



# AMOLED device history and materials market analysis and development trends

**Kihyun Kim**, Senior Analyst

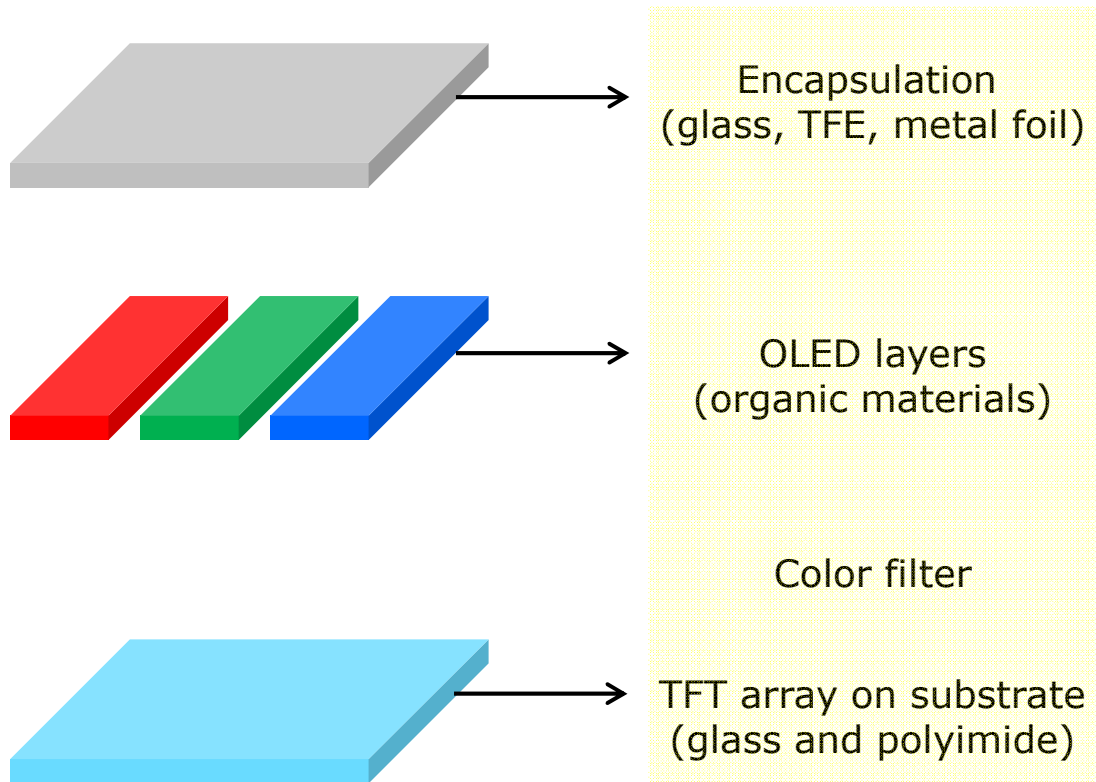
## Contents

- ***AMOLED device analysis by Korean panel makers***
- ***AMOLED materials market analysis***
- ***Light-emitting materials development trends***

