A Review of the "December 2008 Draft Efficiency Standards for Televisions" Proposed by the California Energy Commission

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Abstract

The California Energy Commission ("CEC") seeks to impose on-mode standards for power consumption of televisions, (*e.g.*, watts used) subject to Section 25402(c) of the California Public Resources Code ("CPRC"). The CPRC states, in part, that standards must "not result in any added total costs to the consumer over the designed life of the appliances concerned." In December 2008 the CEC issued a Staff Draft Report ("SDR") which detailed recommendations for television power consumption standards. We find that the CEC has not satisfactorily met the Section 25402(c) requirements with respect to consumer cost and, to the contrary, we have determined that the added costs of these proposed standards is likely to be significant. We further demonstrate how the imposition of regulations on what is a highly competitive industry is likely to generate additional negative economic side effects (*e.g.*, less price competition and less technological innovation). Lastly, we model the potential economic damage to California by estimating the effect of regulation on the State's tax revenues. We estimate that the proposed regulations could result in lost tax revenue of approximately $50 million annually and 4,600 lost jobs in California.

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I. INTRODUCTION

In California, the consumption of energy by certain appliances and equipment is regulated, in part, by the Appliance Efficiency Regulations ("AER").[1] These regulations are designed by the California Energy Commission ("CEC") and seek to impose standards of power consumption, (*e.g.*, watts used) subject to Section 25402(c) of the California Public Resources Code ("CPRC") which states that standards must be "feasible" and "attainable" and must "not result in any added total costs to the consumer over the designed life of the appliances concerned."[2] In April 2008, the CEC issued a Scoping Order to establish standards of power consumption for televisions. Subsequently, the CEC's Staff Draft Report ("Staff Draft Report" or "SDR") was issued in December 2008.[3] The SDR describes the recommendations of the Pacific Gas and Electric Company ("PG&E") and coupled with these recommendations[4] and their own internal assessments, the CEC detailed the following proposals:[5]

Table 1: CEC Staff Proposed Standards

Effective Date	Max. Standby-passive Mode Power Usage (watts)	Max. Active Mode Power Usage (watts)	~~Max.~~ min. Power Factor
Jan. 1, 2011	1 W	0.156 * Screen Area (in²) + 80	0.9
Jan. 1, 2013	1 W	0.120 * Screen Area (in²) + 25	0.9

[1] California Code of Regulations, Title 20, Sections 1601-1608.
[2] 2008 Appliance Efficiency Rulemaking. Draft Efficiency Standards for Televisions. Phase 1, Part C. Docket #07-AAER-03-C. December 2008. CEC-400-2008-028-SD. California Energy Commission, page 1.
[3] CEC Staff Draft Report.
[4] Note that the PG&E proposed regulations are less stringent than the subsequently modified proposal made by the CEC. See PG&E CASE study, pages 13-14, section 6.1.
[5] CEC Staff Draft Report, page 4.

If the proposed standards are accepted by the CEC and subsequently enacted into law, all TVs would have to conform to these standards. TVs that are not compliant would be prohibited from the California market.[6]

The purpose of this paper is to review and comment on the SDR proposed regulations in light of the restriction that regulations must be consumer neutral (*i.e.,* that the total cost imposed on consumers must be no greater than zero). We have determined that the SDR is flawed in a number of important ways – most importantly from the incorrect premise that energy efficiency compliance is costless – but also ranging from a reliance on outdated data to incomplete and unsound analyses. Moreover, setting aside the deficiencies in the SDR, we point out that enacting the proposed regulations may have additional potentially severe economic side effects which should be considered by policy makers and the public; we present a simple model of these effects. As a final point we illustrate the potential impact of the proposed regulations on the State of California by measuring the effect on tax revenues and in-state jobs by way of example.

II. DATA SOURCES

The CASE study was based on data collected by ECOS Consulting for the CEC PIER project and Energy Star data. The Revised CASE study was supplemented with additional data from CEC PIER, Energy Star, CNET, European Information & Communications Technology Industry Association (EICTA- Europe), and Market Transformation Programme (MTP- Europe).[7] Although PG&E stated in the CASE

[6] There is some uncertainty as to whether non-compliant televisions would be completely barred from the California market – for example, consumers could order televisions from other states, online, or through other channels. Los Angeles Times, "Flat-screen TVs to face energy-efficiency rules in California", January 3, 2009; "California weighs tough TV energy standards," January 30, 2009.
[7] PG&E Revised CASE study, page 6, Appendix A.

study their data is available upon request, after several requests the data was not delivered. In an effort to correctly characterize the current television market, two current television energy consumption datasets were utilized in replicating PG&E analyses and our own modeling exercises: Energy Star and CNET.[8] See Exhibit 1 for a complete list of the models included.

III. THE CEC ANALYSIS OF THE INCREMENTAL MANUFACTURING COST OF COMPLIANCE IS FUNDAMENTALLY FLAWED

The single most important element of the SDR is that it purports to demonstrate and assert that the incremental manufacturing cost of complying with the proposed standards is zero. It utterly fails in this regard.

The SDR is essentially based on research conducted and submitted by PG&E in the Codes and Standards Enhancement ("CASE") Initiative "Analysis of Standards Options for Televisions" dated April 1, 2008 and also the revised report dated July 2008 ("Revised CASE")[9]. The CASE study presents certain stylized facts regarding historical energy consumption, market overview and economic analysis but primarily serves as the basis for the CEC's claim that the incremental cost for manufacturers to comply with energy efficiency regulations would be zero.[10]

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[8] The CEC PIER data was not included because it is approximately five years old and is not based on the preferred IEC 62087 test method. IEC 62087 is the most current and agreed upon test method as indicated in the PG&E CASE study, page 2. The Energy Star and CNET datasets were also relied upon by PG&E in the Revised CASE study. While the CNET dataset does not exactly utilize the IEC Testing Methods, PG&E determined this data to be accurate and if anything conservative. *See Revised CASE study, page 7.*

[9] The revised report from July 2008 does not edit any previous recommendations made by PG&E regarding CEC proposed standards, but rather provides more analysis of the current television market.

[10] The PG&E study is itself based on datasets compiled by ECOS Consulting for the CEC PIER project. PG&E April 2, 2008 CASE study Analysis of Standard Options for Televisions.

C. Replicating the "first-order" analysis with current market data indicates that consumers will be negatively impacted by the CEC's proposed standards

The Energy Star and CNET datasets do not contain the pricing information necessary to replicate the "first-order" cost analysis. An algorithmic process was used to research this information.[15] The Energy Star dataset consists of approximately 400 models available for sale globally that currently meet the Energy Star standards.[16] Due to the large size of this dataset, a random sample was selected for pricing analysis.[17] Pricing information was researched for the complete CNET dataset which consists of 137 TVs.

Figure 1 displays the relationship between price and screen area for the Energy Star sample. This "first-order" cost analysis indicates a counterintuitive positive incremental cost for TVs with screen areas less than approximately 900 square inches (approximately 45 inches in diagonal measurement) and a negative cost for the larger screens.

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[15] Pricing information for the Energy Star models was researched on February 4-5, 2009 using brand and model number. The algorithm for finding the most relevant price for each model was approached from the rationale of the discerning consumer who is looking for the lowest price. Amazon.com was the primary source utilized when available due to its free shipping and lack of tax for California purchases. When a television was not listed on Amazon.com, a product search was conducted on Google Checkout and the lowest total price listed was selected. In the rare case that Google Checkout did not list a product, Google was used to locate a priced television at another website or vendor. All shipping and tax rates were based on the following location: 9777 Wilshire Blvd. Beverly Hills, CA 90212. The original sample contained 90 televisions and pricing information was located for 64 models. Most commonly, pricing information was not found for the models unavailable for sale in America.

[16] The Energy Star dataset was pulled January 26, 2009.

[17] A stratified random sample was taken by stratifying by compliancy status (Energy Star compliant vs. CEC 2011 proposed standards compliant) and also by size category (less than 30 inches, 30-39 inches, 40-49 inches, 50 inches or more). This stratification technique increased the likelihood of having sufficient representation for each compliancy status and size.

Figure 1: First-Order Incremental Cost Analysis

(2011 proposed standards, Energy Star data)

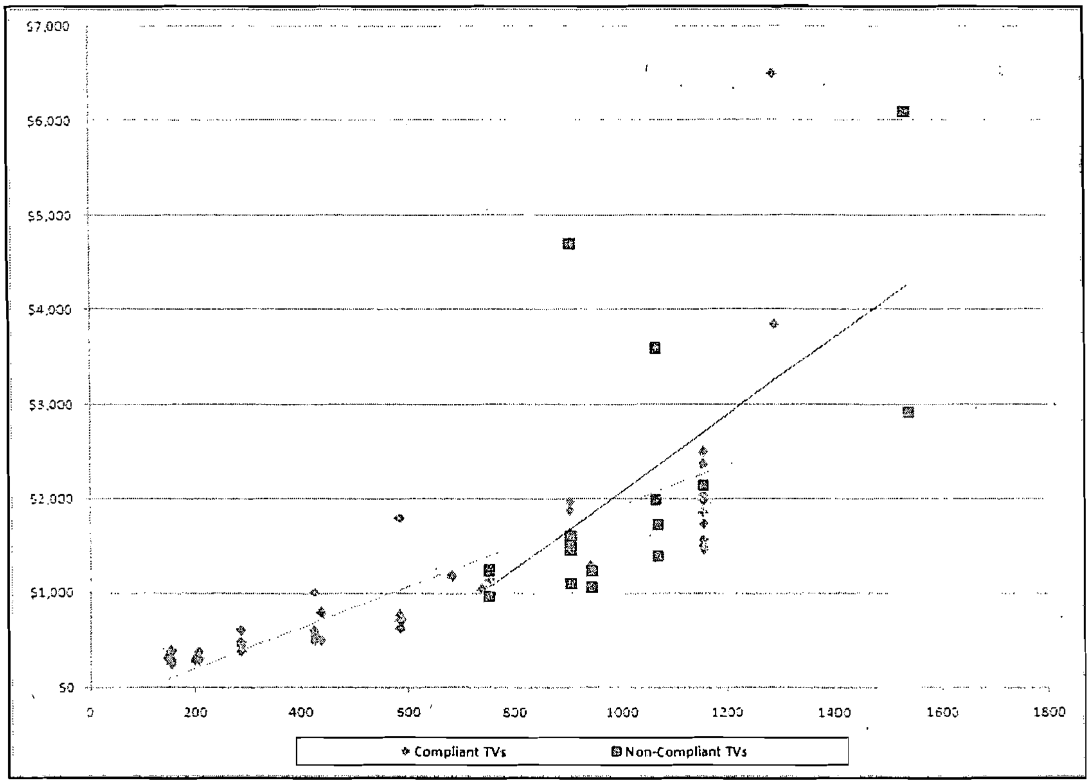
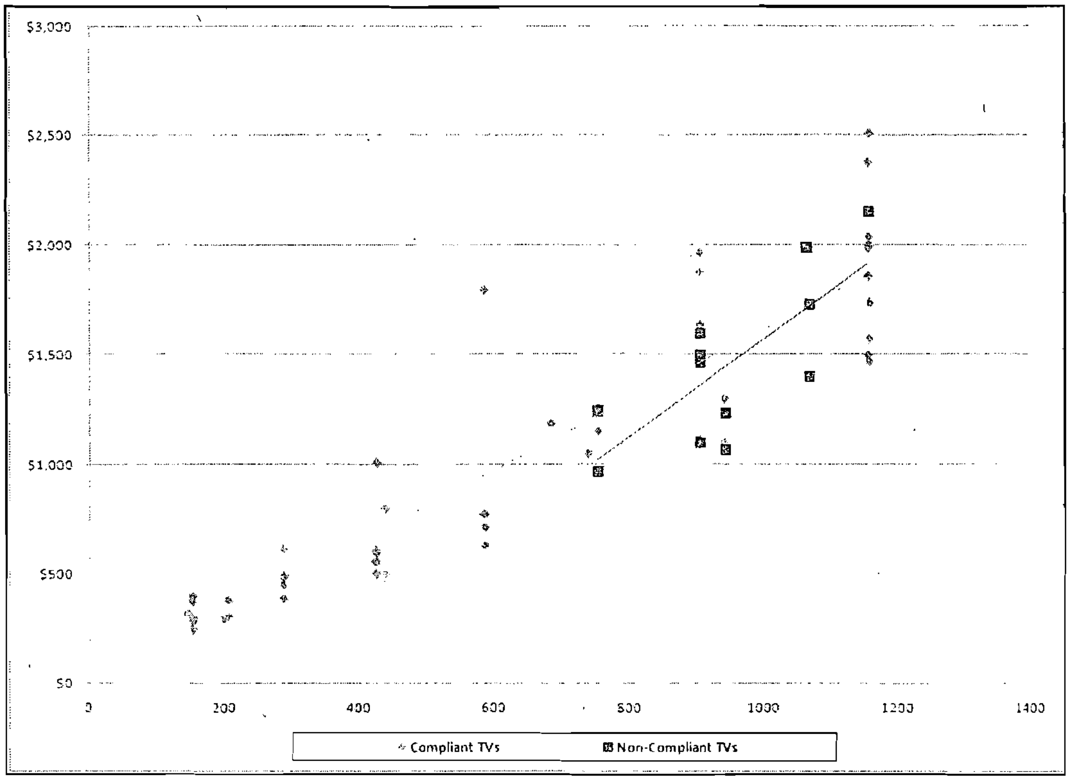


Figure 1 further shows that TVs larger than 1200 square inches (approximately 53 inches in diagonal measurement) and greater than $3,000 do not seem to be typical or well-aligned with the linear relationship between price and screen area more readily visible in smaller televisions. As a simple robustness exercise, Figure 2 presents the "first-order" incremental cost analysis analyzing only televisions smaller than 1200 square inches and less than $3000.

