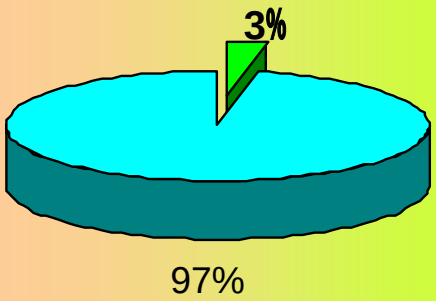
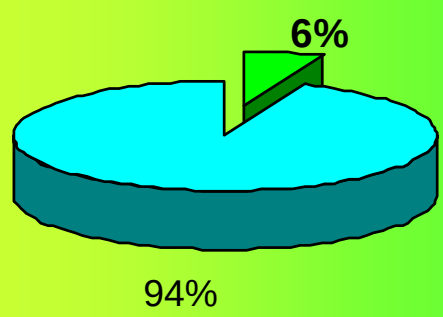
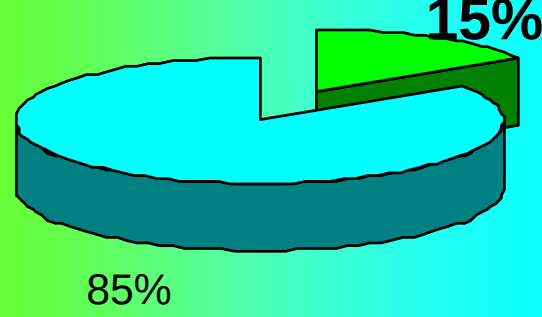
Joint Development of Ultra-Bright, Inorganic EL Light-Emitting Materials

November 2, 2005

KURARAY CO., LTD.

Sales Trends of Display-related Products

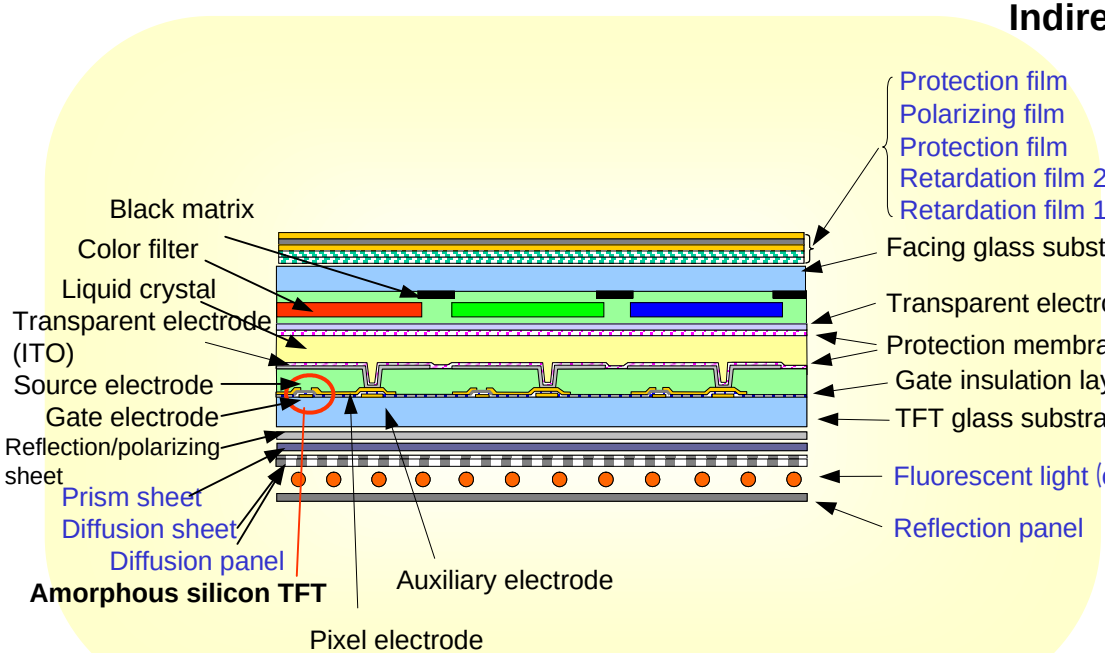
(Kuraray (standalone))