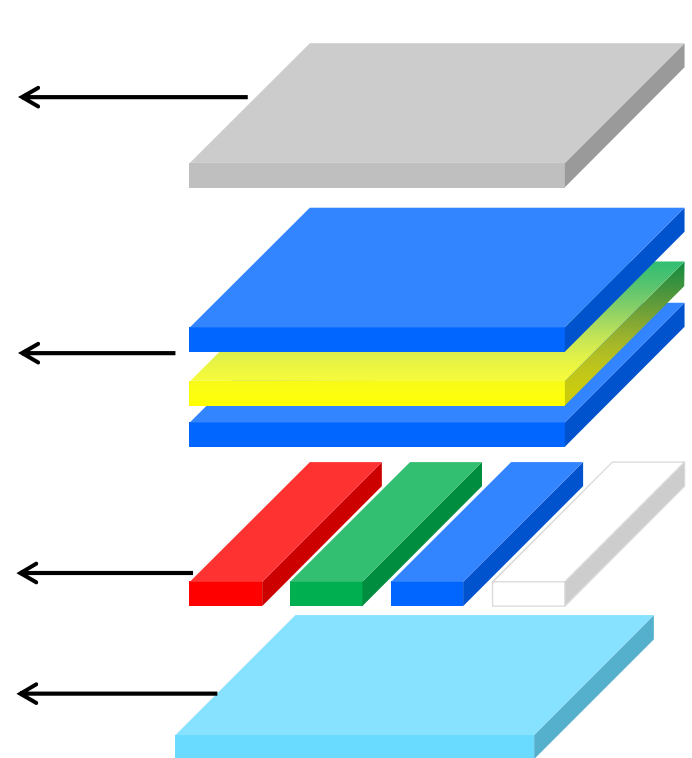
# AMOLED device analysis

# Composition of AMOLED

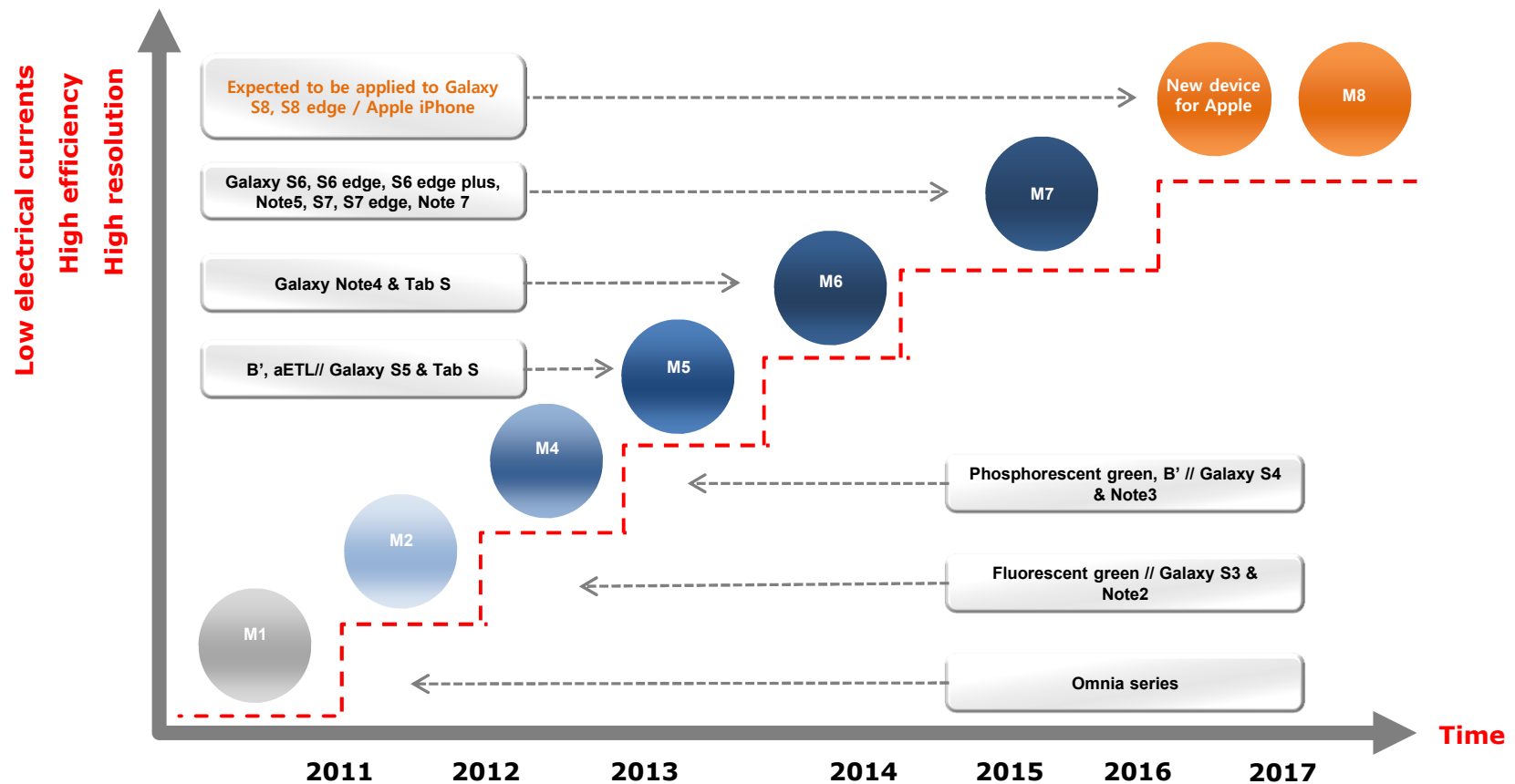
- Small- and medium-sized



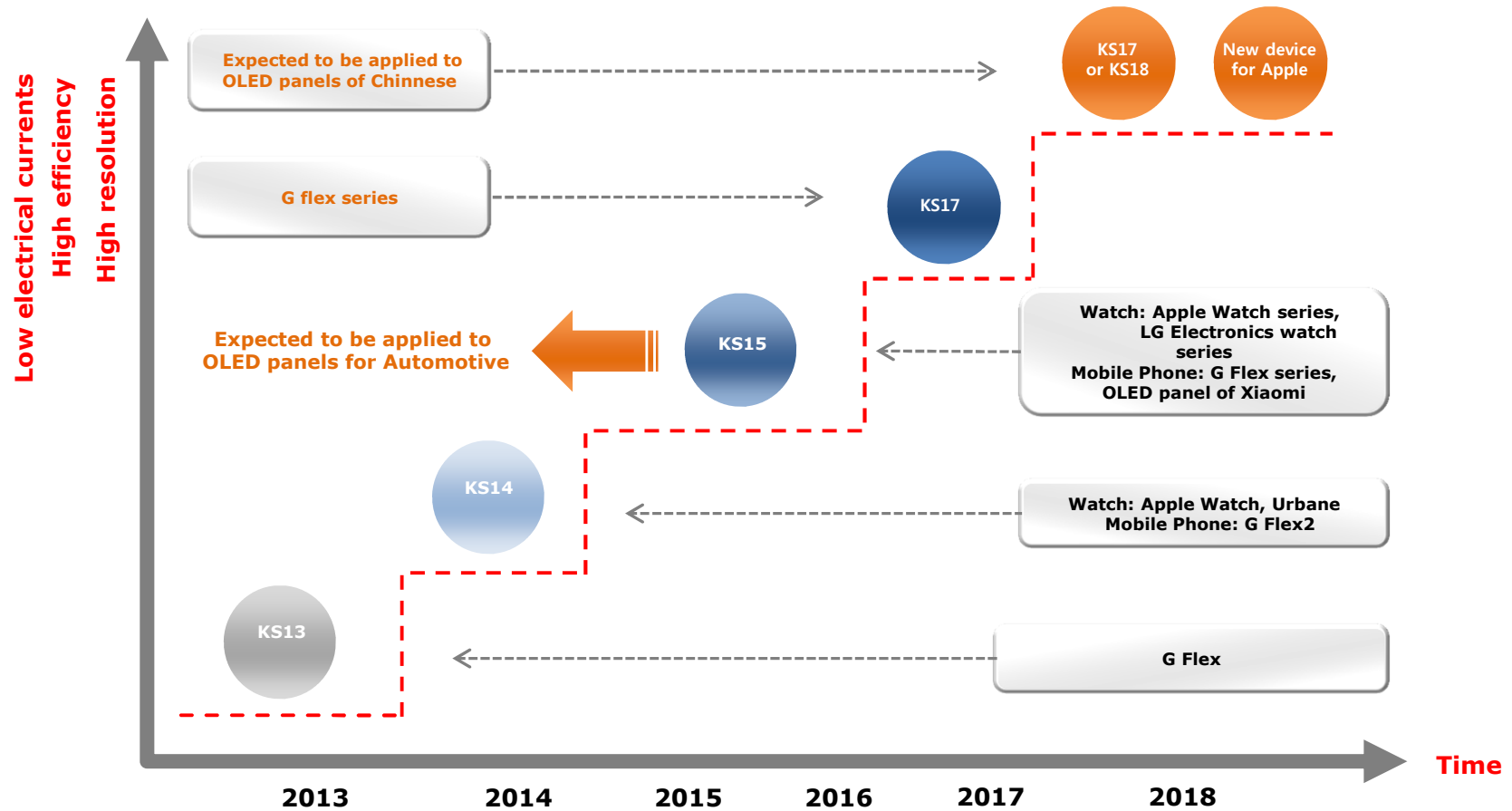
- Large-sized (White OLED)