Figure 2: First-Order Incremental Cost Analysis

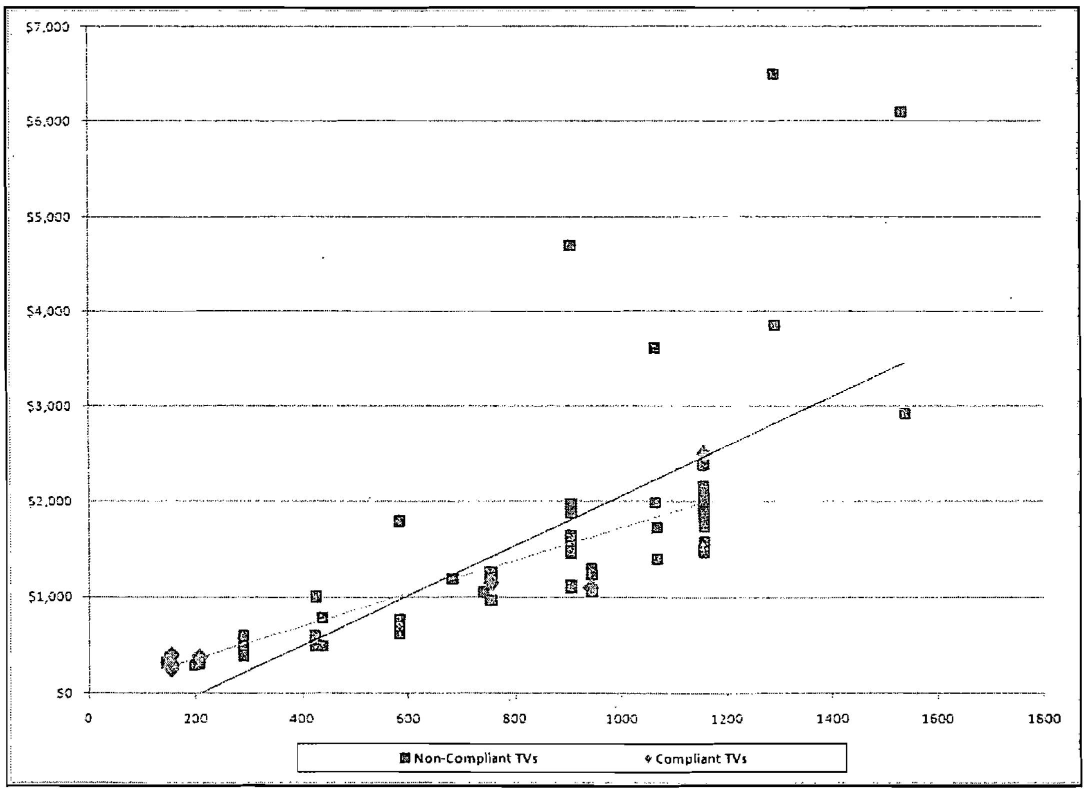
(2011 proposed standards, Energy Star data, screen areas < 1,200 square inches, price < $3,000)



This second analysis of the seemingly more typical televisions indicates a positive incremental cost. More importantly, the reversal of the relationship between the two trend lines from Figure 1 to Figure 2 illustrates the lack of robustness in "first-order" type analyses (in this context). The exclusion of just a few data points drastically altered the fitted regression lines and thus precludes any definitive conclusions on incremental cost. This result is not surprising given that the "first-order" analysis attempts to explain extreme variations in television prices with a simple linear regression model.

Figure 3 replicates the "first-order" incremental cost analysis using the proposed standards for 2013 ("Tier 2 standards") to gauge compliance status. It is important to note that many Energy Star TVs would not be compliant with the proposed 2013 standards. Again, a "first-order" analysis leads to the conclusion that there is positive incremental cost for smaller TVs and negative incremental costs for larger TVs.

Figure 3: First-Order Incremental Cost Analysis
(2013 proposed standards, Energy Star data)



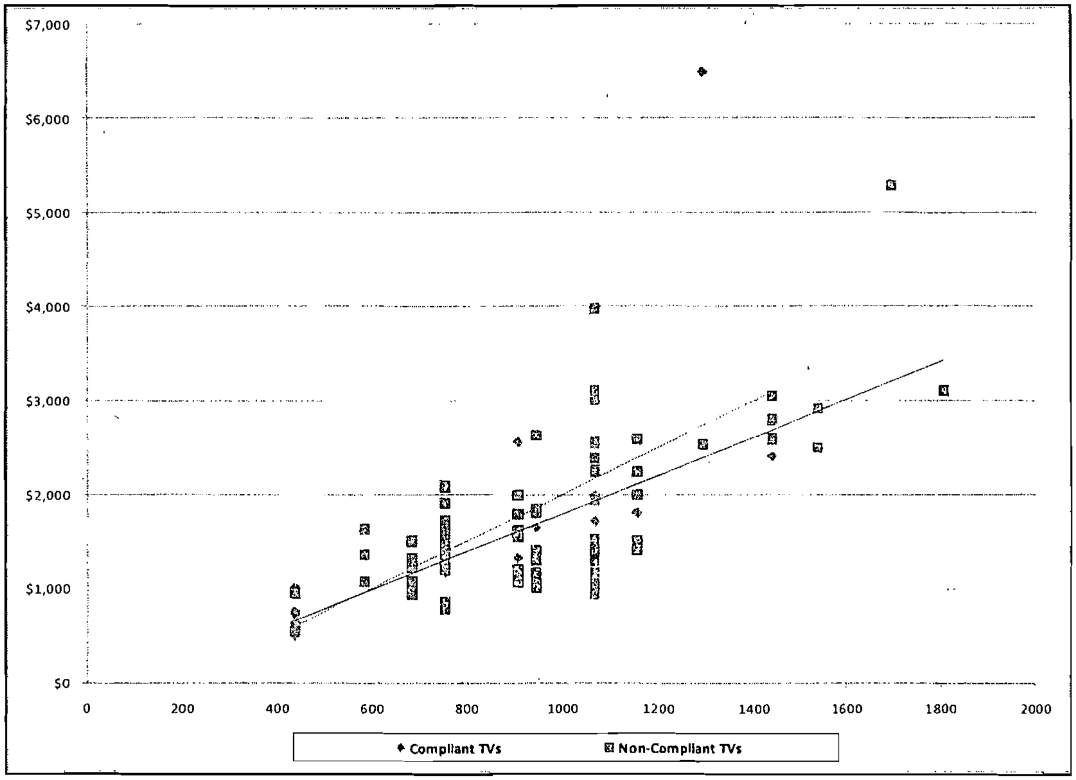
Lastly, these analyses are replicated using the CNET dataset[18] along with the 2011 proposed standards. Figure 4 shows that compliant TVs are more expensive at any

[18] The pricing information was found using the same algorithm described in footnote 15.

screen area above 500 square inches (approximately 34 inches in diagonal measurement).

Figure 4: First-Order Incremental Cost Analysis

(2011 proposed standards, CNET data)



In sum, the CEC fails to establish that the incremental manufacturing cost of producing compliant TVs is negative (i.e., costless). The first order analyses conducted by PG&E and relied upon by the CEC are demonstrably unreliable. Moreover, under certain combinations, these analyses appear to generally support the conclusion that proposed regulations are costly.

IV. THE ASSUMPTION/ASSERTION THAT ENERGY EFFICIENCY COMPLIANCE IS COSTLESS IS CONTRARY TO INDUSTRY FEEDBACK AND DATA

Contrary to the SDR assumption of zero (or negative) incremental costs for compliance with the proposed standards, manufacturers have indicated that the costs of complying with the proposed regulations would be considerable. For example, Vizio, Inc., a manufacturer, claimed in its comments to the CEC that the proposed regulation would raise the price of TVs by "tens of dollars."[19]

Additionally, Best Buy, Inc., a retailer, indicates that consumers pay a premium (about $167 more on average) for energy efficiency when they buy Energy Star compliant TVs versus non-Energy Star compliant TVs, and we know that the CEC's proposed regulation is more stringent than Energy Star. This is entirely consistent with the economic theory of energy-saving innovations, discussed below in Section V.A., which implies that such innovations, while costly to develop and implement for manufacturers, save consumers money, so that in equilibrium energy-saving televisions will cost more. It is unclear, however, whether the simple fact of paying more for an Energy-Star television is cost neutral as the associated cost savings (from reduced energy consumption) have not been verified.

[19] Letter written by Kenneth Lowe, Vizio Co-Founder, Addressed to the CEC. December 15, 2008. Docket 07-AAER-3.

V. THE CEC'S ATTEMPT TO REGULATE ENERGY CONSUMPTION IN TELEVISIONS IS CONTRARY TO FUNDAMENTAL ECONOMIC PRINCIPLES

The unsubstantiated conclusion reached by the CEC that the incremental manufacturing cost of compliant TVs is zero (or negative) is inconsistent with economic theory and concepts. The CEC has failed to grasp these fundamental economic concepts when they state: "In most cases, adding efficient technologies in televisions do not result in increased cost of the television because other components can be reduced, offsetting any increased cost."[20] This statement is economically nonsensical because if manufacturers were able to produce energy saving components for less (feature consumers would pay for), they would already be motivated to do so, as further explained below.

A basic lesson of economic theory is that in a market for differentiated products, such as the TV market, fewer choices for consumers necessarily leads to higher prices and/or reduced innovation.[21] The introduction of new brands and models puts pressure on existing companies to lower prices and improve features and quality.

[20] CEC FAQs, Energy Efficiency Standards for Televisions: "How much will this add to my cost for buying a new television?"

[21] "At some point in time, however, a dominant design or a narrow class of designs emerges and finally becomes established. Only firms that can adopt the dominant design stay in the industry. In addition, competition shifts from design to price, process innovation increasingly dominates product innovation, and economies of scale and learning become important. This induces further exit and also puts potential entrants at a disadvantage." This theory suggests that price is directly correlated to the number of competitors in a market where product innovation is an important characteristic. Syrneonidis, George, *Innovation, Firm Size and Market Structure: Schumpeterian Hypothesis and Some New Themes*, OECD Economic Studies No. 27 1996, page 58. In the television market, we can predict that if there are a small number of firms, prices will rise to cover the cost of research and development until an efficient innovation can be produced. In an unregulated market, competition for a "dominant design" is already in place, as firms must continually adapt to the stay in the industry and maintain market share.

Conversely, market concentration leads to less competition among sellers both in price effects and technological improvement effects.[22]

A. If manufacturers were able to make more energy-efficient sets at no cost they would already be compelled to do so

First, one can safely characterize the economic market (whether it consists of a single market or of multiple distinct markets) for TVs as competitive in an economic sense. There are multiple manufacturers (*e.g.*, Sony, Samsung, Panasonic), prices are relatively similar by type, size and feature set. The distribution channels (*e.g.*, Best Buy, internet) are similar. In other words, the market(s) is(are) competitive and pricing is therefore effectively constrained to equal marginal cost.[23] Consequently, were manufacturers able to make more energy-efficient sets at no cost, they would already be compelled to do so.[24] If a feature is desirable to consumers and costs the manufacturer nothing (or more precisely costs less than the manufacturer can charge), a rational profit-seeking manufacturer would introduce such a feature and attempt to capture some of the gained economic efficiency.

Second, the market already corrects for energy usage through pricing. For example, consumers are willing to pay a premium for Energy Star televisions, since low

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[22] Syrneonidis (1996) summarized widely accepted economic literature on market innovation and found, "R&D [Research & Development] projects typically involve large fixed costs, *i.e.* costs which are independent of the size of the market for the innovation. The disadvantage of small firms stems from the fact that, given the gross rate of return, their expected sales are not sufficiently large to allow them to cover these costs." This implies that if firms are forced into innovation many of the smaller, less prosperous manufacturers will leave the market due to the costs of competition and in turn market concentration will increase. Syrneonidis (1996), page 58.

[23] Marginal cost is the manufacturer's cost of producing one additional unit. In a competitive market with intense price competition, any company setting a price above marginal cost will be undercut, and thereby lose their market share. Thus prices will be bid down to meet marginal cost, which is beneficial to consumers. See Varian, Hal, *Microeconomic Analysis*, 1992, Third Edition, New York: W.W. Norton, Chapter 13.

[24] Moreover, if manufacturers are able to make more energy-efficient sets a no cost, at some point in the future, they would again be compelled to do so.

energy usage televisions save them money.[25] In theory, given full information as to energy consumption costs, high energy usage televisions need to sell at a discount relative to comparable low energy usage televisions, since otherwise consumers would not buy them.[26] The point is that the price mechanism already gives television manufacturers the incentive to develop energy efficient models. This is consistent with indications that energy usage innovations are ongoing for practically every company in the television market.[27]

The following example is illustrative. Suppose a component could be added to a television which reduces the lifetime energy consumption of a television by $50. If the cost of manufacturing the component is less than $50, the component will be added to the television (and if it is greater than $50 it will not be). Assuming that the component costs $30 to make, new models will include it. In this case, an extra $20 of surplus is generated by the energy saving innovation. The cost of the component will be added to the sale price, and the amount will be between $30 and $50, so that manufacturers and consumers will split the $20 surplus (*e.g.*, if $40 is added to the sale price, consumers and manufacturers will each benefit by $10). Consequently there is a direct link between energy conservation and financial incentives to innovate, since both manufacturers and consumers benefit from technological advancements.[28]

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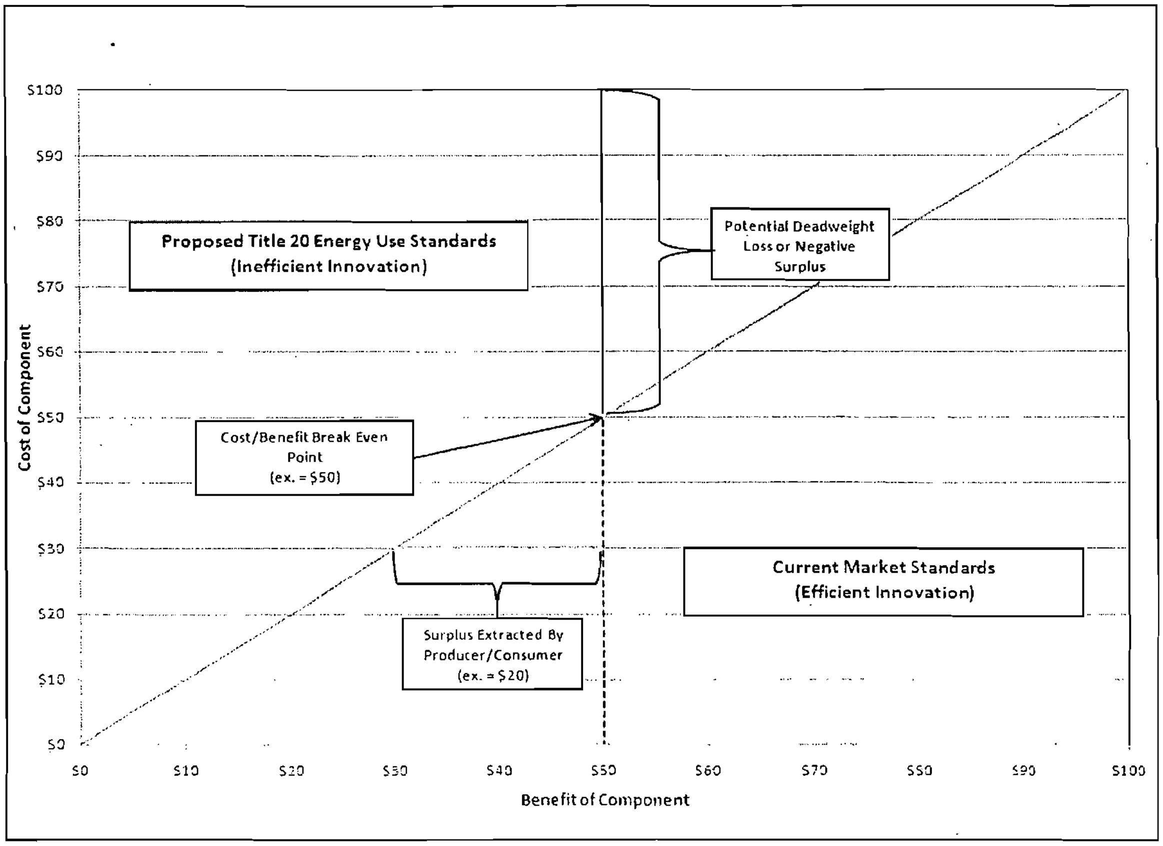
[25] BroadcastEngineering, "Consumer's want 'green' TVs, electronics", December 16, 2008.
[26] Percy's and Energy Star: "Working together for you and the environment", http://www.percys.com/t-estar-products.aspx. Note: It is our understanding that the FTC is in the process of requiring energy use disclosures for televisions and other electronics. This requirement would effectively convey full information to the market regarding energy consumption costs.
[27] See *e.g.*, Appendix F of the April 2, 2008 PG&E Title 20 Standards report; and According to Panasonic's AVC Networks Group President, Toshihiro Sakamoto, "Power reduction will come in two ways. One, Panasonic will reduce the number of components in plasmas, which need more components than LCD TV. Two, Panasonic will try to detect more of the light coming from the light source to the screen itself." Greentech Media, "Venture Power in Japan: Green Electronics", December 29, 2008.
[28] Note that programs such as Energy Star and the FTC's EnergyGuide program reinforce and promote such innovation.

