

Proposal Information Template for: **Digital Set-Top Boxes**

Submitted to:
California Energy Commission
In consideration for the 2008 Rulemaking Proceeding on Appliance Efficiency Regulations,
Docket number 07-AAER-3

Prepared for:
Pacific Gas and Electric Company

Pat Eilert
Gary Fernstrom
Ed Elliot



Prepared by:
Leo Rainer, Davis Energy Group

Last Modified: January 30, 2008

This report was prepared by Pacific Gas and Electric Company and funded by the California utility customers under the auspices of the California Public Utilities Commission.

Copyright 2008 Pacific Gas and Electric Company. All rights reserved, except that this document may be used, copied, and distributed without modification.

Neither PG&E nor any of its employees makes any warranty, express or implied; or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any data, information, method, product, policy or process disclosed in this document; or represents that its use will not infringe any privately-owned rights including, but not limited to, patents, trademarks or copyrights

Proposal Information Template – Digital Set-Top Boxes

2008 Appliance Efficiency Standards

Leo Rainer
Davis Energy Group
January 30, 2008

CONTENTS

Purpose2

Background.....2

Overview.....3

Methodology4

Analysis and Results.....4

Recommendations.....5

Bibliography and Other Research.....6

Purpose

This document is a report template to be used by researchers who are evaluating proposed changes to the California Energy Commission’s (Commission) appliance efficiency regulations (Title 20, Cal. Code Regs., §§ 1601 – 1608) This report specifically covers Digital Set-Top Boxes.

Background

A digital set-top box (STB) can be defined as “a consumer electronic device that receives and decodes digital video signals, and presents the decoded video to a display and/or recording device via one or more analog and/or digital interfaces for consumption by an end user” (CEA-2013). STBs can be separated into classes based on the primary source of their signal (satellite, cable, terrestrial, or IP) and their functionality (analog, basic digital, or advanced digital). Digital STBs are present in 68% of households with an average of 1.9 per home, and they are typically one of the top ten electrical energy using appliances in a household, using upwards of 350 kWh/year. But STBs present unique problems for state regulation of their energy use including:

- Most STBs are leased from the service providers rather than owned by the consumer
- Consumers have little choice when selecting a STB as service providers exhibit a virtual monopoly within any given market
- STBs currently require 24-hour connectivity in order to provide updated information and security
- Most STBs have no low-power mode available to the consumer

There are also a number of STB energy use growth factors that make timely implementation of standards a priority:

- Advanced codecs (coding and decoding equipment) and more complicated interfaces are requiring ever increasing processing power and, consequently, higher energy use.
- Consumer demand for advanced STBs that have the capability for digital video recording (DVR), high definition (HD), and video-on-demand (VOD)—and thus higher energy use—are requiring system operators to change out basic STBs early.
- The need for additional bandwidth is driving cable system operators to force subscribers to transition from analog to digital STBs, which tend to include increased functionality and energy use.

Finally, there are a number of factors that are reducing the energy use of STBs and provide an opportunity for additional savings:

- The use of system-on-chip (SOC), digital tuners, and mobile cores can reduce the energy use of the CPU and its subsystems.
- Manufacturers have become keenly aware of the need for energy efficiency and now include it as one of the primary design rules.
- Improvements in home networking provides the opportunity to use a single central STB that distributes content to smaller, lower power remote STBs.

Overview

Description of Standards Proposal	Require digital set-top boxes to have a maximum sleep state power level of 10 watts and to automatically enter sleep mode after 4 hours without user input. Sleep state power shall be measured using ANSI/CEA-2013-A Annex A.
California Stock and Sales	There are currently about 22 million STBs in California, of which 3 million are analog, 13 million are basic digital, and 6 million are advanced digital. Sales are about 2.3 million per year with over 60% of which are advanced STBs, so the fraction of the stock which are advanced STBs is expected to grow rapidly.
Energy Savings and Demand Reduction	Digital STBs in California currently use 2,600 GWh/year. First year savings from this standard would be 145 GWh/year with savings reaching 834 GWh/year once the STB stock has turned over. Final demand savings would be 95 MW.
Economic Analysis	Lifecycle cost for this measure is estimated at less than \$5 per STB. The average energy savings for a new STB equals 63 kWh/yr which results in a lifecycle net benefit of \$30 and a highly cost-effective benefit/cost ratio of 7.1 when analyzed over its 5 year life. No impact to the California economy, revenue and jobs is expected.
Non-Energy Benefits	None anticipated.
Environmental Impacts	None anticipated.

Acceptance Issues	Possible consumer education needed for understanding of the auto power down feature.
AB 1109 (California Lighting Efficiency and Toxics Reduction Act)	Not applicable.
Federal Preemption or other Regulatory or Legislative Considerations	STBs are not currently a federally covered product., however, the following issues may affect state regulations: <ul style="list-style-type: none"> • Some leased STBs may not actually be purchased within the state. • Cable and Satellite operators are federally regulated. • Section 325 of the 2007 Energy Independence and Security Act requires the labeling STB energy use.