# Development in Samsung Display's OLED display devices

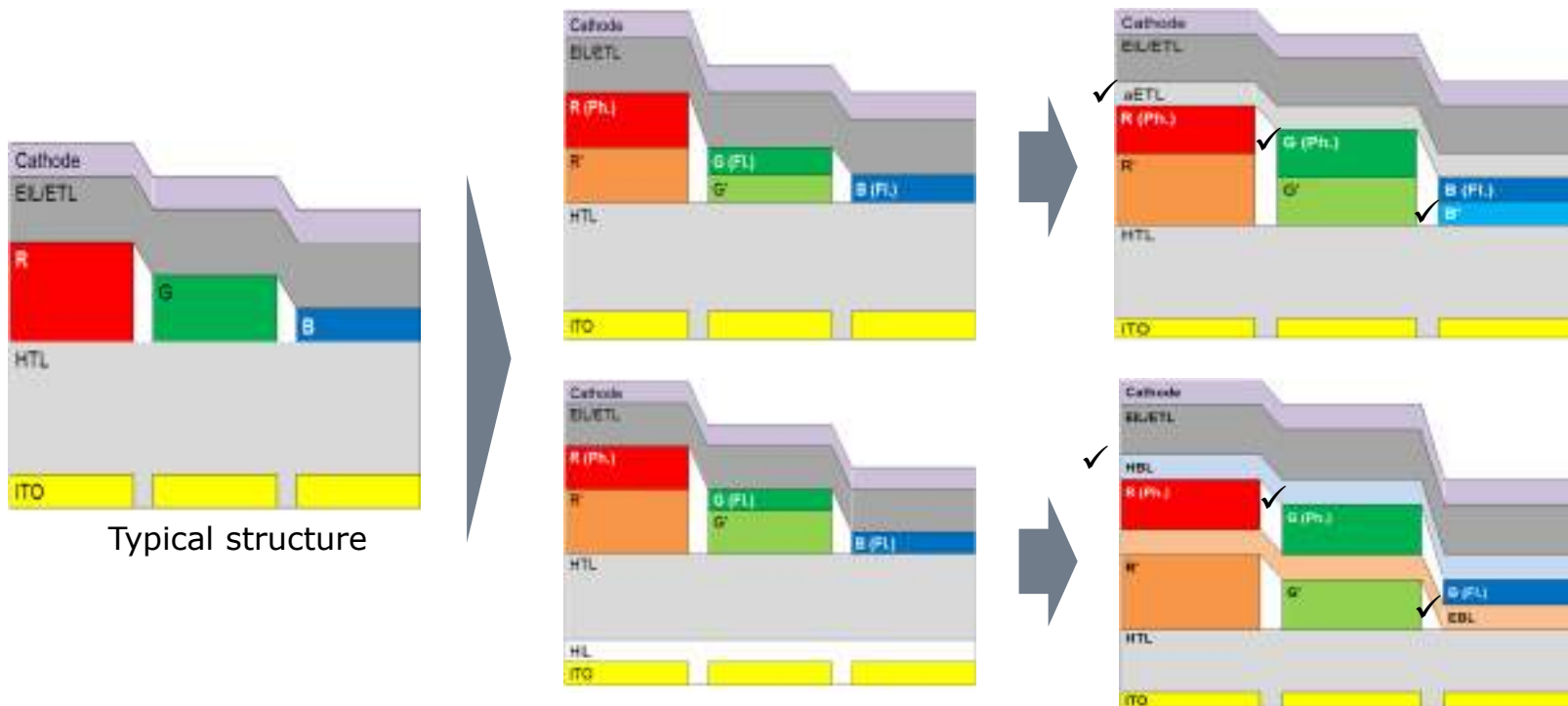


# Development in LG Display's OLED display devices

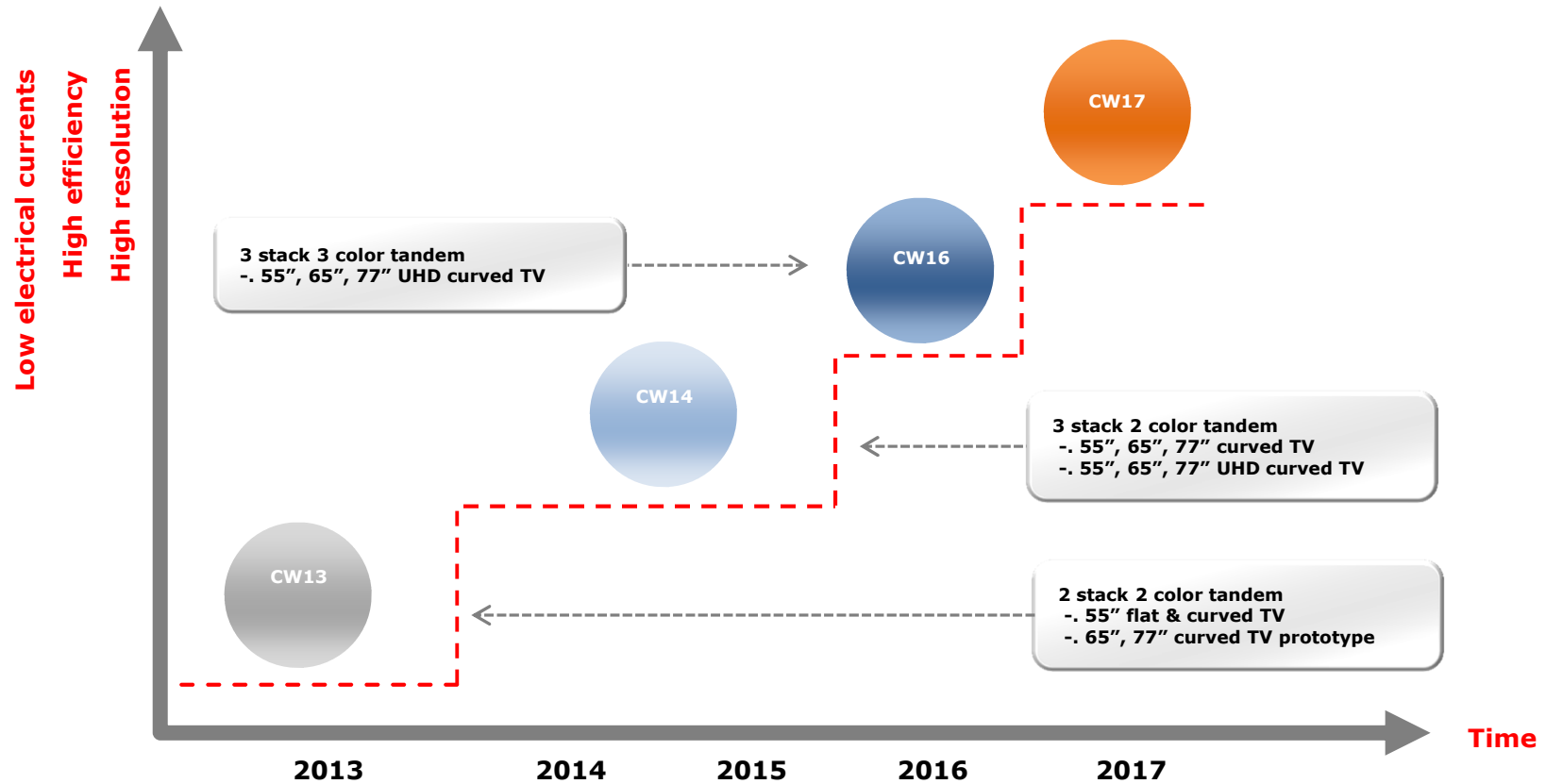


## Small- and medium-sized device of Korean panel makers

- Development in the structure of FMM RGB type AMOLED display of Samsung Display and LG Display
- Use various functional layers for optimized AMOLED devices to improve efficiency and lifespan



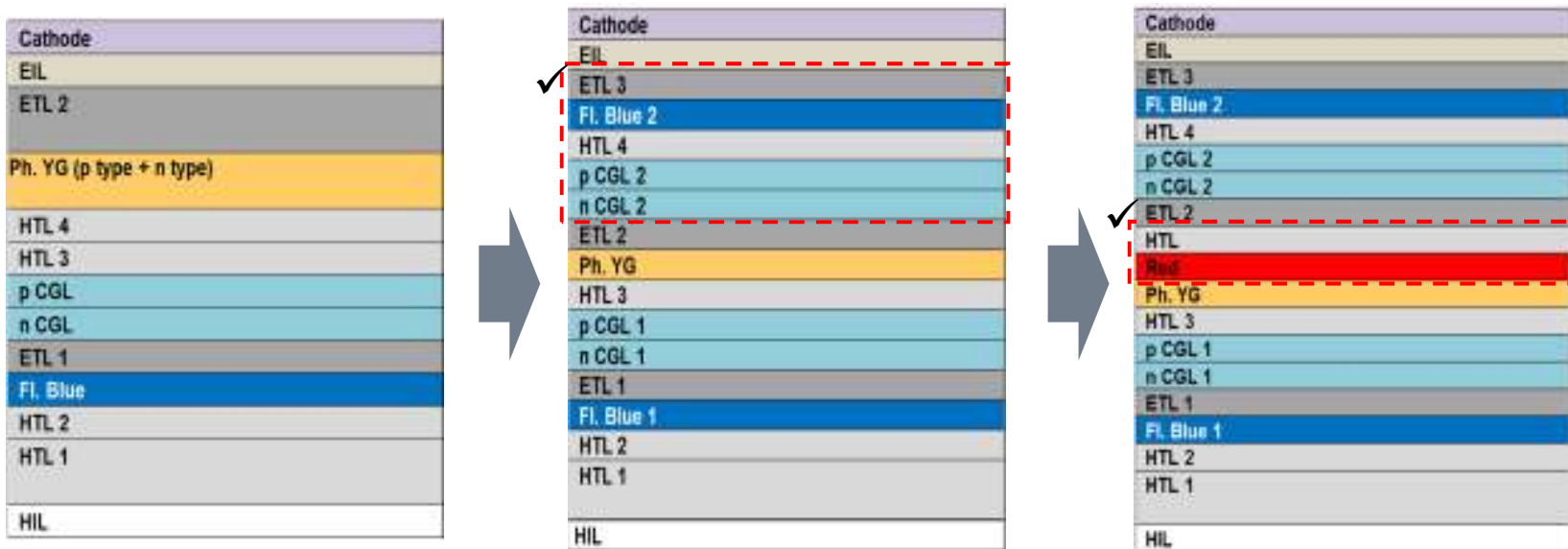
# Development in LG Display's WOELD display devices





## Large-sized device of Korean panel maker

- A **blue stack** is added to improve the efficiency of blue color.
- **Red host** is added to improve white color purity.

