Energy Efficiency in Current Television Display Technologies

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MSE 395

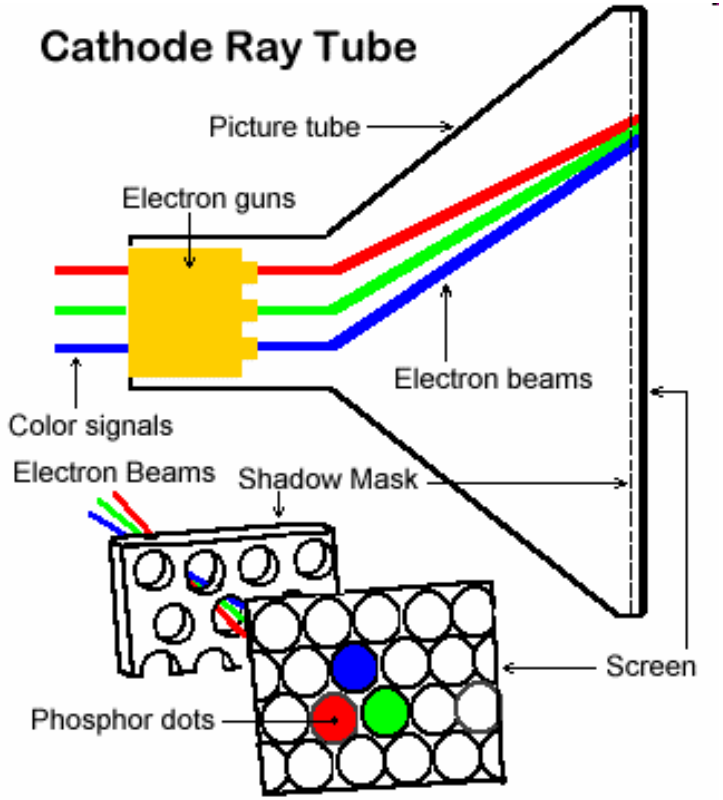
Current Energy Usage

- According to CEA, 36 million TVs in 2009
- >50 billion kWh annually
- 4% of all household electricity use
- Equivalent to power needed for all homes in New York

2008 California Data

Television Type	Existing Stock (Million Units)
CRT	22.3
DLP and Projection	0.7
LCD	10.6
Plasma	1.8
Total	35.4

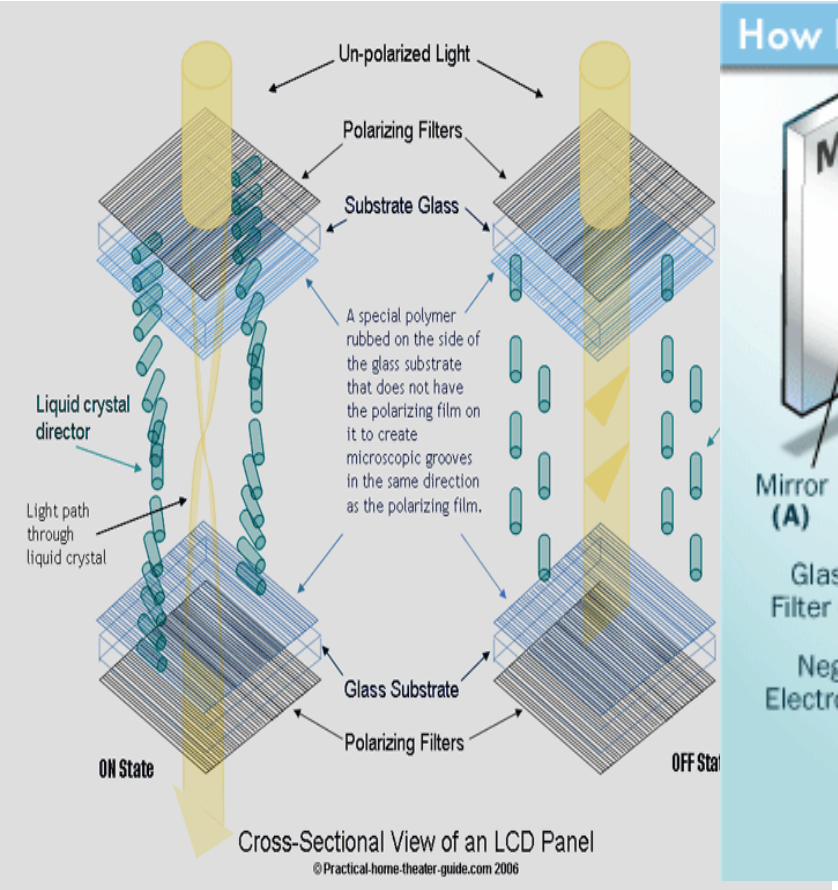
Cathode Ray Tube (CRT)

