh of electricity is wasted, primarily in the form of heat. This loss represents a significant opportunity for energy savings in California.

Staff analysis of available data finds that the proposed standards will save approximately 2,147 GWh a year in energy that is currently being wasted as excess heat after the batteries are fully charged. Reducing the amount of wasted energy from battery charger systems will result in a direct energy cost savings to consumers of about \$301 million per year after all the existing non-compliant stock is replaced<sup>5</sup>. The overall

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<sup>3</sup> [http://www.energy.ca.gov/appliances/battery\\_chargers/documents/2010-10-11\\_workshop/2010-10-11\\_Battery\\_Charger\\_Title\\_20\\_CASE\\_Report\\_v2-2-2.pdf](http://www.energy.ca.gov/appliances/battery_chargers/documents/2010-10-11_workshop/2010-10-11_Battery_Charger_Title_20_CASE_Report_v2-2-2.pdf)

<sup>4</sup> [http://www.energy.ca.gov/appliances/battery\\_chargers/documents/](http://www.energy.ca.gov/appliances/battery_chargers/documents/)

<sup>5</sup> <http://www.energy.ca.gov/2011publications/CEC-400-2011-001/CEC-400-2011-001-SF.pdf>

total energy cost savings to California consumers, from 2013 to 2028, is estimated to be \$1.6 billion after all existing stock of inefficient battery charger systems are replaced with efficient chargers meeting the proposed standards<sup>6</sup>.

After the existing stock of devices is replaced, it is estimated that the efficiency standards will save California consumers \$253 million per year (on average) for small battery charger systems, and \$48 million per year for large battery charger systems. The combined savings to rate payers from consumer and non-consumer battery charger systems would be \$301 million per year.

The first year energy savings generated from this regulation for small and large battery charger systems is estimated to be 335 GWh. This figure is roughly equivalent to the electricity demand that would be served by a new 300 MW natural gas power plant.<sup>7</sup> Meeting this demand, should the standards not be adopted, would impose a significant cost on California ratepayers. The estimated cost of building a natural gas fired power plant is approximately \$300 million. The U.S. [Energy Information Administration \(EIA\)](#) estimates that it costs \$1/KW to build a natural gas power plant<sup>8</sup>. The estimated total value of these regulations in direct energy cost savings stemming from the proposed standards, and from indirect savings in avoided construction costs of a new natural gas power plant, is approximately \$1.9 billion.

#### Technical Feasibility:

The Energy Commission has determined based on the record that there are multiple technologies used in battery chargers currently being built and sold on the market, that cheaply and effectively reduce energy consumption. Some of these technologies are discussed below and in the staff report. The least efficient chargers in the market do not detect when a battery is fully charged. This can be detrimental to the battery life, product safety, and adds unnecessary costs to consumers' electricity bills. The use of efficient power supplies that automatically turning off charge to fully-charged batteries can be achieved by implementing hysteresis capability<sup>9</sup> or other new technologies, and such technologies have not imposed, and will not impose, a large cost on either the manufacturer or the consumer. The use of these technologies will greatly decrease the energy consumption of the most inefficient battery charger systems on the market. The staff report includes the following findings:

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<sup>6</sup> Total Energy savings are calculated using the formula: Present Value Reduced Total Cost over the Design Life of the Appliance (\$) X Estimated Annual Sales (Thousand) X Estimated Appliance Design Life (Years).

<sup>7</sup> <http://iopscience.iop.org/1748-9326/5/1/014017>

For simplicity, staff has used the recently defined Rosenfeld unit to convert from GWh/yr savings to a power plant equivalent. Staff has used multiple the GWh/yr savings by one-sixth to get an MW power plant equivalent. For example: 2000 GWh/yr savings would be equivalent to 333 MW, or 0.67 Rosenfelds. Staff has rounded this number to 300 MW.

<sup>8</sup> <http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/electricity.pdf>

<sup>9</sup> Hysteresis typically refers to turn-on and turn-off points in electrical, electronic and mechanical systems. For example, if a thermostat set for 70 degrees turns on when the temperature reaches 68 and turns off at 72, the hysteresis is the range from 68 to 72.