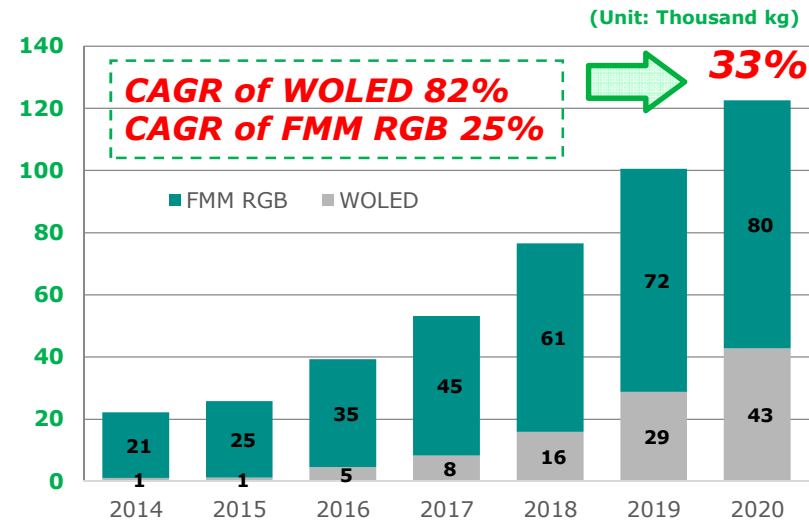


# AMOLED market analysis

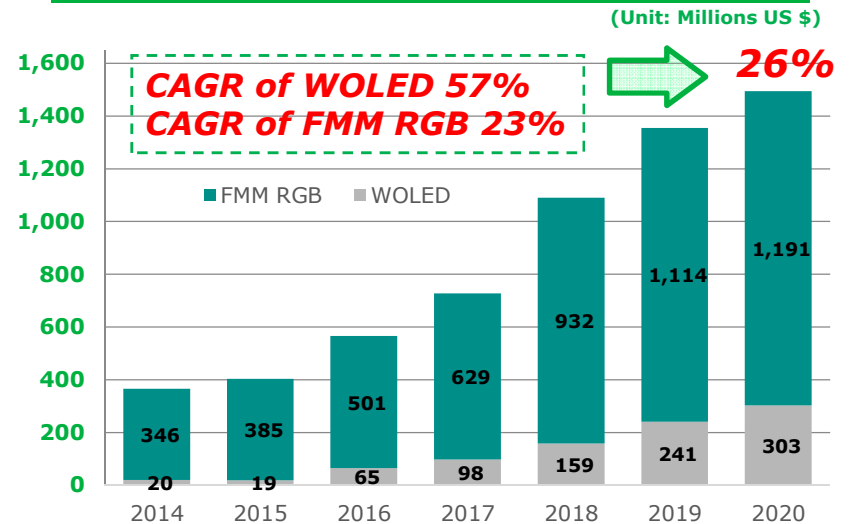
# Materials demand for AMOLED

- New major set makers
- Mass production by Chinese panel makers
- Materials cost down
- Recycling and increased consumption to lead to cost reduction in materials

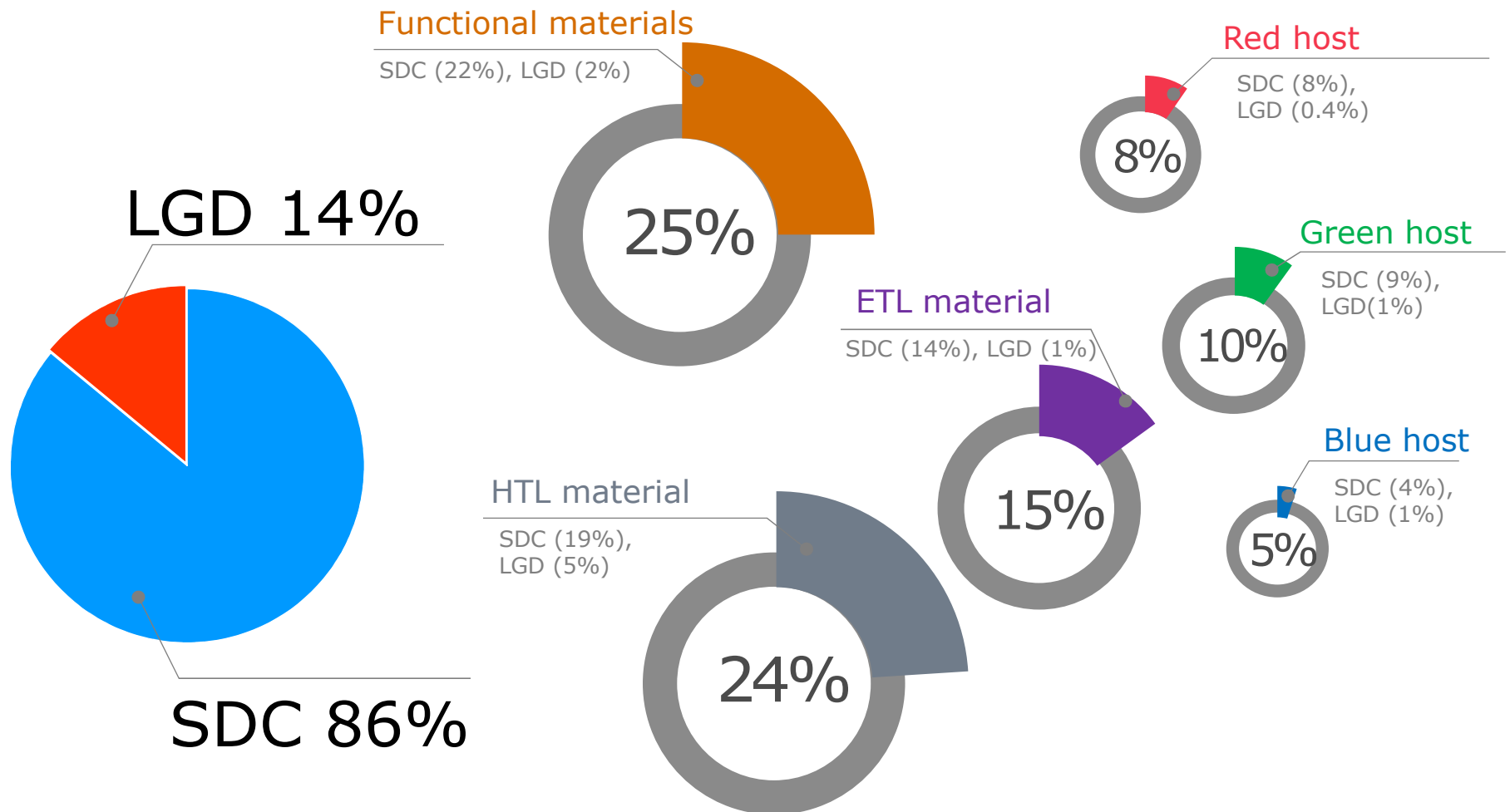
## FMM & WOLED materials consumption forecast