From this example we can understand the effects of the SDR regulations. As the market stands now, televisions efficiently (in a financial sense) incorporate energy usage components. The SDR proposed Title 20 Standards (either 2011 or 2013) would require that economically inefficient components be added to existing televisions.[29] In the example above, this would mean that the additional component would cost more than \$50 to save consumers \$50; *i.e.*, the net effect is not a positive surplus generated, but rather a "deadweight loss" (negative surplus) as economists call it. Figure 5 graphically illustrates this loss.

[29] Consider a television which would be banned under the SDR proposed Title 20 Standards. If a company wants to bring it to market, additional energy savings components will need to be added (assuming such components exist). If adding the component were efficient (in a financial sense), the television would already include it, so we infer that adding it is not efficient

Figure 5: Impact of Market Standards on Innovation and Efficiency



The horizontal X-axis represents the benefits of a television component, such as reduced energy usage or improved picture quality. The vertical Y-axis is the cost of such a component. Units are in dollars. The blue 45 degree line represents the locus of all points where it would be a break-even proposition for a manufacturer to include a component. Note that below the 45 degree line we have efficient components, where the benefits outweigh the costs. Manufacturers will naturally include these components, pass the cost (and benefits) on to the consumer, and share in some of the surplus with the consumer. Conversely, the points above the blue 45 degree line represent inefficient components, that is, those which cost more than the benefits they provide. In the example mentioned with the $30 component which provides $50 of benefit, the green line shows the additional $20 of surplus generated. As we have shown, additional components added as a result of imposed standards will necessarily be in the upper region, since their costs outweigh their benefits (otherwise they would have been added without the impetus of regulations). The red line shows components which cost more than they generate in added value; thus these are inefficient.

B. The SDR proposal will reduce competition and raise prices

Under the SDR 2011 and 2013 standards, a significant fraction of currently available television models would be banned from sale in the state of California; see Exhibit 3. For example, the entire category comprised of plasma displays larger than 60 inches would be eliminated under either the 2011 or 2013 standard according to both the Energy Star and CNET datasets. A majority (80 percent) of plasma televisions between 50 and 59 inches would be eliminated according to the conservative Energy Star dataset under the 2011 SDR standard.

One could conclude that plasma displays would effectively be eliminated from the California market. Similarly large LCD televisions largely fail to comply with the proposed regulations and thus would also be eliminated from the California market. The resulting increase in market power among surviving manufacturers (or display types) would directly lead to higher prices and reduced innovation.[30]

[30] It is beyond the scope of this paper to conduct a detailed analysis of the impact of the regulations on market concentration and a corresponding impact on market power and pricing. However, the academic literature on price competition in consumer electronic goods markets is illustrative. For example, Crawford (2000) finds that while the 1992 Cable Act mandated price reductions of 10% to 17%, there were no observable gains in consumer welfare, and concludes that in spite of the considerable costs associated with the regulation, there is no evidence of benefits to consumers. Moreover, Goolsbee and Petrin (2004) find that the introduction of Direct Broadcast Satellites (DBS), a substitute for cable, led to substantial welfare gains for consumers, and that DBS demand is sensitive both to its price and the price of cable. In other words, competition was more effective than regulation.

C. The SDR regulations will reduce technological innovation

The proposed SDR regulations are likely to reduce technological innovation. To the extent that potential new (or improved) features (*e.g.*, increased size, improved brightness, increased resolution, higher quality sound) require additional power consumption, the SDR proposals would increase the time-to-market for these features. In other words, the SDR proposals reduce the expected financial rewards from technological research and development, since it is ex-ante uncertain how long it would take for a particular improvement to satisfy the standards (if ever). Consequently, manufacturers have less incentive to engage in research and development activities.[31] Under a regulatory approach that is based on energy use limits, if the increased costs cannot be transmitted to consumers, manufacturers would simply choose not to develop such new features.

As a final point, the extremely competitive nature of the TV market(s) should ensure – even in the absence of imposed regulations - that new technologies are continually being developed by the manufacturers. This truism holds with respect to energy efficiency innovations: "television makers are actually already competing intensely to reduce the power consumption on their sets."[32] For example, Panasonic expects that by 2011, it will have the ability to reduce power consumption on its plasma televisions by up to two-thirds.[33] To the extent that the SDR regulations diminish the incentive of firms such as Panasonic to develop more efficient technologies (*e.g.*, since large size plasma as well as LCD TVs could potentially be banned outright in California), innovation would be diminished and consumers would be harmed.

[31] Compliance costs may crowd-out research and development spending as well.

[32] Greentech Media, "California to Pass Energy Efficient Rules on TVs – But Don't Worry," January 6, 2009,

[33] Panasonic indicates that the improved efficiency will be achieved by reducing the number of components in plasma displays and by more efficiently directing the light from light sources onto the screen. Greentech Media, "Venture Power in Japan: Green Electronics," December 29, 2008.

VI. THE SDR PROPOSED REGULATIONS COULD COST THE STATE OF CALIFORNIA $50 MILLION IN LOST ANNUAL TAX REVENUE AND 4,600 TOTAL LOST JOBS

Through the use of a simple model, we illustrate the potential impact of the SDR regulations directly on the State of California as measured in tax revenues and state employment; see Appendix A for complete details on the model. It should be noted that the model depends on several simplifying assumptions and that a definitive study is beyond the scope of this report. Nevertheless, we feel that regulatory bodies attempting to impose new regulations should consider these potential effects and that this simple model serves to illustrate the potential impact.

Before presenting our results, some fundamental economic principles of consumer behavior are required here to frame the analysis.

Figure 6: Supply and Demand in the Television Market

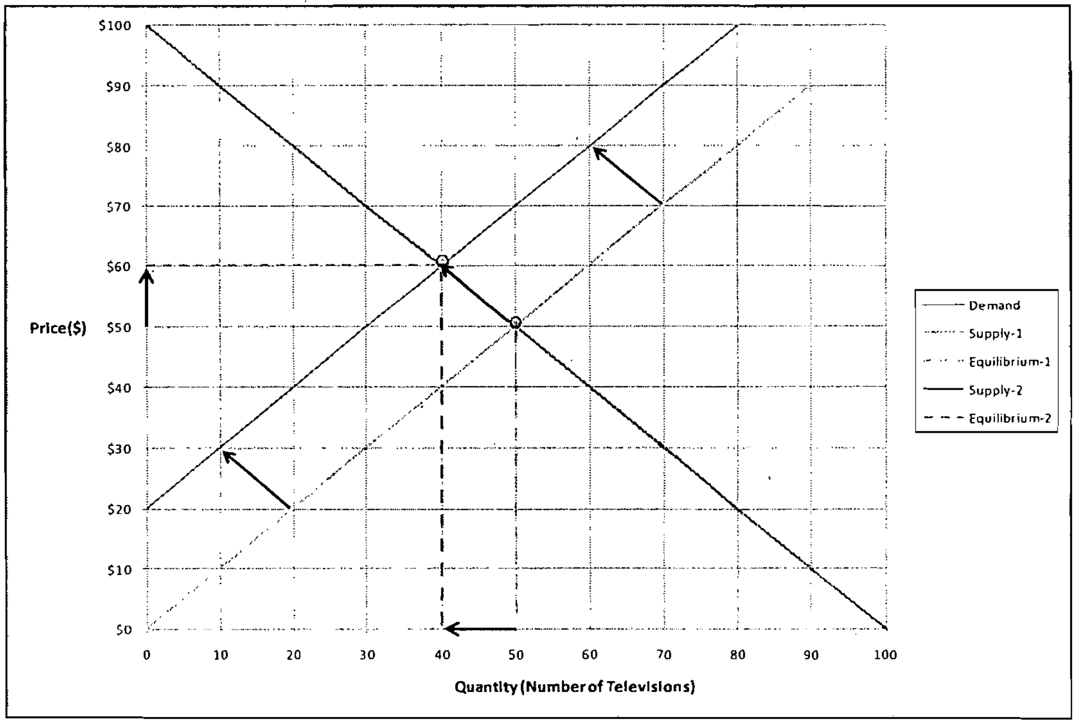


Figure 6 shows standard supply and demand curves which capture the television market at two equilibrium price points, pre- and post- regulation. The first equilibrium (Equilibrium-1) shows a hypothetical market price and quantity, supplied and demanded, prior to regulation. The enactment of the regulation will cause the supply curve to shift up (from Supply-1 to Supply-2), since it will take a higher price for a company to supply a given quantity. The result, given that demand is constant, is higher prices and fewer televisions sold – a reduced market for televisions.

According to basic microeconomics, the effect of a price increase can be broken into two parts: an *income* effect and a *substitution* effect.[34] The income effect comes from

[34] Varian, Hal, *Microeconomic Analysis*, 9th Edition, 1992, New York: Norton, Chapters 7 through 9.

the fact that increasing the price of a good is analogous to decreasing the incomes of consumers, since they now cannot buy as much. For example, suppose a consumer has an income of $100 which is allocated between 40 Starbuck coffees (at $2 apiece) and 20 muffins (at $1 apiece). Increasing the price of coffee to $4 means the consumer can only buy 20 coffees assuming 20 muffins are still desired. This is analogous to reducing income from $100 to $60. In the case of televisions, increasing prices due to regulation will cause a negative income effect, so that consumers have less purchasing power overall.

The other part is the *substitution effect.* Raising the price of coffee in the above example may stimulate the purchase of more muffins, since now the price of muffins is relatively cheaper. The magnitude of the substitution effect will depend on consumer preferences. At a recent hearing on the CEC's SDR, it was suggested that dollars left unspent in the consumer electronics market will be spent instead on other goods, thereby stimulating the economy in a compensatory manner – e.g., that consumers who forgo television purchases substitute 20 toasters instead. This argument is fundamentally flawed; given that televisions are a durable good the consumer will react according to one of the four groups defined below.[35]

1. *Unresponsive* consumers. Defined as consumers who are effectively unresponsive to price increases of a magnitude caused by the regulations. They simply buy the television they want at the increased price.

2. *Price-conscious* consumers. Defined as consumers who purchase televisions at the same time as before, though they will spend the same amount of money as they would have regardless of the regulation. In short, they will buy

[35] In actuality there would be a continuum of consumers which span these four categories.

smaller or less feature-rich televisions and get less for their money because of the regulation.

3. *Substituting* consumers. Defined as consumers who, faced with higher prices in the television market, will look for alternative purchasing options. They may buy a used television, purchase out of state, or purchase through another available sales channel.

4. *Delaying* consumers. Defined as consumers who will delay their purchase longer than they otherwise would have. Note that when buying at that later date, their decisions may be classified according to one of the three above groups.

Under certain assumptions with regards to consumer substitution (e.g., purchasing a compliant TV instead of a banned TV) and technological improvements (e.g., TVs becoming compliant by 2011 or 2013 at no extra cost), we estimate the following lost revenue and lost jobs for the State of California presented in Table 2 using both the Energy Star and CNET datasets.

Table 2: Estimated Lost California Revenue and Jobs with Adjustments

	2011		2013	
	Energy Star	CNET	Energy Star	CNET
Lost Revenue	$ 22,572,466	$ 70,511,000	$ 49,826,844	$ 53,534,201
Lost Jobs	1,947	6,083	4,299	4,619

These calculations give a range of estimates for the lost tax revenue and lost jobs in the state of California. Since the CNET data is taken from the universe of all televisions models and the Energy Star data is from relatively energy-efficient televisions, Energy Star non-compliance rates are lower and thus Energy Star loss estimates are smaller as well. As intended, the adjustments tend to reduce estimates, and since the Title 20 standards for 2013 are more stringent, the loss estimates for 2013 are larger. Given that any pair of year/dataset yields significant lost revenues and jobs for the State, we believe that the conclusion that the proposed standards will negatively impact the state is supported.[36]

VII. THE EVIDENCE AND REASONS PROFERRED FOR THE PROPOSED REGULATIONS ARE MISLEADING

The CEC attempts to motivate the need for television energy efficiency regulatory standards by indicating that television viewing (including programming recording and playback) currently represents ten percent of residential electricity usage and that power consumption is growing rapidly (and consequently needs to be regulated). The CEC provides some stylized facts but little evidence in this regard and essentially relies on the CASE report.[37] Our review of the CASE report indicates that the "evidence" provided therein as supporting the need for regulation is highly misleading.

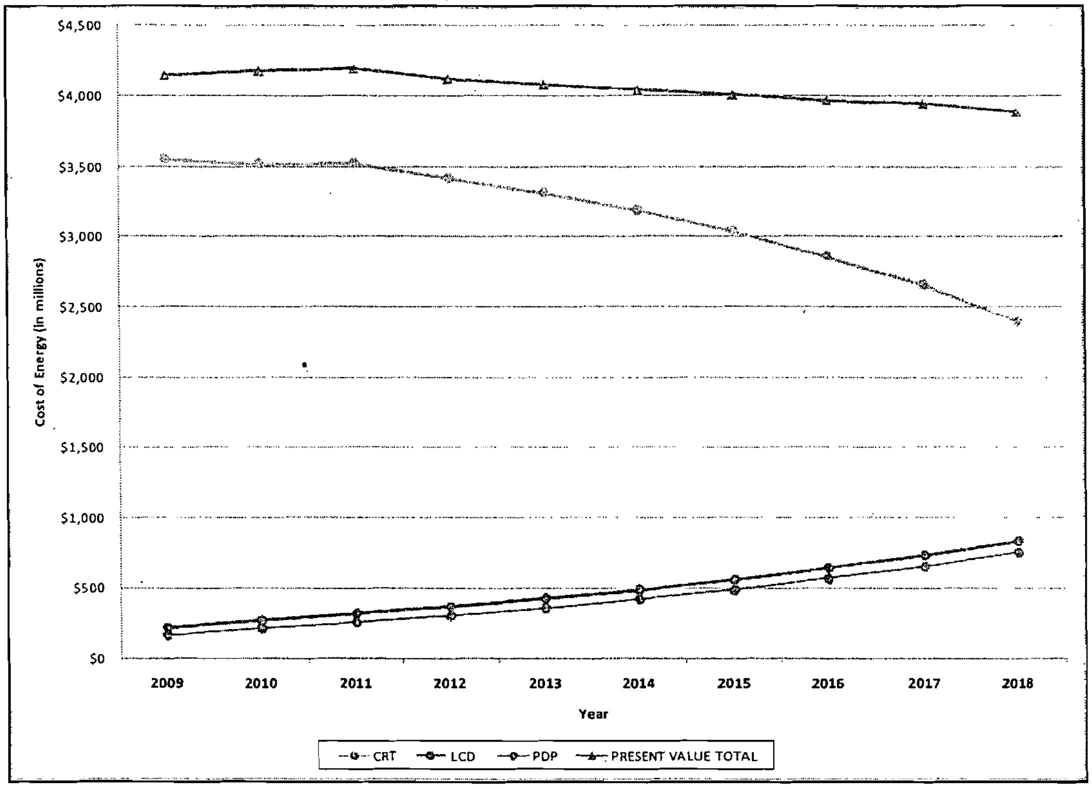
[36] Our understanding is that these job losses would occur across a number of different types of establishments in the California state economy, such as large scale retailers (e.g. Best Buy) and independent specialty retailers and installers of high-end equipment (such as Ken Crane). In fact, independent high-end retailers and installers may be forced into bankruptcy since their current existence relies upon the sale of fully-featured big-screen televisions, which tend to be non-compliant with the proposed SDR regulations. This is consistent with comments made by the Plasma Display Coalition (PDC) and Custom Electronic Design and Installation Association (CEDIA) on the December 15, 2008 CEC Efficiency Committee Public Workshop on Appliance Efficiency Standards.
[37] CEC Staff Draft Report, pages 1, 5-6.