- (1) A significant amount of energy in battery charger systems is lost in using inefficient power supplies to convert AC power to DC power. This loss can be minimized by the use of efficient power supplies<sup>10</sup> and the proposed standards for most battery chargers can be met by the use of energy efficient power supplies.
- (2) Many battery-equipped products have a battery charger that continues to provide charge to the battery after it is fully charged. An efficient battery charger shuts off the continuous flow of electricity to fully charged batteries and provides a low periodic maintenance charge to the batteries.
- (3) The continuous current heats the fully charged battery resulting in wasted energy and potentially damaging the battery itself.

Inefficient battery charger systems can be modified to improve the charge efficiency of the battery chargers by including charge sensors to measure battery condition and can switch off the charge to fully charged batteries. This capability can be implemented with inexpensive, “off the shelf” technology that will not require major redesign of products. This technology can be applied to batteries that have a low maintenance charge loss.

Some battery chemistries lose charge over time after they are fully charged. This phenomenon is called self discharge. Battery charger system designs can be modified to provide a low periodic maintenance charge to keep batteries subject to self-discharge at sufficient charge levels. To accomplish periodic maintenance capability a battery charger must incorporate charge controller for the transition from a charge mode to a low power maintenance mode. Switching chargers off and on for periodic maintenance can be accomplished by implementing hysteresis. A charge controller can be designed using a comparator to read battery charge condition and an electronic switch to turn charge off or on<sup>11</sup>. Electronic switching can also be accomplished by using a timer, a temperature sensor, a voltage sensor, a transistor, or any number of other open or closed control systems. The incremental cost of incorporating a charge control mechanism in a battery charger will be offset by the energy savings generated over the life of the product<sup>12</sup>. The technology and designs for efficient charging and maintenance mode are readily available and can be achieved through non-proprietary approaches.

Battery charger systems can incorporate existing switch technology to turn power off or on to prevent wasting energy and potential battery damage. In fact, many battery charger systems on the market today already meet the proposed standards at

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<sup>10</sup> At present, the Energy Commission and DOE regulate external power supplies (EPS). DOE- and Energy Commission-compliant power supplies are marked as “IV” and ENERGY STAR® has developed a more stringent specification using the mark “V”. The EPS regulations exclude battery charger power supplies (BCPS).

<sup>11</sup> A comparator is a device that can compare two voltages or currents and switch its output to indicate which is larger.

<sup>12</sup> [http://www.energy.ca.gov/appliances/battery\\_chargers/documents/2011-03-03\\_workshop/presentations/Proposed\\_Standards\\_for\\_Battery\\_Chargers-Suzanne\\_Foster\\_Porter\\_and\\_Philip\\_Walters.pdf](http://www.energy.ca.gov/appliances/battery_chargers/documents/2011-03-03_workshop/presentations/Proposed_Standards_for_Battery_Chargers-Suzanne_Foster_Porter_and_Philip_Walters.pdf) Page 29

competitive price points. Strategies described in the staff report to improve battery charger efficiency include linear design, switch mode, ferroresonant, and silicon control rectifier.

Linear designs that use linear transformers to convert AC power to DC and that use full wave rectifiers instead of half wave rectifiers can drastically improve efficiency<sup>13</sup>. Replacing linear power supplies with switch mode power supplies and the charge regulating elements or some form of charger termination cost-effectively improve the 24-hour efficiency of small chargers by nearly 45 percent, while simultaneously reducing battery maintenance and no battery mode power.