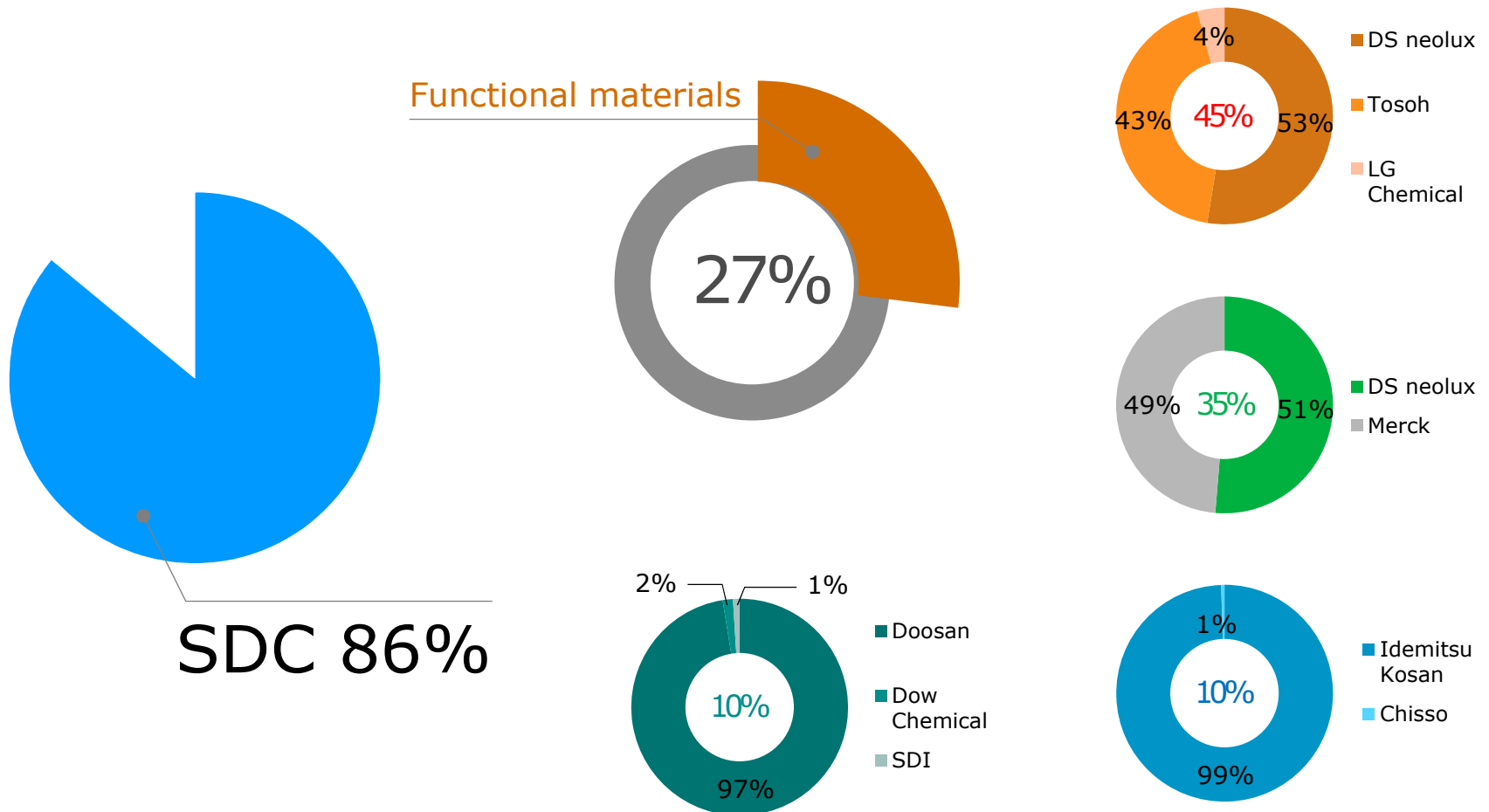
## FMM & WOLED materials revenue forecast



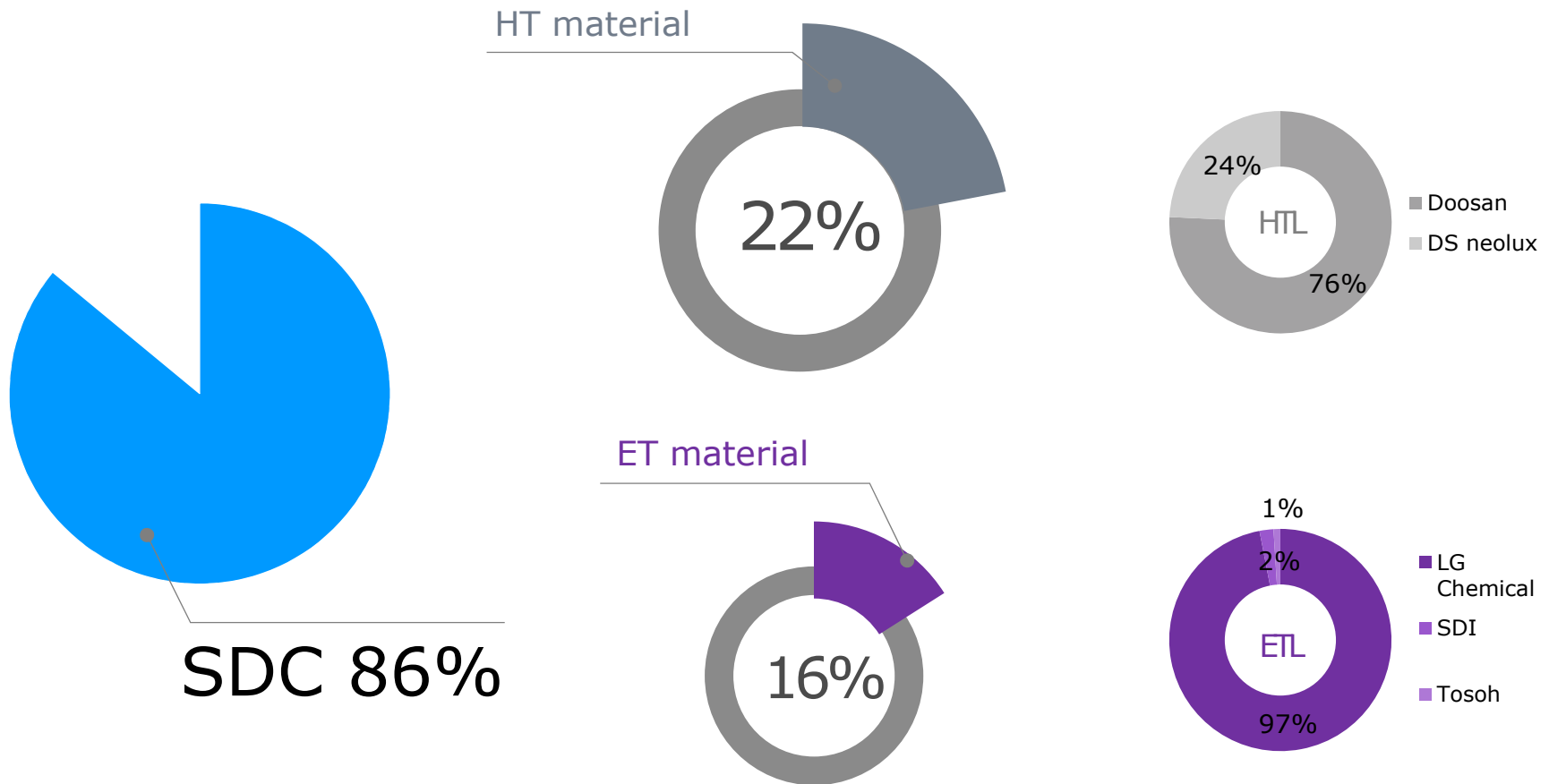
# Consumption of light-emitting materials by Korean panel makers