	FY1994	FY1999	FY2004
Sales Ratio			
Core products for display-related areas	・Rear-projection TV screens (Fresnel lens and a lenticular lens)	・Rear-projection TV screens (Fresnel lens and a lenticular lens) ・Films for polarizing plate	・Rear-projection TV screens (Fresnel lens and a lenticular lens) ・Films for polarizing films ・Pellets for light guide plates

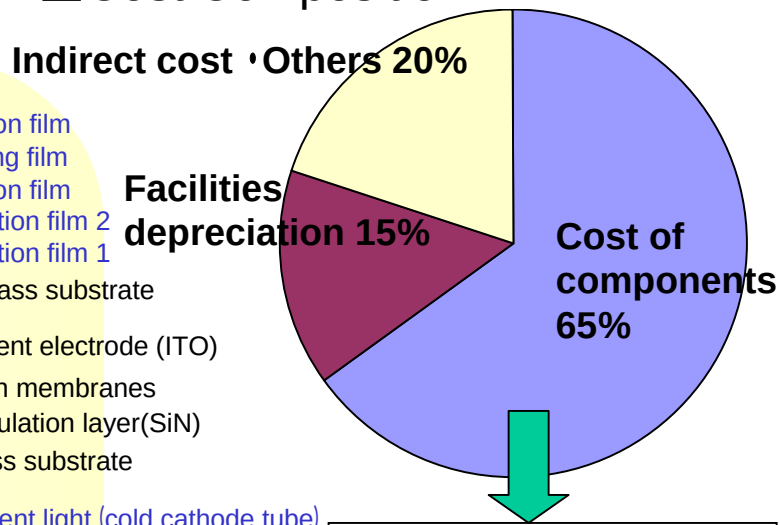
Display-related products positioned as the priority business area;
Concentrated R&D activity at Optical Device R&D Center