Switch mode chargers can be made more efficient through various design methods. Hysteresis charging can reduce energy usage in maintenance mode by using short spurts of high current to maintain the battery's voltage. Resonant switching configuration in charge mode can reduce switching losses in large battery charger systems with switch-mode power supplies. This design provides power transistors that switch on and off at the precise time that the voltage or current passes through zero, reducing heating loss in the transistors<sup>14</sup>. Synchronous rectification in charge mode can reduce voltage drops and thus power losses in the power supply by using a transistor to conduct during certain cycles of operation as opposed to a diode. Periodic maintenance with a combination of battery voltage sensing circuitry and the switching controlled energy delivery allows switch mode systems can provide periodic maintenance to batteries, as opposed to constant unchecked battery maintenance.

Ferroresonant chargers can be made more efficient by incorporating hybrid technology that can optimize the magnetic flux coupling in the transformer to improve power conversion efficiency. This technology significantly improves the efficiency of large battery chargers. Silicon-controlled rectifier (SCR) chargers can be made more efficient by reducing switching losses via incorporating higher switching frequencies. High frequency chargers have much lower switching losses and thus much better power conversion

#### Inductive Charger Systems:

Inductive charger systems use a wireless power supply and are a unique class of product. In some products, such as toothbrushes, wireless power delivery provides a great deal of utility, such as avoiding contact corrosion for products that are exposed to water and chemicals. However, this method of power delivery is inherently less efficient than direct wiring. The proposed regulations apply to charge efficiency, maintenance mode, and no battery modes. To ensure the feasibility of implementing inductive charging in this specific case, Energy Commission staff has proposed alternative compliance options for inductive charger systems.

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<sup>13</sup> A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which is in only one direction, a process known as rectification.

<sup>14</sup>[http://www.efficientproducts.org/reports/bchargers/1270\\_BatteryChargerTechincalPrimer\\_FINAL\\_29Sep2006.pdf](http://www.efficientproducts.org/reports/bchargers/1270_BatteryChargerTechincalPrimer_FINAL_29Sep2006.pdf)

## Battery Backup and Uninterruptible Power Supplies:

These systems operate primarily in maintenance mode. Battery backup systems only charge batteries in the case of a power brownout or blackout. This means that the battery charger system is almost exclusively in a low-power maintenance mode. These products can comply with the proposed regulations by improving fixed system losses and power conversion efficiency.

## Cost Effectiveness of Proposed Battery Charger Systems Regulations:

Based on the record, staff has determined that the proposed energy efficiency standards for battery charger systems are technically feasible, attainable, and cost effective, as the proposed standards will not result in any added cost to the consumer over the design life of the product. While the incremental cost of some products may increase depending on what approach manufacturers take in order to achieve compliance with the standards, the energy savings over the life of the products will exceed these costs. Some examples of the incremental cost analysis included in CASE report include the following:<sup>15</sup>

- Improving the efficiency of a low power product like a cordless phone or power tool can cost less than \$1.00 when implemented as part of a normal design process, because changes can be as simple as exchanging linear power supplies with switch mode supplies. For a total incremental cost of less than \$2.00, switch controlled current regulating components, usually AC-to-DC converters, can be incorporated to significantly reduce maintenance and no-battery losses.
- A battery charger system can be completely redesigned and brought to market at an incremental manufacturing cost near zero. By replacing some components with more efficient ones, incremental component costs near \$0.40 are common. One simple solution is switching off or on a charge current to a battery, and can be accomplished by the use of transistor designed to operate as a comparator. Switching charger current off or on can also be done by use of timer or IC chip. These parts are readily available at a cost of less than \$1.00.

The efficiency standards can be met by incorporating the above mentioned changes or other available technologies for battery charger systems, which in turn allow manufacturing changes that more than offset any increased cost and lead to low net cost increases depending on the specific routes the manufacturer chooses to pursue. The added total cost is obtained by comparing the cost and performance of a typical model that the consumer would be expected to purchase with the proposed standards in effect to the cost and performance of a typical model that the consumer would be expected to purchase without the proposed standards in effect. The analysis in the staff report shows that the proposed efficiency standards will save significant energy statewide.

