

Imagine Designs, Inc. Display Technology Overview

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Summary:

Imagine Designs, Inc. has invented and had verified that our display technology as applied to all types of displays including TVs can reduce power consumption by 75%. This verification was done by an independent Engineering firm, Optical Research Associates, ORA, using "LightTools" version Code V. Therefore, the CEC's initiative to reduce energy consumption of TVs by 33% by 2011 is achievable. The main source of the savings is that the IDI technology doesn't have the LCD array located between the light source and the viewer. By eliminating the LCD array light blockage, the light source amplitude can be reduced by 80% thus proportionally reducing power consumption.

Imagine Designs, Inc.:

Corporate Summary:

- Background
 - Incorporated 1994
 - Optics and Lighting Design for 20 years
 - Licensing technology for 10 years
 - New, unique optics concept conceived in 2005, patent # 7,499,206
- Brian Richardson - Founder, CEO and VP Engineering
 - BSME, Univ. Cal – Berkeley – VP Eng. Morpheus Lights, Founder of IDI
 - Olympian – Bobsled Team
 - Designed > 25 lighting and display products.
 - 32 patents granted or filed
- Pete Pappanastos – VP Business Development
 - BSEE, Auburn Univ. - VP Ops & Quality – Pyramid, Tandem, ReSound, Sun
 - Colleague of Dr. Deming for 13 years
 - Founder & COO of Step-Labs – sold to Dolby Labs
 - Joined IDI in 2008

Technology Highlights:

- **Architecture for Transmissive Displays**
 - Works for all sizes of displays, cell phone, laptop, TV and signage
 - Total Internal Reflection light valve - Patent # 7,499,206
 - Optics Concept – reflector associated with each aperture/contact

- **Reflector Technology**
 - Does not use Semiconductor processing to manufacture reflector
 - Only the Master Tool is made using Semiconductor technology
 - Reflector is replicated from Master Tool (film) or Mold (thin plastic) from a variety of transparent polymers

- **Performance Advantages**
 - Display Efficiency - >55% vs current technology 6-8% i.e. 5-10 times less power
 - Display: Contrast ratio - >7000:1 (iPhone 300:1)
 - Display: Brightness: >1600 NIT (iPhone 300 NIT)
 - Off-axis contrast ratio (30 degrees from normal): greater than 600:1
 - Brightness - sufficient for viewing in daylight & night

- **Cost Advantages**
 - Fewer components, mechanical and electronic
 - Cost is disruptively less

Technology Advantages

- **Ecology**
 - Green - no mercury or toxic liquid crystal materials.
 - Energy efficient – for same foot

- **Performance**
 - Greatly improved (contrast ratio, refresh rate, smaller size and better colors).
 - Wider operational temperature range

- **Manufacturing**
 - Simple to manufacture, only three main components.
 - Utilizes only conventional, proven process technologies.
 - Conventional materials; glass, metal layers and plastic films.

- **Other apps**
 - Flexible displays may be feasible.
 - Heads-up display
 - 3D display

Background:

California Energy Commission, whose Executive Director is Melissa Jones, announced that beginning in 2011 that TV power consumption must be reduced by more than 33% by 2011 and 49% by 2013.

A. CEC Ruling

Below is the link to the information.

<http://blog.wired.com/gadgets/2009/03/california-tv.html>

This is a summary of info from above link

The CEC proposal is set up as a two-tiered system. The first enforces efficiency standards beginning in 2011 and would save 3,831 Giga-watt hours (and bring down overall TV energy consumption by 33%) by placing a cap on the *active mode* power usage (in watts) of individual TVs. Current standards in California only regulate TVs in *standby mode*, at a cap of 3.0 watts. As noted by the Commission, current LCDs use about .27-watts per square inch and plasmas use 0.36-watts per square inch. The [CEA](#), working on behalf of companies likely to be most affected by the proposal (over-40-inch CRT and Plasma television makers), says pushing through this law would immediately take out 25 percent of TVs off the market. According to the Commission, energy used in standby mode only represents about 5 percent of all TV energy consumption.

The ruling is based on the following formulas:

CSC Staff Standards

	Effective Date	Maximum Active Mode Power Usage (Watts)
Tier 1	January 1, 2011	0.156 Screen area /sq. inch + 32
Tier 2	January 1, 2013	0.120 Screen area /sq. inch + 25

B. Actual consumption data

Some typical numbers (data is normalized) i.e. Cost to run over 365 days, assuming it's turned on for 8 hours a day and off for 16. We currently use the average price of energy in the U.S. during 2007, which is 10.6 cents per kilowatt.

Brand	Diagonal Size	\$ Cost per year
LG	47"	84
Sharp	46"	80
Samsung	46"	77
Sony	46"	80
Vizio (2 models)	47"	75 & 87

Below is a link to a chart that shows how much energy is consumed by the different TV's. (the ones above are included)

http://reviews.cnet.com/4520-6475_7-6400401-3.html

C. California Leads the Way – What is the Rosenfeld Effect?

The **Rosenfeld Effect** is the empirical fact that electricity use per capita in California (CA) has been almost flat from 1973 to 2006 whereas use in the US has gone up 50%.

California has led the way in many things particularly control of energy consumption per capita. Energy consumption will come to the forefront and will receive much attention as it relates to global warming.

http://en.wikipedia.org/wiki/Rosenfeld_Effect

D. One theory is that the companies will have to reduce brightness (see the article that is connected to the link below). That won't go over very well with consumers.

<http://www.highdefforum.com/high-definition-news-informative-articles/86789-california-plans-limits-flatpanel-tv-power-consumption.html>

E. Then there is the LA Times Article that was run in January 2009.. The latest ruling matches with what the commission said they would do. I put in a call to Melissa Jones, Executive Director to discuss our technology and ask for help.

<http://www.latimes.com/business/la-f...,2869589.story>

F. Conclusion

The article says that this law will save 3,831 Gigawatt-hr. (Gw) (33 1/3%) savings per year.

If 3,831 GW is 33 1/3% savings; therefore, total consumption is 11,493 GW-hr. or 11,493,000,000,000 watt-hr

If cost is \$0.14/Kw-hr. then

The total cost per year in CA is \$1,609,160,000 i.e. \$1.6 Billion to power TVs

The IDI technology which will consume 75% less power and save more than \$1.2 Billion per year in CA.

and \$12 Billion per year in the United States.

We at Imagine Designs, Inc. congratulate the CEC for taking the initiative to drive energy savings and if the major TV companies begin working with the IDI technology now they will be able to achieve goals as stated by CEC in time to meet requirements for 2011 and 2013 power consumption.