

DisplaySearch TV Market Outlook

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IEEE Santa Clara Valley Consumer Electronics Society Meeting

Agenda

- DisplaySearch Overview
- Global TV Shipment Review and Outlook by Technology
- 2006 Flat Panel Price Compression
- 2007 Price and Margin Outlook
- Technology Developments

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Surveying the Entire Display Supply Chain



Eqpt./Materials Suppliers

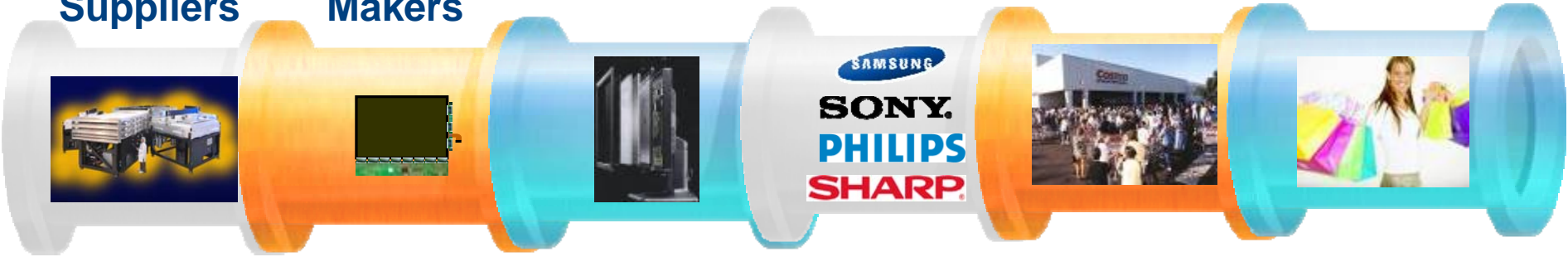
Panel Makers

OEMs

Brands

Retailers

Consumers



- All Array Tools
- Glass
- Chemicals, Targets
- Color Filters
- Liquid Crystal
- Polarizers
- Backlight Films
- Backlight Lamps
- Backlight Units
- Driver ICs
- PDP Optical Filters

- a-Si TFT LCDs
- p-Si TFT LCDs
- AMOLEDs
- PMOLEDs
- STN LCDs
- TN LCDs
- VFDs
- Electrophoretic
- Microdisplays
- FEDs





- TVs
- Monitors
- Mobile Phones
- Notebooks
- Public Displays
- Cameras
- Automotive
- MP3
- DVD Players
- Games
- MFPs

- Asia Pacific
- China
- Eastern Europe
- Japan
- Latin America
- Middle East/Afr.
- North America
- Western Europe

- Dept. Stores
- Direct/Catalog
- Distributors
- E-Commerce
- Mass merchants
- National Chains
- Resellers
- Specialty Retailers
- 600 retailers
- 120K stores

- Canada
- Europe
- Japan
- Mexico
- US
- >2.5M panelists
- Own our own panel

Full Service Coverage Within The NPD Group

				
Market Research Coverage				
PRODUCTION				
Worldwide/Regional Shipments/Forecasts	✓			✓
Panel/Imager/Tube Shipments/Forecasts	✓			✓
Design Wins	✓			✓
Supply Chain/Value Chain Analysis	✓			✓
Technology Analysis	✓			✓
Performance Comparisons	✓			✓
Panel Supply & Demand Analysis	✓			✓
Panel/TV Inventory Tracking	✓			✓
Cost/Price Tracking and Forecasting	✓			✓
RETAIL SALES & ENVIRONMENT				
Retail Sell-Through and Distribution		✓	✓	✓
Volume Weighted Avg. Retail Pricing		✓	✓	✓
Regional/User Specific Sell Through		✓	✓	✓
Weekly/Monthly Sell Through		✓	✓	✓
Warehouse Club Sell Through *	✓	✓		✓
Channel Inventory Tracking	✓	✓		✓
Shelf Share			✓	✓
In Store Promotion			✓	✓
Circular Promotion	✓		✓	✓
NON-RETAIL SALES				
Direct Sales Tracking *	✓	✓		✓
Commercial Sales Tracking	✓	✓		✓
CONSUMER				
Consumer Sales - All Outlets		✓		✓
Demographic Profiles		✓		✓
Consumer Promotion		✓		✓
Retailer Customer Satisfaction		✓		✓
Reasons For Purchasing		✓		✓
GENERAL				
Price Tracking	✓	✓	✓	✓
Channel/Market Analysis	✓	✓	✓	✓

*For NPD Intellect, this is only from consumer data

For distribution to attendees only. Content remains the property of DisplaySearch



DisplaySearch Has Many Experienced TV Analysts Around the World

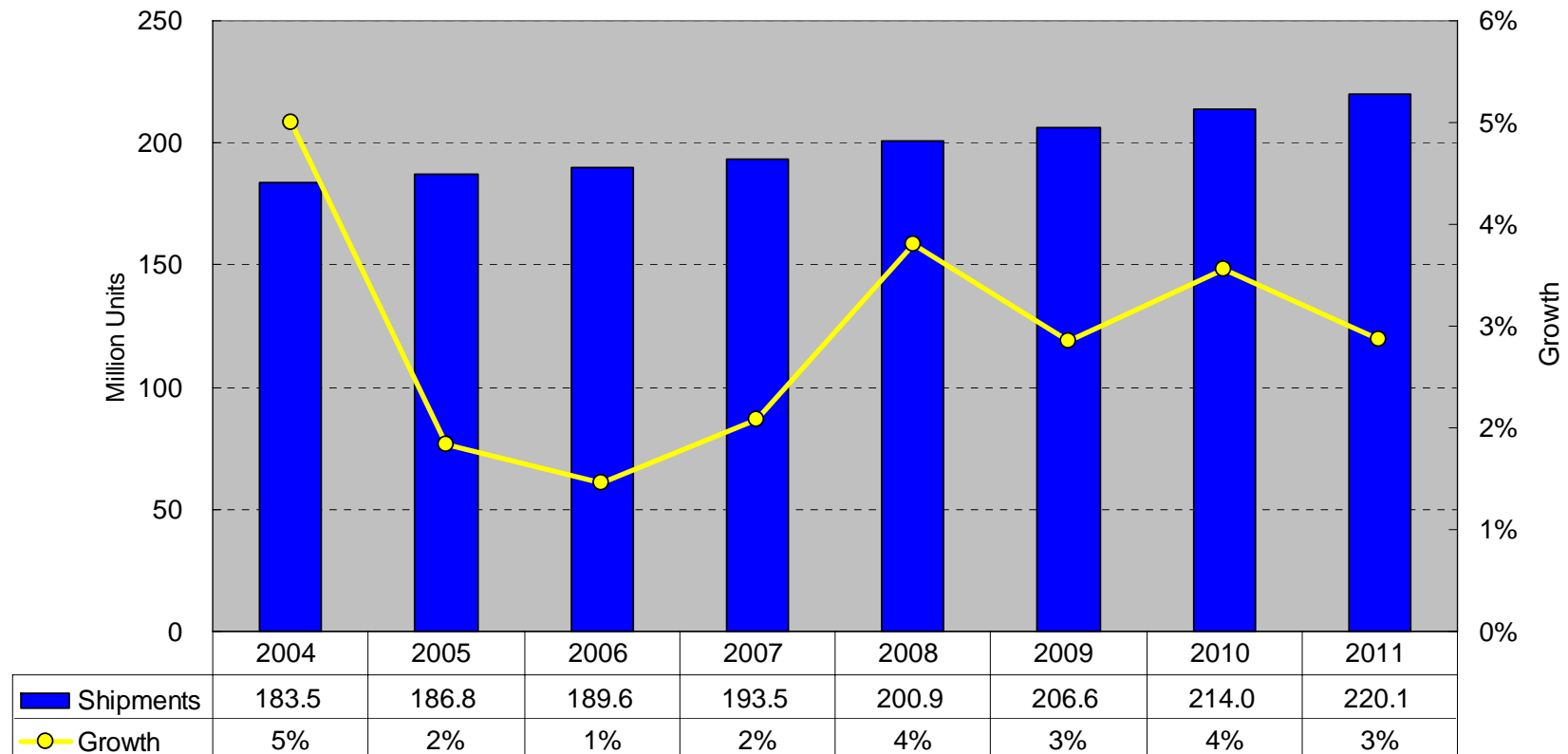
Country	Name	TV Experience
USA	Paul Gagnon	Circuit City, Hitachi
	Vish Nayak	NEC, Sony
	Mark Schutter	Mitsubishi, Revox, Photonics
	Edward Taylor	Sony
	Ross Young	Founder
China	Bing Zhang	Konka
Japan	Yoshio Tamura	TSR
	Hisakazu Torii	Mitsubishi
	Tadashi Uno	DNP
Korea	HS Ahn	Samsung
	Calvin Lee	Samsung SDI
	YS Chung	Samsung SDI
Taiwan	Brian Chen	AUO
	David Hsieh	HannStar, Hitachi
	Luke Yao	ITRI
	Deborah Yang	Philips
Europe	Meko	Beko, Eizo, Maxdata, Mitsubishi

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Global TV Shipments

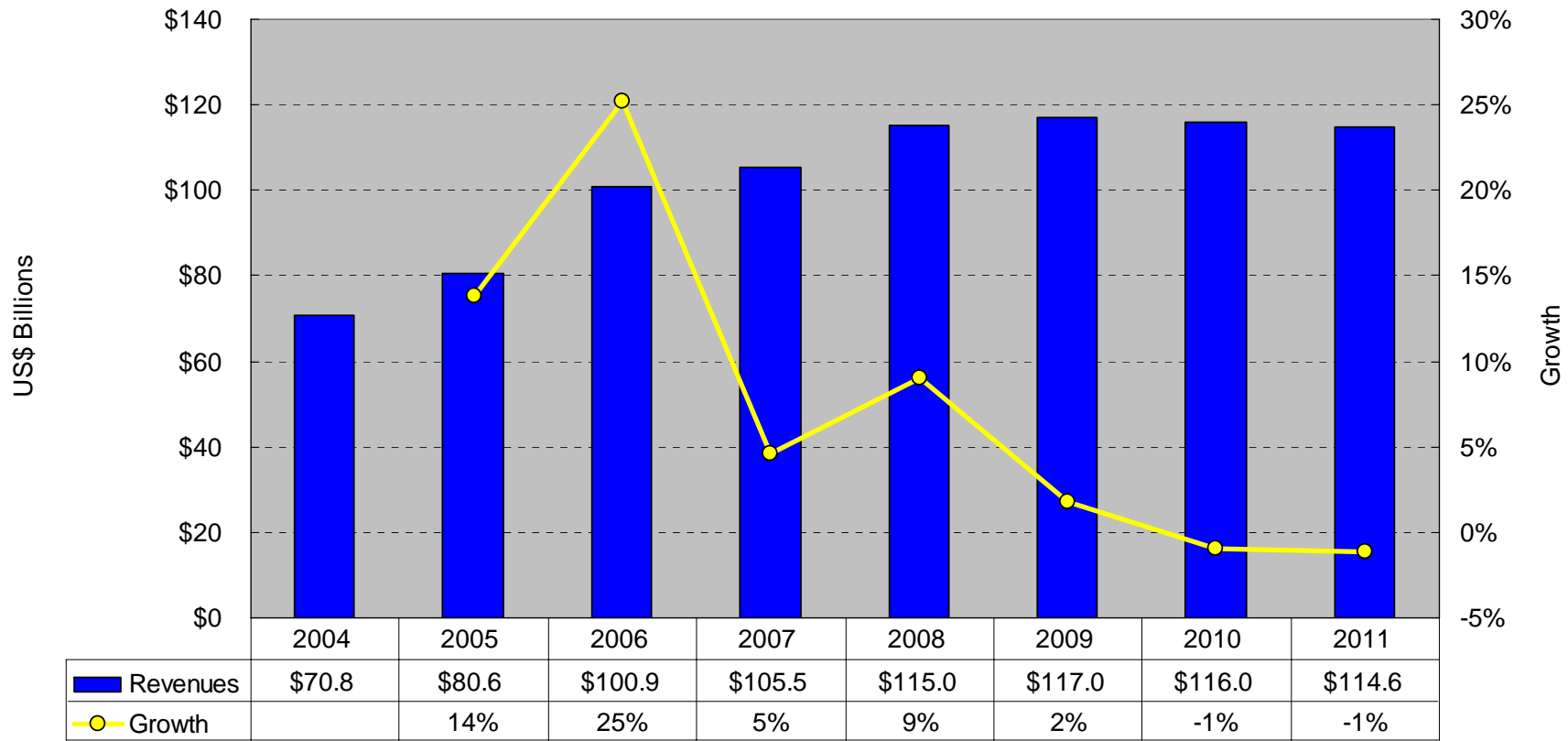
- Global growth was low in 2005 and 2006 with negative growth in Europe on unrealized World Cup demand. Growth was also negative in Japan.
- TV shipments should grow sharply in 2008 in response to the Beijing Olympics and remain strong as the digital TV transition peaks in North America in 2009



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

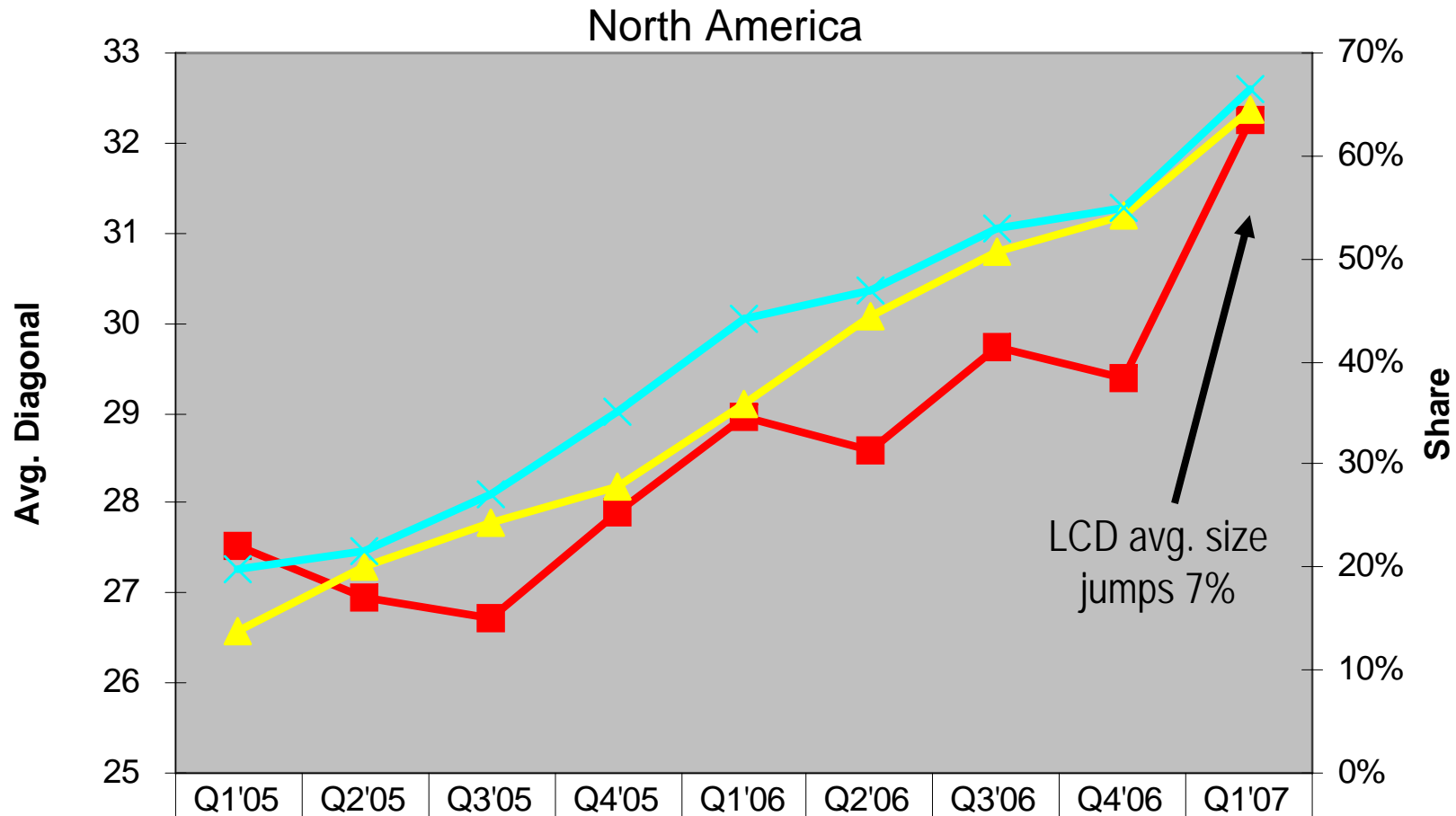
Global TV Revenues

- TV revenues rose a record 25% in 2006 to \$101 billion on strong share growth by flat panel technologies that pushed ASPs higher.
- Revenues should peak in 2009 and decline slightly each year thereafter as rapid flat panel price declines outweighing unit gains.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Higher ASPs from Larger Sizes, HD & Flat Panels