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<sup>15</sup> [http://www.energy.ca.gov/appliances/battery\\_chargers/documents/2010-10-11\\_workshop/2010-10-11\\_Battery\\_Charger\\_Title\\_20\\_CASE\\_Report\\_v2-2-2.pdf](http://www.energy.ca.gov/appliances/battery_chargers/documents/2010-10-11_workshop/2010-10-11_Battery_Charger_Title_20_CASE_Report_v2-2-2.pdf)

## Self-Contained Lighting Controls:

The Energy Commission is proposing to add to the Appliance Efficiency Regulations in Title 20 of the CCR certain self-contained lighting controls currently regulated under Title 24. As Title 24 is an installation-based regulation, and Title 20 is a sales-based regulation, the addition of self-contained lighting control regulations into Title 20 will better ensure that only those devices that comply with the standards are being sold or offered for sale in California. The cost effectiveness, feasibility, and energy saving required findings for self-contained lighting controls were met under Title 24 rulemaking processes conducted from 1978 through 2007<sup>16</sup>. The requirements of the Title 24 rulemaking process are sufficiently similar to establish cost effectiveness, feasibility, and energy savings for the currently proposed self-contained lighting control standards.

## **LIST OF DOCUMENTS INCORPORATED BY REFERENCE**

IEC 62040-3 ed.2.0 (2011)                      Uninterruptible Power Systems

Copies available from:                      International Electrotechnical Commission  
3, rue de Varembe  
P.O. Box 131  
CH – 1211 Geneva 20  
Switzerland  
<http://www.iec.ch>  
Phone: +41 22 919 02 11  
FAX: +41 22 919 03 00

## **FEDERAL TEST METHODS**

CFR, Title 10, Section 430.23 (2011)

Copies available from:                      Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402  
[www.access.gpo.gov/nara/cfr](http://www.access.gpo.gov/nara/cfr)  
[www.gpoaccess.gov/cfr/](http://www.gpoaccess.gov/cfr/)

## **FEDERAL LAW**

The proposed regulations for battery charger systems require the measurement of active, maintenance, and no battery modes. The Energy Commission adopted a test method for battery charger systems which is the Energy Efficiency Battery Charger

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<sup>16</sup> [www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF](http://www.energy.ca.gov/2008publications/CEC-400-2008-001/CEC-400-2008-001-CMF.PDF) and  
[http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs\\_relied\\_upon.html](http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs_relied_upon.html)

System Test Procedure Version 2.2 dated November 12, 2008 and published by ECOS and EPRI Solutions<sup>17</sup>.

DOE published a Final Rule for test procedures for consumer battery chargers on June 1, 2011. The DOE test procedure is essentially the same test procedure adopted by the Energy Commission in 2008. The DOE's test procedure pre-empts the current Energy Commission battery charger system test procedure for devices considered to be "consumer products" under federal law. However, this does not change the energy measurement required in the proposed battery charger system regulations. The DOE test procedure is available in 10 CFR Part 430, Energy Conservation Program for Consumer Products, Appendix Y to Subpart B of Uniform Test Method for Measuring the Energy Consumption of Battery Chargers<sup>18</sup>. The Energy Commission is proposing to use the new federal test procedure for both consumer and non-consumer small battery charger systems and to use the ECOS test procedure for large battery charger systems.

### **OTHER STATUTORY REQUIREMENTS**

Public Resources Code section 25402(c)(1) mandates that the Energy Commission:

- (1) adopt minimum levels of operating efficiency (efficiency standards) for appliances that use a significant amount of energy on a statewide basis;
- (2) ensure that such standards be based on feasible and attainable efficiencies or feasible improved efficiencies; and
- (3) ensure that such standards be cost-effective based on a reasonable use pattern, i.e., not result in added total costs to the consumer, considering both the increased costs of the efficiency improvement and the reduced utility bill costs resulting from the improved efficiency, over the design life of the appliance

As discussed in the informative digest, the Energy Commission believes that the standards in the proposed regulations will result in significant energy savings, are feasible and attainable, and are cost-effective.

### **LOCAL MANDATE**

The proposed amendments will not impose a mandate on state or local agencies or districts.