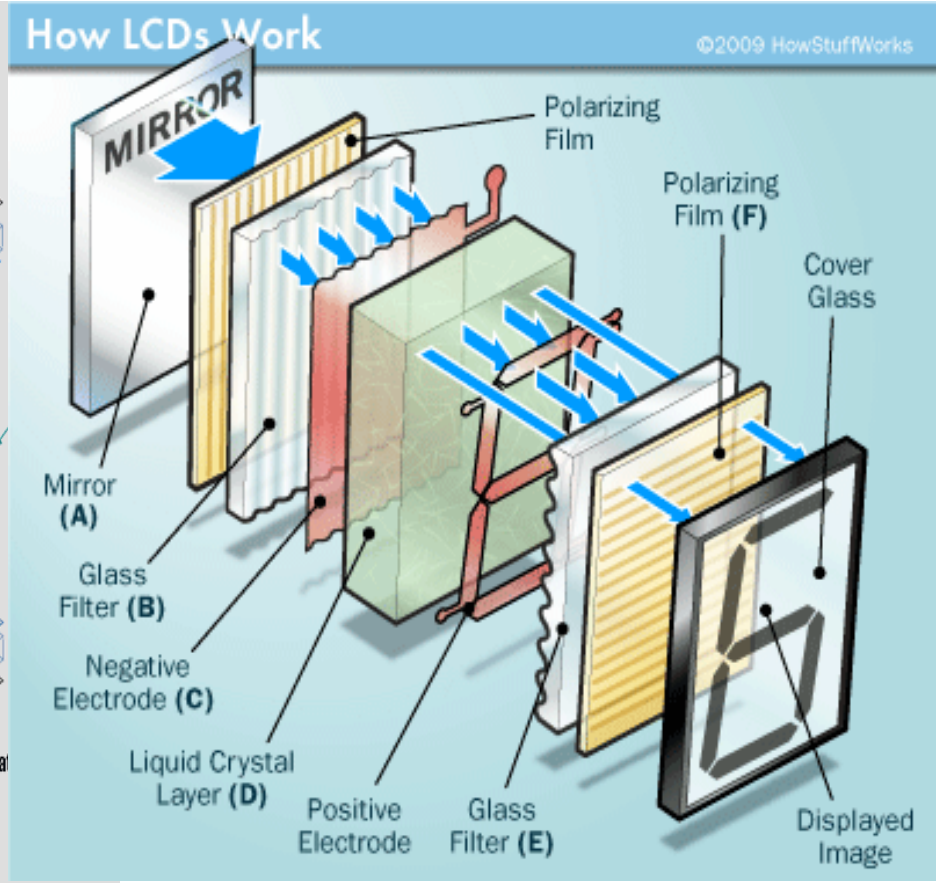


- Electron Beams turned on/off depending on color use
- Leaded glass tubes to insulate electron beams

http://www.jegsworks.com/Lessons/lesson5/lesson5-4.htm

Liquid Crystal Display (LCD)