A. The offset of inefficient televisions being replaced by more efficient sets is not properly recognized

One of the primary motivating factors behind the CEC's regulatory efforts is the stylized fact (asserted in the PG&E report) that the total number of TVs in use is increasing and therefore power consumption is increasing. We do not dispute the fact of increased total TVs in use. However, in evaluating this increase on power consumption, one should consider the benefits of the *replacement effect* (i.e., gains caused by the replacement of inefficient CRT televisions with predominantly LCD technology).[38] The SDR ignores the replacement effect when making the following claim: "PG&E's analysis indicates that energy consumption of digital flat screen TVs is, in addition to other factors, proportional to screen size. The demand for larger screen size TVs is continuously growing; consequently, energy consumption is also on the rise."[39] As one can see from Figure 7, a simple modeling exercise with conservative assumptions illustrates that while energy costs and consumption are increasing due to consumers watching more television on larger screens, the offset due to efficient technology actually keeps energy costs to consumers constant over time. See Exhibit 4 for a complete breakdown of costs and inputs by year.

[38] LCD televisions compose approximately 90% of the market of new television purchases and LCD televisions are 70% more energy efficient than CRT televisions. See Business and Climate, "Put yourself in the picture over energy efficient TV screens", March 30, 2007, page 8.
[39] CEC Staff Draft Report, page 2.

Figure 7: Total Estimated Energy Cost of Televisions by Type

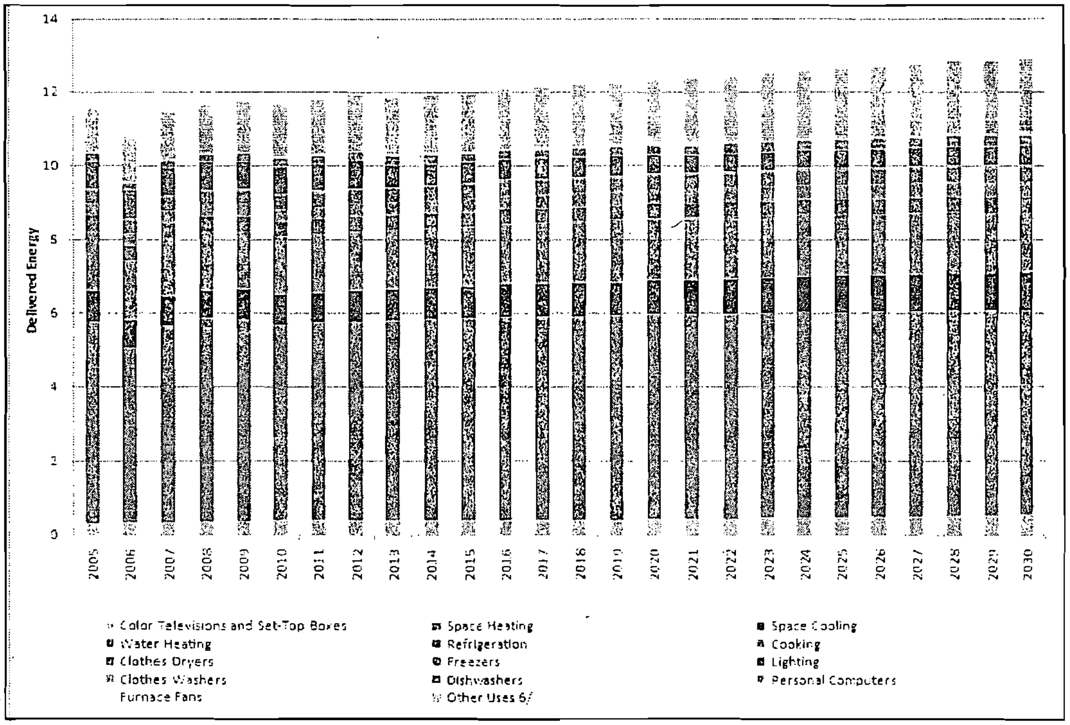


These results demonstrate that the CEC's claims that larger screen sizes necessitate energy control and regulation are unsupported.

B. CASE distorts energy consumption forecasts from the EIA 2008 Annual Energy Outlook

PG&E (and ultimately the CEC) draws upon the Energy Information Administration ("EIA") Annual Energy Outlook 2008 to support the claim that the television market is, and will be, experiencing relatively large growth over the next 20 years and provides graphical evidence of energy consumption growth rates with the magnitudes of energy use as a function of bubble size. Note, however, that Figure 8 indicates that televisions represent consistently less than 5 percent of energy consumption.

Figure 8: Annual Energy Consumption by Appliance Type



C. The CEC falsely portrays the ability of the current stock of television to comply with more stringent standards

The CEC relies upon the assertion by PG&E that larger TVs are well above the Energy Star qualification percentage goals of 25 percent[40] and thus "there is strong motivation to set a Title 20 Standard that is more stringent."[41] While PG&E notes that 61 percent of TVs greater than 50 inches are Energy Star compliant, they fail to

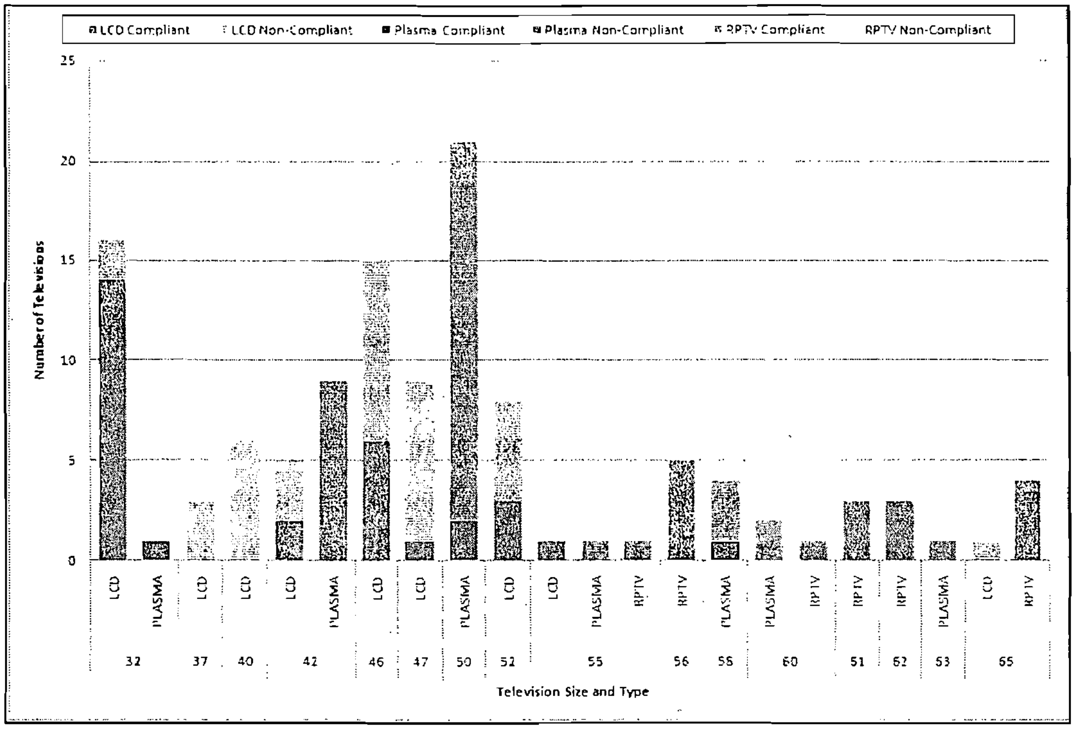
[40] PG&E CASE study, page 5, section 3.2.
[41] PG&E CASE study, page 5, section 3.2.

recognize that this percentage is quite misleading due to the fact that these models in their dataset consist primarily of rear-projection televisions. It is the non-compliant TVs (the LCD and plasma TVs that are in high demand) which would be banned with the enactment of the proposed regulations.[42]

To illustrate the dramatic effect that the proposed regulations would have, Figure 9 shows the number of compliant versus non-compliant TVs by size and display type that would be banned under the 2011 SDR recommendations utilizing the CNET data. The darker hues show compliant television within each size and type category while the lighter hues show the number of non-compliant TVs. As one can see in the figure, the only categories with majority compliance are 32-inch LCD TVs and, of course, all categories capturing rear-projection TVs. In fact, only 13 of the 48 (29 percent) LCD TVs above 40 inches are compliant with the 2011 SDR standards, which, with the CNET data, translates to roughly 70 percent of the products most demanded by consumers being eliminated from the market if just the 2011 SDR standards are approved.[43]

[42] PG&E readily admits in their incremental cost analysis that rear projection TVs are a subset of TVs that do not truly represent the price to size relationship appropriate for TVs that make up the majority of television energy consumption.
[43] Of all the LCD televisions in the CNET sample, only 42% are SDR compliant. See section 3 for the details on the detrimental economic impact of eliminating the majority of a product market.

Figure 9: Energy Standards Compliance by Television Size and Type



Taking the PG&E recommendations as a starting point, the SDR makes additional, seemingly arbitrary, revisions under the assertion that these revisions will "allow more time and flexibility for televisions less than 50 inches to comply with the proposed standards and captures greater savings in larger screen sizes."[44] The decision by the CEC to allow more time for smaller televisions that (a) do not need the time and (b) are not the televisions being most demanded by consumers is outwardly illogical and does not accurately reflect the choices of California consumers.

[44] CEC Staff Draft Report, page 4.

VIII. CONCLUSION

While we recognize that the motivation behind the proposed regulations is well intentioned, the analyses provided by the CEC simply fail to provide the basis for informed decision making. We have demonstrated that the SDR does not adequately address the fundamental issue of whether the proposed regulations are cost-neutral on consumers and, crucially, the evidence appears to indicate the contrary. We have demonstrated how the SDR, and the PG&E report which serves as the basis for much of the SDR, suffer from methodological and economic errors. We have further demonstrated the importance of appropriately measuring the cost of the regulations and producing a correct and reliable study in the context of the economically harmful side effects that could arise from regulating a competitive industry (*e.g.*, reduction in competition or innovation).

To illustrate the potential harm to the State of California we constructed an example of how state revenues and jobs could be affected, as shown in Appendix A. Under certain simplifying assumptions we determined that the state would suffer tax revenue losses of up to $50 million and job losses of 4,600 annually.

In conclusion, given that: (1) the current analysis as to the impact on consumers is quite limited (and seems to indicate that consumers would be on average worse off in any event); (2) the potential economic side effects of the proposed regulations are severe; (3) competition is driving energy efficiency gains already; and (4) the State of California is likely suffer noticeable impacts on revenues and jobs, we conclude that there is no demonstrated reason nor adequate justification for the CEC to promulgate regulations for the on-mode power consumption of televisions.

IX. APPENDIX A: THE CALIFORNIA STATE IMPACT MODEL

In attempt to measure the effect of the SDR proposals on the state of California we develop a "displacement" model to examine the impact on state tax revenues and jobs.[45] Exhibits 5A-D present a baseline scenario which models lost tax revenue and lost jobs proportionally to the eliminated sales due to the imposed compliance standards (i.e., some television models are banned and the resulting lost sales translate into lost tax revenue and lost jobs).[46] Exhibits 5A-D are projections for the 2011 and 2013 proposed standards using both the Energy Star and CNET data.[47]

Exhibits 6A-D adjust the baseline scenarios (presented in Exhibits 5A-D) to incorporate adjustments for technological progress (i.e., television models becoming compliant before 2011 or 2013), consumer behavior (i.e., substitution effects where consumers shift consumption patterns) and associated price differentials (i.e., the substitution from non-compliant models to compliant ones will come at a higher price to consumers and thus lead to lower lost tax revenue).[48] Finally, we apply economic multipliers to account for indirect and induced output and employment effects.[49]

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[45] Specifically, it is a model of displaced consumer spending caused by the ban of certain models of televisions.

[46] If the temporary California state sales tax increase of 1% does not expire in 2011, all sales tax loss figures in exhibits 5 and 6 are underestimated. *See http://www.boe.ca.gov/sutax/0401TaxIncrease.htm.*

[47] Since the CNET data is taken from the universe of all contemporary television models, and the Energy Star data is only from relatively energy-efficient televisions, the displacement estimates using the Energy Star data are smaller. In addition, since the 2013 requirements are more stringent, the 2013 estimates are larger than the 2011 estimates.

[48] The underlying assumption is that the additional required components come at some expense.

[49] Indirect effects flow from consumer electronic industry purchases of non-consumer electronic industry goods and services. Induced effects flow from the consumption driven by the incomes provided by the consumer electronics industry (i.e., employees spending their incomes). *See Price Waterhouse*, page 4.

To adjust for technological progress we invoke a version of Moore's Law (that technological progress roughly doubles every couple of years) and decrease the non-compliance rates by half every two years.[50] So for example, by 2011, half of the (currently) non-compliant televisions will become compliant due to technology improvements, and by 2013 75% of (currently) non-compliant models will become compliant. Second, the adjusted model assumes that 50% of revenues lost from non-compliant models being banned from the market will be realized by consumers substituting towards compliant models. The price effect occurring due to the substitution from non-compliant models to compliant ones will come at an additional cost of 10 percent. Lastly, we adjust for the indirect and induced effects that are brought about as a result of decreasing revenues and jobs in the consumer electronics industry.[51]

[50] Gordon Moore's original paper with this observation is from 1965, but it has become folk wisdom (and an accepted truth) in technological manufacturing circles. See Intel's web page devoted to Moore's Law at http://www.intel.com/technology/mooreslaw/index.htm for a history and description.
[51] See PriceWaterhouse, page 4.