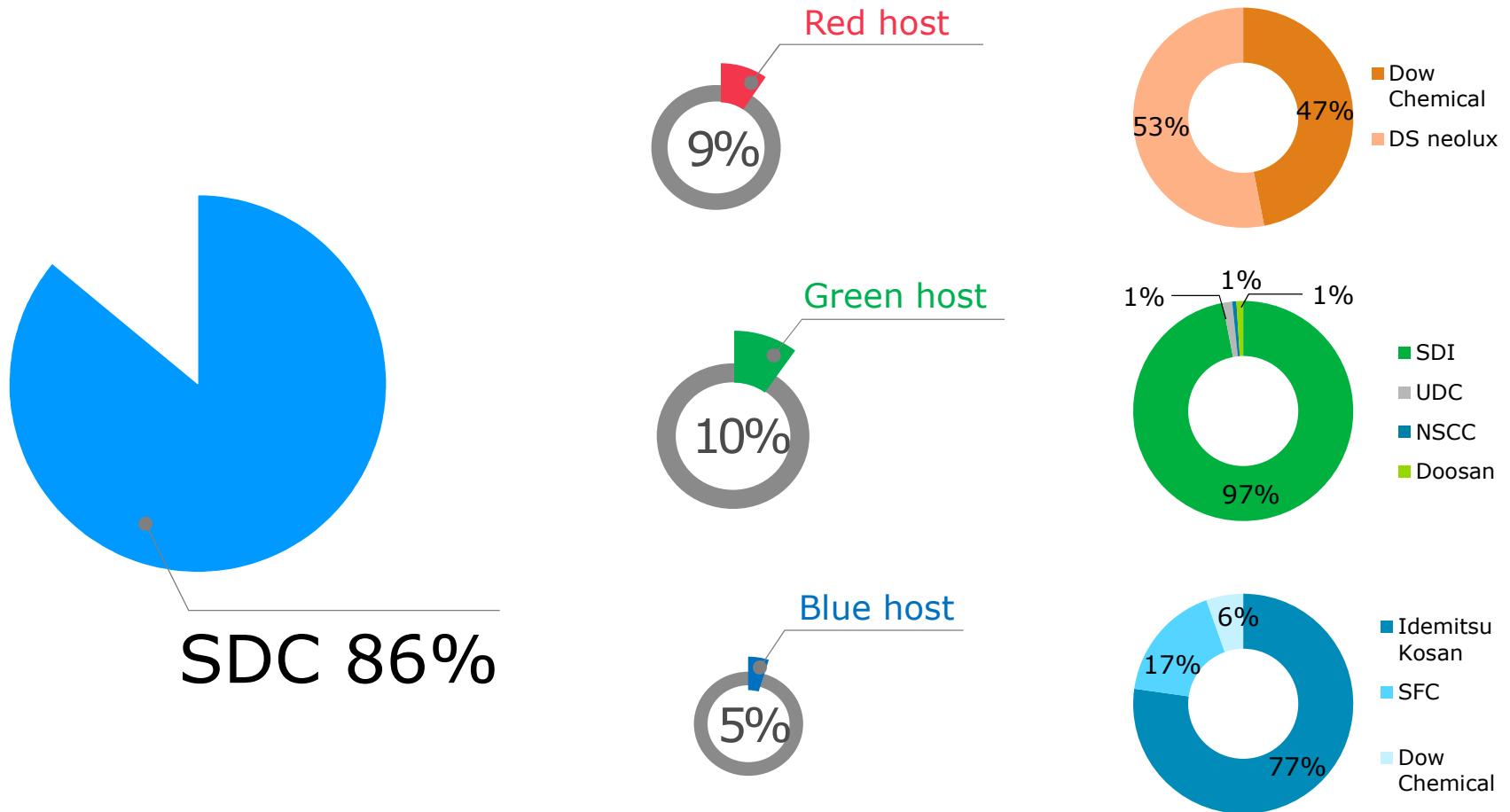
# Consumption of light-emitting materials by Samsung display



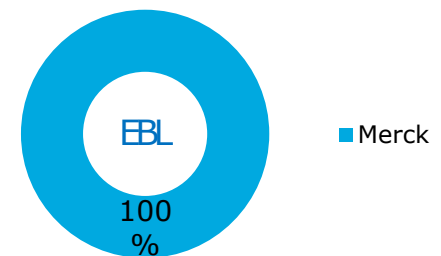
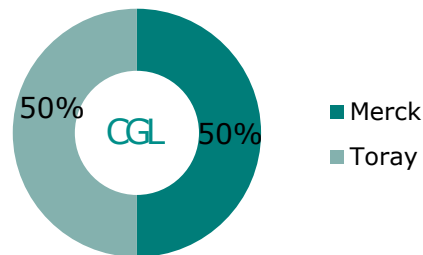
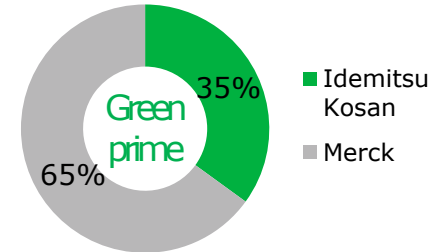
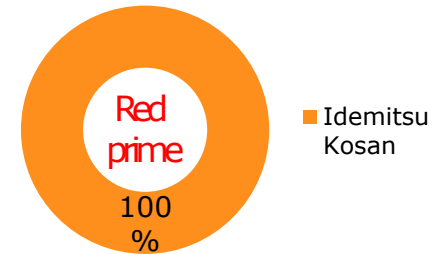
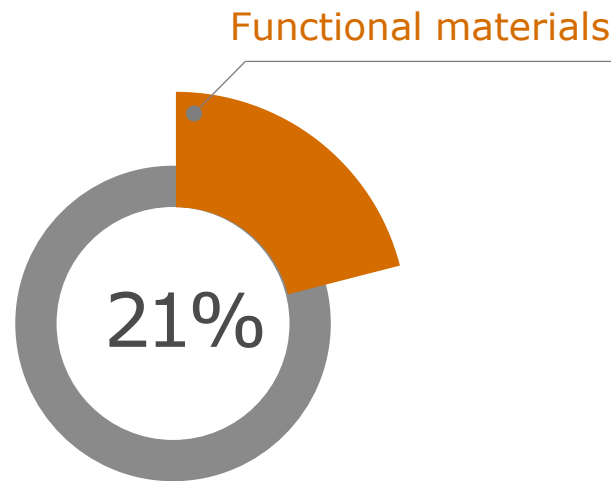
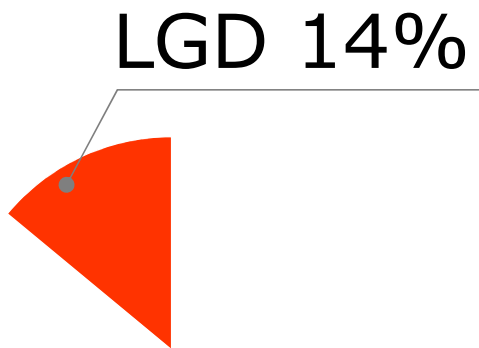
# Consumption of light-emitting materials by Samsung display