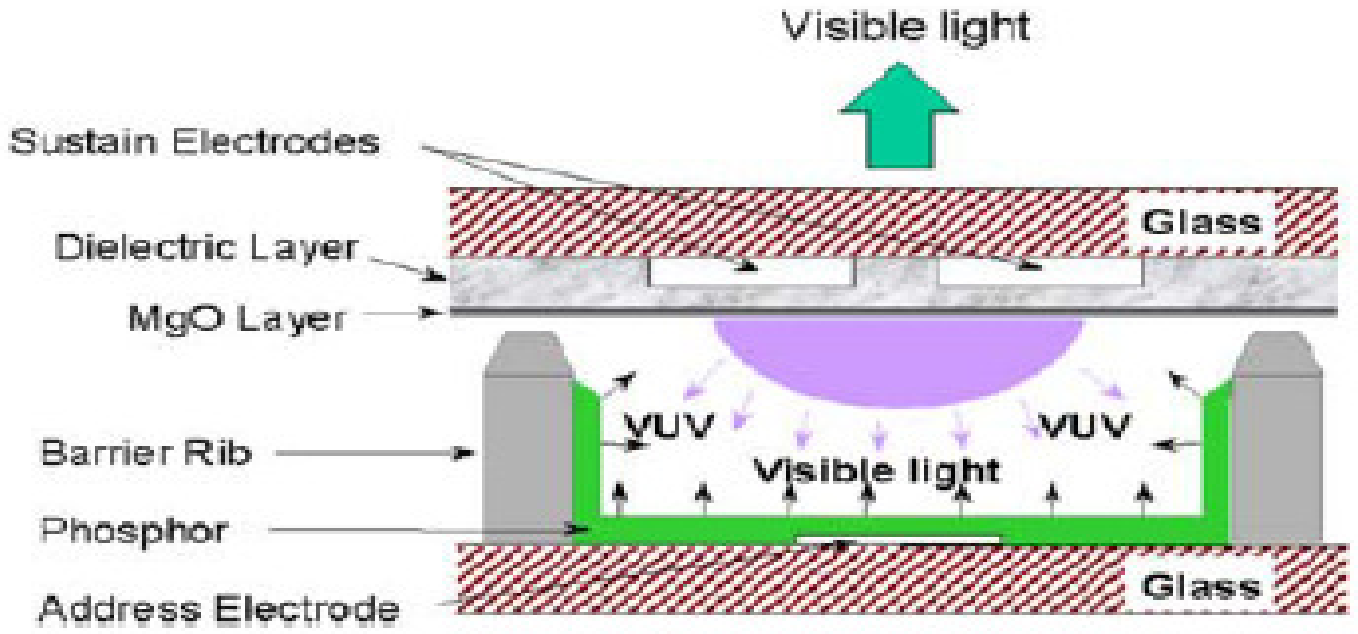




LCD Details

- Pixel - Three Subunits with red/green/blue filters in order to produce spectrum
- Thin Film Transistor sustains voltage across pixel, until new signal arrives
- Liquid Crystal Properties
  - Dielectric Anisotropy
  - Temperature Range requires 10-20 compounds

Plasma Display Panel (PDP)



- Three subpixels with red/blue/green phosphors

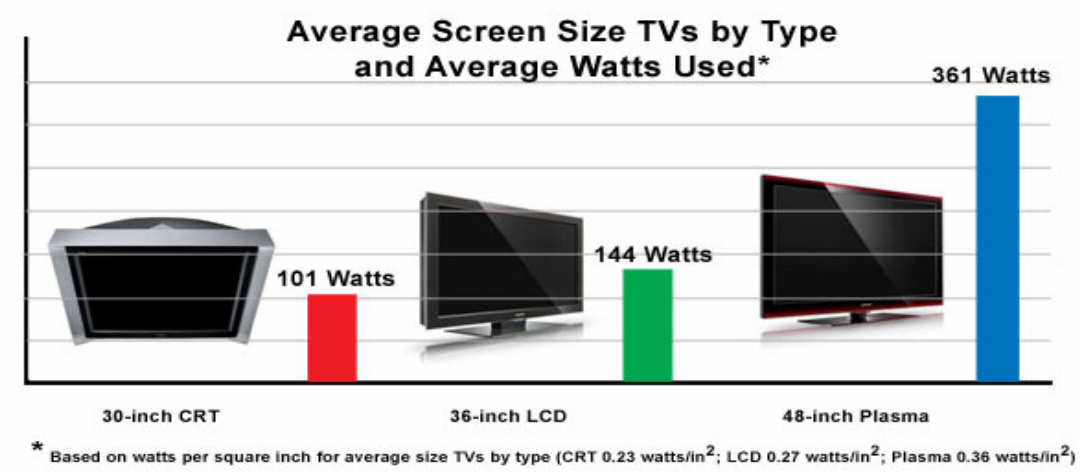
PDP Details

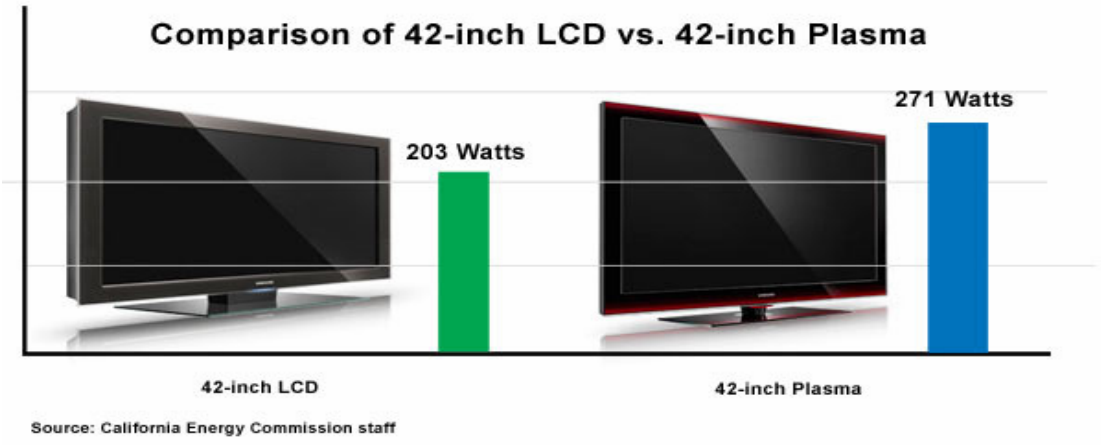
- 2 lumens/W vs 5 lumens/W
- Efficiencies
  - Vacuum Ultraviolet Radiation ~ 10%
  - Phosphors ~ 20-40%
- Electrodes
  - Sustain electrode – Indium Tin Oxide
  - Address electrode – Establishes voltage difference
- Control voltage difference, control intensity