Exhibit 1

CNET Data

Model	Screen Type	Screen size	Watts: Power on
Envision A27W221	LCD	27	105.97
Dell W3706MC	LCD	37	180.13
JVC LT-40FN97	LCD	40	195
JVC LT-32X787	LCD	32	140.04
Philips 37PF9631D	LCD	37	183.32
Philips 42PF9831D	LCD	42	236.38
Samsung LN-S4096D	LCD	40	209.14
Samsung LN-R3228W	LCD	32	116.81
Samsung LN-S3251D	LCD	32	155.6
Samsung LN-S4051D	LCD	40	203.05
Sharp LC-37D40U	LCD	37	177.25
Sharp LC-37D90U	LCD	37	218.74
Sharp LC-46D62U	LCD	46	255.72
Sony KDL-52XBR2	LCD	52	307.03
Sharp LC-65D90U	LCD	65	583.82
Sony KDL-32S2000	LCD	32	127.5
Soyo DYLT032D	LCD	32	129.53
Vizio GV42L	LCD	42	208.41
Vizio L32	LCD	32	152.28
Vizio L37HDTV	LCD	37	156.28
Vizio L42 HDTV	LCD	42	202.67
Westinghouse LTV-32w3	LCD	32	146.06
Westinghouse LTV-40W1HDC	LCD	40	243.76
Westinghouse LVM-47w1	LCD	47	207.74
Winbook 46D1	LCD	46	220.94
Sharp LC-32D43U	LCD	32	144.11
Samsung LN-T4661F	LCD	46	245.63
Sony KDL-46S3000	LCD	46	202.58
LG 47LB5D	LCD	47	245.85
Viewsonic N3235w	LCD	32	146.85
HP LC4776N	LCD	47	273.65
Samsung LN-T4665F	LCD	46	246.89
Vizio GV42LF	LCD	42	215.99
Westinghouse TX-47F430S	LCD	47	278.86
Toshiba 52LX177	LCD	52	322.1
Sharp LC-52D64U	LCD	52	280.22
Vizio GV52LF	LCD	52	344.52
Sony KDL-46XBR4	LCD	46	256.19
JVC LT-47X788	LCD	47	246.61
Mitsubishi LT-46144	LCD	46	309.58
JVC LT-47X898	LCD	47	300.78
Samsung LN-T4681F	LCD	46	194.65
Samsung LN-T4671F	LCD	46	296
Toshiba 40RF350U	LCD	40	221.49
Philips 42PFL7432D	LCD	42	134.04
Philips 47PFL9732D	LCD	47	250.1

CNET Data

Model	Screen Type	Screen size	Watts: Power on
Olevia 252T FHD	LCD	52	257.29
Vizio VO47LF	LCD	47	277.52
Insignia NS-LCD32	LCD	32	143.2
Sharp LC-32D44U	LCD	32	126.25
Samsung LN32A450	LCD	32	130.65
Samsung LN52A650	LCD	52	219.9
LG 47LG60	LCD	47	267.21
Toshiba 32CV510U	LCD	32	131.34
Sony KDL-32M4000	LCD	32	112.94
Philips 42PFL5603D	LCD	42	91.23
LG 32LG30	LCD	32	117.88
Sony KDL-46W4100	LCD	46	274.43
Mitsubishi LT-46148	LCD	46	263.78
Samsung LN46A750	LCD	46	184.62
Westinghouse VK-40F580D	LCD	40	246.81
Toshiba 42RV530U	LCD	42	218.08
Panasonic TC-32LX85	LCD	32	97.79
Sony KDL-46Z4100	LCD	46	268.57
Samsung LN46A550	LCD	46	137.12
Vizio SV470XVT	LCD	47	239.59
Samsung LN46A950	LCD	46	145.98
Vizio VO32L	LCD	32	104.9
Sony KDL-52XBR6	LCD	52	272.63
Sony Bravia KDL-55XBR8	LCD	55	239.83
Sharp Aquos LC-52D65U	LCD	52	210.35
LG 32LG40	LCD	32	116.19
Sharp Aquos LC-46D85U	LCD	46	182.32
Honeywell MT-HWJCT42B2AB Altura MLX	LCD	42	207.27
Haier HL47K	LCD	47	237.3
AOC A42HD84	Plasma	42	282.47
Dell W4201C	Plasma	42	306.93
Dell W5001C	Plasma	50	393.5
Hitachi 55HDT52	Plasma	55	410.48
LG 50PC3D	Plasma	50	337.84
Maxent MX-50X3	Plasma	50	381.47
Panasonic TH-42PX60U	Plasma	42	245.04
Panasonic TH-42PHD8UK	Plasma	42	234.33
Panasonic TH-50PH9UK	Plasma	50	312.84
Panasonic TH-58PX600U	Plasma	58	442.35
Philips 42PF9631D	Plasma	42	311.3
Pioneer PDP 5060HD	Plasma	50	301.84
Pioneer PRO-FHD1	Plasma	50	353.87
Samsung HP-R4252	Plasma	42	263.2
Samsung HP-S4253	Plasma	42	281.12
Vizio P42HDTV	Plasma	42	188.26
Vizio VM60PHDTV	Plasma	60	523.13

CNET Data

Model	Screen Type	Screen size	Watts: Power on
Panasonic TH-42PX700U	Plasma	42	464.07
Vizio VP50HDTV	Plasma	50	317.23
Samsung HP-T5064	Plasma	50	321.62
LG 50PC5D	Plasma	50	320.03
Pioneer PDP-5080HD	Plasma	50	330.6
Panasonic TH-58PZ700U	Plasma	58	609.53
Panasonic TH-50PH10UK	Plasma	50	379.32
Samsung FP-T5084	Plasma	50	412.85
Hitachi P50H401	Plasma	50	336.1
Panasonic TH-58PZ750U	Plasma	58	562.52
Insignia NS-PDP42	Plasma	42	216.76
Samsung PN50A550	Plasma	50	446.6
Panasonic TH-46PZ85U	Plasma	46	454.51
Panasonic TH-42PX80U	Plasma	42	260.18
Panasonic TH-50PZ800U	Plasma	50	191.44
LG 50PG50	Plasma	50	401.02
Panasonic TH-50PZ850U	Plasma	50	163.8
Pioneer PDP-5020FD	Plasma	50	293.33
Vizio VP422	Plasma	42	283.83
Vizio VP322	Plasma	32	122.97
LG 50PG20	Plasma	50	284.64
Samsung PN50A650	Plasma	50	380.58
LG 50PG30	Plasma	50	401.67
LG 60PG60	Plasma	60	507.83
Pioneer PRO-111FD	Plasma	50	333.54
Panasonic TH-58PZ800U	Plasma	58	196.37
Samsung PN63A760	Plasma	63	509.24
Vizio VP505XVT	Plasma	50	474.03
Panasonic TH-50PF11UK	Plasma	50	449.62
HP MD6580n	RPTV	65	268.29
JVC HD-56FN97	RPTV	56	205.98
Mitsubishi WD-62628	RPTV	62	259.73
Mitsubishi WD-65831	RPTV	65	257.28
JVC HD-56G887	RPTV	56	193.32
Panasonic PT-61DLX76	RPTV	61	195.3
Samsung HL-S5679W	RPTV	56	149.85
Samsung HL-S5687W	RPTV	56	149.85
Sony KDS-60A2000	RPTV	60	190.45
Samsung HL-T5687S	RPTV	56	154.78
Mitsubishi WD-65734	RPTV	65	240.26
Panasonic PT-61LCZ70	RPTV	61	264.6
Sony KDS-55A3000	RPTV	55	210.4
Mitsubishi WD-65833	RPTV	65	225.22
Samsung HL61A750	RPTV	61	171.24
Mitsubishi WD-65735	RPTV	65	219.27

Source: CNET's Quick Guide: TV power consumption, http://reviews.cnet.com/4520-6475_7-6400401-3.html

Exhibit 2: Comparison of Features that Effect Cost of Televisions by Screen Size

TV Size	TV Models Compared	General Features	Sound Features	LED backlight Technology	[illegible]	Input Video Format	Notes
32	Insignia NS-LCD32-09(S) Sony Bravia KDL-32S2000(S) JVC LT-32X787 (SS) Sharp LC-32D43U (SS)	·Auto power off ·Black level expander ·3:2 pull down compensation ·Video Noise reduction	·Advanced Hyper Surround Sound		·Memory Stick ·Compact Flash Card ·SD Memory Card		
37	Sharp LC-37D90U(S) Philips 37PF9631D(SS)	·Sleep timer ·MP3 playback ·Active control ·Pixel Plus 2 HD ·Parental control ·Ambilight 2 Channel ·JPEG photo playback ·Smart Picture Control ·Anti-reflection coating ·2:2 pull down compensation ·3:2 pull down compensation	·Smart Sound Control			480i 480p 720p 1080i	The most expensive model has increased cost due to backlight, high rated picture and brand name.
40	JVC LT-40FN97 (S) Westinghouse (S) Westinghouse VK-40F580D(SS) Samsung LN-S4051D (SS)	·On-screen menu ·Channel labeling ·DNIe (Digital Natural Image engine) ·JPEG photo playback ·DayBright ·SpineDesign			·SmartMedia Card ·Memory Stick ·Compact Flash Card ·SD Memory Card		Between the two Westinghouse models, differences include resolution and S Video Composite
42	Panasonic Viera TH-42PX80U(S) Vizio VP422 (S) Envision A42HD84(SS) Philips 42PF9831D(SS)	·DCDi (Directional Correlation Deinterlacing) ·Pixel Plus 3 HD	·Subwoofer				The most expensive model in this category is an LCD while all other models a plasma
46	Samsung LN-T4661F(S) Samsung LN-T4681F(S) Samsung LN46A950(SS) Sharp Aquous LC-46D85U(SS)	·LED backlight technology ·Wide Color Gamut-CCFL				1080p	The less expensive models are one year older than the more expensive models
47	Haier HL47K(S) Vizio SV470XVT(S) Philips 47PFL9732D(SS) JVC LT-47X898(SS)	·D.I.S.T (Digital Image Scaling Technology) ·Ambilight 2 Channel ·Dynamic Contrast			·USB Port		According to CNET the less expensive model has "Serious Flaws". Also, the expensive model has a 2 year warranty.
50	LG 50PG60(S) LG50PG20(S) Pioneer PDP-5060HD(SS) Pioneer PRO-FHD1(SS)						Surprisingly older models are more expensive in this category
52	Sharp Aquos LC-52D64U(S) Sharp Aquos LC-52D65U(S) Toshiba 52LX177(SS) Sony Bravia KDL-52XBR6(SS)	·Game mode ·X.v.Color ·Motionflow ·MP3 playback ·On-screen menu ·Channel labeling ·JPEG photo playback · Live Color Creation ·Video noise reduction	·Subwoofer	·Wide ·Color Gamut-CCFL		480i 480p 720p 1080/24p 1080/60i 080/60p	
55	Hitachi 55HDT52(S) Sony Bravia KDL-55BR8(SS)	·Game mode ·X.v.Color ·Motionflow ·Photo TV HD ·On-screen menu ·Parental control ·Contrast enhancer ·Live Color Creation ·Video noise reduction ·Ambient light sensor (ALS)				480i 720p 480/60p 1080/24p 1080/60i 1080/60p	The Sony is an LCD while Hitachi is a Plasma however, the Sony brand name is superior to Hitachi
58	Panasonic Viera TH-58PZ800U (S) Panasonic Viera TH-58PZ750U(S) Panasonic Viera TH-58PZ700U(SS) Panasonic Viera PX600U(SS)	·Q-link. ·MPEG4-Movie ·JPEG photo playback.				480i 480p 720p 1080/24p 1080/60i 1080/60p	According to CNET Notes, the expensive models have superb image quality which "makes it worth the price".
60	Vizio VM60P (S) LG 60PG60(SS)	·XD Engine technology ·MP3 playback ·Parental control ·On-screen menu ·JPEG photo playback ·V-Chip ·Channel labeling ·Video noise reduction ·Digital MPEG Noise Reduction Circuit			·USB input		
Above 60	Sharp LC-65D90U(S) Samsung PN63A760 (SS)	·MP3 playback ·On-screen menu ·Touch of Color (ToC) ·Pre-loaded Content Library ·DNIe (Digital Natural Image engine)	·SRS TruSurround XT			480i 480p 720p 1080i 1080p	

Source: Random selection of TVs from the CNET sample "139 HDTVs' power consumption compared"

Note: (S) denotes Low Price Models, (SS) denotes High Price Models

Exhibit 3: Non-Compliance Rates by Type and Size Category

Television Type	Energy Star 2011	CNET 2011	Energy Star 2013	CNET 2013
LCD TVs Under 24	0%	n/a	20%	n/a
LCD TVs 24 to 34	0%	11%	83%	100%
LCD TVs 35 to 39	0%	80%	93%	100%
LCD TVs 40 to 44	4%	86%	93%	93%
LCD TVs 45 to 49	17%	70%	88%	100%
LCD TVs 50 and up	28%	60%	93%	100%
Plasma TVs Up to 49	29%	86%	100%	100%
Plasma TVs 50 to 59	80%	90%	100%	97%
Plasma TVs 60 and up	100%	100%	100%	100%
RPTV with 1080p	0%	0%	0%	40%

Note: The CNET sample contains 137 TVs tested by CNET for power consumption in watts between roughly January 2006 and December 2008. There was one 720p RPTV model in the CNET sample that could not be grouped into the CEA forecast categories, the JVC HD-56G887, and was therefore excluded. The RPTV non-compliance rate of 0% is independent of its exclusion. See CNET, "The chart: 139 HDTVs' power consumption compared".