Structure of Liquid Crystal Display (LCD) and Cost Composition

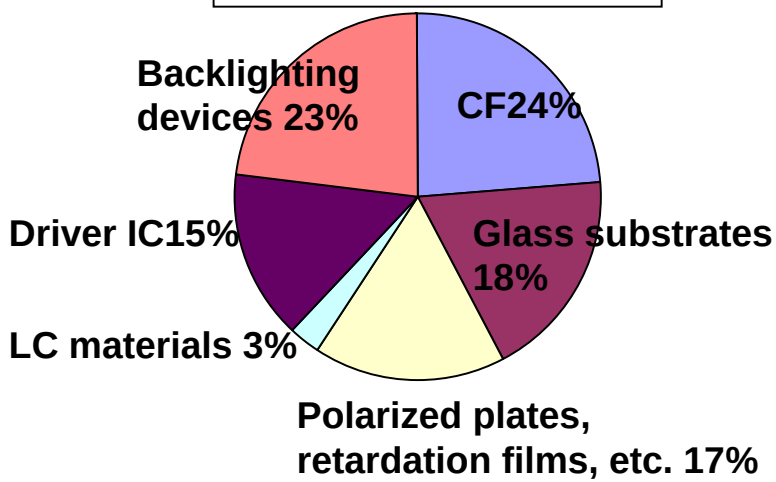
■ LCD Structure



■ Cost Composition

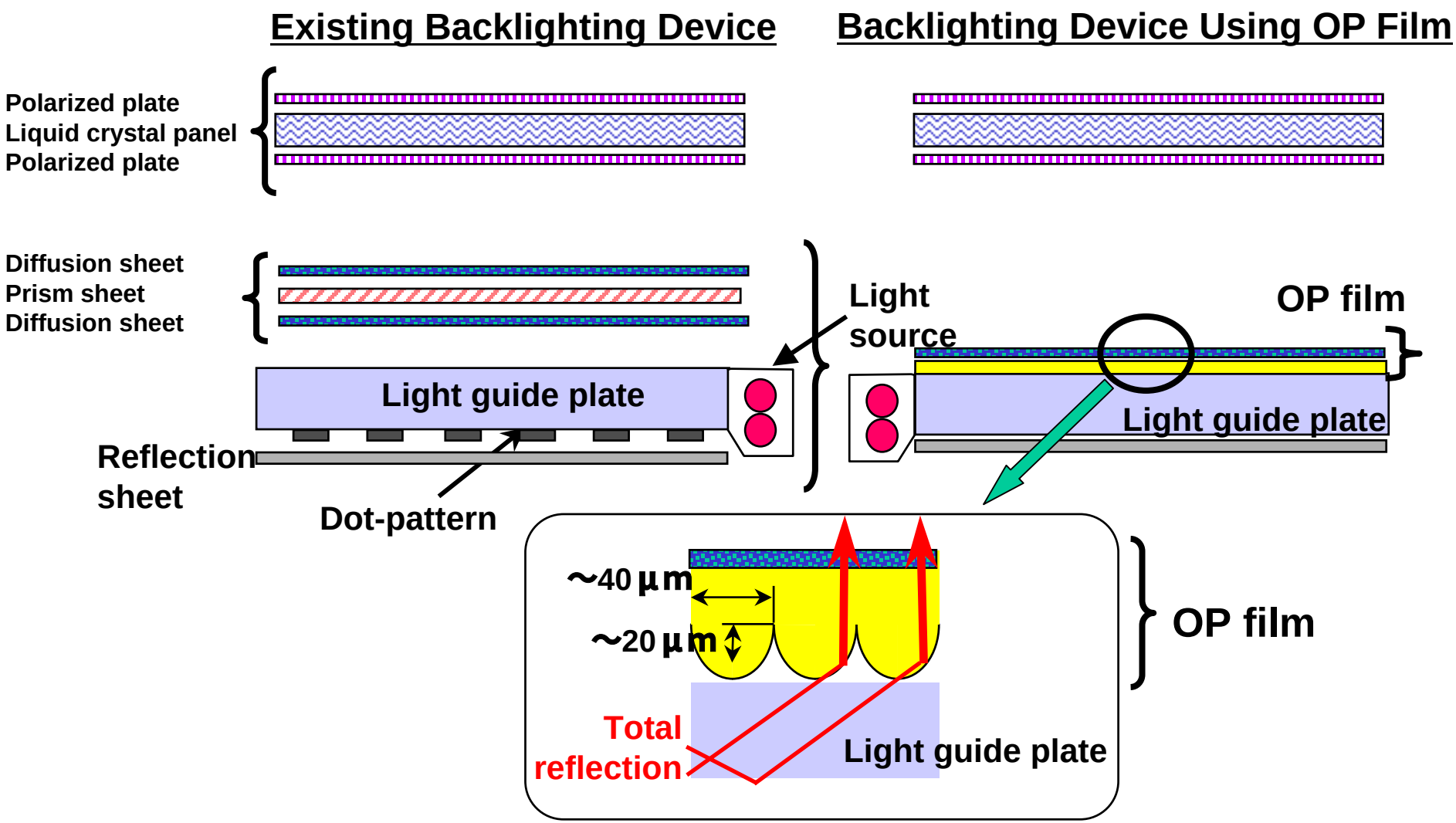


Breakdown of cost of components (TFT)

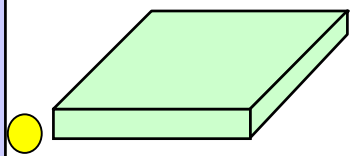
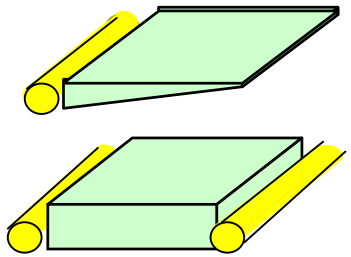
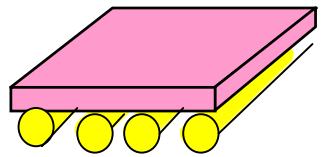


Reduction of ancillary components and shortening of production process are key to cost reduction.
Development of ways to reduce production costs of backlighting devices is particularly slow.