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<sup>17</sup> [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/tp\\_battery\\_chargers\\_active.html](http://www1.eere.energy.gov/buildings/appliance_standards/residential/tp_battery_chargers_active.html)

<sup>18</sup> <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=003167d81e86c893a2b9650c38c70883&rgn=div9&view=text&node=10:3.0.1.4.18.2.9.6.34&idno=10>

## **ECONOMIC AND FISCAL IMPACTS**

The Energy Commission has made the following initial determinations.

### **FISCAL IMPACT**

**Costs Requiring Reimbursement.** The proposed amendments will not impose on local agencies or school districts any costs for which Government Code sections 17500 - 17630 require reimbursement.

**Other Non-Discretionary Costs or Savings for Local Agencies.** Local agencies that purchase battery charger systems or self-contained lighting controls subject to efficiency standards may have to pay increased purchase costs for those appliances. However, those costs will be recovered by reductions in electricity bills. These costs are not specific to local agencies but instead are related to the incremental cost of improving efficiency for a broad range of battery charger systems that local agencies and other consumers alike will buy.

**Costs or Savings for State Agencies.** State agencies that purchase battery charger systems, battery charger-equipped devices, or self-contained lighting controls subject to efficiency standards may pay increased purchase costs for those appliances. However, those costs will be recovered by reductions in electricity bills. These costs are not specific to state agencies but instead are related to the incremental cost of improving efficiency for a broad range of battery charger systems that local agencies and other consumers alike will buy.

**Cost or Savings in Federal Funding to the State.** The proposed amendments will not result in any costs or savings in federal funding to the state.

### **EFFECT ON HOUSING COSTS**

There will be no significant effect on housing costs. The costs of owning and operating a home will decrease as a result of lower electricity costs by using the efficient battery charger system and self-contained lighting controls. The Energy Commission has determined that the proposed efficiency standards will not result in added total costs to the consumer, considering both the increased costs of the efficiency improvement and the reduced utility bill costs resulting from the improved efficiency, over the design life of the appliance.

### **SIGNIFICANT STATEWIDE ADVERSE ECONOMIC IMPACT DIRECTLY AFFECTING BUSINESS, INCLUDING THE ABILITY OF CALIFORNIA BUSINESSES TO COMPETE WITH BUSINESSES IN OTHER STATES**

The Energy Commission has determined that there will be no significant statewide adverse economic, fiscal, or environmental impact directly affecting businesses, including small businesses, as a result of the proposed amendments, including the ability of California businesses to compete with businesses in other states.

Based on the record before it the Energy Commission has determined that there will be no net increase in the life cycle cost of battery charger systems, battery charger equipped devices, or self-contained lighting controls due to the proposed efficiency standards.

Many products with that already meet the proposed standards are currently being sold. There is no evidence in the record to show that an efficient battery charger system is more costly over the lifetime of the product than an inefficient battery charger system. Furthermore, for most battery charger systems the proposed regulations can be met by implementing common, relatively inexpensive design changes. These design changes may require manufacturers to turn the charger off when the battery is fully charged and by implementing hysteresis during charging. The proposed battery charger system standards will not result in any added cost and/or added total cost to the consumer over the design life of the efficient battery chargers. Thus, the efficiency standards can be met by incorporating existing efficiency technologies in battery charger systems.

In addition, the Energy Commission staff has determined that the proposed regulations would save consumers an estimated 2,147 GWh per year after the existing stock is replaced. The total value of statewide energy savings over the life of the regulations, from 2013 to 2028, for California consumers is projected to be \$1.6 billion. Staff believes this \$1.6 billion in consumer energy cost savings could help stimulate California business since the \$1.6 billion represents an increase in disposable income that consumer would otherwise be spending on higher energy bills due to the use of inefficient battery charger systems.

The required findings of cost effectiveness, feasibility, and energy savings required for self-contained lighting controls were met under Title 24 rulemaking processes conducted from 1978 through 2007<sup>19</sup>. The requirements of the Title 24 rulemaking process are sufficiently similar to establish cost effectiveness, feasibility, and energy savings for the currently proposed self-contained lighting control standards.