Methodology

Estimating STB stock and sales is challenging due to the rapid changes that occur in the market. Estimates from different sources vary and projections can be vastly different. This analysis relied on national stock and sales from various sources which was then adjusted for California by multiplying by 12% (California’s fraction of national population). Analog stock is from TIAx 2007. Basic digital stock and sales are from projections made for 2008 by IDC 2005. Penetration of HD STBs is from CEA 2007. The sales of DVR STBs is changing fastest of all so our analysis relied on the average of data from four reports (TIAx 2007, Parks 2005, Watson 2007, and Kagan 2006). Power levels of STBs is from TIAx 2007. Hours of operation were taken from both TIAx 2007 and Energy Star 2008. Energy use was estimated for analog, basic digital, HD digital, DVR digital, and HD+DVR digital STBs. These were then combined using the estimated stock and sales of each type. Full turnover savings were calculated by assuming that sales of advanced digital STBs were 68% of total sales in the first year and linearly expanded until they were 90% of total sales in the fifth year.

Analysis and Results

Total current California STB energy use by type is summarized in the table below. Note that basic digital STBs make up over half of the stock energy use.

<i>STB Type</i>	<i>Energy Use (GWh/yr)</i>
Analog	471
Basic Digital	1,619
HD Digital	244
DVR Digital	330
HD+DVR	413
Total	3,077

We had limited sources for estimating the sales breakdown by type of advanced STB (HD, DVR, etc); therefore, we analyzed sales weighted energy savings by assuming an average

advanced STB with power draw that was an average of HD, DVR, and HD+DVR. A summary for the first year, five year total, and overall savings is shown in the table below. Note that over 90% of the savings accrues from the advanced STBs due to their high base sleep mode power use.

STB Type	Base Case (GWh/yr)		Proposed Standard (GWh/yr)		Savings (GWh/yr)
	First Year	Five Years	First Year	Five Years	
Basic	97	307	80	254	53
Advanced	316	1921	188	1141	781
Total	413	2228	268	1395	834

Recommendations

The following are recommended changes to Title 20 sections 1601 – 1605¹:

1601(u)

Power supplies, which are single voltage external AC to DC and AC to AC power supplies included with other retail products, and single voltage external AC to DC or AC to AC power supplies sold separately, excluding power supplies that are classified as 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; and consumer audio and video equipment, which are televisions, [digital set-top boxes](#), compact audio products, digital versatile disc players, and digital versatile disc recorders.

1602(u)

[“Digital set-top box \(STB\)” means a consumer electronic device that receives and decodes digital video signals, and presents the decoded video to a display and/or recording device via one or more analog and/or digital interfaces for consumption by an end user. “Digital set-top box” may include one or any combination of satellite, cable, terrestrial and/or IP receiving technologies.](#)

1604(u) Power Supplies and Consumer Audio and Video Equipment.

[\(3\) Digital Set-top Box Equipment. The test method for digital set-top box equipment is ANSI/CEA-2013-A – “Digital STB Background Power Consumption.”](#)

1605.3(u)

[\(2\) Digital Set-top Boxes. The power usage in the sleep mode of digital set-top box equipment manufactured on or after January 1, 2010 shall be not greater than 10 watts.](#)

[\(i\) Auto Power Down. Digital set-top boxes shall have the capability to automatically switch from the On state to a Sleep state after a period of time without user input \(such as channel change, volume change, or menu access\). It is acceptable for the current program to complete before switching to the](#)

¹ Recommended additions are underlined.

Sleep state. Digital set-top boxes shall be shipped from the manufacturer with the auto power down setting engaged at four hours or less of inactivity. The energy-related settings shipped as the default by the manufacturer shall persist unless the user chooses at a later date to manually: a) disable the auto power down, or b) adjust the default time period from four hours or less to some other value.

Bibliography and Other Research

- Canadian Standards Association (CSA), 2007, "Draft Standard C380-06: Test procedure for the measurement of energy consumption of set-top boxes (STBs)", August, 2007.
- Consumer Electronics Association (CEA), 2006, "Draft ANSI/CEA-2013-A: Digital STB Background Power Consumption", July, 2006.
- Consumer Electronics Association (CEA), 2006, "Draft CEA-2022: Digital STB Active Power Consumption Measurement", October, 2006.
- Consumer Electronics Association (CEA), 2007, "30 Percent Of U.S. Households Own An HDTV, CEA Research Finds", June, 2007. Downloaded from:
http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=11309.
- Energy Star, 2008, "ENERGY STAR Program Requirements for Set-top-Boxes, Eligibility Criteria, DRAFT 3, Version 2.0", January 14, 2008.
- Federal Communications Commission (FCC), 2006, "13th Annual Report to Congress on Video Competition and Notice of Inquiry for the 14th Annual Report", press release November, 2007. Downloaded from:
http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-278454A1.pdf.
- IDC, 2005, "Worldwide and U.S. Digital Set-Top Box 2005-2009 Forecast and Analysis", May 2005, IDC #33346.
- IDC, 2005, "U.S. Digital Cable, Satellite, and Telco TV Subscriber 2005-2009 Forecast", December 2005, IDC #34628.
- International Electrotechnical Commission (IEC), 2002, "IEC-62087: Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment", March, 2002.
- TIAX, 2007, "Energy Consumption by Consumer Electronics in U.S. Residences," Final Report to the Consumer Electronics Association (CEA), January, 2007.
- Watson, Stephan, 2007, "Taking Control of the TV As DVR's Take Over", August 2007, Downloaded from:
http://www.redorbit.com/news/entertainment/1048152/taking_control_of_the_tv_as_dvrs_take_over/index.html.