Comparison of Structure of Backlighting Device Using Light Guide



Development of Light Guide Backlighting Device

Type	Edge light type		Back light type	Area emission
Shape				
Structure	**LED (Point light source) + OP light guide**	**Cold cathode tube (linear light source) + OP light guide**	**Cold cathode tube (linear light source) + Diffusion panel**	**EL (Area emission)**
Properties	**Thin. Low power consumption**	**Thin.**	**High brightness**	**Ultra-thin. Low power consumption. Enables components integration.**
Application (Size)	**Cellular phones/PDAs (2”〜5”)**	**Monitors (10”〜20”)**	**TVs (20”+)**	**All purposes (all sizes)**

Research Subject

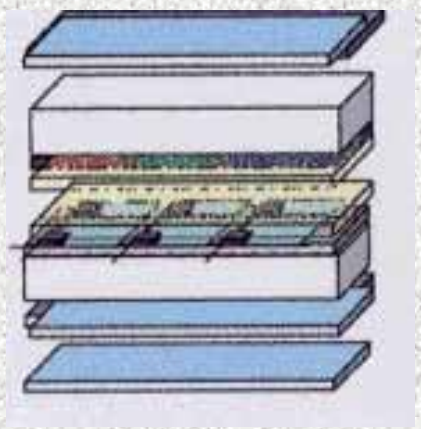
TRADIM(Major project by METI)

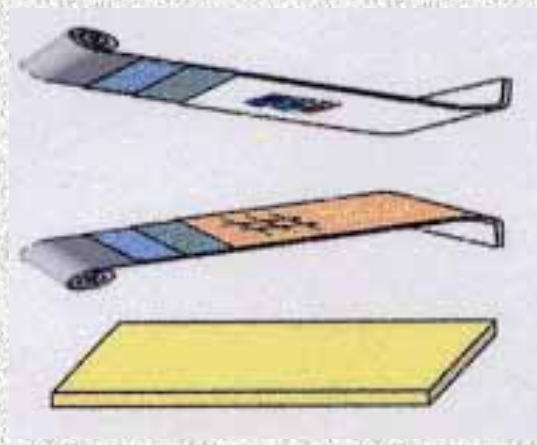
Establish roll-to-roll production process technologies to simplify components of liquid crystal panels

Current:
liquid crystal using glass substrate
(30 layers/components)

liquid crystal using plastic film substrate
(3 components)

Polarizing film
Retardation plate
Glass substrate
Color filter
Orientation film
TFT circuit
Reflection coating
Glass substrate
Retardation plate
Polarizing film
Backlight





Liquid crystal using plastic film substrate



Thin, light and flexible

What is Electroluminescence (EL)?

>EL is a material which emits light when an electric current is passed through it (same as light-emitting mechanism of a firefly) .

>In EL devices, light-emitting material is either vapor deposited or printed thinly on electrodes placed on glass substrates (simple structure) .

>EL is self luminescent, bright, low energy consumption, high response speed, and environmentally friendly with no use of mercury.

>Flexible displays can be produced by using plastic substrates.

>Unlike light-emitting diode (LED), EL emits light by area emission and therefore is able to light a large area.