In conclusion, Energy Commission staff has found that the proposed battery charger systems and self-contained lighting control regulations meet the requirements of Public Resources Code section 25402(c)(1), and that the proposed standards will not result in any added total cost to the consumer over the design life of the battery charger systems or self-contained lighting control. Therefore, there will be no adverse economic impacts to businesses, nor any adverse impacts on California businesses to compete with businesses in other states.

Nevertheless, the Energy Commission invites interested persons to submit alternative proposals to lessen any adverse economic impact on business that might exist, which may include the following considerations:

- (1) Establishing differing compliance or reporting requirements, or timetables that take into account the resources available to businesses.

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<sup>19</sup> [http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs\\_relied\\_upon.html](http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs_relied_upon.html)

- (2) Consolidation or simplification of compliance and reporting requirements for businesses.
- (3) Use of performance standards rather than prescriptive standards.
- (4) Exemption or partial exemption from the regulatory requirements for businesses.

## **IMPACTS ON THE CREATION OR ELIMINATION OF JOBS WITHIN THE STATE, THE CREATION OF NEW BUSINESSES OR THE ELIMINATION OF EXISTING BUSINESSES, OR THE EXPANSION OF BUSINESSES IN CALIFORNIA**

The proposed amendments will have no impact on elimination of jobs, or the elimination of existing businesses, in California. The proposed regulations may result in the creation of jobs, businesses, or the expansion of existing businesses in the State.

Based on the record before it, the Energy Commission has determined that there may be an increase in the purchase price of battery charger systems due to the proposed efficiency standards. However, the proposed regulations for most battery chargers can be met by implementing simple design changes. While there will be incremental cost impacts to comply with the regulations, staff has found that these incremental costs are more than offset by savings in energy costs due to the improvements in energy efficiency. Therefore, there will not be any impact on the elimination of jobs with the State.

In addition, Energy Commission staff has determined that the proposed regulations would save consumers 2,147 GWh annually from 2013 to 2028. These savings will help protect the California economy with a stabilizing effect on energy prices, which is key to the economy and jobs. The total value of this energy savings for the California consumers over the lifetime of the battery charger system regulations will be \$1.6 billion. This \$ 1.6 billion in consumer energy cost savings will stimulate consumer spending or investment which will in turn result in the creation of jobs.

The required findings of cost effectiveness, feasibility, and energy savings required for self-contained lighting controls were met under Title 24 rulemaking processes conducted from 1978 through 2007<sup>20</sup>. The requirements of the Title 24 rulemaking process are sufficiently similar to establish cost effectiveness, feasibility, and energy savings for the currently proposed self-contained lighting control standards.

## **COST IMPACTS ON REPRESENTATIVE PERSON OR BUSINESS**

There will be no significant cost impacts on businesses and individuals that purchase battery charger systems or self-contained lighting controls subject to the proposed regulations. The costs of owning and operating a battery charger system, product

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<sup>20</sup> [http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs\\_relied\\_upon.html](http://www.energy.ca.gov/title24/2008standards/rulemaking/documents/docs_relied_upon.html)

equipped with a battery charger, or self-contained lighting control will decrease as a result of lower electricity costs by using the efficient battery charger system. The Energy Commission staff has determined that the proposed regulations will not result in added total costs to the consumer, considering both the increased costs of the efficiency improvement and the reduced utility bill costs resulting from the improved efficiency over the design life of the appliance.

## **BUSINESS REPORTS**

The proposed regulations would require mandatory data submittal of energy efficiency data for manufacturers (i.e., Business Reports) to the Energy Commission about the battery charger systems that they manufacture. (In California, there are few manufacturers of the appliances that would be added to the regulations by the proposed amendments). The Energy Commission estimates that the annual reporting cost to be \$374 per manufacturer.