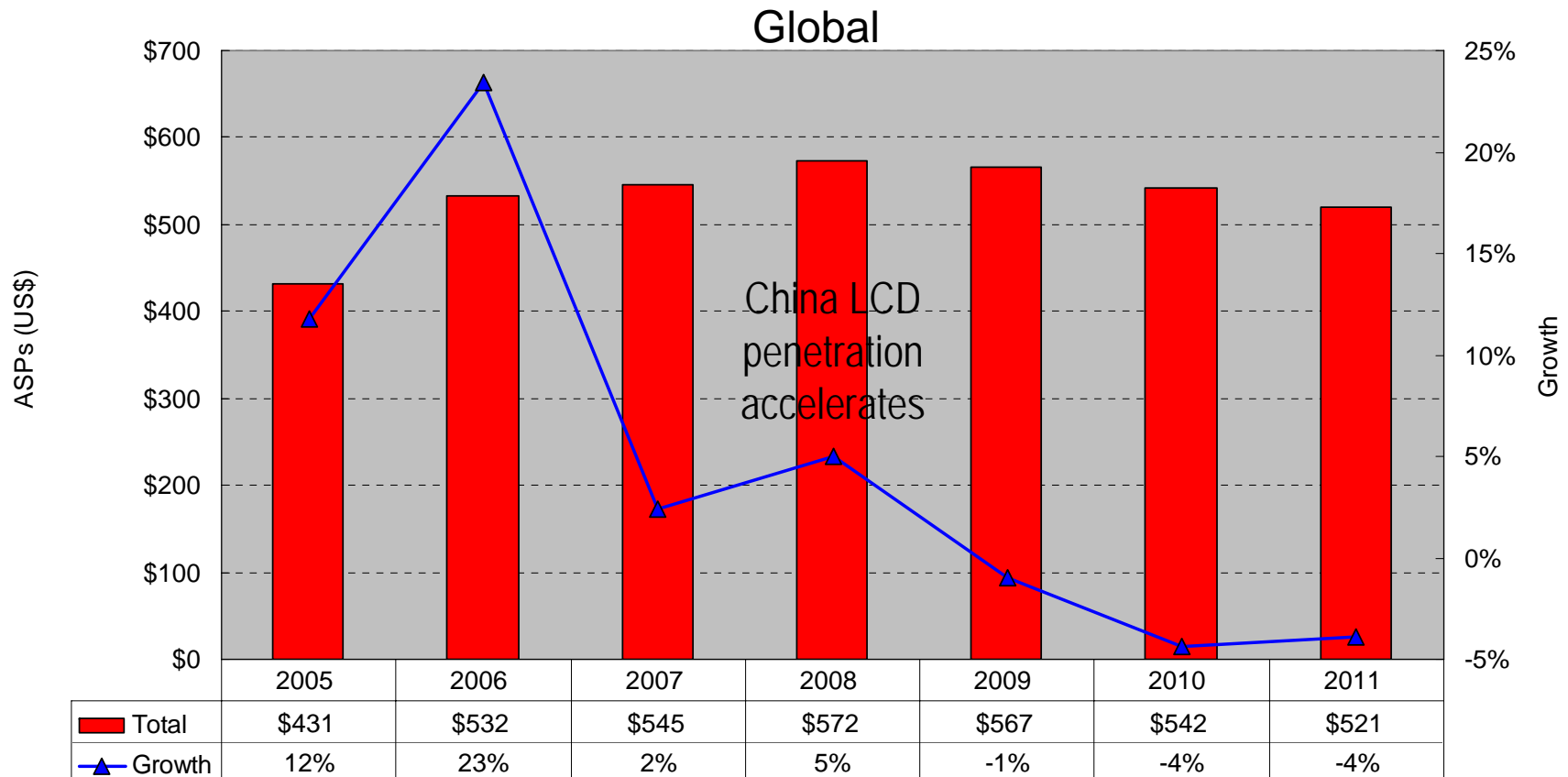


—■— Avg. Size	27.5	27.0	26.7	27.9	29.0	28.6	29.7	29.4	32.3
—▲— FP Share	14%	20%	24%	28%	36%	44%	51%	54%	65%
—×— HD Share	20%	22%	27%	35%	44%	47%	53%	55%	67%

Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

What's the outlook for those prices?

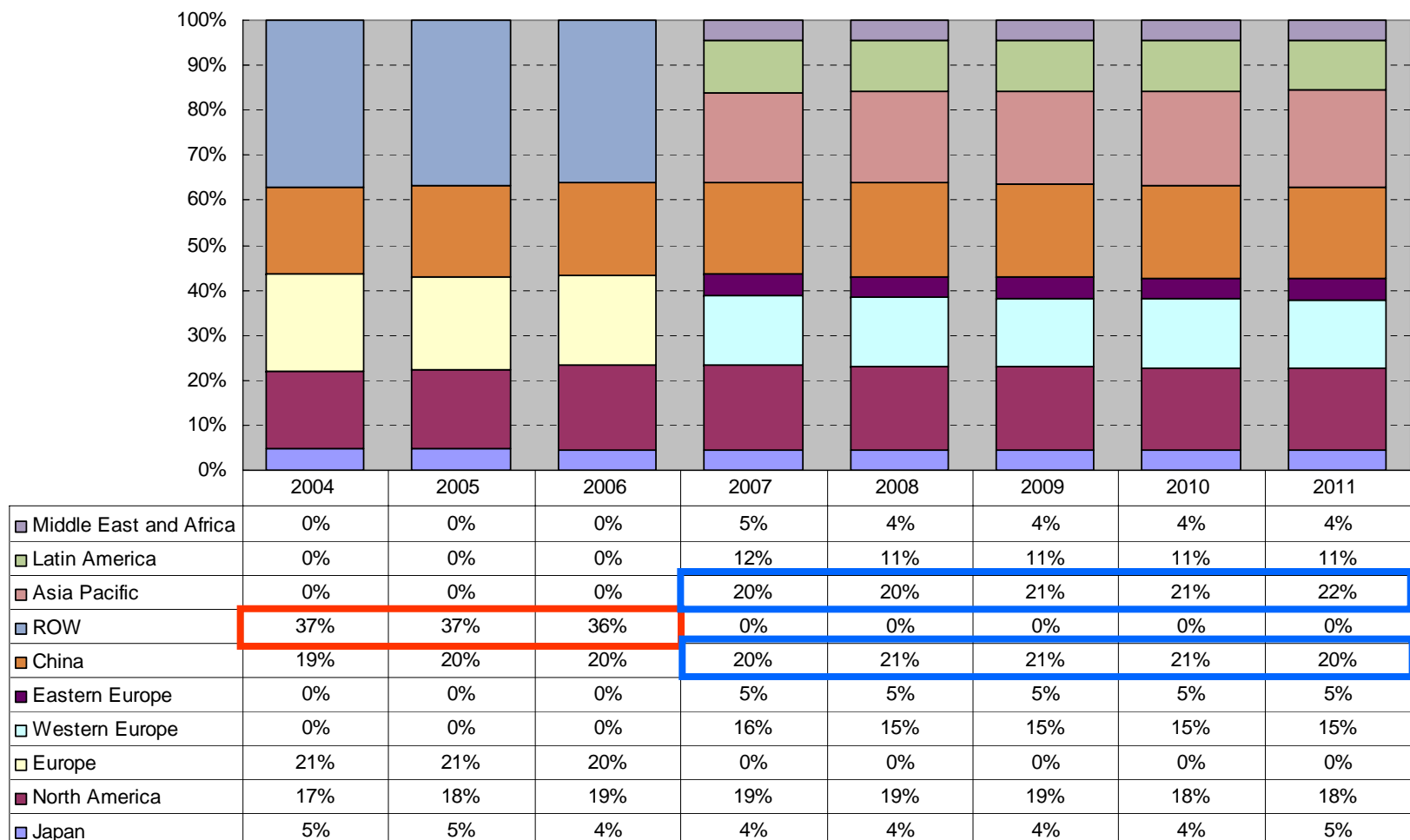
- TV ASP growth driven by greater FPD penetration and average size growth, but at individual sizes and technologies declines were severe
- However, FPDs are already reaching a saturation point in many regions as prices continue to fall rapidly



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Regional TV Shipment Share

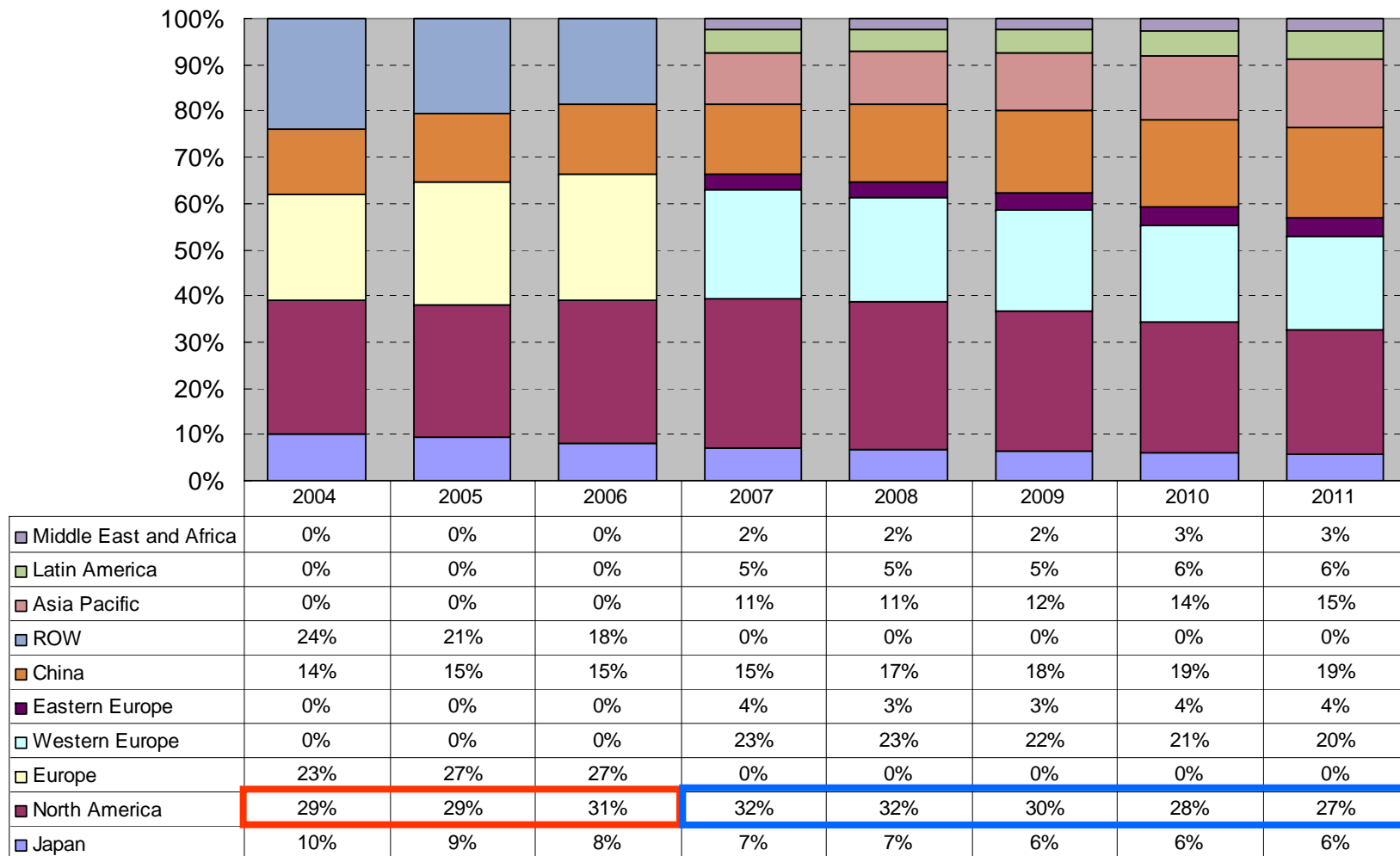
- ROW accounted for the largest share of unit shipments from 2004-2006 with Asia Pacific comprising the largest portion of those. Asia Pacific and China should share that lead through the forecast



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Regional TV Revenue Share

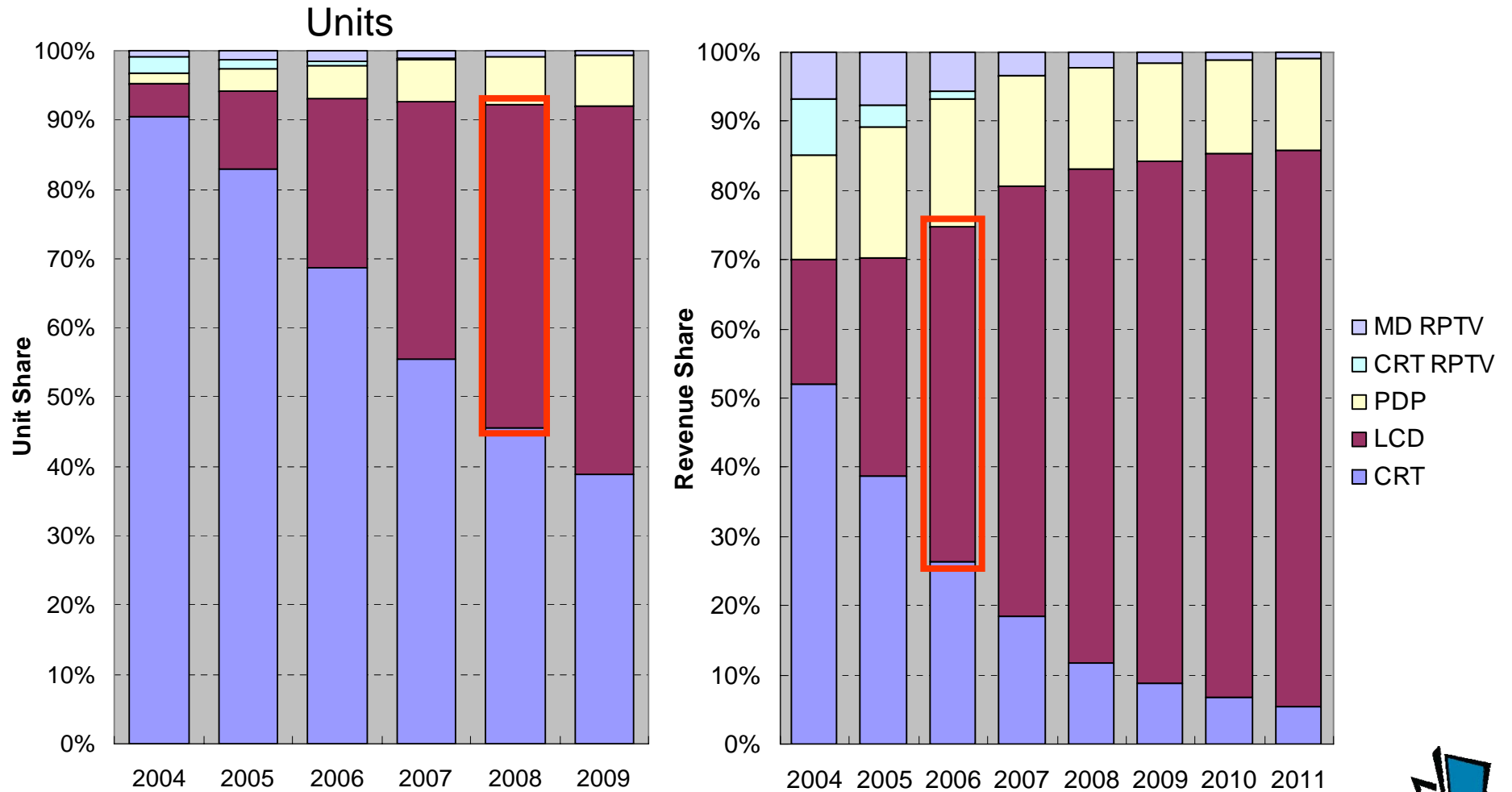
- Larger screen sizes and the potential for additional growth at larger sizes should continue to keep North America #1 in revenues.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Global TV Technology Share