How to Increase Efficiency

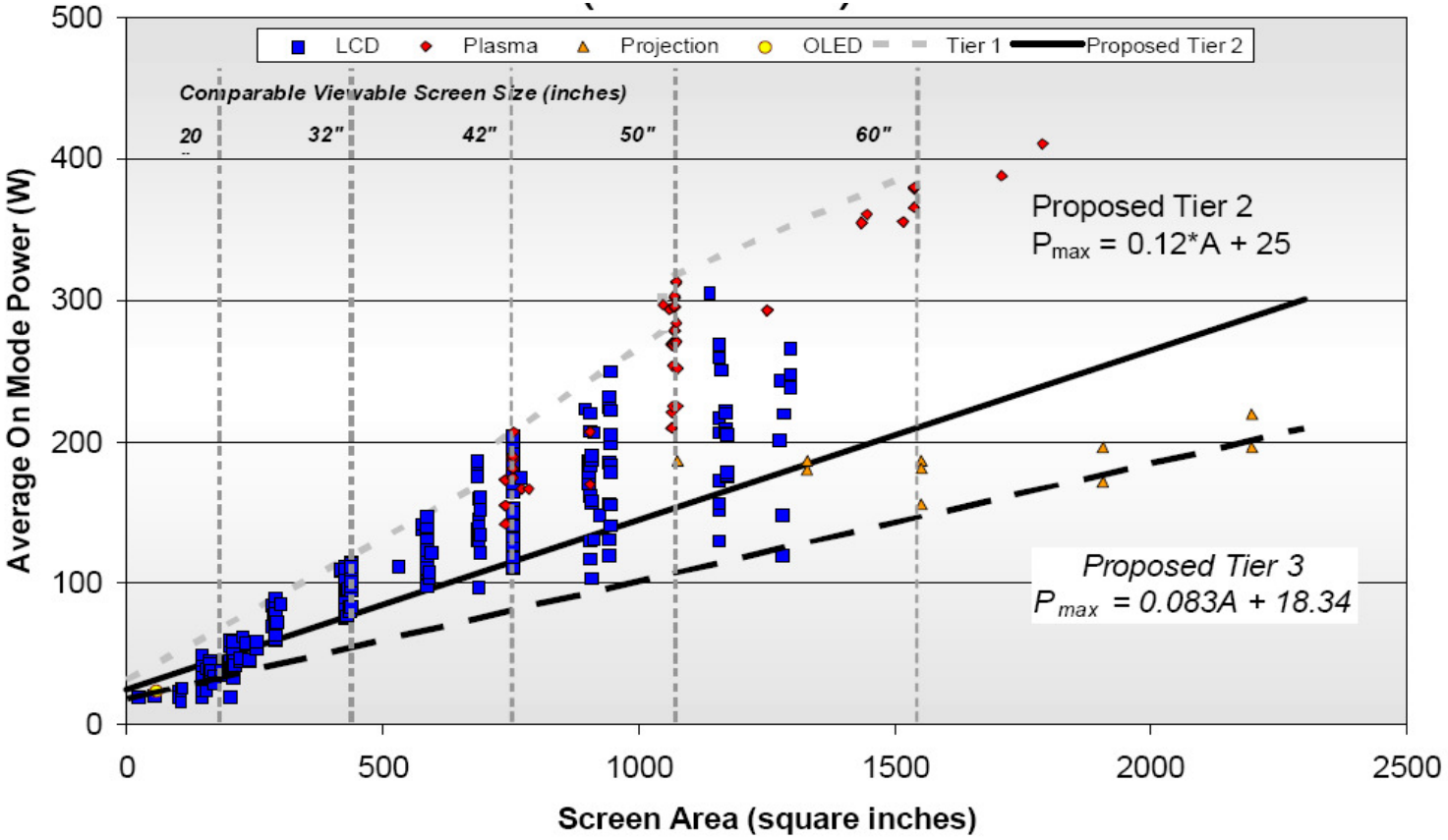
- Increase Panel Transmittance
- Improve luminous efficiency
- More efficient lamps/backlight structure – Sony
- Intelligent ambient light sensing – Sharp
- New Sony Bravia model – “Most Energy Efficient Television” – 32in, 89W

Comparing Technologies





EPA Energy Star Requirements



- Tier 2 – 2010
- Tier 3 - 2012

Conclusions

- New LCD models have just become more efficient than CRT
- Cheaper Production Costs/Less Defects → Bigger TVs for same price
- OLEDs and other emerging technologies may prove to be more efficient

Questions?

Bibliography

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