Exhibit 4: Cost Benefit Analysis of the Television Market and Energy Consumption

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AVERAGE ENERGY CONSUMPTION (COST FACTORS)	*Television Size (in.)* [1]	35.8	36.8	37.6	38.3	39.0	39.7	40.5	41.2	42.0	42.8
	Television Area (in.²) [2]	547.6	578.7	604.1	626.8	650.3	674.8	700.1	726.4	753.6	781.9
	Energy Cost ($/kWh) [3]	0.1592	0.1499	0.1478	0.1454	0.1443	0.1435	0.1431	0.1427	0.1433	0.1430
	Hours Per Year [4]	3,030	3,071	3,112	3,155	3,198	3,241	3,285	3,330	3,375	3,421
	Cost Multiplier [5]	0.4824	0.4602	0.4599	0.4586	0.4614	0.4650	0.4702	0.4752	0.4836	0.4894
	TELEVISION TYPE										
STOCK OF TELEVISION UNITS [6]	CRT	27,583,333	27,166,667	26,130,048	24,460,667	22,722,722	20,914,286	19,033,383	17,077,993	15,046,041	12,935,405
	DLP	6,472,222	8,916,667	9,953,897	11,534,942	13,169,680	14,859,530	16,605,949	18,410,424	20,274,480	22,199,677
	LCD	2,166,667	2,833,333	3,212,596	3,698,663	4,201,187	4,720,604	5,257,359	5,811,908	6,384,717	6,976,264
	PDP	2,194,444	2,666,667	3,035,293	3,399,535	3,775,906	4,164,725	4,566,318	4,981,020	5,409,171	5,851,122
	TOTAL	38,416,667	41,583,333	42,331,833	43,093,806	43,869,495	44,659,146	45,463,010	46,281,345	47,114,409	47,962,468
TOTAL ESTIMATED ENERGY COST [7]	CRT	3,552,267,081	3,522,118,828	3,531,116,739	3,417,473,406	3,311,507,850	3,184,231,672	3,038,472,900	2,856,745,349	2,655,832,584	2,395,822,717
	DLP	222,299,606	308,704,627	359,537,841	431,089,326	513,781,975	606,061,469	710,646,645	826,112,388	960,613,087	1,104,361,691
	LCD	160,284,695	211,277,358	249,932,191	297,722,224	353,012,738	414,690,303	484,587,674	561,705,617	651,561,067	747,484,675
	PDP	191,328,846	234,358,078	278,306,028	322,509,051	373,934,387	431,189,839	496,051,531	567,367,162	650,579,033	738,880,807
	TOTAL	$4,126,180,228	$4,276,458,890	$4,418,892,800	$4,468,794,007	$4,552,236,950	$4,636,173,283	$4,729,758,750	$4,811,930,515	$4,918,585,771	$4,986,549,890
	PRESENT VALUE [8]	$4,126,180,228	$4,151,901,835	$4,165,230,276	$4,089,579,563	$4,044,603,569	$3,999,203,799	$3,961,098,491	$3,912,539,855	$3,882,777,028	$3,821,775,273

Notes:

[1] The Revised PG&E CASE Study cited the "Average Screen Size for North American TV Shipments" that explicitly forecasts the average screen sizes for 2009-2012 as noted in the exhibit. The growth rate of these forecasts asymptotically approaches approximately 2%, therefore we estimated growth for the years 2013-2018 as the last projected growth rate of 1.86%. *See Revised PG&E CASE Study, p. 13, box 3.*

[2] Television Area = [Television Size]*[Area:Size Multiplier]*[Television Size]. [Area:Size Multiplier] is derived by assuming an aspect ratio of 16:9 and applying the Pythagorean Theorem. This results in a multiplier of (16/9)*(81/337).

[3] Energy Information Administration 2009 Annual Energy Outlook (Early Release) estimates of the cost per kilowatt hour in the End-Use Residential sector of California for 2009-2018. *See Table 84. Electric Power Projections for EMM Region, Western Electricity Coordinating Council / California.*

[4] Nielsen Media Research estimated the average total number of daily viewing hours and minutes for U.S. households in 2008 to be 8:18. This total was then multiplied by 365 days for a 2009 year estimate. The calculated geometric mean for the growth in years 1998-2008 of 1.36% acts as the yearly growth rate. This rate should be interpreted as a conservative estimate because the increase in the 2007-2008 period was only 0.81%. *See Nielsen Media Research, "Americans Can't Get Enough Of Their Screen Time", November 24, 2008, table 3.*

[5] Cost Multiplier = [Energy Cost ($/kwH)]*[Hours Per Year]/[1,000].

[6] The stock of televisions is forecasted in the PG&E Emerging Technologies Program December 2006 Report, Consumer Electronics: Market Trends, Energy Consumption, and Program Recommendations 2005-2010, p. 40, table 4.2-8. The 2009 and 2010 estimates of market stock are directly from the 2005-2010 table. The exact figures and assumption (e.g., PG&E accounts for 36% of the California population) were applied in the PG&E CASE Study, p. 13, table 4. We utilize 2005-2010 PG&E projections and forecast 2011-2018 based on the following simple linear regressions: CRT STOCK PROPORTION$_{(t)}$ = -0.05 + 0.96*[YEAR #$_{(t)}$], DLP STOCK PROPORTION$_{(t)}$ = 0.03 + 0.01*[YEAR #$_{(t)}$], LCD STOCK PROPORTION$_{(t)}$ = 0.01 + 0.01*[YEAR #$_{(t)}$], PDP STOCK PROPORTION$_{(t)}$ = 0.01 + 0.02*[YEAR #$_{(t)}$]. The proportion in units is calculated by taking the total stock of the year and multiplying by the proportion for that television type of the year.

[7] TOTAL ESTIMATED ENERGY COST$_{(t)}$ = [STOCK$_{(t)}$]*[Cost Multiplier$_{(t)}$]*[Energy Consumption by Television Type$_{(t)}$]. CRT power consumption is calculated with the assumption that LCD televisions are 70% more energy efficient than CRT televisions. *See Business and Climate, "Put yourself in the picture over energy efficient TV screens", March 30, 2007, p.8.* The average energy usage for Energy Star Qualified converter boxes (DTAs), 6.26 watts, was added to the energy consumption of CRT televisions to account for the transition to Digital Television. *See Energy Star: Digital-to-Analog Converter Boxes (DTAs) Qualified Product List, February 1, 2009.* DLP, LCD, PDP power consumption is calculated using the average television area for each year multiplied by the average watt per square inch used by each specific technology (0.13, 0.28, 0.33 respectively). *See CNET'S Quick Guide, "The basics of TV power consumption", February 6, 2009.*

[8] The reasonable discount rate of 3% assumed in the CEC Staff Draft Report is applied to calculate the Present Value. *See CEC Staff Draft Report, p. 7.*

Exhibit 5A: Energy Star 2011 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20

	CEA Forecasted CA Revenue (2011)	Energy Star Sample Size	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = [C] / [B]	[E] = [A] * [D] * [4]	[F] = [A] * [D] * [5]	[G] = [F] * [6]	[H] = [E] + [G]	[I] = [F] / [7]
Source	[1]	[2]	[3]		[4]	[5]	[6]		[7]
LCD TVs Under 24	$ 148,521,040	85	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 24 to 34	$ 558,038,021	86	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 35 to 39	$ 81,836,931	30	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 40 to 44	$ 589,548,368	56	2	4%	$ 1,526,509	$ 5,379,606	$ 277,050	$ 1,803,559	87
LCD TVs 45 to 49	$ 619,100,866	48	8	17%	$ 7,480,802	$ 26,363,266	$ 1,357,708	$ 8,838,510	429
LCD TVs 50 and up	$ 806,051,531	43	12	28%	$ 16,308,484	$ 57,473,104	$ 2,959,865	$ 19,268,349	935
Plasma TVs Up to 49	$ 65,799,838	17	5	29%	$ 1,403,085	$ 4,944,643	$ 254,649	$ 1,657,734	80
Plasma TVs 50 to 59	$ 245,685,739	25	20	80%	$ 14,249,773	$ 50,217,951	$ 2,586,224	$ 16,835,997	817
Plasma TVs 60 and up	$ 28,398,440	7	7	100%	$ 2,058,887	$ 7,255,770	$ 373,672	$ 2,432,559	118
RPTV with 1080p	$ 17,989,164	0	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [8]	$ 989,045	0	0	0%	$ -	$ -	$ -	$ -	0
Total [9]		397	54	14%				$ 50,836,709	2,466

Notes:

[1] National forecasts of sales revenue by television type for year 2011 were projected by the CEA. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The Energy Star dataset contains 397 LCD or plasma, 115V TVs that meet the Energy Star requirements and is as of January 26, 2009. Models that were categorized as "Other" under the screen type are not included in this table. There were no RPTVs included in this dataset, thus a non-compliance rate of 0% is conservatively utilized. See Energy Star, "Television Product List".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate. http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[5] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output. This percentage was utilized to estimate the lost labor compensation in CA.

[6] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 7) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[7] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[8] The CEA forecasts $7 million in revenue in 2011 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0.476 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[9] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

Exhibit 5B: CNET 2011 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20

	CEA Forecasted CA Revenue (2011)	CNET Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = [C] / [B]	[E] = [A] * [D] * [4]	[F] = [A] * [D] * [5]	[G] = [F] * [6]	[H] = [E] + [G]	[I] = [F] / [7]
Source	[1]	[2]	[3]		[4]	[5]	[6]		[7]
LCD TVs 24 to 34	$ 558,038,021	19	2	11%	$ 4,258,711	$ 15,008,222	$ 772,923	$ 5,031,635	244
LCD TVs 35 to 39	$ 81,836,931	5	4	80%	$ 4,746,542	$ 16,727,397	$ 861,461	$ 5,608,003	272
LCD TVs 40 to 44	$ 589,548,368	14	12	86%	$ 36,636,220	$ 129,110,543	$ 6,649,193	$ 43,285,413	2,100
LCD TVs 45 to 49	$ 619,100,866	27	19	70%	$ 31,585,609	$ 111,311,569	$ 5,732,546	$ 37,318,155	1,810
LCD TVs 50 and up	$ 806,051,531	10	6	60%	$ 35,063,242	$ 123,567,174	$ 6,363,709	$ 41,426,951	2,009
Plasma TVs Up to 49	$ 65,799,838	14	12	86%	$ 4,088,990	$ 14,410,103	$ 742,120	$ 4,831,110	234
Plasma TVs 50 to 59	$ 245,685,739	29	26	90%	$ 15,969,573	$ 56,278,739	$ 2,898,355	$ 18,867,928	915
Plasma TVs 60 and up	$ 28,398,440	3	3	100%	$ 2,058,887	$ 7,255,770	$ 373,672	$ 2,432,559	118
RPTV with 1080p	$ 17,989,164	15	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [8]	$ 989,045	0	0	0%	$ -	$ -	$ -	$ -	0
Total [9]		136	84	62%				$ 158,801,754	7,703

Notes:

[1] National forecasts of sales revenue by television type for year 2011 were projected by the CEA. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The CNET sample contains 137 TVs tested by CNET for power consumption in watts between roughly January 2006 and December 2008. There was one 720p RPTV model in the CNET sample that could not be grouped into the CEA forecast categories, the JVC HD-56G887, and was therefore excluded. See CNET, "The chart: 139 HDTVs' power consumption compared".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[5] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output. This percentage was utilized to estimate the lost labor compensation in CA.

[6] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 7) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[7] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[8] The CEA forecasts $7 million in revenue in 2011 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0.476 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[9] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

Exhibit 5C: Energy Star 2013 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20

	CEA Forecasted CA Revenue (2012)	Energy Star Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2013)	Estimated CA Labor Compensation Lost (2013)	Estimated CA Income Tax Revenue Lost (2013)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = [C] / [B]	[E] = [A] * [D] * [4]	[F] = [A] * [D] * [5]	[G] = [F] * [6]	[H] = [E] + [G]	[I] = [F] / [7]
Source	[1]	[2]	[3]		[4]	[5]	[6]		[7]
LCD TVs Under 24	$ 129,606,024	85	17	20%	$ 1,879,287	$ 6,622,840	$ 341,076	$ 2,220,364	108
LCD TVs 24 to 34	$ 521,098,624	86	71	83%	$ 31,190,176	$ 109,918,016	$ 5,660,778	$ 36,850,954	1,788
LCD TVs 35 to 39	$ 62,836,397	30	28	93%	$ 4,251,930	$ 14,984,322	$ 771,693	$ 5,023,622	244
LCD TVs 40 to 44	$ 581,714,949	56	52	93%	$ 39,161,881	$ 138,011,284	$ 7,107,581	$ 46,269,463	2,244
LCD TVs 45 to 49	$ 609,591,880	48	42	88%	$ 38,670,985	$ 136,281,305	$ 7,018,487	$ 45,689,472	2,216
LCD TVs 50 and up	$ 786,944,223	43	40	93%	$ 53,072,982	$ 187,035,715	$ 9,632,339	$ 62,705,322	3,042
Plasma TVs Up to 49	$ 50,977,149	17	17	100%	$ 3,695,843	$ 13,024,606	$ 670,767	$ 4,366,611	212
Plasma TVs 50 to 59	$ 221,204,847	25	25	100%	$ 16,037,351	$ 56,517,598	$ 2,910,656	$ 18,948,008	919.
Plasma TVs 60 and up	$ 27,572,497	7	7	100%	$ 1,999,006	$ 7,044,743	$ 362,804	$ 2,361,810	115
RPTV with 1080p	$ 5,797,026	0	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [8]	$ 154,673	0	0	0%	$ -	$ -	$ -	$ -	0
Total [9]		397	299	75%				$ 224,435,625	10,887

Notes:

[1] National forecasts of sales revenue by television type for year 2012 were projected by the CEA and used as a conservative estimate for 2013 revenues. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The Energy Star dataset contains 397 LCD or plasma, 115V TVs that meet the Energy Star requirements and is as of January 26, 2009. Models that were categorized as "Other" under the screen type are not included in this table. There were no RPTVs included in this dataset, thus a non-compliance rate of 0% is conservatively utilized. See Energy Star, "Television Product List".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[5] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output. This percentage was utilized to estimate the lost labor compensation in CA.

[6] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 7) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[7] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This percentage was utilized to estimate the lost employment in CA.

[8] The CEA forecasts $1 million in revenue in 2012 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0.476 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[9] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

Exhibit 5D: CNET 2013 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20

	CEA Forecasted CA Revenue (2012)	CNET Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = [C] / [B]	[E] = [A] * [D] * [4]	[F] = [A] * [D] * [5]	[G] = [F] * [6]	[H] = [E] + [G]	[I] = [F] / [7]
Source	[1]	[2]	[3]		[4]	[5]	[6]		[7]
LCD TVs 24 to 34	$ 521,098,624	19	19	100%	$ 37,779,650	$ 133,140,132	$ 6,856,717	$ 44,636,367	2,165
LCD TVs 35 to 39	$ 62,836,397	5	5	100%	$ 4,555,639	$ 16,054,631	$ 826,814	$ 5,382,452	261
LCD TVs 40 to 44	$ 581,714,949	14	13	93%	$ 39,161,881	$ 138,011,284	$ 7,107,581	$ 46,269,463	2,244
LCD TVs 45 to 49	$ 609,591,880	27	27	100%	$ 44,195,411	$ 155,750,063	$ 8,021,128	$ 52,216,540	2,533
LCD TVs 50 and up	$ 786,944,223	10	10	100%	$ 57,053,456	$ 201,063,393	$ 10,354,765	$ 67,408,221	3,270
Plasma TVs Up to 49	$ 50,977,149	14	14	100%	$ 3,695,843	$ 13,024,606	$ 670,767	$ 4,366,611	212
Plasma TVs 50 to 59	$ 221,204,847	29	28	97%	$ 15,484,339	$ 54,568,715	$ 2,810,289	$ 18,294,628	887
Plasma TVs 60 and up	$ 27,572,497	3	3	100%	$ 1,999,006	$ 7,044,743	$ 362,804	$ 2,361,810	115
RPTV with 1080p	$ 5,797,026	15	6	40%	$ 168,114	$ 592,454	$ 30,511	$ 198,625	10
Direct-View (CRT) Digital Displays [8]	$ 154,673	0	0	0%	$ -	$ -	$ -	$ -	0
Total [9]		136	125	92%				$ 241,134,716	11,697

Notes:

[1] National forecasts of sales revenue by television type for year 2012 were projected by the CEA and used as a conservative estimate for 2013 revenues. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008. p. 20, table A-1.