# Consumption of light-emitting materials by Samsung display

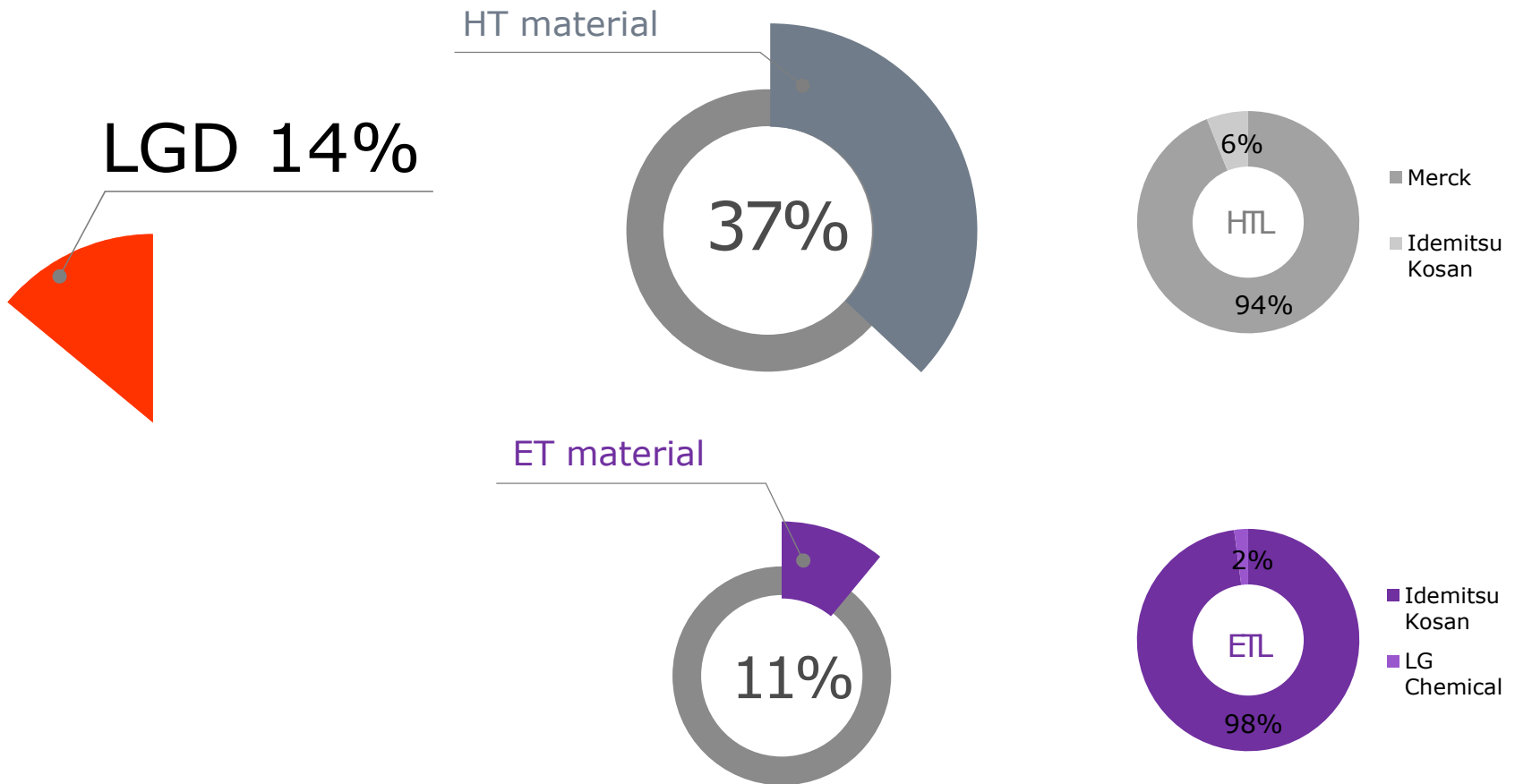


# Consumption of light-emitting materials by LG display

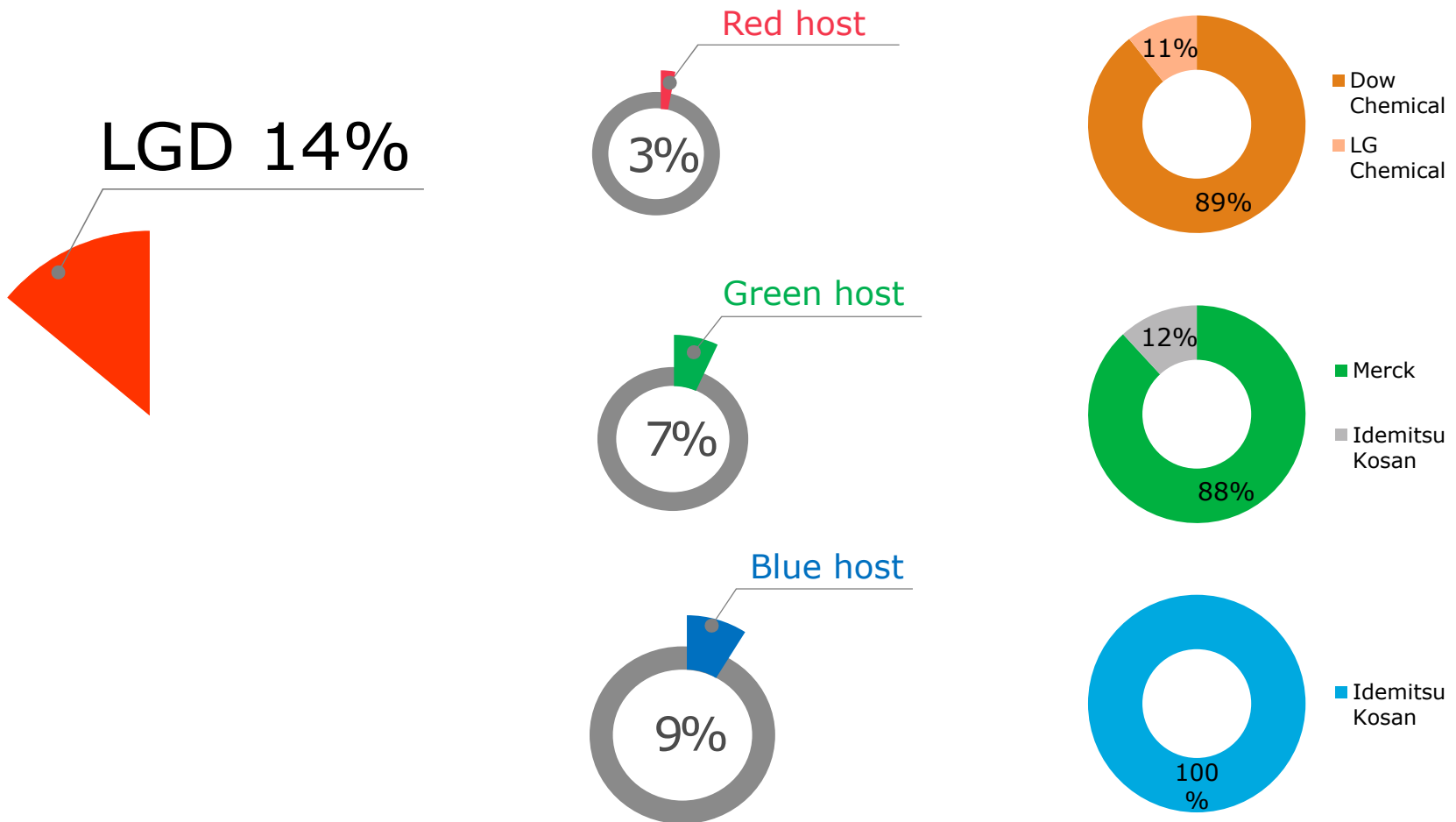




# Consumption of light-emitting materials by LG display

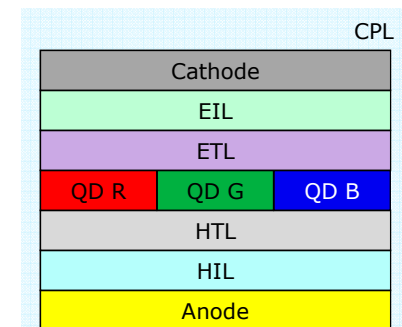
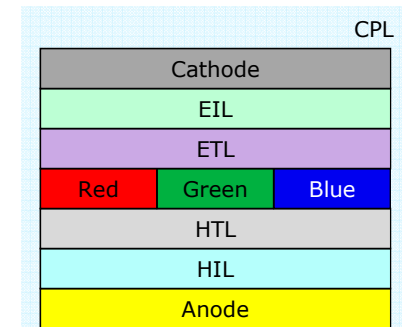
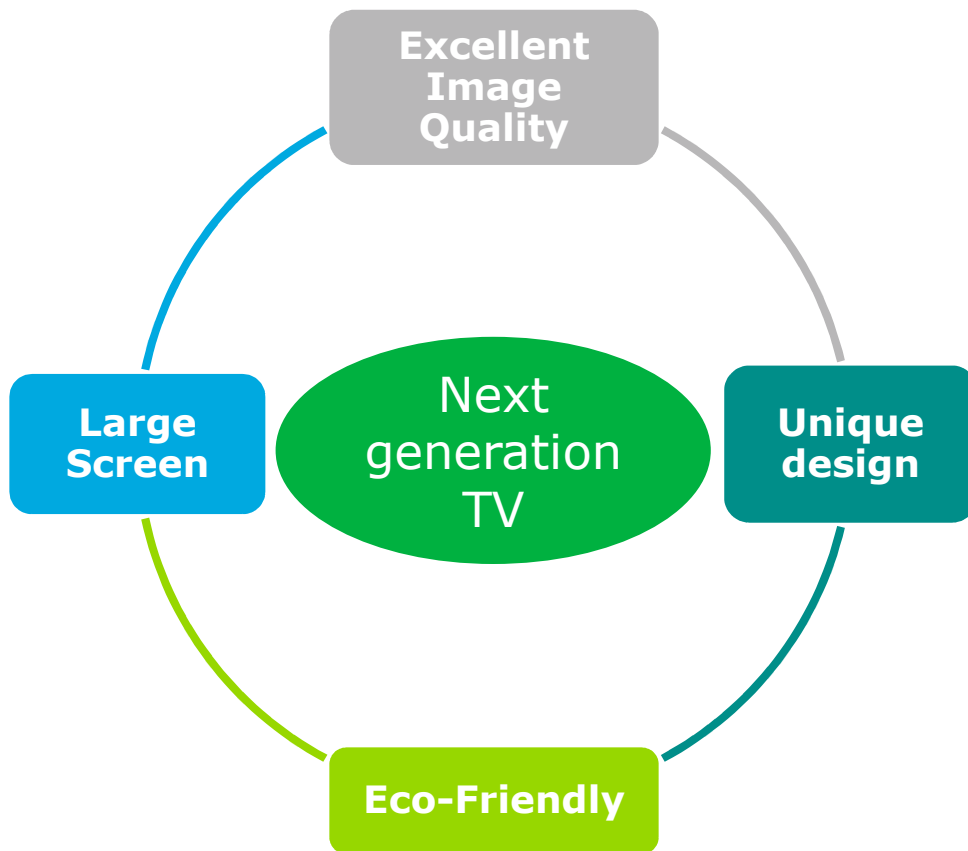


