Cost of Efficiency – LCD Television

- LCD can be made more efficient
- Light management film costs offset by savings on lamps, inverters, and smaller power supply
- Net additional manufacturing costs, if any, are small
- LED backlights offer additional efficiency, with cost adder, but LED cost adders decreasing as volumes grow
- Net savings from lower operating cost not visible to consumers

Technology / Market Forecasts from the McLaughlin Consulting Group

- Prism Film (BEF), Reverse Prism Film, Polarization Recycling Film (DBEF) and Brightness Enhancement Diffusers
  http://www.mcgweb.com/reports/bef2007.htm
- The Fast Track for LEDs into Large-Area LCDs
  http://www.mcgweb.com/reports/led07.htm
- Both studies use proprietary cost/performance database to calculate low cost configurations
- LED model also has preference/value function to predict incremental selling prices for features

Light Management Films

- Polarization recycling – 3M or wire-grid films improve usable light output by ~ 55%
  ➔ 35% reduction in light/power input
- Prism films focus light to viewer in front
- Combine with polarization recycling – together improve light output ~ 110%
  ➔ 47% reduction in power input
- Light management films (mostly) pay for themselves in lamp, inverter and power supply savings

Light Management in Backlights: Example for 46" LCD-TV

	Differences — 46" LCD-TV, 2009			
	Street price	Electricity saving/ year	Power (W)	
A	$6	$0	0	
B	$7	$3	-13	
C	**$4**	**$16**	**-64**	**Most common 2009**
D	$0	$33	-127	**Most common 2010**

source: McLaughlin Consulting Group LCD Brightness Enhangement film study
http://www.mcgweb.com/reports/bef2007.htm

TV use 5 hours/day, power cost = $0.14/ kWh

A: No BEF or DBEF, 3 gain diffusers (25 CCFLs)
B: BEF (Cavity, Area Diffuser) (24 CCFLs)
C: DBEF(Cavity, Area Diffuser) (20 CCFLs)
D: BEF+DBEF (Cavity, Area Diffuser) (15 CCFLs)

LED Backlight for LCD-TV

- LCDs now more efficient than CCFLs
- Performance gap growing
- Cost premium shrinking, but still high
- But, performance features come with LEDs

Additional LCD-TV Efficiencies

- Dynamic backlight, local dimming
- Improved LCD array aperture
- Increased filter transmission

Future

- Eliminate color filters

Summary on LCD Efficiency

- Technology exists to improve backlight power consumption
- Most film power reductions pay for themselves
- Power efficiency can be accelerated with incentives and consumer recognition
- Life cycle reductions in power usage result in net savings in most cases
- LED backlight cost gap narrowing