[2] The CNET sample contains 137 TVs tested by CNET for power consumption in watts between roughly January 2006 and December 2008. There was one 720p RPTV model in the CNET sample that could not be grouped into the CEA forecast categories, the JVC HD-56G887, and was therefore excluded. See CNET, "The chart: 139 HDTVs' power consumption compared".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[5] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output. This percentage was utilized to estimate the lost labor compensation in CA.

[6] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 7) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[7] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[8] The CEA forecasts $1 million in revenue in 2012 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0.476 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[9] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

Exhibit 6A: Energy Star 2011 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20 (With Adjustments)

	CEA Forecasted CA Revenue (2011)	Energy Star Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = ([C]/[B])*(1-[4])	[E] = [A] * [D] * [5] * [6]	[F] = [A] * [D] * [6] * [7]	[G] = [F] * [8]	[H] = [E] + [G]	[I] = [F] / [9]
Source	[1]	[2]	[3]	[4]	[5], [6]	[6], [7]	[8]		[9]
LCD TVs Under 24	$ 148,521,040	85	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 24 to 34	$ 558,038,021	86	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 35 to 39	$ 81,836,931	30	0	0%	$ -	$ -	$ -	$ -	0
LCD TVs 40 to 44	$ 589,548,368	56	2	2%	$ 343,465	$ 1,210,411	$ 67,210	$ 410,674	20
LCD TVs 45 to 49	$ 619,100,866	48	8	8%	$ 1,683,180	$ 5,931,735	$ 329,367	$ 2,012,547	96
LCD TVs 50 and up	$ 806,051,531	43	12	14%	$ 3,669,409	$ 12,931,448	$ 718,034	$ 4,387,443	210
Plasma TVs Up to 49	$ 65,799,838	17	5	15%	$ 315,694	$ 1,112,545	$ 61,775	$ 377,469	18
Plasma TVs 50 to 59	$ 245,685,739	25	20	40%	$ 3,206,199	$ 11,299,039	$ 627,392	$ 3,833,591	184
Plasma TVs 60 and up	$ 28,398,440	7	7	50%	$ 463,250	$ 1,632,548	$ 90,649	$ 553,899	27
RPTV with 1080p	$ 17,989,164	0	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [10]	$ 989,045	0	0	0%	$ -	$ -	$ -	$ -	0
Total [11], [12]		397	54	14%				$ 22,572,466	1,947

Notes:

[1] National forecasts of sales revenue by television type for year 2011 were projected by the CEA. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The Energy Star dataset contains 397 LCD or plasma, 115V TVs that meet the Energy Star requirements and is as of January 26, 2009. Models that were categorized as "Other" under the screen type are not included in this table. There were no RPTVs included in this dataset, thus a non-compliance rate of 0% is conservatively utilized. See Energy Star, "Television Product List".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4

[4] We assume technological advances will allow 50% of the non-compliant models to comply with Title 20 by 2011 This estimate is in the spirit of Moore's Law, that the technological progress of electronic components roughly doubles every couple of years.

[5] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[6] The substitution and price effects are taken into account by multiplying the previously calculated lost revenue by the multiplier (1 - Substitution Effect - (Substitution Effect * Price Effect)) = (1 - 0.50 - (0.50 * 0.10)) = 0.45.

[7] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output This percentage was utilized to estimate the lost labor compensation in CA.

[8] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 9) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[9] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[10] The CEA forecasts $7 million in revenue in 2011 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[11] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

[12] The economic multipliers are applied to account for indirect and induced effects. We use an Output Multiplier of 1.95 and an Employment Multiplier of 3.51 to adjust the total estimated lost revenues and lost jobs, respectively. See Price Waterhouse Coopers, p. 2, table E-1.

Exhibit 6B: CNET 2011 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20 (With Adjustments)

	CEA Forecasted CA Revenue (2011)	CNET Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = ([C]/[B])*(1-[4])	[E] = [A] * [D] * [5] * [6]	[F] = [A] * [D] * [6] * [7]	[G] = [F] * [8]	[H] = [E] + [G]	[I] = [F] / [9]
Source	[1]	[2]	[3]	[4]	[5] , [6]	[6] , [7]	[8]		[9]
LCD TVs 24 to 34	$ 558,038,021	19	2	5%	$ 958,210	$ 3,376,850	$ 187,504	$ 1,145,714	55
LCD TVs 35 to 39	$ 81,836,931	5	4	40%	$ 1,067,972	$ 3,763,664	$ 208,982	$ 1,276,954	61
LCD TVs 40 to 44	$ 589,548,368	14	12	43%	$ 8,243,149	$ 29,049,872	$ 1,613,028	$ 9,856,178	472
LCD TVs 45 to 49	$ 619,100,866	27	19	35%	$ 7,106,762	$ 25,045,103	$ 1,390,659	$ 8,497,421	407
LCD TVs 50 and up	$ 806,051,531	10	6	30%	$ 7,889,229	$ 27,802,614	$ 1,543,773	$ 9,433,002	452
Plasma TVs Up to 49	$ 65,799,838	14	12	43%	$ 920,023	$ 3,242,273	$ 180,031	$ 1,100,054	53
Plasma TVs 50 to 59	$ 245,685,739	29	26	45%	$ 3,593,154	$ 12,662,716	$ 703,112	$ 4,296,266	206
Plasma TVs 60 and up	$ 28,398,440	3	3	50%	$ 463,250	$ 1,632,548	$ 90,649	$ 553,899	27
RPTV with 1080p	$ 17,989,164	15	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [10]	$ 989,045	0	0	0%	$ -	$ -	$ -	$ -	0
Total [11] , [12]		136	84	62%				$ 70,511,000	6,083

Notes:

[1] National forecasts of sales revenue by television type for year 2011 were projected by the CEA. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The CNET sample contains 137 TVs tested by CNET for power consumption in watts between roughly January 2006 and December 2008. There was one 720p RPTV model in the CNET sample that could not be grouped into the CEA forecast categories, the JVC HD-56G887, and was therefore excluded. See CNET, "The chart: 139 HDTVs' power consumption compared".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] We assume technological advances will allow 50% of the non-compliant models to comply with Title 20 by 2011. This estimate is in the spirit of Moore's Law, that the technological progress of electronic components roughly doubles every couple of years.

[5] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[6] The substitution and price effects are taken into account by multiplying the previously calculated lost revenue by the multiplier (1 - Substitution Effect - (Substitution Effect * Price Effect)) = (1 - 0.50 - (0.50 * 0.10)) = 0.45.

[7] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[8] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 9) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[9] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This percentage was utilized to estimate the lost employment in CA.

[10] The CEA forecasts $7 million in revenue in 2011 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[11] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

[12] The economic multipliers are applied to account for indirect and induced effects. We use an Output Multiplier of 1.95 and an Employment Multiplier of 3.51 to adjust the total estimated lost revenues and lost jobs, respectively. See Price Waterhouse Coopers, p. 2, table E-1.

Exhibit 6C: Energy Star 2013 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20 (With Adjustments)

	CEA Forecasted CA Revenue (2012)	Energy Star Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2013)	Estimated CA Labor Compensation Lost (2013)	Estimated CA Income Tax Revenue Lost (2013)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = ([C]/[B])*(1-[4])	[E] = [A] * [D] * [5] * [6]	[F] = [A] * [D] * [6] * [7]	[G] = [F] * [8]	[H] = [E] + [G]	[I] = [F] / [9]
Source	[1]	[2]	[3]	[4]	[5] , [6]	[6] , [7]	[8]		[9]
LCD TVs Under 24	$ 129,606,024	85	17	5%	$ 211,420	$ 745,069	$ 41,371	$ 252,791	12
LCD TVs 24 to 34	$ 521,098,624	86	71	21%	$ 3,508,895	$ 12,365,777	$ 686,624	$ 4,195,519	201
LCD TVs 35 to 39	$ 62,836,397	30	28	23%	$ 478,342	$ 1,685,736	$ 93,602	$ 571,945	27
LCD TVs 40 to 44	$ 581,714,949	56	52	23%	$ 4,405,712	$ 15,526,269	$ 862,114	$ 5,267,826	252
LCD TVs 45 to 49	$ 609,591,880	48	42	22%	$ 4,350,486	$ 15,331,647	$ 851,308	$ 5,201,794	249
LCD TVs 50 and up	$ 786,944,223	43	40	23%	$ 5,970,711	$ 21,041,518	$ 1,168,355	$ 7,139,066	342
Plasma TVs Up to 49	$ 50,977,149	17	17	25%	$ 415,782	$ 1,465,268	$ 81,361	$ 497,143	24
Plasma TVs 50 to 59	$ 221,204,847	25	25	25%	$ 1,804,202	$ 6,358,230	$ 353,048	$ 2,157,250	103
Plasma TVs 60 and up	$ 27,572,497	7	7	25%	$ 224,888	$ 792,534	$ 44,006	$ 268,895	13
RPTV with 1080p	$ 5,797,026	0	0	0%	$ -	$ -	$ -	$ -	0
Direct-View (CRT) Digital Displays [10]	$ 989,045	0	0	0%	$ -	$ -	$ -	$ -	0
Total [11] , [12]		397	299	75%				$ 49,826,844	4,299

Notes:

[1] National forecasts of sales revenue by television type for year 2012 were projected by the CEA and used as a conservative estimate for 2013 revenues. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The Energy Star dataset contains 397 LCD or plasma, 115V TVs that meet the Energy Star requirements and is as of January 26, 2009. Models that were categorized as "Other" under the screen type are not included in this table. There were no RPTVs included in this dataset, thus a non-compliance rate of 0% is conservatively utilized. See Energy Star, "Television Product List".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80 See CEC Staff Draft Report, p. 4.

[4] We assume technological advances will allow 75% of the non-compliant models to comply with Title 20 by 2013. This estimate is in the spirit of Moore's Law, that the technological progress of electronic components roughly doubles every couple of years. Thus over a period of four years, it will double twice, and 75% of the originally non-compliant models will become compliant.

[5] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[6] The substitution and price effects are taken into account by multiplying the previously calculated lost revenue by the multiplier (1 - Substitution Effect - (Substitution Effect * Price Effect)) = (1 - 0.50 - (0.50 * 0.10)) = 0.45

[7] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output This percentage was utilized to estimate the lost labor compensation in CA.

[8] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 9) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[9] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This percentage was utilized to estimate the lost employment in CA.

[10] The CEA forecasts $1 million in revenue in 2012 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0. watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[11] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

[12] The economic multipliers are applied to account for indirect and induced effects. We use an Output Multiplier of 1.95 and an Employment Multiplier of 3.51 to adjust the total estimated lost revenues and lost jobs, respectively. See Price Waterhouse Coopers, p. 2, table E-1.

Exhibit 6D: CNET 2013 Estimated Lost Tax Revenue and Lost Jobs in California Due to Imposition of Title 20 (With Adjustments)

	CEA Forecasted CA Revenue (2012)	CNET Sample	# Non-Compliant	% Non-Compliant	Estimated CA Sales Tax Revenue Lost (2011)	Estimated CA Labor Compensation Lost (2011)	Estimated CA Income Tax Revenue Lost (2011)	Total Lost Revenue	Number of Jobs Lost
Calculation	[A]	[B]	[C]	[D] = ([C]/[B])*(1-[4])	[E] = [A] * [D] * [5] * [6]	[F] = [A] * [D] * [6] * [7]	[G] = [F] * [8]	[H] = [E] + [G]	[I] = [F] / [9]
Source	[1]	[2]	[3]	[4]	[5] , [6]	[6] , [7]	[8]		[9]
LCD TVs 24 to 34	$ 521,098,624	19	19	25%	$ 4,250,211	$ 14,978,265	$ 831,686	$ 5,081,896	244
LCD TVs 35 to 39	$ 62,836,397	5	5	25%	$ 512,509	$ 1,806,146	$ 100,288	$ 612,798	29
LCD TVs 40 to 44	$ 581,714,949	14	13	23%	$ 4,405,712	$ 15,526,269	$ 862,114	$ 5,267,826	252
LCD TVs 45 to 49	$ 609,591,880	27	27	25%	$ 4,971,984	$ 17,521,882	$ 972,923	$ 5,944,907	285
LCD TVs 50 and up	$ 786,944,223	10	10	25%	$ 6,418,514	$ 22,619,632	$ 1,255,982	$ 7,674,496	368
Plasma TVs Up to 49	$ 50,977,149	14	14	25%	$ 415,782	$ 1,465,268	$ 81,361	$ 497,143	24
Plasma TVs 50 to 59	$ 221,204,847	29	28	24%	$ 1,741,988	$ 6,138,980	$ 340,874	$ 2,082,862	100
Plasma TVs 60 and up	$ 27,572,497	3	3	25%	$ 224,888	$ 792,534	$ 44,006	$ 268,895	13
RPTV with 1080p	$ 5,797,026	15	6	10%	$ 18,913	$ 66,651	$ 3,701	$ 22,614	1
Direct-View (CRT) Digital Displays [10]	$ 154,673	0	0	0%	$ -	$ -	$ -	$ -	0
Total [11] , [12]		136	125	92%				$ 53,534,201	4,619

Notes:

[1] National forecasts of sales revenue by television type for year 2012 were projected by the CEA and used as a conservative estimate for 2013 revenues. See CEA 2012 Industry Forecasts - Total U.S. Market, January 2009, FC - 108. According to Price Waterhouse Coopers Report, California accounts for 14.4% of total revenue in the direct consumer electronics market of the U.S. CEA revenue was multiplied by this percentage to calculate California's contribution of revenue in the television market. See Price Waterhouse Coopers, U.S. Economic Contribution of Consumer Electronics: A Study of Direct, Indirect, and Induced Effects on Employment and Business Activity, April 2008, p. 20, table A-1.

[2] The CNET sample contains 137 TVs tested by CNET for power consumption in watts between roughly January 2006 and December 2008. There was one 720p RPTV model in the CNET sample that could not be grouped into the CEA forecast categories, the JVC HD-56G887, and was therefore excluded. See CNET, "The chart: 139 HDTVs' power consumption compared".

[3] The compliance number from the sample was determined by applying the following Alternate CEC proposed standard (referenced above) for the January 1, 2011 Effective Date: Maximum Active Mode Power Usage (Watts) = 0.156 * Screen Area + 80. See CEC Staff Draft Report, p. 4.

[4] We assume technological advances will allow 75% of the non-compliant models to comply with Title 20 by 2013. This estimate is in the spirit of Moore's Law, that the technological progress of electronic components roughly doubles every couple of years. Thus over a period of four years, it will double twice, and 75% of the originally non-compliant models will become compliant.

[5] In order to calculate the lost tax revenue, the television revenue for California was multiplied by the current sales tax rate of 7.25%. See Sales Tax, California State Board of Equalization, Detailed Description of the Sales and Use Tax Rate, http://www.boe.ca.gov/news/sp111500att.htm. Also, since some counties have additional taxes imposed, this is a conservative estimate.