The Energy Commission estimates that the annual reporting costs for self-contained lighting controls will be \$0 as they are already required under Title 24 to be certified to the Energy Commission. This certification will move to Title 20 resulting in neither additional nor fewer reporting requirements.

It is necessary for the health, safety, and welfare of the people of California that the proposed regulations apply to businesses, for two basic reasons. First, the Energy Commission is statutorily-required to adopt efficiency standards and the submittal of data is necessary to determine compliance with the standards. Second, the data required to be submitted will be used to increase consumer awareness, to complement utility efficiency programs, and for research, all of which will foster additional efficiency, in turn leading to economic, energy reliability, and environmental benefits.

## **SMALL BUSINESS**

There will be no significant cost impacts on small businesses that purchase battery charger systems, battery charger-equipped products, or self-contained lighting controls subject to the proposed regulations. The costs of owning and operating a battery charger system, battery charger-equipped product, or self-contained lighting control will decrease as a result of lower electricity costs by using the efficient battery chargers. The Energy Commission has determined that the proposed regulations will not result in added total costs to the consumer, considering both the increased costs of the efficiency improvement and the reduced utility bill costs resulting from the improved efficiency, over the design life of the appliance.

## **ALTERNATIVES**

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 or would be as effective as and less burdensome to

affected private persons than the proposed amendments. To date, the Energy Commission has found no alternatives to the proposed action that would be more effective, or as effective and less burdensome.

The Energy Commission considered alternatives for self-contained lighting controls. However the purpose of the self-contained lighting control regulations is to expand the authority of the current installation-based building code to a sales-based appliance code and not to change the product requirements. It was determined that adopting unaltered self-contained lighting control requirements would result in the minimum impact to businesses and consumers while maintaining maximum effectiveness.

The staff of the Energy Commission investigated two alternatives to the proposed battery charger system regulations:

The first alternative was to choose more stringent energy efficiency limits for the appliances in the scope of this regulation. It was determined that this would increase the effectiveness of the regulations in terms of resulting energy savings but would be more burdensome to business and less cost-effective to consumers. Therefore, this alternative was rejected.

The second alternative was to choose a less stringent standard or to not adopt any standards at all. This alternative was less effective in terms of resulting energy savings and therefore was rejected. Any standard less than what is proposed would not achieve all feasible and cost-effective energy efficiency savings as mandated under the Public Resources Code.

Staff therefore has determined, based on the record, that:

- (1) the energy savings achieved from adopting the proposed efficiency standards for battery charger systems results in a significant amount of energy savings on a statewide basis;
- (2) the proposed efficiency standards are based on feasible and attainable efficiencies of battery charger systems currently being made and sold, and that these efficient battery charger systems will result in a significant reduction in California's energy consumption growth rates;
- (3) the proposed efficiency standards will not result in any added total cost for the consumers over the lifecycle of the battery charger system and that any incremental cost difference between the efficient battery charger system and the energy wasting battery charger system currently being sold will be recovered over the life of the product; and
- (4) in calculating the cost-effectiveness of the efficiency standards, staff considered the value of the energy saved, impact on product efficacy for the consumer, and the life cycle cost to the consumer of complying with the standard

## DESIGNATED CONTACT PERSONS

Please contact the following person, preferably by e-mail, for general information about the proceeding or to obtain any document relevant to the proceeding, including this document, the Express Terms, the Initial Statement of Reasons, the Form 399, and any other document in the rulemaking file:

Angelica Ramos  
California Energy Commission  
1516 Ninth Street, Mail Station 25  
Sacramento, California 95814-5512  
Telephone: 916-654-4147  
Fax: 916-654-4304  
E-mail: [aromo@energy.state.ca.us](mailto:aromo@energy.state.ca.us)

Please contact the following person, preferably by e-mail, for substantive questions:

Harinder Singh  
California Energy Commission  
1516 Ninth Street, Mail Station 25  
Sacramento, California 95814-5512  
Telephone: 916-654-4091  
Fax: 916-654-4304  
E-mail: [hsingh@energy.state.ca.us](mailto:hsingh@energy.state.ca.us)

The backup contact person for substantive questions is:

Kenneth Rider  
California Energy Commission  
1516 Ninth Street, Mail Station 25  
Sacramento, California 95814-5512  
Telephone: 916-654-5006  
Fax: 916-654-4304  
E-mail: [krider@energy.state.ca.us](mailto:krider@energy.state.ca.us)

Mr. Singh and Mr. Rider also can assist in obtaining documents and in answering general questions.