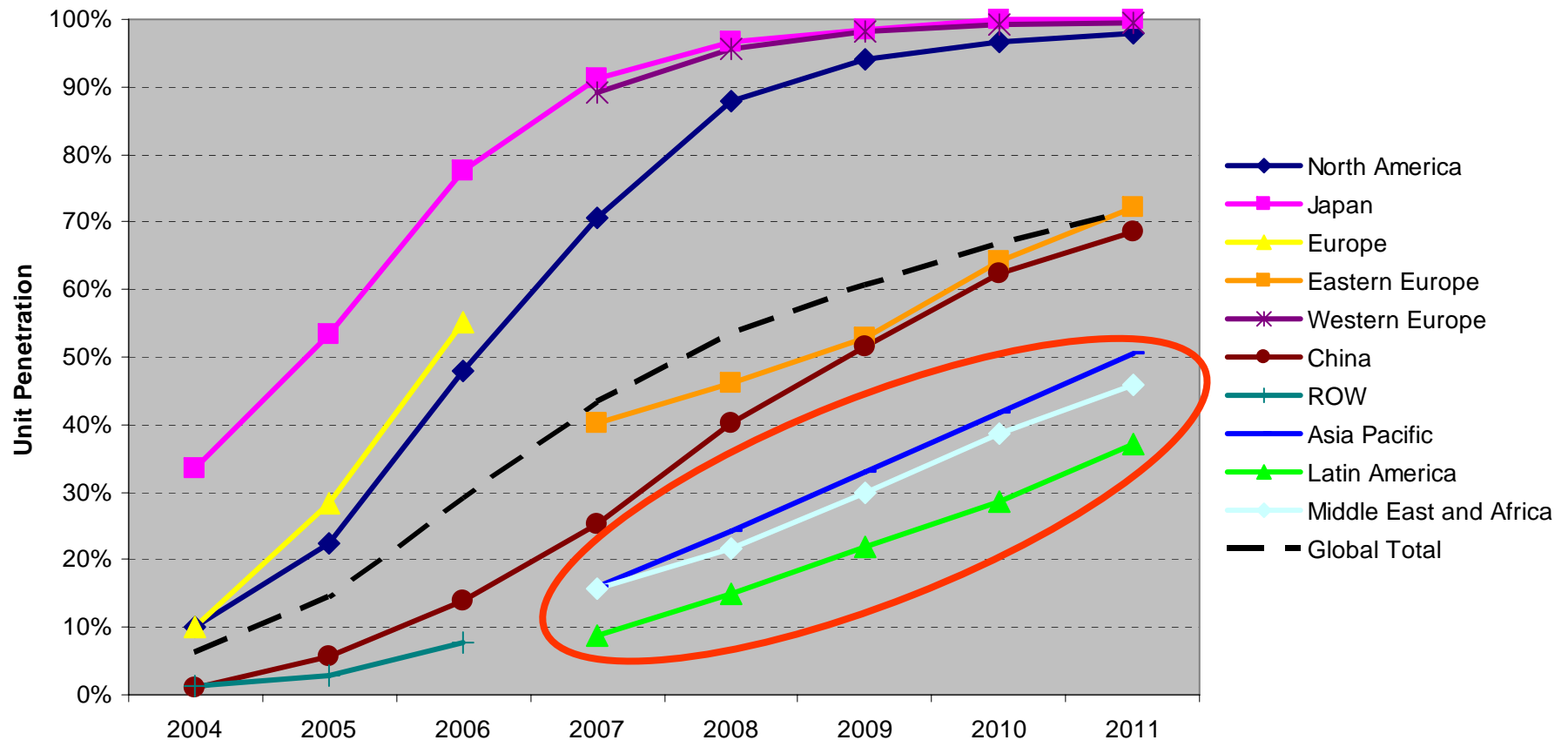
- LCD became the dominant global technology on a revenue basis in 2006 and should overtake CRT on a unit basis in 2008.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Flat Panel Penetration

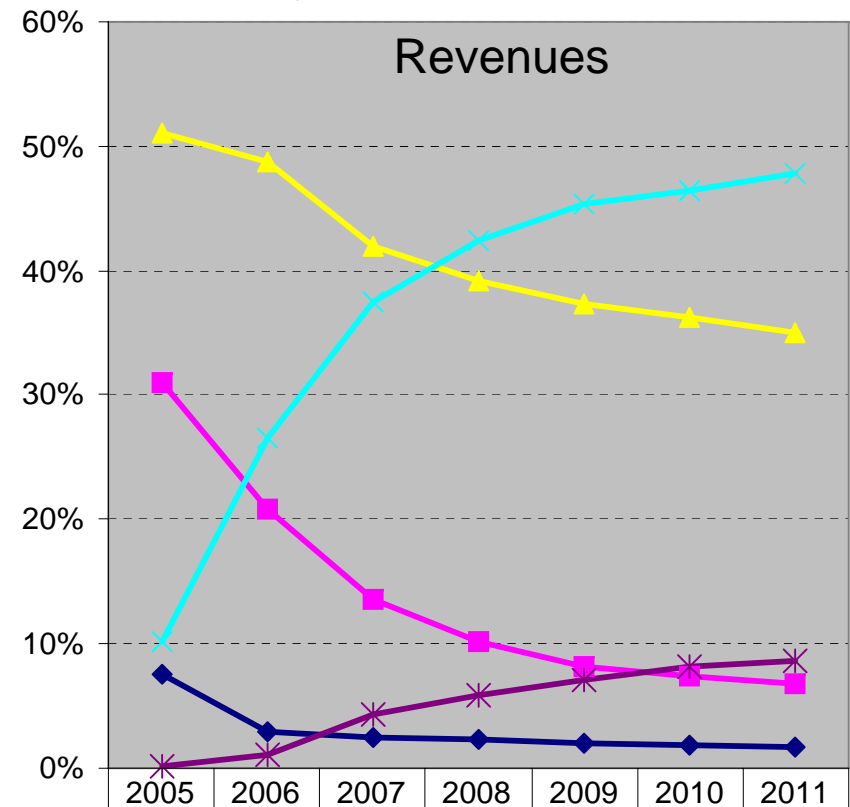
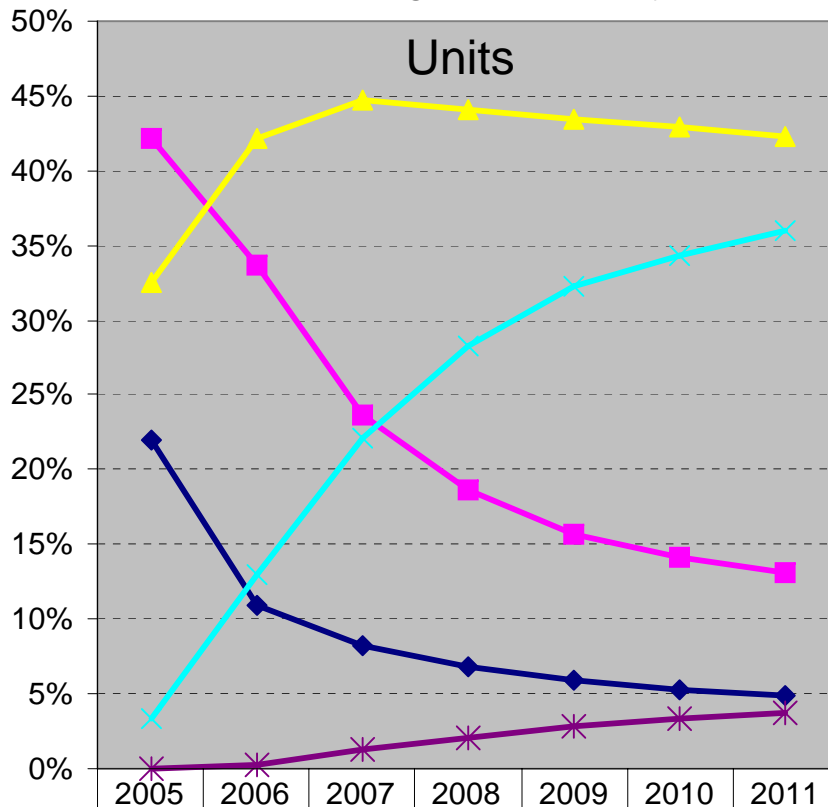
- Japan leading, followed very closely by Western Europe.
- North America growing the fastest with intense competition among companies and technologies as well as a looming digital TV transition.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

40"+ to Dominate LCD TV Revenues

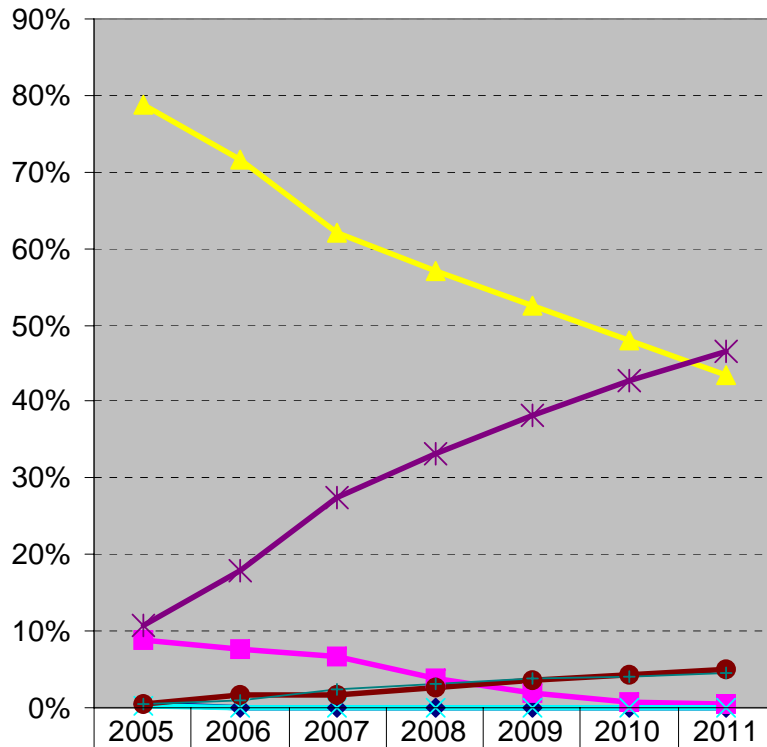
- 30-39" most popular size on a unit basis throughout the forecast.
- 40-49" LCD TVs to grow to nearly half of all LCD TV revenues by 2011.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

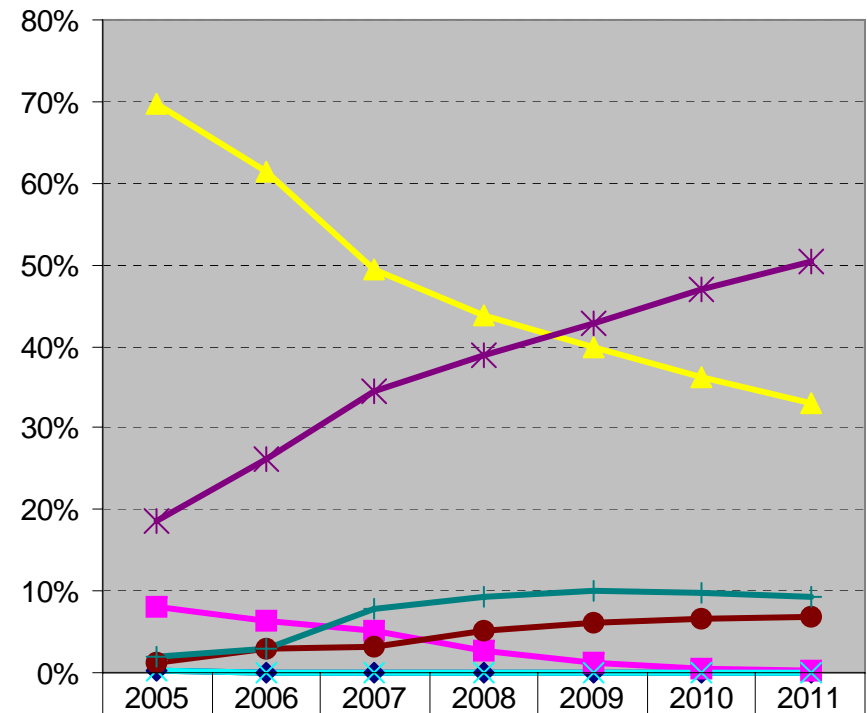
50" to Lead in PDP Units and Revenues

Units



◆ 30"-34"	0%	0%	0%	0%	0%	0%	0%
■ 35"-39"	9%	8%	7%	4%	2%	1%	0%
▲ 40"-44"	79%	72%	62%	57%	53%	48%	44%
✕ 45"-49"	0%	0%	0%	0%	0%	0%	0%
✱ 50"-54"	11%	18%	27%	33%	38%	43%	46%
● 55"-59"	1%	2%	2%	3%	4%	4%	5%
+ 60"+	1%	1%	2%	3%	4%	4%	5%

Revenues

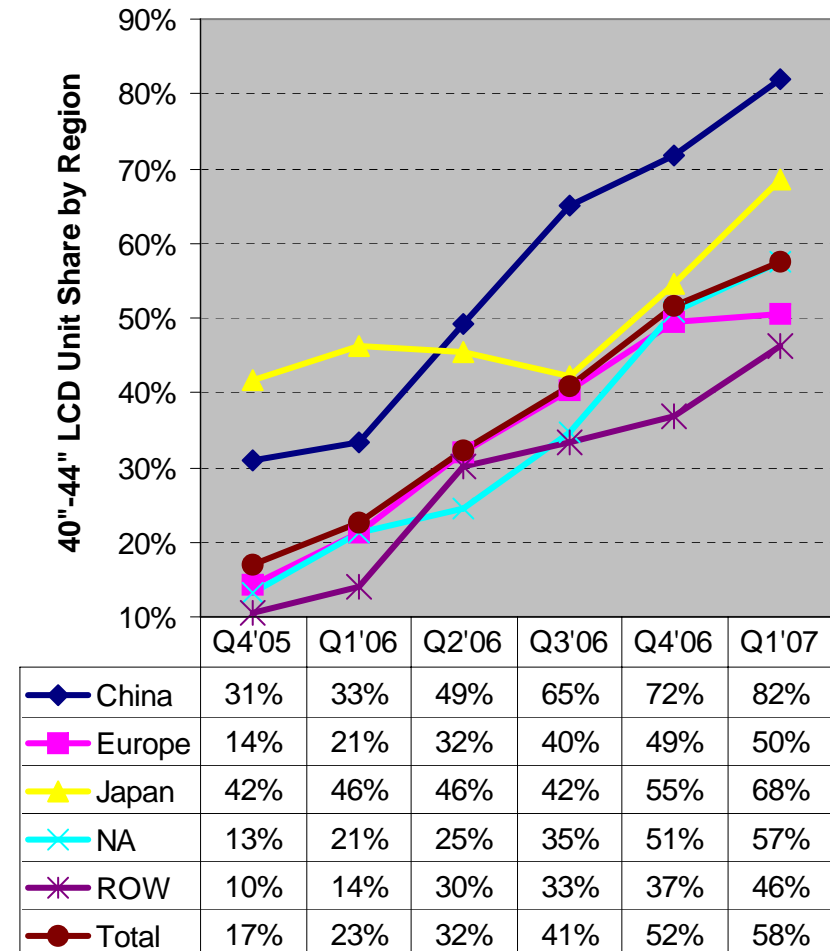
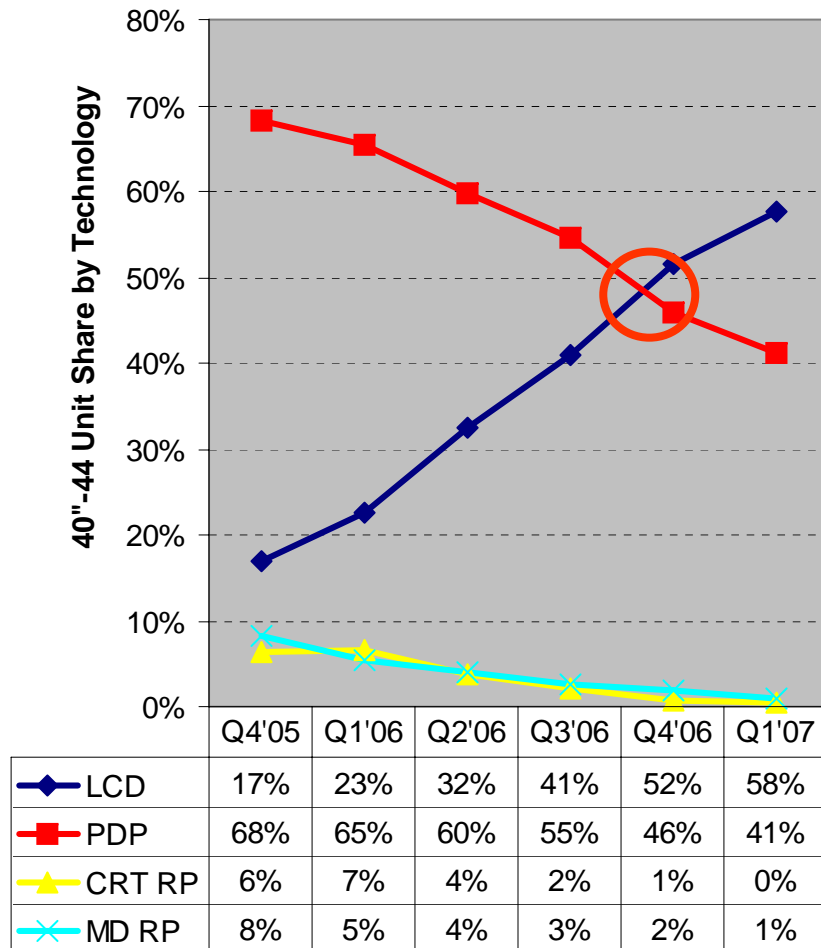


◆ 30"-34"	0%	0%	0%	0%	0%	0%	0%
■ 35"-39"	8%	6%	5%	3%	1%	1%	0%
▲ 40"-44"	70%	61%	49%	44%	40%	36%	33%
✕ 45"-49"	0%	0%	0%	0%	0%	0%	0%
✱ 50"-54"	19%	26%	35%	39%	43%	47%	50%
● 55"-59"	1%	3%	3%	5%	6%	7%	7%
+ 60"+	2%	3%	8%	9%	10%	10%	9%

Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

40-44" TV Share by Tech/Region

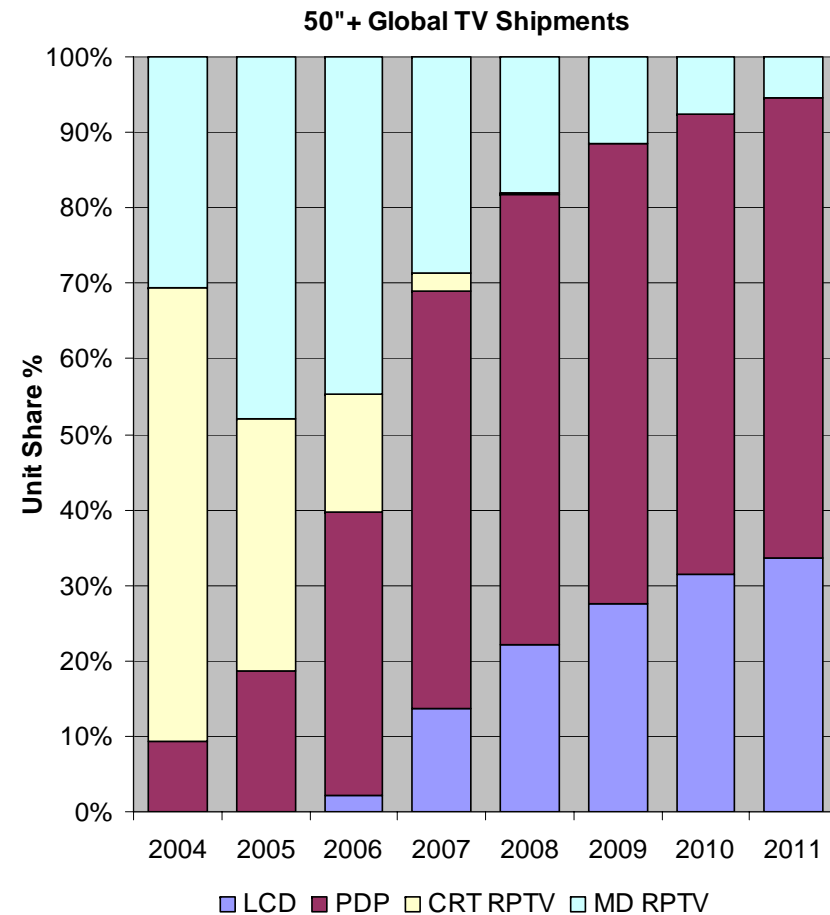
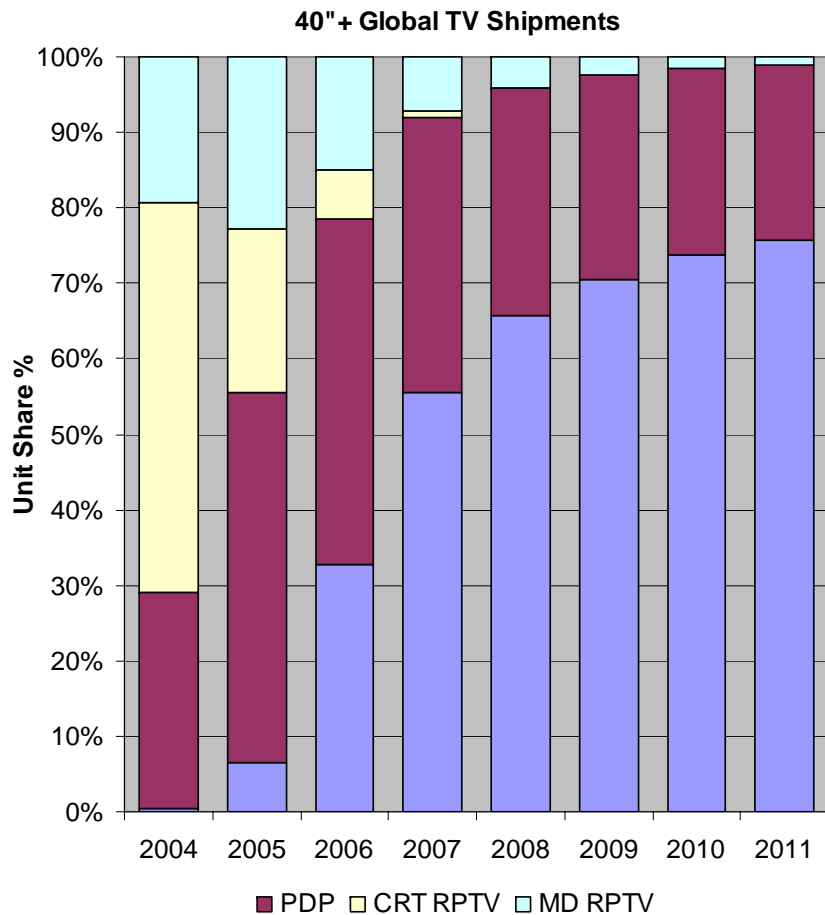
- LCDs overtook PDPs in Q4'06 growth as prices fell, more brands entered and existing brands shifted their emphasis. Strong gains in all regions.
- Availability of 1080p in LCD earlier than PDP generated additional demand.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

LCD TVs to dominate 40"+, PDPs #1 at 50"+

- With large share gains at 40-49" in 2007, LCDs will account for the majority of 40"+ TVs throughout the forecast.
- PDPs to dominate with a cost advantage over LCD at 50"+ and greater acceptance WW over RPTV.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

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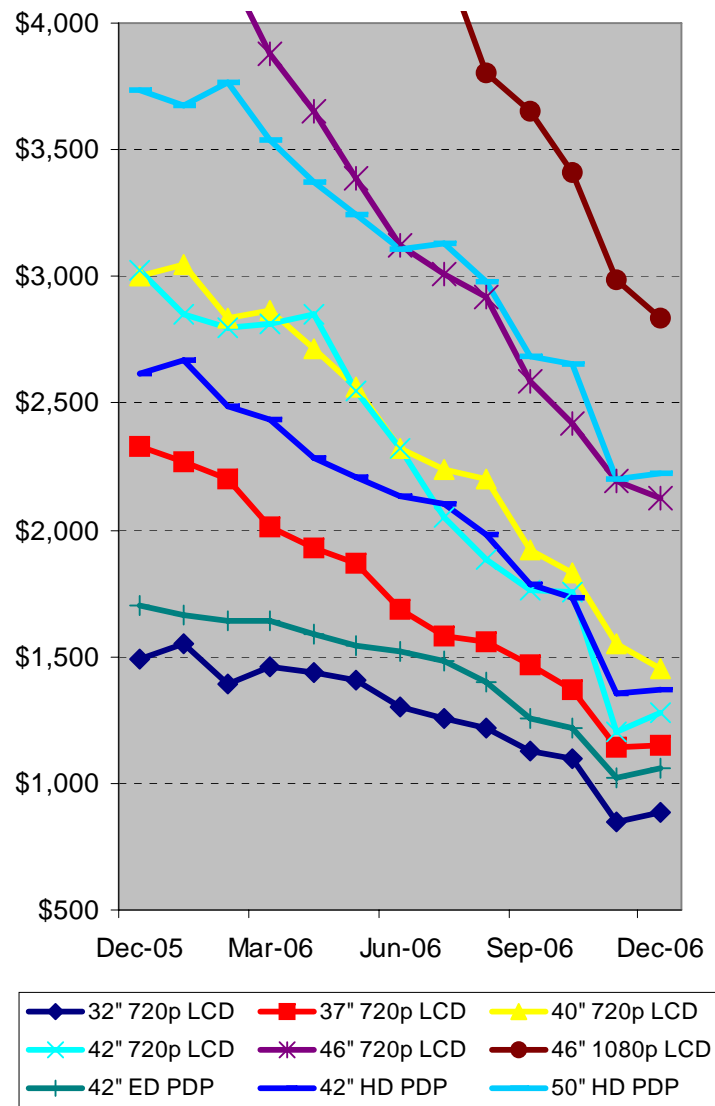
38% - 75% Price Reductions at Individual TV Sizes! Panel Prices Fell Slower, Squeezing Brand/Retailer Margins

TVs

LCDs	Dec-05	Dec-06	Change
32" 720p	\$1,490	\$886	-41%
37" 720p	\$2,328	\$1,148	-51%
40" 720p	\$2,999	\$1,451	-52%
42" 720p	\$3,027	\$1,275	-58%
46" 720p	\$4,531	\$2,122	-53%
46" 1080p	\$11,526	\$2,839	-75%
PDPs			
42" ED	\$1,705	\$1,058	-38%
42" HD	\$2,620	\$1,372	-48%
50" HD	\$3,732	\$2,226	-40%

Panels

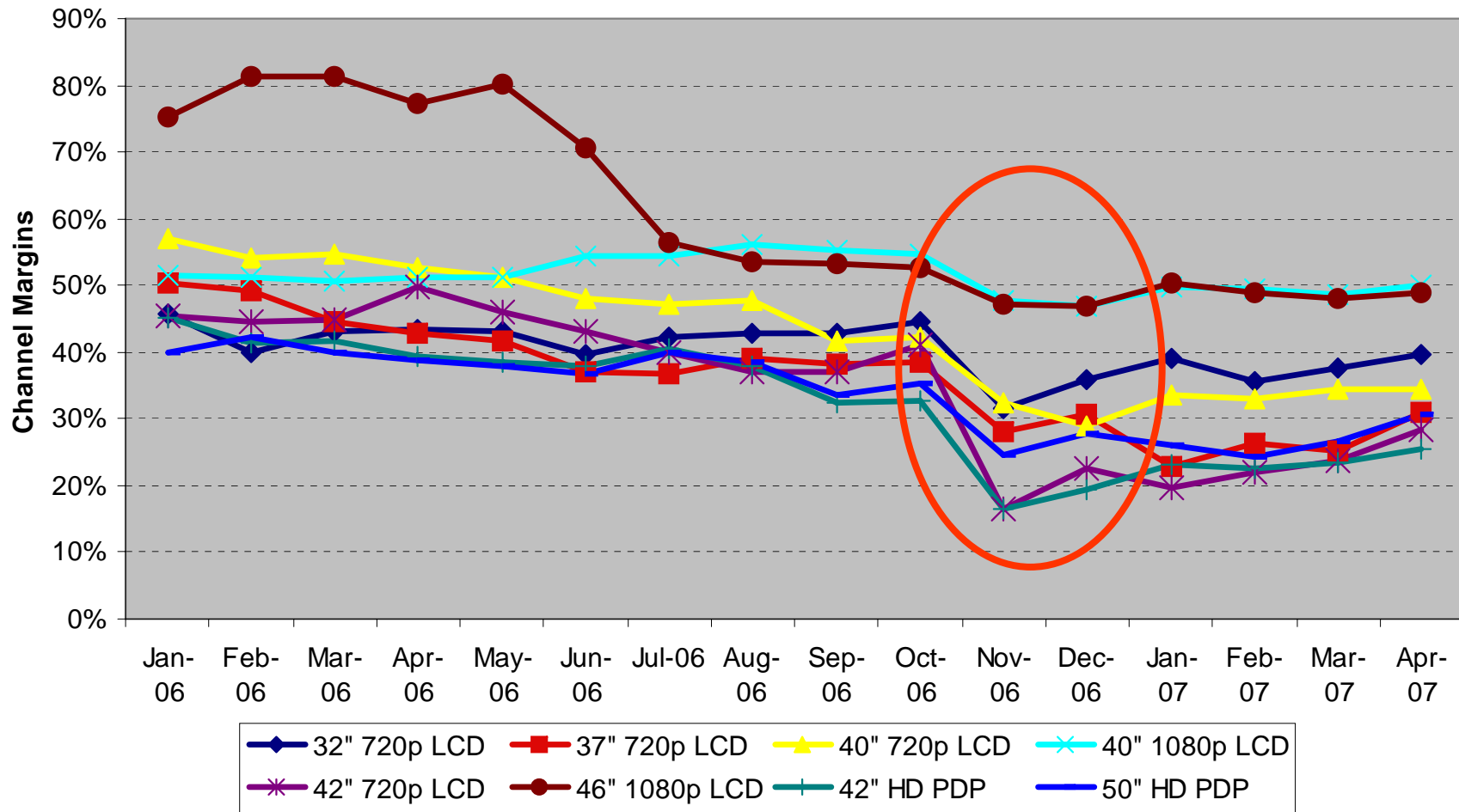
LCDs	Dec-05	Dec-06	Change
37" 720p	\$793	\$496	-37%
40" 720p	\$915	\$665	-27%
42" 720p	\$1,150	\$626	-46%
46" 720p	\$1,524	\$930	-46%
46" 1080p	\$1,600	\$1,030	-36%
PDPs			
42" ED	\$648	\$453	-30%
42" HD	\$773	\$537	-31%
50" HD	\$1,324	\$848	-36%



Source: DisplaySearch's Monthly TV Cost/Price Forecast Report

Channel Margins Fell Significantly Throughout 2006

- Channel margins were severely impacted in 2H'06 and have not rebounded as expected for most product classes.
- 1080p margins are healthy and retailers have continued to emphasize 1080p in advertising

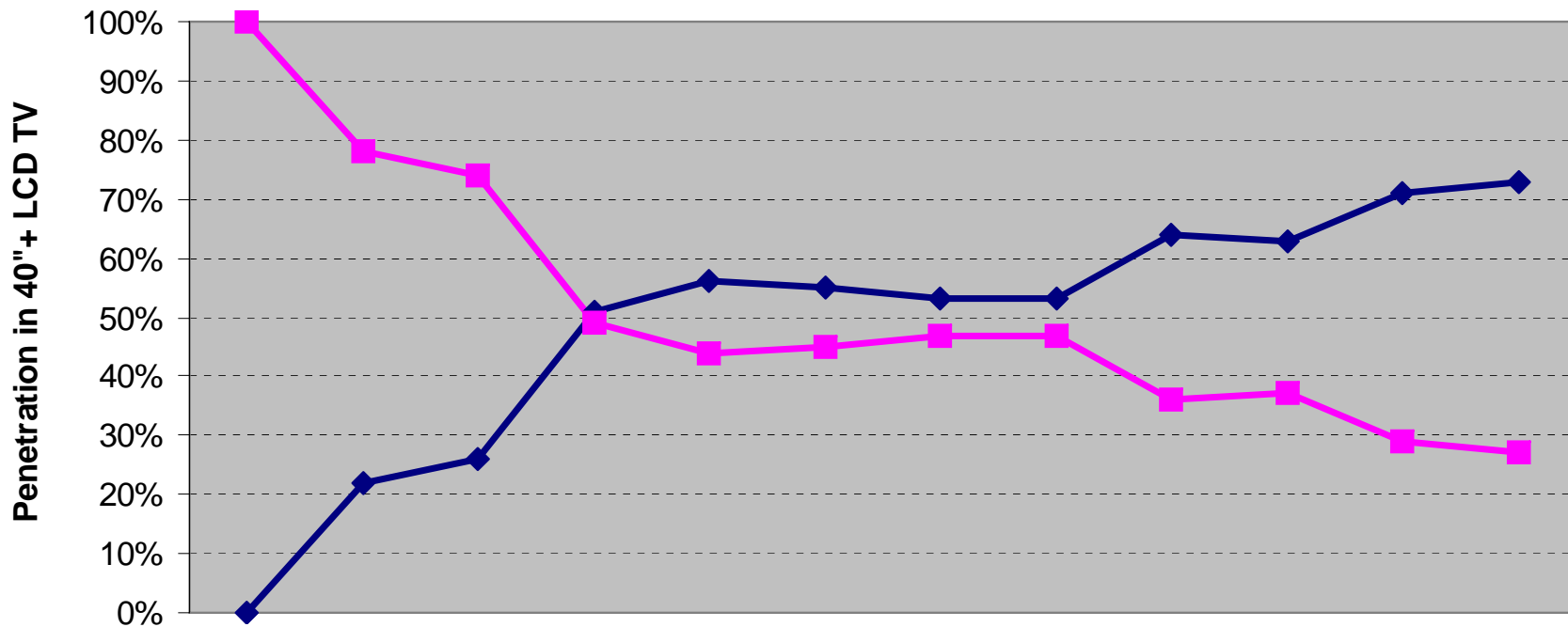


Source: Monthly TV Cost/Price Forecast Report. Defined as street price minus ex-hub cost.

For distribution to attendees only. Content remains the property of DisplaySearch

1080p Ad Share

- From first 1080p ads in Aug '06 to nearly ¾ of all 40"+ LCD TV ads in June
- National CE retailers need to be cautious about pushing some customers to Clubs and Wal-Mart.



	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07
◆ 1080p	0%	22%	26%	51%	56%	55%	53%	53%	64%	63%	71%	73%
■ 720p	100%	78%	74%	49%	44%	45%	47%	47%	36%	37%	29%	27%

Source: DisplaySearch's Weekly TV Flash Report

Retailer Stocks Negatively Affected by Falling TV Prices

2006 Stock Performance

	Year	H1	H2
Dow Jones	16%	4%	12%
Morgan Stanley Retail Index	16%	3%	12%
Best Buy	14%	26% →	-10%
S&P 500	14%	2%	12%
Nasdaq Composite	10%	-2%	11%
S&P 500 Retail	9%	-1%	11%
Retail Holders Trust	4%	-1%	5%
Circuit City	-15%	21% →	-30%

**CE Stocks
reversed
sharply in
2H06**

Why did it happen?