Display

Lighting

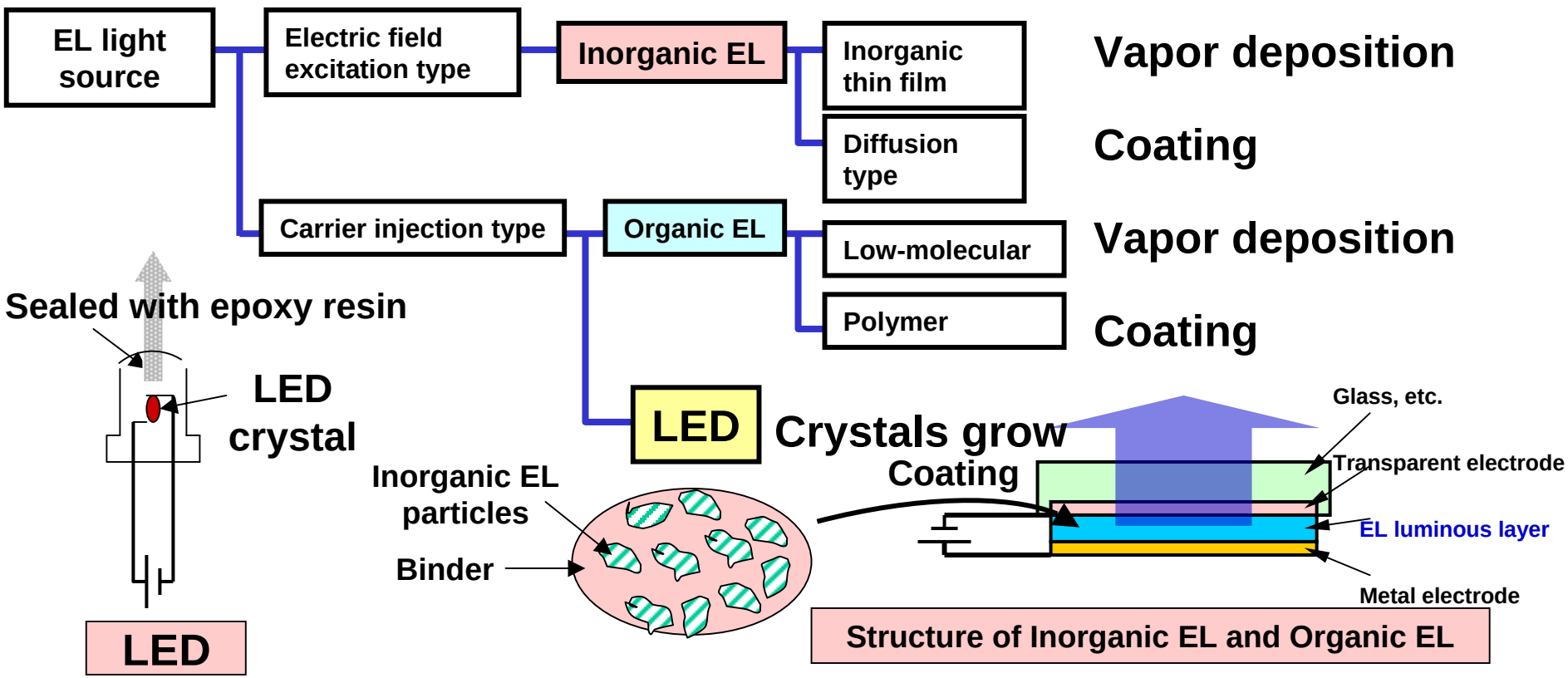
… if high brightness and long lifetime are achieved.

Types of Electroluminescence (EL)

- EL emits light by area emission, which enables high resolution, production of thinner panels, low power consumption, and high response speed.

LED emits light by point light sources **(blue light-emitting material produced in single crystal: Difficult to make large-sized panels). Notable example: Nichia's blue LEDs**

Inorganic ＥＬ, LED (metal compound) , Organic EL (organic compound)



Challenges in Development of Electroluminescence (EL)

- Current big technological challenges: Brightness and lifetime (in blue EL materials in particular)
  - **Inorganic EL：Low brightness (1,000cd/m2 or less); Shortage in capability of emitting blue light; Needs high voltage (＞100V).**
  - **Organic EL：Short life (tends to deteriorate easily because of its organic property); Weak capability of emitting blue light; High production cost.**

The ultimate light source *IF* the problems of low brightness and short lifetime (i.e. the "trade-off" relationship where raising brightness shortens lifetime) are solved.

Current Properties of Display by Type

		Cathode Ray Tube	Liquid Crystal Display	Plasma Display Panel	Electroluminescence (EL)	
		CRT	LCD	PDP	Inorganic EL	Organic EL
Image Quality	Brightness	○	△	△	×	△
	Viewing angle	◎	△	○	◎	
	Moving image	◎	△	○	◎	
Application to flat-panel TVs/displays		×	○	△	◎	
Power consumption		×	△	△	○	
Product lifetime		◎	○	△	◎	△

Position of Ultra-bright “Blue Inorganic EL”

T. CHATANI & CO., LTD. invented ultra-bright, inorganic EL light emitting materials ➡ Joint development with Kuraray Co., Ltd.