[6] The substitution and price effects are taken into account by multiplying the previously calculated lost revenue by the multiplier (1 - Substitution Effect - (Substitution Effect * Price Effect)) = (1 - 0.50 - (0.50 * 0.10)) = 0.45.

[7] Gross output in the consumer electronics sector in CA (consumer market) in 2008 was $56,102,000,000. See Price Waterhouse, page 20, table A-1. Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Therefore labor compensation accounts for a calculated 25.55% of total CA gross output. This percentage was utilized to estimate the lost labor compensation in CA.

[8] The calculated income tax rate is 5.55% on average. This estimate is arrived at by utilizing the weighted average compensation of $61,492 (see footnote 9) and assuming the Schedule X tax schedule (see Schedule X: State of California Franchise Tax Board, http://www.ftb.ca.gov/forms/2008_california_tax_rates_and_exemptions.shtml).

[9] Labor compensation in the consumer electronics sector in CA (consumer market) in 2008 was $14,334,000,000. See Price Waterhouse, page 24, table A-3. Employment (number of jobs) in the consumer electronics sector in CA (consumer market) in 2008 was 233,102. See Price Waterhouse, page 26, table A-4. Therefore the average weighted compensation was calculated to be approximately $61,492. This estimate was utilized to estimate the lost employment in CA.

[10] The CEA forecasts $1 million in revenue in 2012 for Direct-View (CRT) Digital Televisions. Given that LCD televisions are 70% more energy efficient than CRT screens and LCD screens on average consume 0.28 watts per square inch, we estimate that CRT televisions on average consume 0.476 watts per square inch (0.28 * 1.7). Therefore the proportion of compliant CRT digital televisions is logically low; but due to a lack of data, we have chosen the most conservative approach by assuming 0% non-compliance of Direct-View (CRT) Digital TVs.

[11] The CEA forecast includes OLED (Organic Light-Emitting Diode) and Digital Combination televisions. We consider these to be significantly different than the mass consumer market and do not include them in our model.

[12] The economic multipliers are applied to account for indirect and induced effects. We use an Output Multiplier of 1.95 and an Employment Multiplier of 3.51 to adjust the total estimated lost revenues and lost jobs, respectively. See Price Waterhouse Coopers, p. 2, table E-1.

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- University of Southern California, Marshall School of Business, 2001
- Capital Economics, 1996 – 1998

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Dr. Wazzan's research on the economics of patent licensing, the impact of socially motivated shareholder activism on securities prices, the effects of federal and state legislation on medical care costs and the use of statistics in labor law analyses has been published in economics journals and law reviews.

LITIGATION EXPERT RETENTIONS

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United States of America v. Frederick S. Schiff.
United States District Court, District of New Jersey
Retained by Plaintiff United States of America, Department of Justice, U.S. Attorney's Office, State of New Jersey.
February 2008. Report.
March 2008. Hearing testimony.

First National Mortgage Company, v. Federal Realty Investment Trust.
United States District Court, Northern District of California.

Retained by Defendant.
January 2008. Report.

United States of America v. Mark D. Lay.
United States District Court, Northern District of Ohio, Eastern Division
Retained by Plaintiff United States of America, Department of Justice, U.S. Attorney's Office, State of Ohio.
October 2007. Report.

Edward D. Ekstrom and Juliet M. Ekstrom-Anderson v. Trend Micro Kabushiki Kaisha
Third District Judicial Court for Salt Lake County.
Retained by Plaintiff.
August 2007. Report.

Karl Sapper & Son, Inc. v. Chalmers-Randolph, LLC.
Superior Court of the State of California, County of Los Angeles, Central District.
Retained by Plaintiff.
February 2007. Report.
July 2007. Deposition testimony.
February 2008. Trial testimony.

James Vlahos and Nicholas Vlahos, v. International Baking Company, Inc. and Sara Lee Fresh Inc.
Superior Court of the State of California, for the County of San Mateo.
Retained by Defendant.
December 2006. Deposition testimony.

In Re Copper Antitrust Litigation.
United States District Court, Western District of Wisconsin.
Retained by Defendant J.P. Morgan Chase & Company, and Morgan Guaranty Trust Company of New York.
November 2006. Report.
December 2006. Deposition testimony.

Richard Cavanaugh, v. Unisource Worldwide Inc.
United States District Court, Eastern District of California, Fresno Division.
Retained by Defendant.
October 2006. Report.
January 2007. Deposition testimony.

VCode Holdings, Inc. and VData LLC, v. Adidas America Inc., Advanced Micro Devices, Inc., Boston Scientific Corp., Stamps.com Inc., Hitachi Global Storage Technologies (Thailand), Ltd., and Hitachi Global Storage Technologies, Inc.
United States District Court, District of Minnesota
Retained by Defendant Stamps.com Inc.
March 2006. Report.

Joseph C. Canouse v. True Religion Apparel, Inc.
United States District Court, Central District of California – Western Division.
Retained by Defendant.
October, 2005. Report.
December, 2005. Declaration.
February, 2006. Deposition testimony.

Rita F. Oliai v. Coram Healthcare Corporation.
United States District Court, Central District of California.
Retained by Plaintiff.
May, 2005. Report.
August, 2005. Deposition testimony.
October, 2005. Trial testimony.

Foundstone Inc. v. Jassen Glaser; Eric Caso; Michael Morton and Dan Kuykendall.
American Arbitration Association, Arbitration Tribunal.
Retained by Plaintiff.
February, 2004. Report.

Scott William Curry, v. AXT, Inc.
United States District Court, Central District of California.
Retained by Defendant.
January, 2004. Report.

Walter Brashier, et al. v. KPMG LLP.
Court of Common Pleas, State of South Carolina, County of Greenville.
Retained by Defendant.
September, 2003. Report.

Joseph J. Jacoboni, v. KPMG LLP.
The United States District Court, for the Middle District of Florida, Orlando Division.
Retained by Defendant.
August, 2003. Report.

Scott E. Barmer, v. Lincoln Financial Advisors Corp.
Superior Court of the State of California, County of San Francisco.
Retained by Defendant.
January, 2003. Report.

Ernest H. Sponzilli, v. Regents of the University of California, et al.
Superior Court of the State of California, County of Los Angeles.
Retained by Plaintiff.
October, 1998. Report.
October, 1998. Deposition testimony.

SELECTED CONSULTING EXPERIENCE

Securities, Valuation and Corporate Finance

- Computed option values for publicly and privately held firms
- Analyzed the business and stock price impact of tender offers
- Analyzed the stock price impact of gaining or losing investment bank analyst coverage
- Conducted solvency analyses using option-based and accounting-based models
- Evaluated damages sustained due to artificially imposed capital constraints
- Evaluated the stock price impact of negative public announcements and news including the temporary and permanent stock price impact of SEC imposed trading halts
- 409A valuation
- Evaluated the nature and impact of exchange traded commodities/metals futures and forward transactions including hedging strategies and techniques. Evaluated allegations of commodities market manipulation and insider trading
- Analyzed the potential profitability of off-shore tax strategies
- Analyzed foreign currency hedging strategies and markets in connection with commodities metals trading
- 10b5 Analyses
- Evaluated commodities price impacts due to selected transactions on the London Metals Exchange and COMEX markets
- Class certification

Mortgage backed securities, Lending and Risk

- Evaluation and pricing of mortgage risk and appropriate interest rates
- Evaluated mortgage terms in alleged predatory lending context
- Analysis of FICO scores, analysis of how scores are computed, which variables predominate and how these scores are used with respect to lending and rates
- Analyzed the economic significance of structured and off-balance sheet finance transactions from both a general point of view and with respect to specific transactions

Commercial Damages

- Analyzed of damages as a result of business interruption in various industries, including: steel, software/internet commerce and railroad/truck shipping
- Analysis of damages from alleged breach of contract
- Analysis of damages from alleged breach of fiduciary duties
- Analysis of damages from alleged fraud

Labor Economics

- Computed damages resulting from alleged wrongful termination
- Conducted class certification analyses in "wage & hour" litigation in a number of industries including: food service, retailing, and lab technicians
- Conducted damage analyses in "wage & hour" litigation including statistical analysis of survey results
- Conducted statistical and econometric analyses in disparate impact matters
- Conducted statistical and econometric analyses in alleged age, race, and gender discrimination including EEOC matters

Intellectual Property

- Conducted financial and economic valuation of patent infringement damages, including lost profits and reasonable royalties analyses, in a wide range of industries including: semiconductors; oil-field services; chemical compounds; aerospace; medical systems; avionics; semiconductor capital equipment; automated manufacturing; software and 3D computer graphics systems
- Conducted financial and economic valuation of damages arising from theft of trade secrets in a wide range of industries including: semiconductors, software, and semiconductor capital equipment
- Analysis of antitrust counterclaims

Antitrust Economics and Competition Policy

- Class Certification
- Analysis of the competitive impact of mergers or joint ventures in various industries including: satellite communications; multi-channel video programming distribution; petroleum refining; bio-agricultural products; lead-acid batteries; broadcast radio and aerospace.
- Predatory pricing.
- Price fixing.
- Collusion.
- Vertical and Horizontal restraints.
- Market definition.

Statistics and Econometrics

- The application of econometric and statistical models to a variety of areas including class certification, complex litigation, damages, market power, and economic impact studies.
- Random sampling.

- Point estimation.
- Construction of confidence intervals.
- Determinations of appropriate sample sizes.

Life Sciences Economics

- Valuation of start up firms and new technologies.
- Patent portfolio valuation.
- Pharmaceutical price modeling.
- Damages calculations from infringement actions.
- Public policy (e.g., analysis of legislative impacts on the cost and provision of health care; analysis of the impact of pay-for-performance legislation)

PUBLICATIONS AND PAPERS

"Allocating Costs in Ninth Circuit Predatory Pricing Cases: *Marsann Co. v. Brammall, Inc.* and its Problematic Progeny, *Inglis v. Continental Baking* and *Thales v. Matsushita,"* University of California, Santa Barbara, Department of Economics, Working Paper #5-08. Under submission to *Antitrust Bulletin*.

"The Economic Merits of Theoretical Non-infringing Alternatives," Resolution Economics, LLC working paper. Under submission to *IPL Newsletter*, American Bar Association, Section of Litigation.

"Predatory Pricing and the Allocation of Costs in the Ninth Circuit," *Antitrust Litigator*, Antitrust Litigation Committee, Section of Litigation, American Bar Association. Summer 2008. Vol. 7 No. 3.

"A Review of Canadian Private-Sector Lawyer Income," Prepared for the Canadian Superior Courts Judges Association, and included in *Submission of the Canadian Superior Courts Judges Association and the Canadian Judicial Council to the 2007 Judicial Compensation and Benefits Commission.* December 13, 2007.

"The Effects of KSR v. Teleflex on Patent Licensing Costs," *UCLA Journal of Law and Technology*, Volume 11, Issue 2, Spring 2007.

"Consideration of Design Around Solutions in Determining Patent Damages," *IP Remedies*, Intellectual Property Litigation Newsletter, American Bar Association, Section of Litigation, November 2007.

"Junk Forecasts in the Courtroom?: Assessing the "S" Curve Approach to Calculating Damages," *Journal of Forensic Economics*, vol. 19:3, 2007.

"An Economic Analysis of the Impact of Pay-for-Performance Initiatives on Physicians, Patients and Insurance Providers," *Indiana Health Law Review*, 2006. Volume Three, Issue 2, 2006. University of Indiana School of Law.

"An Economic Assessment of Damage Caps in Medical Malpractice Litigation Imposed by State Laws and the Implications for Federal Policy and Law," *Health Matrix: Journal of Law-Medicine*, Volume 16, Issue 2, 2006. Case Western Reserve University School of Law.

"Controlling Medical Malpractice Insurance Costs – Congressional Act or Voter Proposition?" *Indiana Health Law Review*, Volume Three, Issue 1, 2006. University of Indiana School of Law.

"Statistical Analysis and Interpretation of Data Commonly Used in Employment Litigation," *Duquesne Business Law Journal*, Volume 8, Number 1, Spring 2006. Duquesne University School of Law.

"Simple Statistics for Employment Law Practitioners," *Employer-Employee Relations Committee Newsletter*, Fall/Winter 2005, American Bar Association, Tort Trial and Insurance Practice Section.

"The Statistical Analysis and Interpretation of Survey Data in Wage and Hour Litigation," Included in Wage-Hour Class Actions: How to Bring, Defend and Resolve Them. Los Angeles County Bar Association, Labor & Employment Law Section, 2005.

"Reasonable Royalty: Countering Claims of Non-Profitability," *Perspectives*. Vol. 2, No. 1. January 2001.

"The Effect of Socially Activist Investment Policies on the Financial Markets," *Journal of Business*: Vol. 72. No. 1. January 1999.

"The Correlation Between Market Liquidity and Information-Based Trading," UCLA Department of Finance (1996).

"The Impact of Earnings Announcements on Market Liquidity and Price Discovery: An Intraday, Multi-Market Analysis," UCLA Department of Finance (1996).

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Current Professional Positions

- Economist, Resolution Economics, 2007 -

Education

- Ph.D. Economics, Harvard, 2005
- B. A., Economics and Mathematics, University of California, Berkeley, 2000

Dr. Torelli is an Economist in the Los Angeles office of Resolution Economics, LLC and specializes in providing economic expertise in the areas of employment, health and labor economics, health and social policy, and statistics and econometrics.

He attended Harvard on a National Science Foundation Graduate Fellowship and a Harvard University Fellowship during 2000-2005. At Resolution Economics he has worked on litigation cases involving single-plaintiff and class action racial discrimination, wage and hour violations, securities fraud, and health care policy.

PAPERS

"Smoking, Birth Weight, and Child Development," Harvard University, 2003

"The Political Response to Recent Changes in U.S. Wage Inequality," Harvard University, 2005

"An Empirical Analysis of 'Acting White'" with Roland Fryer, Harvard Professor of Economics, 2005

"The Association Between Maternal Smoking During Pregnancy and Fetal and Infant Health" and "Evaluating the Infant Health Effects of Maternal Smoking during Pregnancy using Matching and Propensity Score Analyses," with Ken Chay, UC Berkeley Professor of Economics, and Carlos Flores, University of Miami Professor of Economics, 2004

Dawn Eash, M.S.

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Current Professional Position

- Manager, Resolution Economics, 2008–

Past Professional History

- Alvarez & Marsal, 2007 – 2008
- LECG, 2006 - 2007

Education

- M.S., Statistics, North Carolina State University, 2006
- B. S., Statistics and Finance, California Polytechnic State University, San Luis Obispo, 2004

Past and Present Professional Associations

- American Statistical Association (ASA)

Ms. Eash is a Manager in the Los Angeles office of Resolution Economics, LLC and specializes in providing expertise in the areas of statistics and econometrics, securities, healthcare and labor economics, and complex damages.

She attended North Carolina State University on a National Science Foundation Graduate Fellowship. Prior to joining Resolution Economics, Ms. Eash worked with Alvarez & Marsal, Dispute Analysis & Forensic Services. She has worked on litigation cases and consulting matters involving securities fraud, single-plaintiff and class action discrimination, wage and hour violations, wrongful termination, and healthcare overpayment claims.