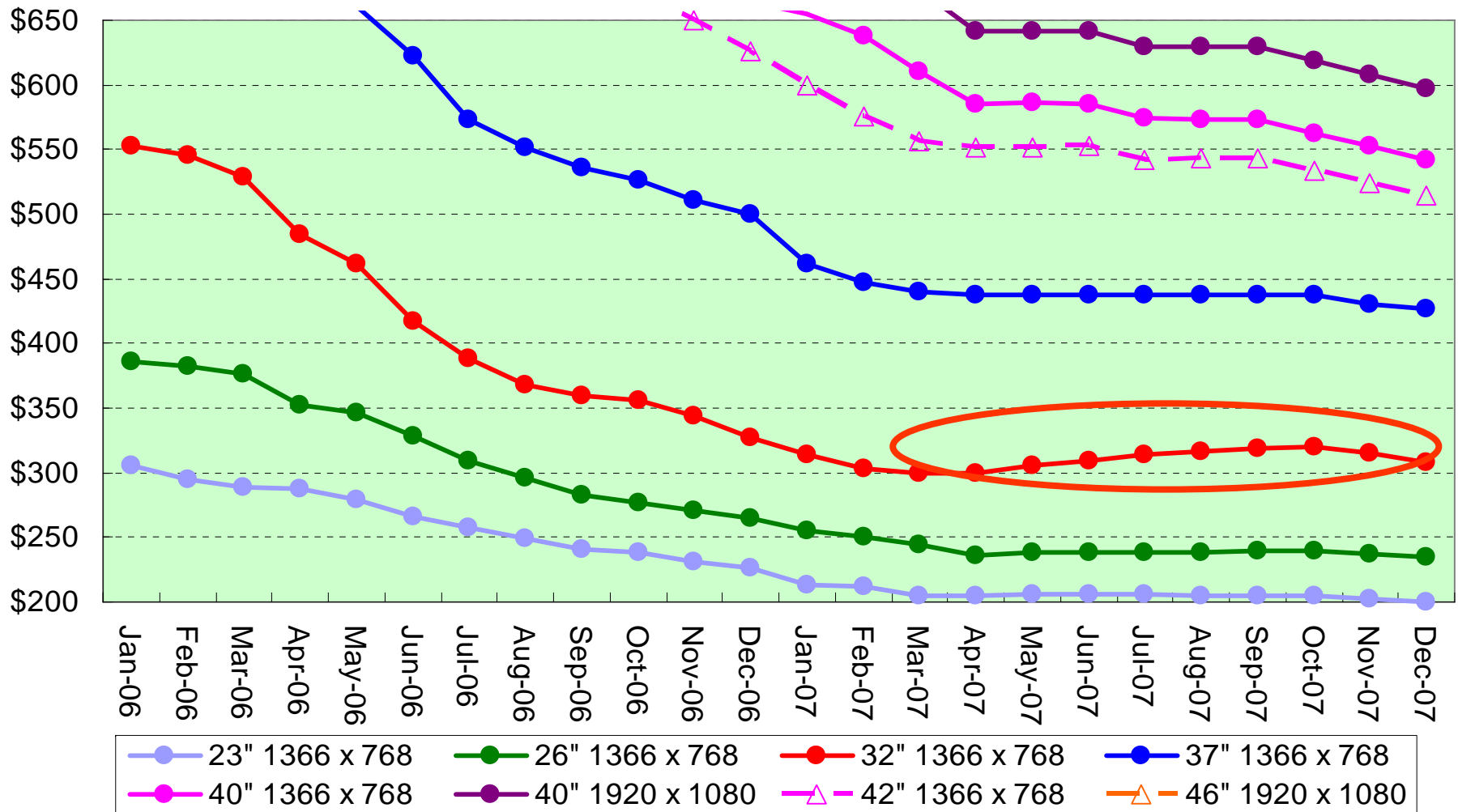
- Intense competition
 - Many brands with too much supply
 - Sony and Samsung price battle
 - Rising tier 2 brands (Vizio, Syntax, Westinghouse) at much lower prices
 - Vizio is a unique example
 - #3 US 32"+ flat panel brand in Q1'07
 - Panasonic drops MAP policy on Black Friday
- Weak World Cup sell-through in Europe forced manufacturers to stuff retail channel in US, placing pressure on prices
- Wal-Mart and warehouse clubs pressuring national CE retailers
 - Leads to increasing discount pressure and financing offers
 - Wal-Mart to be a major player in 2007 after weak attempt in late 2006 to break in to FPD business

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LCD TV Panel Prices Stabilizing, 32" Rising

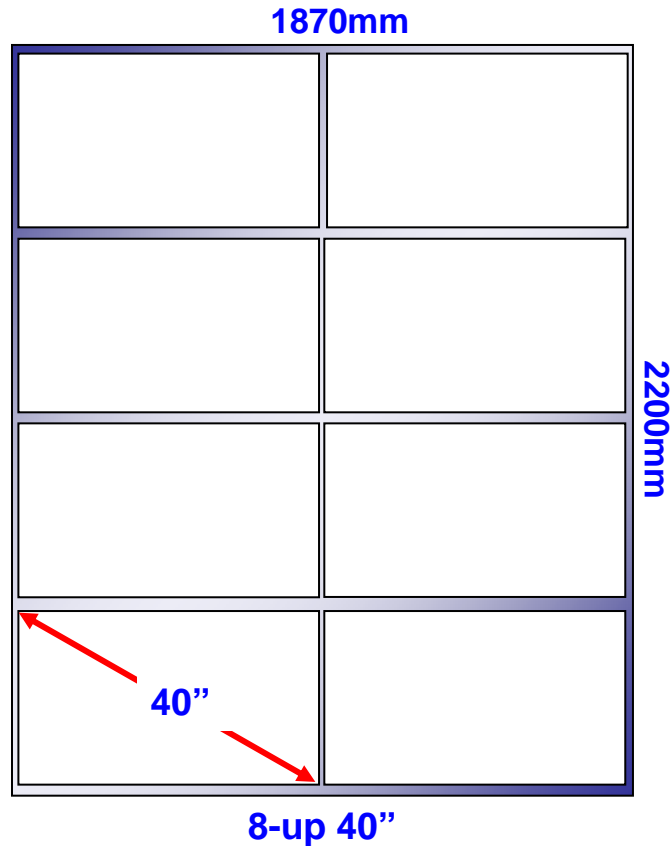
- 32" prices started rising in May, more of a correction due to low margins and revenue disparity with other panels made from 6G and 7G fabs. A 25% decline is still expected at 32" from 2006 to 2007.



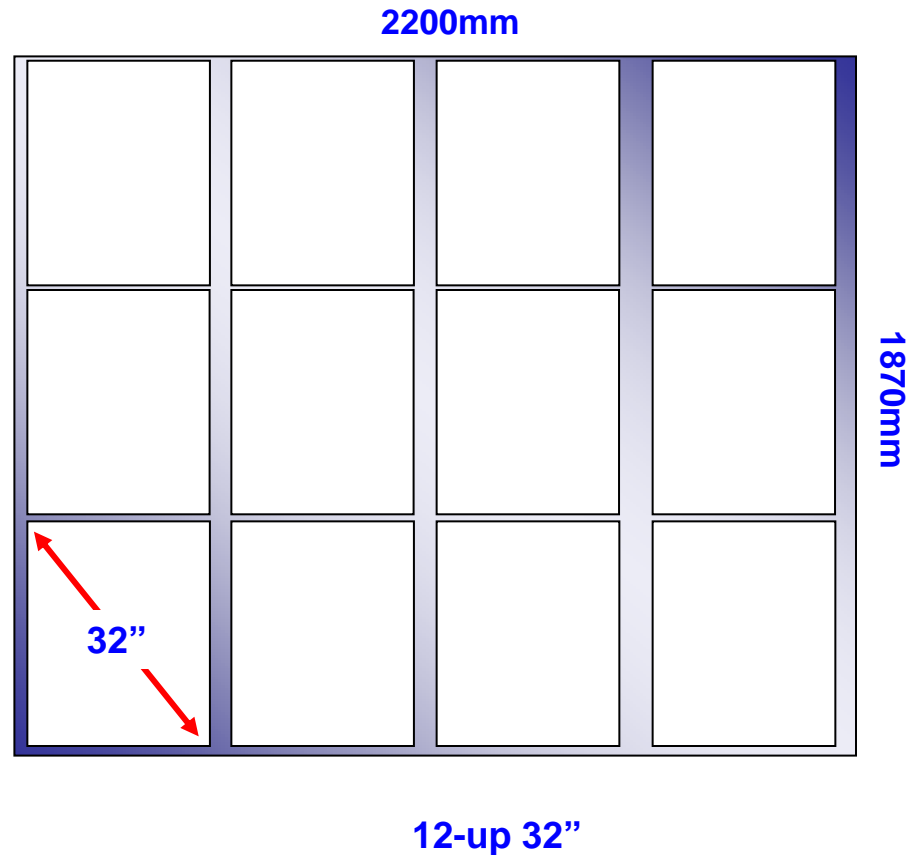
Source: DisplaySearch's Monthly Large-area TFT LCD and PDP Pricing Report

Disincentive to Make 32" – 7G Case

- 24% difference in revenues by making 40" rather than 32" assuming 100% yields in May.



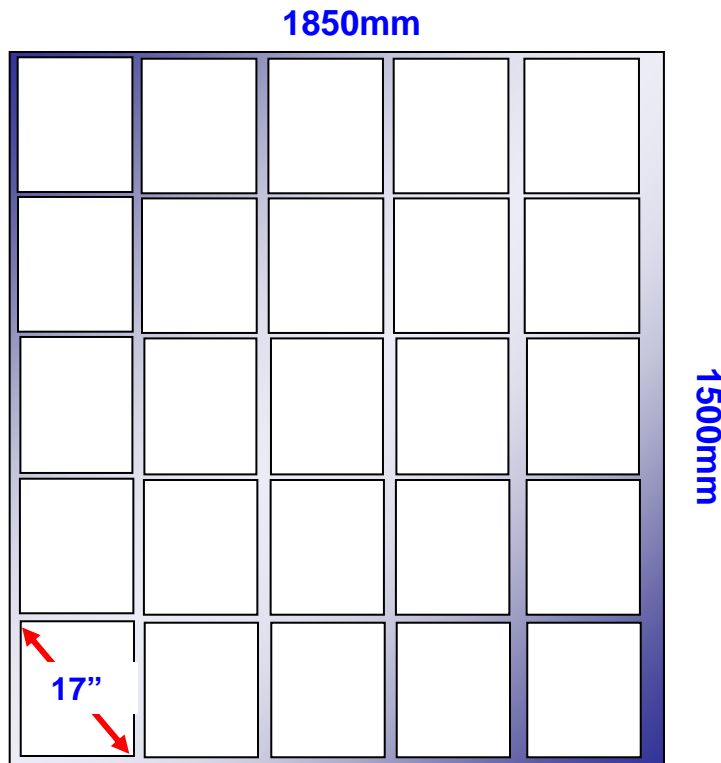
\$4512



\$3648

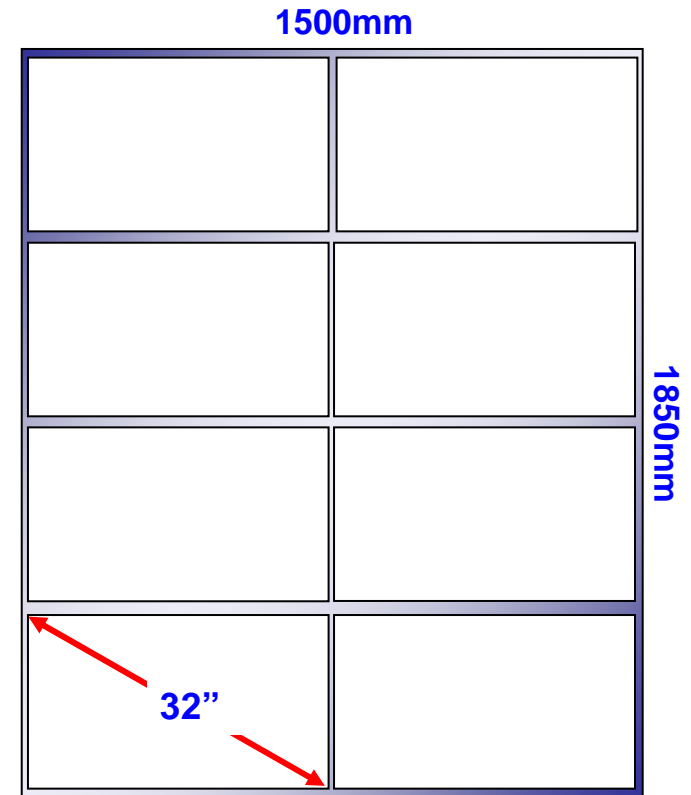
Disincentive to Make 32" – 6G Case

- 16% difference in revenues by making 17" assuming 100% yields!



25-up 17"

\$2825

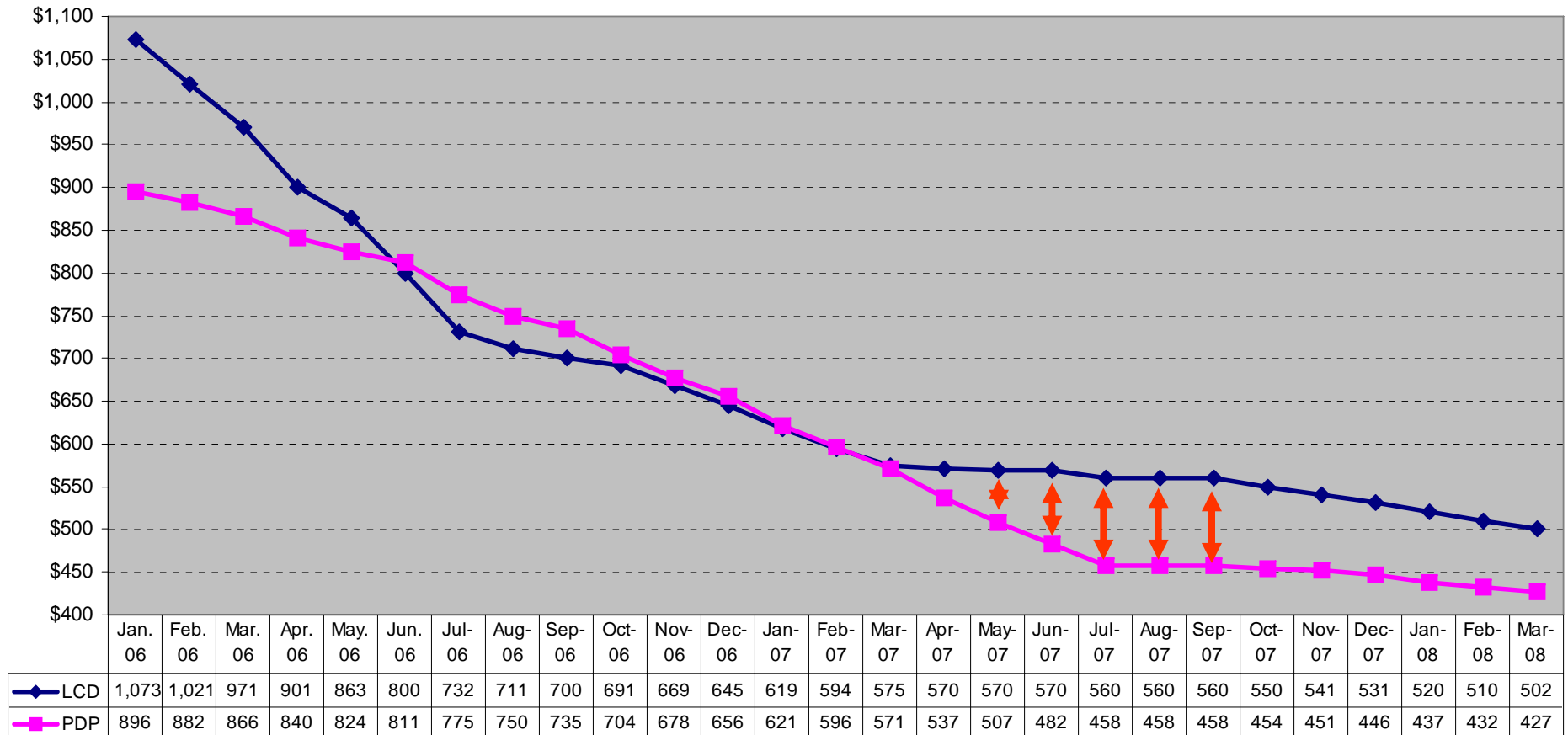


8-up 32"

\$2432

42" 720p LCD vs. PDP Panel Price Forecasts*

- At 42", with LCD prices stabilizing and PDP prices continuing to fall, PDPs are expected to enjoy a widening price advantage from price parity in March to a 17% - 18% advantage from July-November.



*Includes power supply costs for LCDs and PDPs and optical filters for PDPs
 Source: DisplaySearch's Monthly Large-area TFT LCD and PDP Pricing Report

Is Q4'07 going to be as aggressive?