	Brightness (cd/m^3)	Lifetime (hours)
Ultra-bright, inorganic EL material	350,000	25,000+
Inorganic EL	100	30,000
Organic EL (low-molecular type)	1,000	10,000

- Emits light at low voltage (5～6V:) ➡ Works on batteries
- Ultra-bright with low heat generation ➡ Long lifetime
- Method employing coating enables production of large-area light sources. ➡ Low production cost
- High stability against air and humidity ➡ Ease of handling (production)

T. CHATANI & CO., LTD.
Corporate Data

- **T. CHATANI & CO., LTD. (Headquarters: Chuo-ku, Osaka)**
  - **Established 1937**
  - **Capital ¥300 million (Unlisted)**
  - **Financial results (FY2004) Net sales: ¥66 billion, Ordinary income: ¥280 million**
  - **Business: Export, import and domestic trade of automobiles, industrial machinery & equipment, tires and other industrial and household goods.**

Manufacture and sales of backlighting devices (toll manufacturing)

Ultra-Bright Inorganic EL/Targeted Applications

Light sources for displays (¥1 trillion)

- LCD backlighting devices (firstly to be used as light source for "MIRABRIGHT")
- Emergency lights, traffic signs

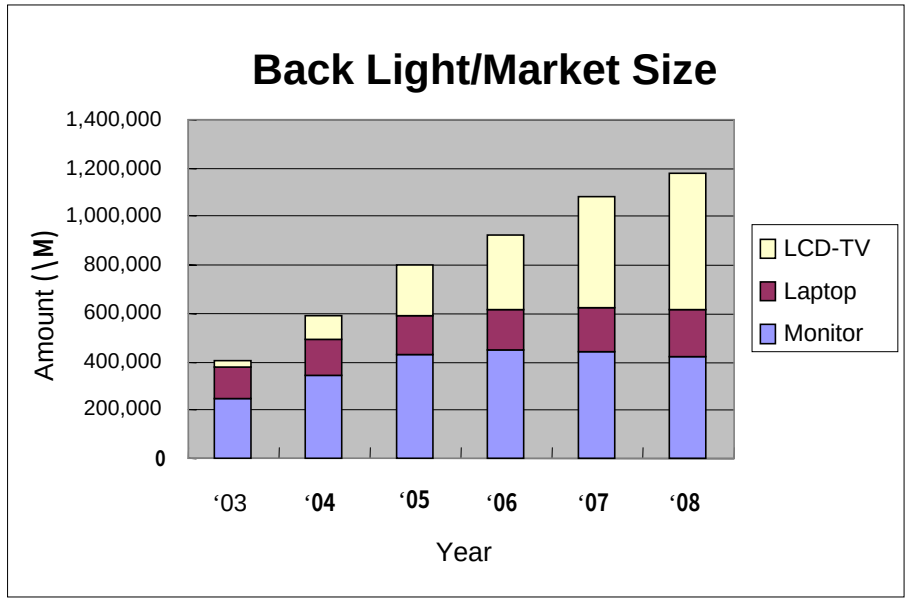
Lamps (¥4 trillion)

- Traffic lights, car headlamps, commercial illumination
- Alternatives to incandescent lamps and fluorescent tubes

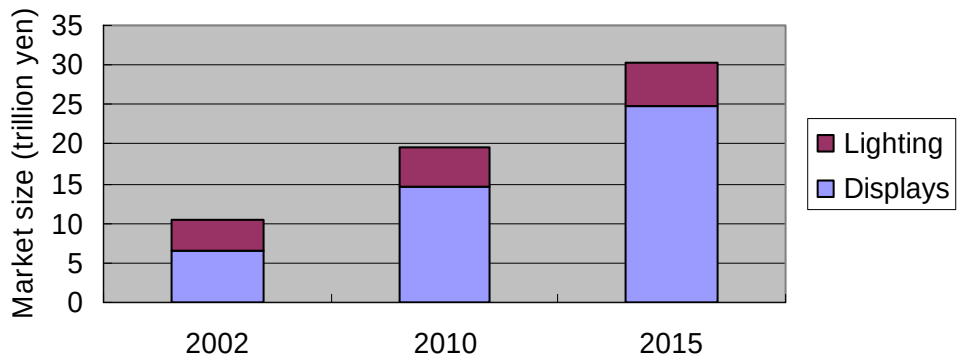
Displays (¥10 trillion)

- TVs
- Advertising billboards

High brightness needed in large panels and lighting.



Market Size of Displays and Lighting



Figures in ( ) are estimated global market sizes for 2008.

Sources: Techno Systems Research Co., Ltd.(04/4), OITDA(04/11)