## **PUBLIC ADVISER**

The Energy Commission's Public Adviser's Office provides the public assistance in participating in Energy Commission activities. If you want information on how to participate in this rulemaking, please contact:

Jennifer Jennings, Public Adviser  
California Energy Commission  
1516 Ninth Street, Mail Station 12  
Sacramento, California 95814-5512  
Telephone: 916-654-4489  
Fax: 916-654-4493  
E-mail: [pao@energy.state.ca.us](mailto:pao@energy.state.ca.us)

## **NEWS MEDIA INQUIRIES**

News media inquiries should be directed to Media and Public Communications Office at (916) 654-4989, or by e-mail at [mediaoffice@energy.state.ca.us](mailto:mediaoffice@energy.state.ca.us).

## **AVAILABILITY OF THE TEXT OF THE PROPOSED AMENDMENTS (EXPRESS TERMS), THE INITIAL STATEMENT OF REASONS (ISOR), AND THE INFORMATION UPON WHICH THE PROPOSAL IS BASED (RULEMAKING FILE)**

The first action to take to obtain documents in this rulemaking proceeding is to visit the Energy Commission's appliance efficiency website at [http://www.energy.ca.gov/appliances/battery\\_chargers/documents](http://www.energy.ca.gov/appliances/battery_chargers/documents).

The website will have all of the documents prepared by the Energy Commission, including the Express Terms of the proposed amendments (written in plain English and set forth in a format that indicates both the existing text and the proposed text), the Initial Statement of Reasons, and all documents relied upon by the Energy Commission, as well as most of the other documents in the rulemaking file.

The Express Terms and the Initial Statement of Reasons are also available at no cost from the contact person, Angelica Ramos (see above).

The Energy Commission's Docket Office has available all of the documents in the rulemaking file; for copies, please contact:

Docket Office  
California Energy Commission  
1516 Ninth Street, MS 4  
Sacramento, California 95814-5504  
916-654-5076

## **AVAILABILITY OF MODIFIED AMENDMENTS (15-DAY LANGUAGE)**

At the November 30, 2011 adoption hearing, the Energy Commission may adopt the proposed amendments substantially as described in this NOPA. If modifications are made, and they are sufficiently related to the originally proposed amendments, the full-modified text with changes clearly indicated will be made available to the public at least 15 days before the Energy Commission adopts the amendments. A notice of the availability of any such text will be placed on the Energy Commission's website and will be mailed to all persons to whom this notice is being mailed, who submitted written or oral comments at any hearing, who submitted written comments during the public comment period, or who requested to receive such notices. In addition, copies may be requested from the contact person named above and from the Docket Office. The Energy Commission will accept written comments on any such modified text for at least 15 days after the text is made available to the public. Adoption of the 15-Day language will be considered at a public hearing scheduled in the notice of availability.

## **FINAL STATEMENT OF REASONS**

The Energy Commission will prepare a Final Statement of Reasons on the amendments, responding to all relevant comments made during the proceeding. The Final Statement of Reasons will be available from the contact person named above and from the Docket Office, and will be posted on the Energy Commission's website.

## **INTERNET ACCESS**

Documents prepared by the Energy Commission for this rulemaking, including this NOPA, the Express Terms, the ISOR, and most other documents in the rulemaking file, will be posted on the Energy Commission's website, [http://www.energy.ca.gov/appliances/battery\\_chargers/documents](http://www.energy.ca.gov/appliances/battery_chargers/documents).

**Note:** The California Energy Commission's formal name is the State Energy Resources Conservation and Development Commission.