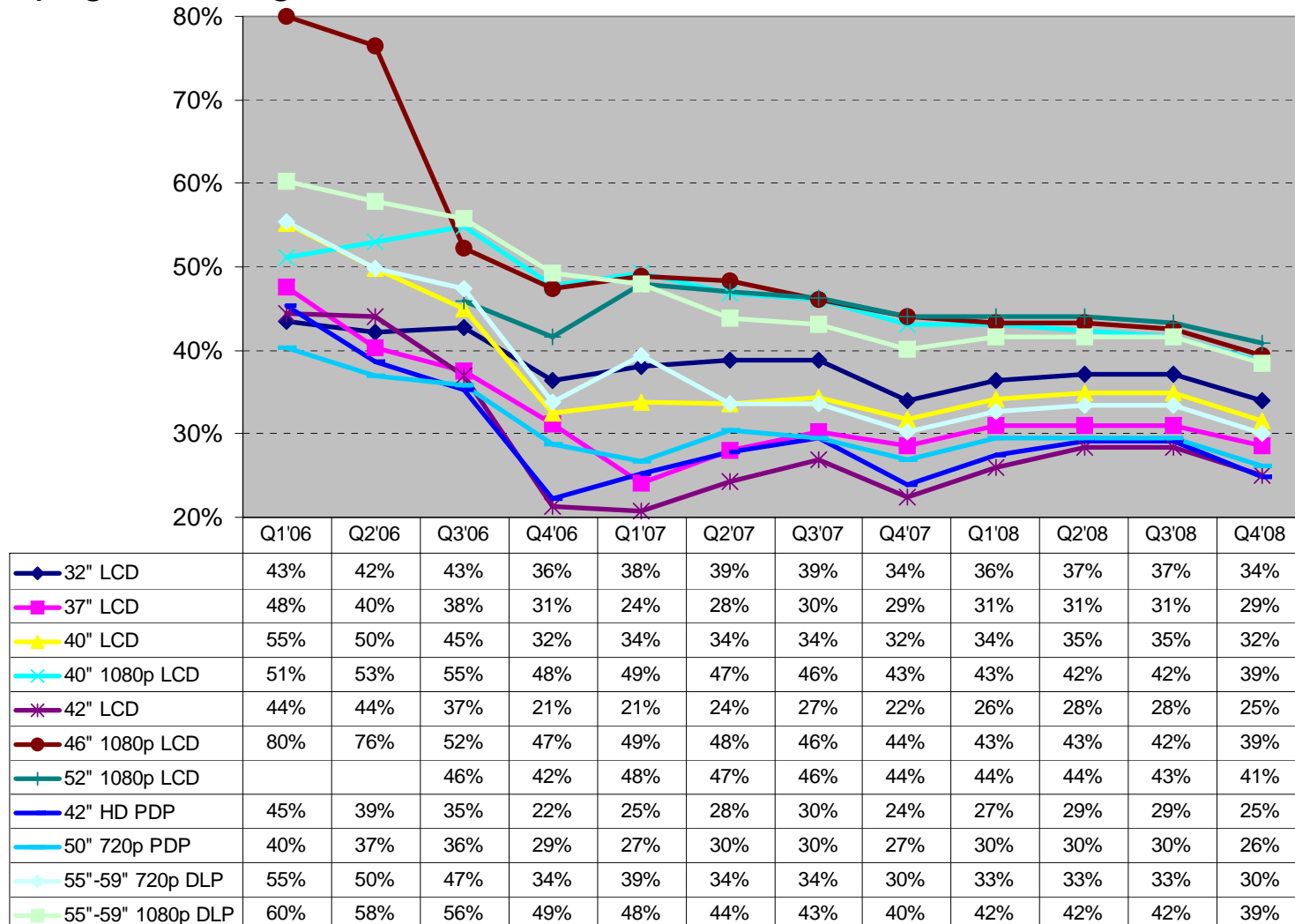
- Tight supply during 2H'07 in LCD should help ease retail price declines compared to Q4'06.
- Some Tier 3 brands might have trouble getting supply.
- PDP prices should be much more aggressive with under-utilized capacity. Could see \$799 42" HD PDP on Black Friday with narrow channel margins

		Y/Y ASP Change		
		Q4'06	Q4'07	
LCD	26-27" 768p	-35%	-17%	} Y/Y ASP declines should slow significantly for <50" LCD
	32" 768p	-39%	-16%	
	37" 768p	-49%	-21%	
	40-44" 768p	-53%	-19%	
	40-44" 1080p	-81%	-28%	
	46-47" 768p	-52%	-27%	
	46-47" 1080p	-33%	-31%	
	52" 1080p	-	-28%	
PDP	42" HD	-46%	-33%	} PDP price declines should continue to be aggressive on under-utilized capacity
	50" HD	-40%	-41%	
	60"+ HD	-32%	-35%	

Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Channel Margin Analysis

- Channel margins projected to level off. If product mix shifts significantly to 1080p, gross margin dollars can increase.

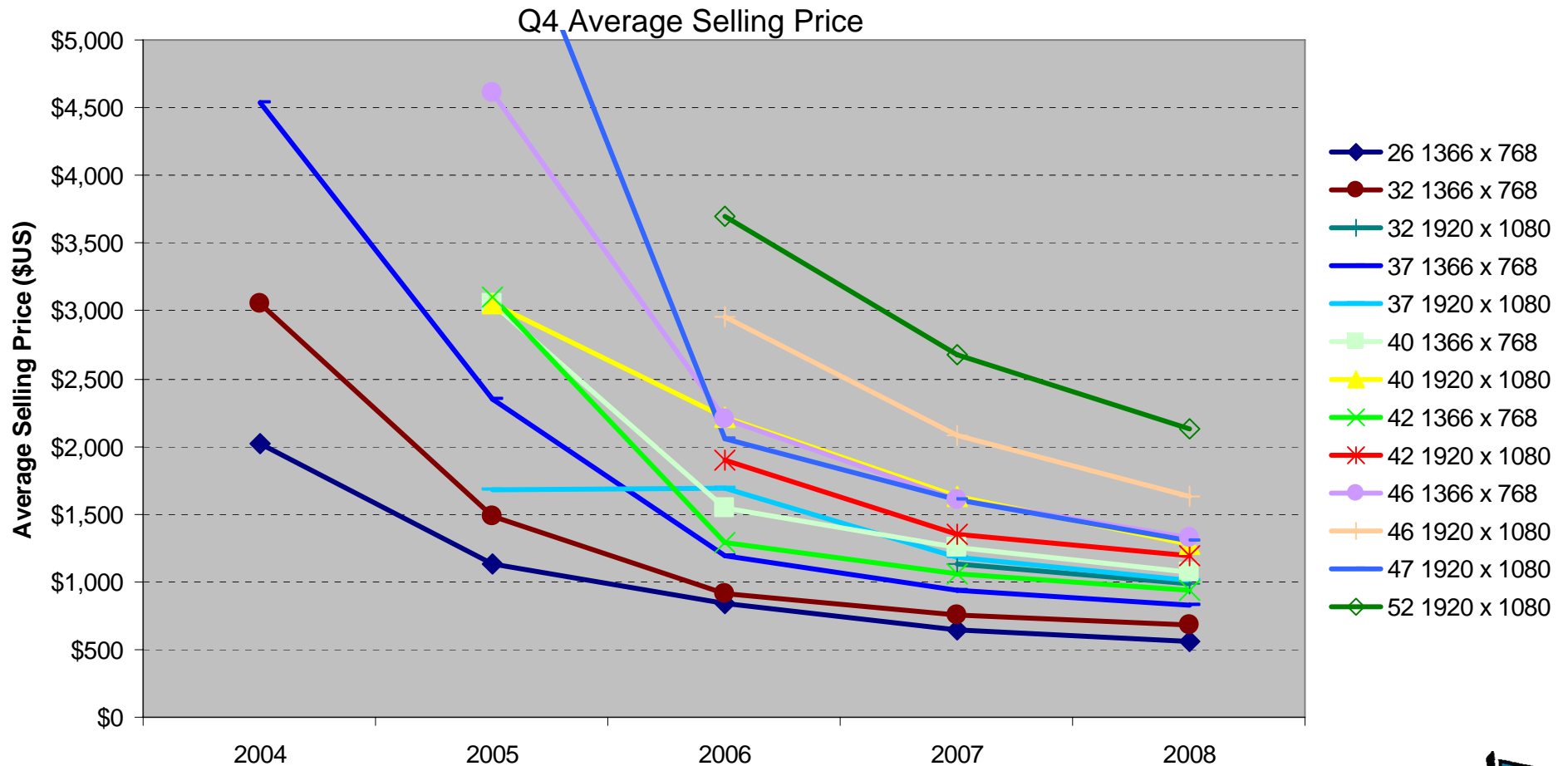


Source: DisplaySearch's *Monthly TV Cost/Price Forecast Report*. Defined as street price minus ex-hub cost.

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NA LCD TV ASP Forecast

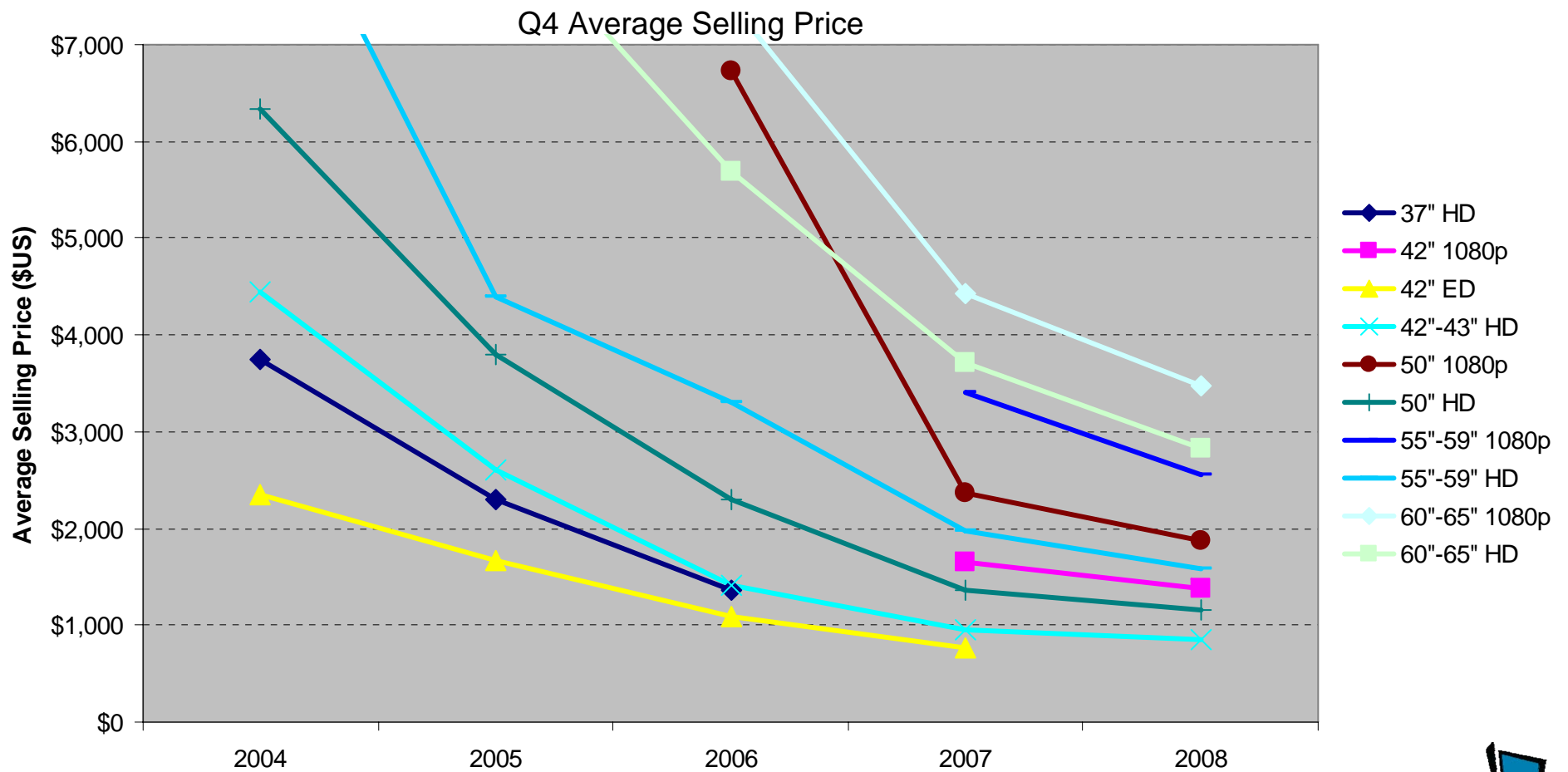
- 42" and 47" prices should remain below 40" and 46" respectively through the forecast. Strong brand power at 40"/46" (Sony and Samsung) helping to keep ASPs higher.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

NA PDP TV ASP Forecast

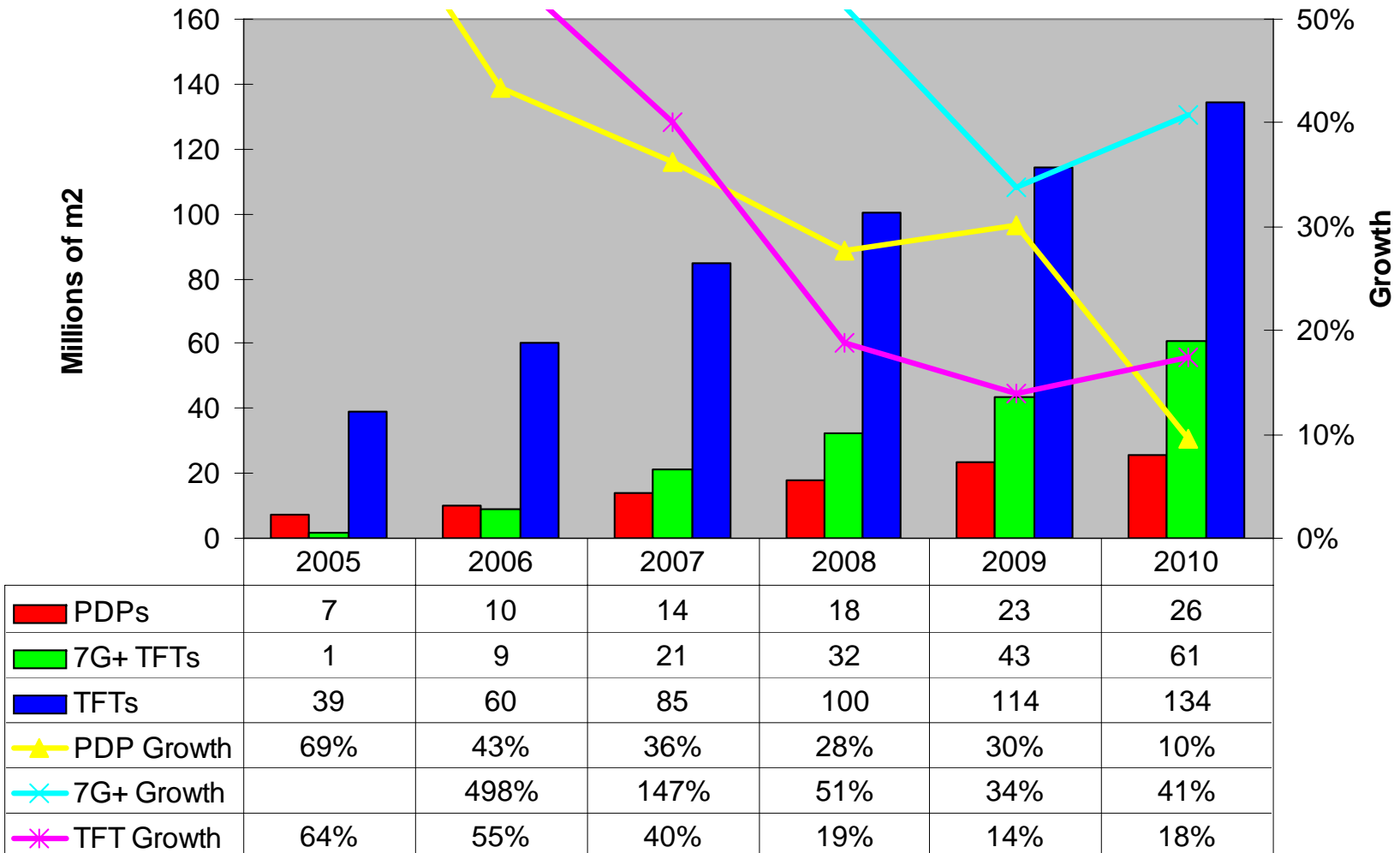
- 37" shipments end in early 2007 as 42" HD prices approached in Q4'06.
- 50" 1080p prices should fall rapidly in 2007 with Q4 pricing falling below \$2400 and below \$2000 in Q4'08.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

TFT and PDP Capacity Growth

- 7G+ TFT LCD capacity to more than double PDP capacity from 2010.