# Consumption of light-emitting materials by LG display



# Light-emitting materials development trends

# Next generation TV



## Printing OLED TV

### Printing technology



### Technical Challenges



World's largest 4K OLED by Panasonic

- **Materials**
  - High boiling point
  - Viscosity
  - Surface tension
  - High purity grade
  - Low particle count
  
- **Process**
  - Uniformity
  - Yield
  - Device Quality
  - Scale up

# Status of printing materials

## FMM evaporation

Color	CIE(x,y)	Efficiency(cd/A)
Red	(0.68,0.32)	58
Green	(0.21,0.72)	137
Blue	(0.14,0.05)	6

*Still lack of lifetime & efficiency*

## Sumitomo Chemical

Color	CIE(x,y)	Efficiency(cd/A)	LT95(khr)
Red	(0.66,0.34)	28	5.8
Green	(0.32,0.63)	92	17.0
Blue	(0.14,0.11)	9.3	0.4

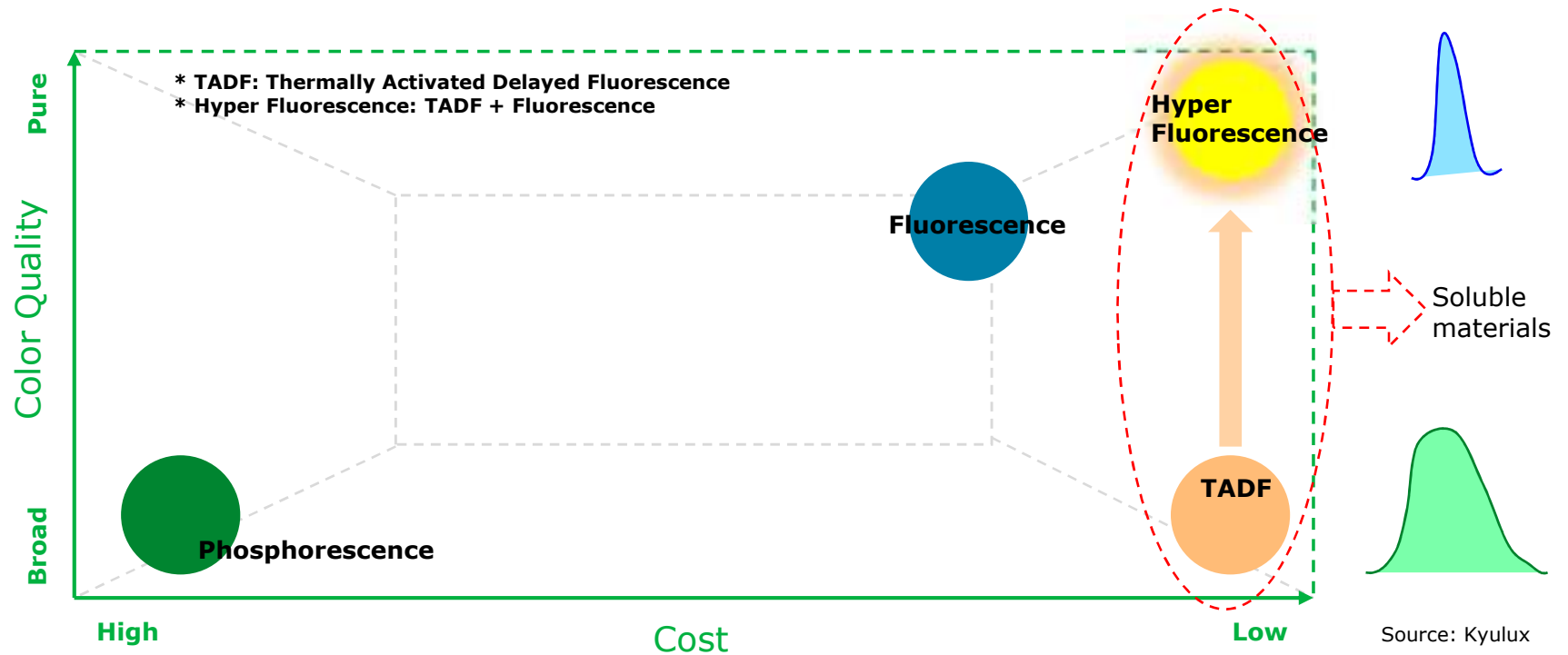
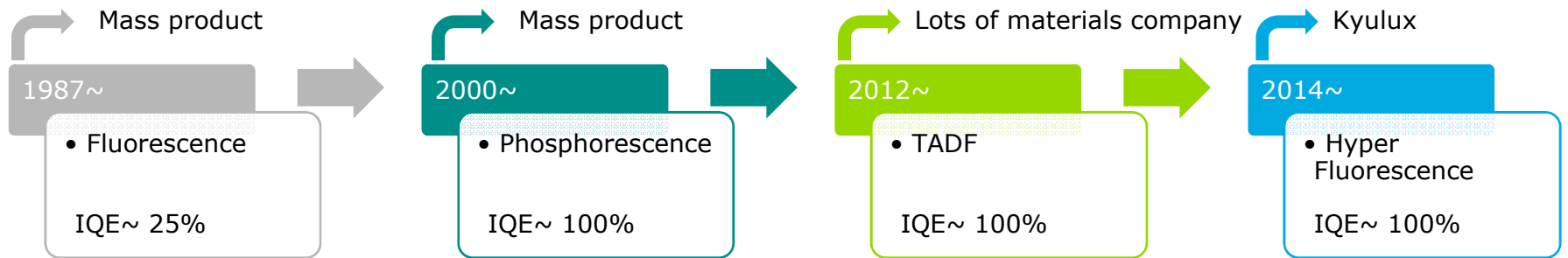
## Dupont

Color	CIE(x,y)	Efficiency(cd/A)	LT95(khr)
Red	(0.65,0.35)	22	9.5
Green	(0.27,0.67)	80	6.0
Blue	(0.14,0.09)	5.3	1.7

## Merck

Color	CIE(x,y)	Efficiency(cd/A)	LT95(khr)
Red	(0.65,0.35)	23	10
Green	(0.32,0.64)	83	8.5
Blue			

# Generation of lighting emitting materials



Source: Kyulux