Source: DisplaySearch's Quarterly TFT LCD Supply/Demand and Capital Spending Report

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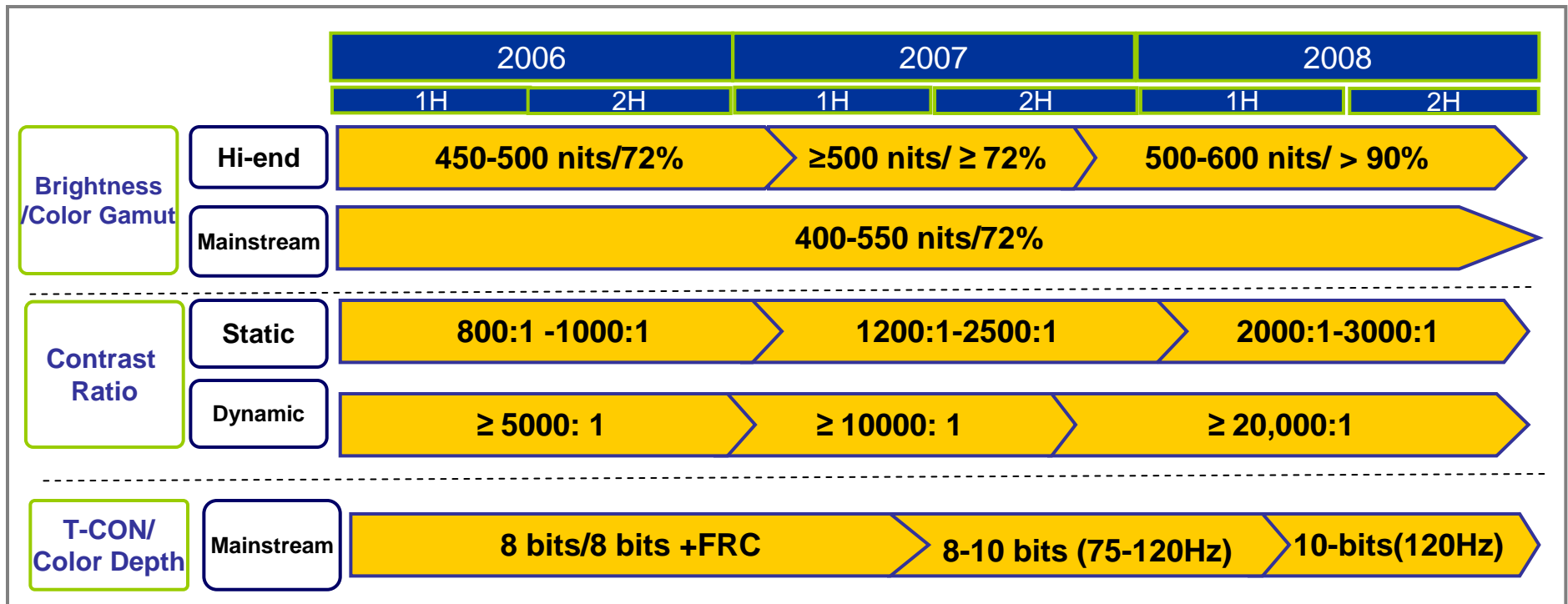
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Plasma Panel Development Trends

	2H'06	1H'07	2H'07	1H'08
1080p	65"+	50"+	42"+	
Luminous Efficiency	2.0 - 2.2 lm/W		2.0 - 2.5lm/W	2.5 - 3.0+ lm/W
Optical Filter	Glass/Film			
Peak/Full White Brightness	1200-1500 cd/m2 180-220 cd/m2			1500-2000 cd/m2 250 - 300 cd/m2
Contrast Ratio Dark/150 lux	4000 – 10,000:1 160:1 -250:1		4000-20000:1 160-350:1	
Gray Scale	12-13 bits		16-bits	
Glass Thickness	1.8mm-2.8mm		1.8mm	

LCD TV Panel Development Trends

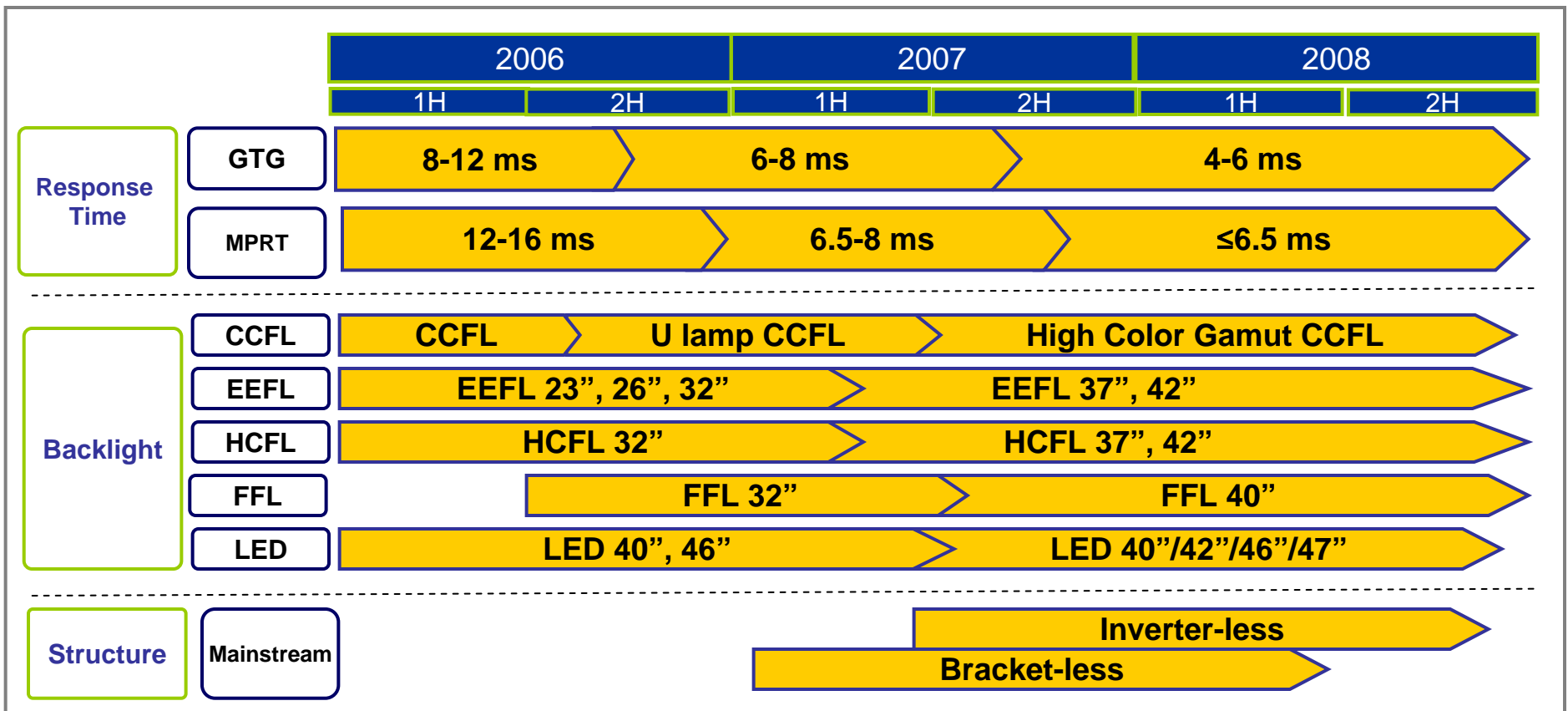
- Brightness, color depth, contrast and gray scale continue to improve.



Source: DisplaySearch's Quarterly Large-area TFT LCD Product Planning Report

LCD TV Panel Development Trends

- Response times have also improved through faster response LC and high speed driving.
- New backlight technologies expanding performance capabilities, but still costly.



CCFL = Cold Cathode Fluorescent Lamp; EEFL = External Electron Fluorescent Lamp FFL = Flat Fluorescent Lamp MPRT= Moving Picture Response Time

Source: DisplaySearch's Quarterly Large-area TFT LCD Product Planning Report

LED Backlights w/ Local Dimming

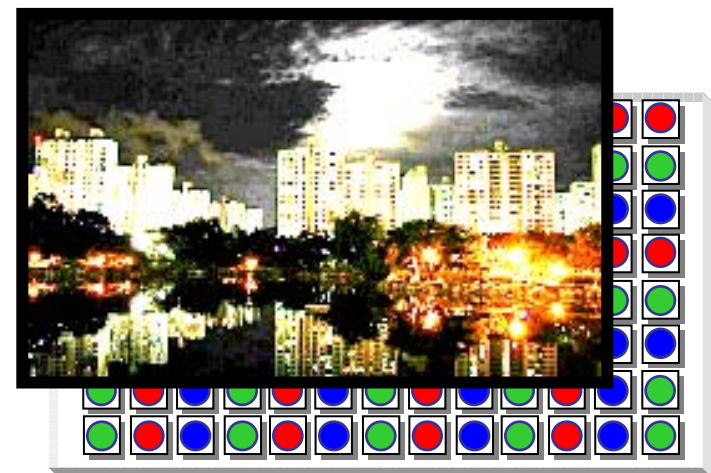
- Ability to modulate LEDs individually can produce deeper blacks, can produce equivalent or better picture window performance of plasma resulting in a picture that really pops. Sunsets, lightning, fireworks look spectacular compared to conventional LCD TVs.

CCFLs



1500:1 (7500:1)

LEDs



>20,000:1

LED Backlight Costs – 42” 1080p, June 2007

- RGB LED backlight unit costs are 400% higher than CCFL-based solutions today. Due to low efficiency, a high number of LEDs plus BEF/DBEF is required.

Light Source	CCFL			RGB LED
	BEFIII	BEFIII+DBEF	DBEF-DTV	BEFIII+DBEF
Film Configuration				
Light Source #	20	18	20	300
Light Source Unit Price	\$1.8	\$1.8	\$1.8	\$1.6
Total Light Source Cost	\$36.0	\$32.4	\$36.0	\$486.0
Light Source Assembly	\$5.2	\$5.0	\$5.2	\$55.0
Reflective Sheet	\$3.1	\$3.1	\$3.1	\$3.1
Diffuser Plate	\$10.8	\$10.8	\$10.8	\$11.8
Diffusion Sheet	\$6.4	\$3.2	\$4.5	\$6.0
Prism Sheet (BEF-III)	\$16.9	\$16.9		\$16.9
DBEF/ DBEF-DTV		\$26.2	\$40.9	\$27.6
Inverter	\$40.5	\$37.8	\$40.5	\$50.0
Bezel & Frame	\$6.5	\$6.5	\$6.5	\$6.5
Others Materials Subtotal	\$19.5	\$19.5	\$19.5	\$45.0
Overhead,SG&A, Package	\$16.0	\$18.0	\$19.0	\$27.0
Total Cost	\$160.9	\$179.4	\$186.0	\$734.9

Source: DisplaySearch's Quarterly Backlight Report

White vs. RGB LEDs

- White is much more efficient than RGB, resulting in fewer LEDs and lower costs. However, it is at the low end of the color gamut requirements. This is why it has gained rapid acceptance in S/M and is gaining acceptance now in NBs and slower acceptance in TVs. But, some panel suppliers are pursuing white as contrast improvements outweigh color gamut.
- Some LED TV programs have been delayed/postponed: CMO 32", CPT 37" and AUO 37".
- DS is currently projecting 7% LED penetration into TVs in 2010, at the high end.

Parameter	RGB	White
Efficiency (lm/W)	30-45	60-80
Color Gamut (NTSC)	>100%	40% - 65%
Color Mixing	Difficult	OK
Adjustable White Point	Yes	No
Control Circuit	Complicated	Simple
Power	>CCFL	<CCFL
Lifetime	>50K	20-40K

Source: DisplaySearch's Quarterly Backlight Report

100/120Hz Driving Roadmap By Panel Makers

- 100/120 Hz 10-bit panels proliferating as panel makers strive for further differentiation supported by HDMI 1.3.

	32" HD	37" HD	37" Full HD	40"/42" HD	40"/42" Full HD	46"/47" HD	46"/47" Full HD	52" Full HD	57" Full HD	65" Full HD
Samsung	Q2'07 (8 bit) Q3'07 (McFi)			Q1'07(10 bits) Q3'07(8 bits) Q3'07(McFi)	Q1'07(10 bit) Q3'07 (10 bit,McFi)	Q3'07(10 bit) Q3'07 (8 bit, McFi)	Q3'07(10 bit) Q3'07 (10 bit, McFi)	Q3'07(10 bit) Q3'07 (10 bit, McFi)	Q3'07(10 bit) Q3'07 (10 bit, McFi)	
LPL	Q2'07 (8 bit+FRC)	Q4'06 (8 bit+FRC)	Q1'07 (8 bit+FRC)	Q4'06(10 bit)	Q2'07(10 bit)		Q2'07(8 bit) Q2'07(10 bit)	Q2'07(10 bit)	Q3'07(10 bit)	
AUO	Q4'06 (8bit)	Q4'06 (8bit)		Q1'07 (8 bit)	Q3'07(10 bit)		Q3'07(10 bit)			Q4'07(10 bit)
CMO	Q1'07 (8 bit)			Q2'07 (8 bit)	Q2'07 (8 bit) Q3'07(10bit)		Q4'07 (8 bit)			
Sharp	Q1'07 (8 bit)	Q3'07 (8 bit)	Q3'07 (8 bit)				Q3'07 (8 bit)	Q3'07 (8 bit)		
CPT		Q2'07 (8 bit)								

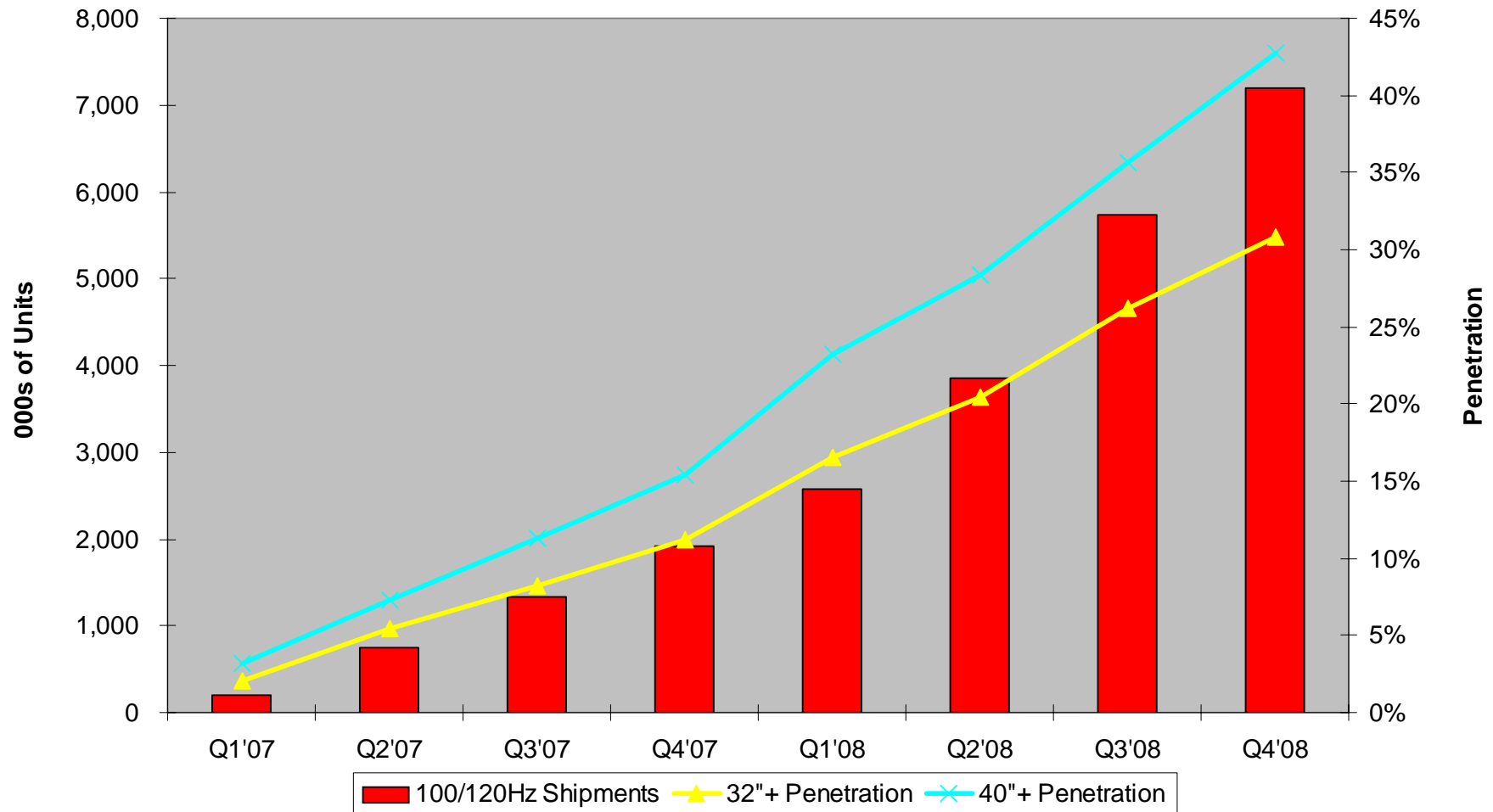
Source: DisplaySearch's Quarterly Large-area TFT LCD Product Planning Report

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100-120Hz LCD TV Panel Forecast – Rapid Growth

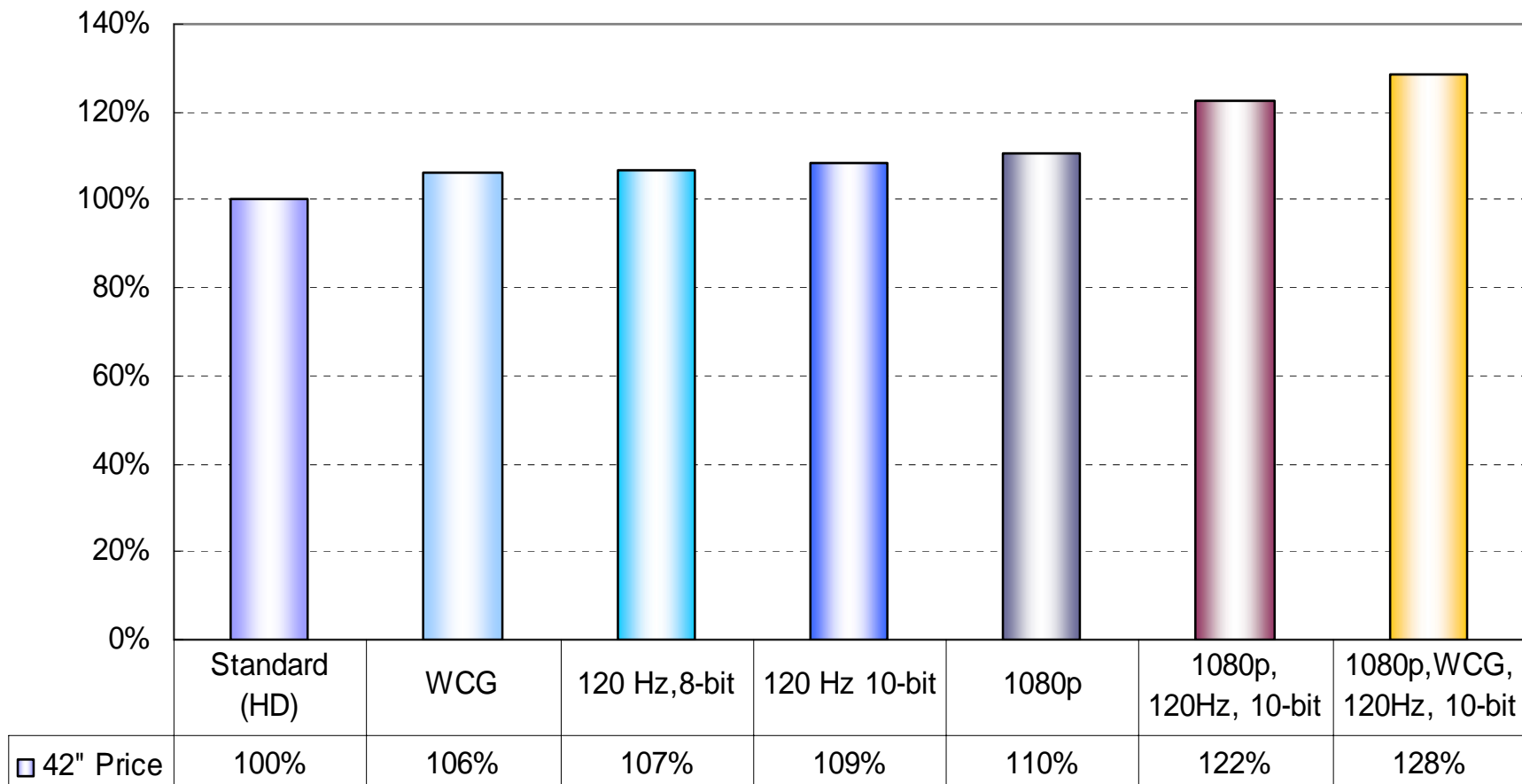
- Rapid growth expected, particularly in Europe where higher frame rates are better understood from CRT experience.
- Some difficulties explaining 120Hz benefit for retailers



Source: Quarterly TV Electronics Report

Benefits of Differentiation

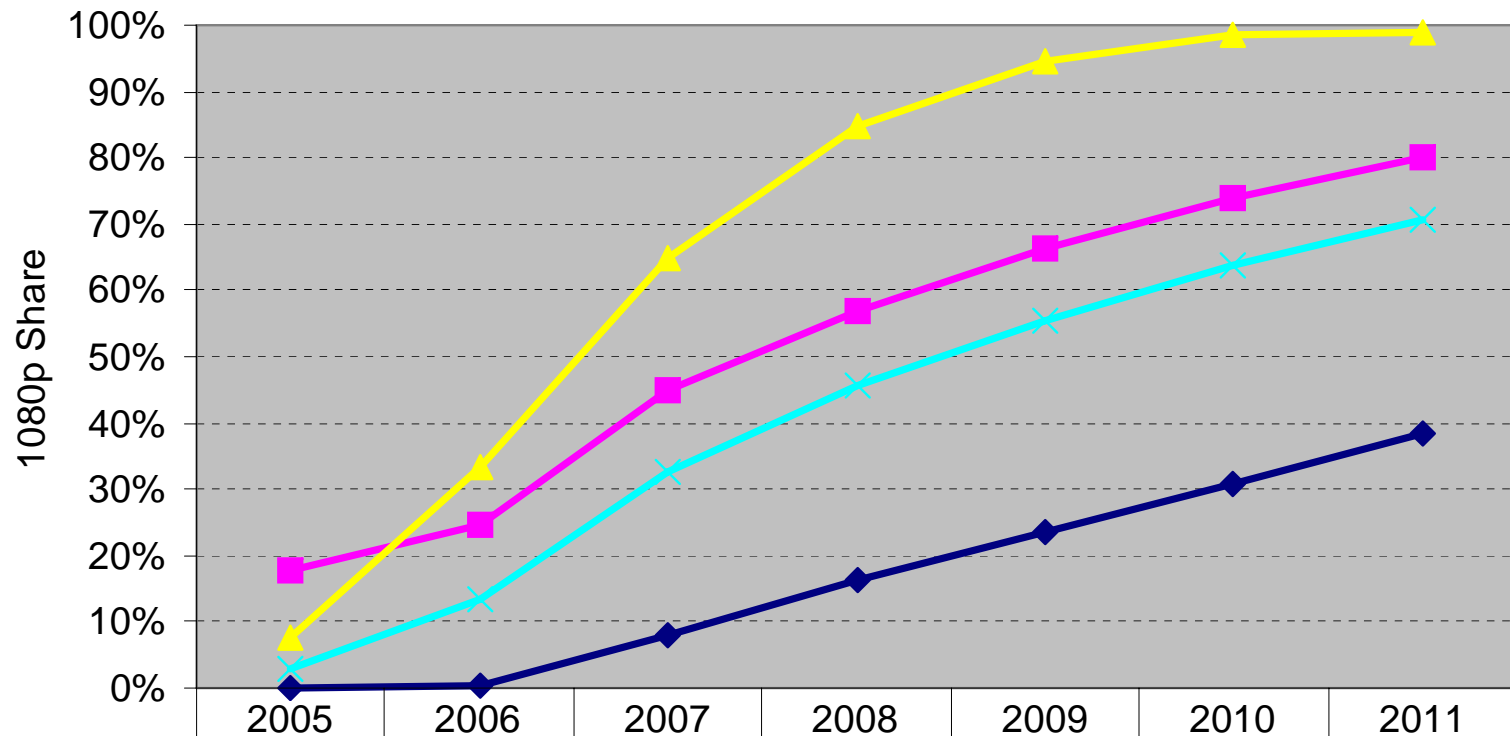
- Enhancing the performance through added features can boost revenue per substrate by as much as 28% as shown below.
- LED backlight panels will carry an even larger premium.



Source: DisplaySearch's Quarterly Large-area TFT LCD Product Planning Report

40"+ 1080p Penetration

- 71% of 40"+ TVs to be 1080p by 2011, growing at an 84% CAGR to 52M sets WW.

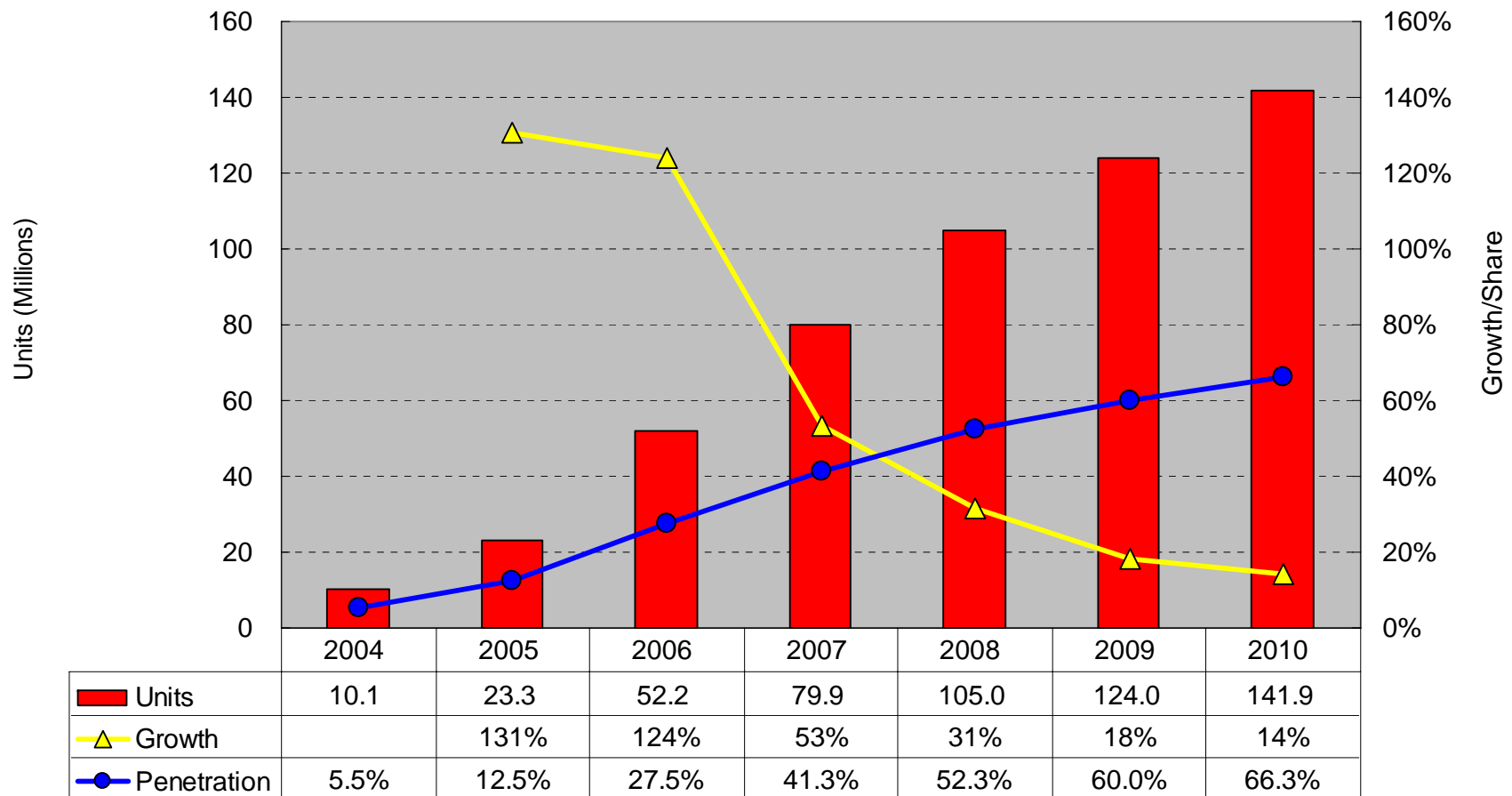


◆ 40"+ PDPs	0%	0%	8%	16%	23%	31%	39%
■ 40"+ LCDs	18%	25%	45%	57%	66%	74%	80%
▲ 40"+ MD RPTVs	8%	33%	65%	85%	94%	99%	99%
✕ All 40"+ TVs	3%	13%	33%	46%	55%	64%	71%

Source: Quarterly Global TV Shipment and Forecast Report

HD Share Growing

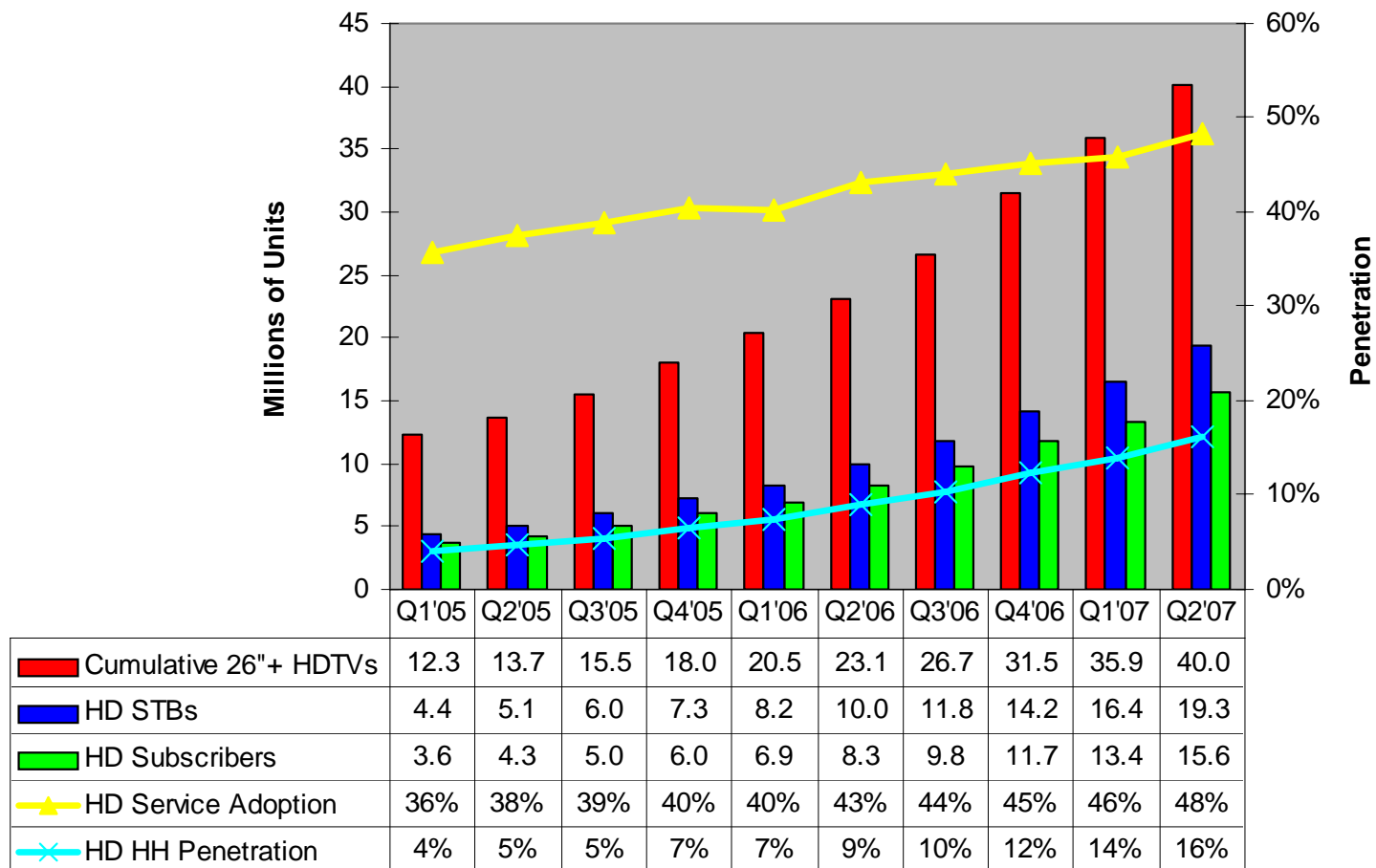
- HD penetration continues to gain momentum as prices fall, reaching 2/3 of unit shipments by 2010.
- High CRT share and lack of HD infrastructure in developing markets primary impediment to quicker adoption.



Source: DisplaySearch Q2'07 Global TV Shipment and Forecast Report

Majority of HDTVs Still Not Getting HD Service

- At the end of March, there were 13.4M HD subscriber households in the USA, accounting for 14% of all multi-channel households. 46% of 26"+ HDTVs are receiving HD service. There is still a tremendous opportunity for service providers to upgrade more than half of all HDTVs to receiving HD service.



Source: DisplaySearch's Weekly TV Supply Chain Report

Summary

- TV market continues to grow on a unit basis, but price declines threaten future revenue growth as new technologies start to saturate markets.
- Flat panels and HD continue to grow rapidly driving blended ASPs higher in the near term even as individual sizes/resolutions fall rapidly. Blended prices start to decline from 2009.
- North America should remain the largest market worldwide for TV revenues owing to greater acceptance of larger screen sizes. Critical region for PDP and RPTV brands.
- LCDs now dominate global TV revenue dollars and should overtake CRT on a unit basis by 2008 while PDP will rule at 50"+
- FPD ASP erosion was severe during 2H'06, significantly impacting channel margins, but should ease during 2007 at <40" sizes where supply tightens during 2H'07. Large sizes and PDP continue to have better availability and prices should continue to decline.
- New PDP and LCD technology improvements should help improve cost reductions, improve performance and offer more value to support retail ASPs, though margins will still gradually decline.
- While HDTV penetration is increasing along with programming, there is still a significant opportunity for HD service providers with HD service adoption among HDTV owners still less than 50%.

Thank You

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