

ElectroniCast Consultants



India LED Lighting Market Forecast

Solid-State Lighting (SSL) General Lighting LED Lamp Consumption Market Forecast (2010-2015)

Publish Date: September 28, 2011
Text Pages: 546
Also Included: Excel Market Forecast Database and PowerPoint Slides
Fee: \$4,200

India - LED Lighting Market Forecast This report, by ElectroniCast Consultants, provides the research findings of our study of the consumption of Light Emitting Diode Lamps (also known as “consumer-level bulbs” or “consumer-level globes”), which are used in luminaires in stationary (non-vehicle) solid-state lighting (SSL) General Lighting applications in India.

Solid State The term "solid state" refers to the fact that light in a light emitting diode (LED) is emitted from a solid object, that has do not contain moving parts or parts that can break, rupture, shatter, leak or contaminate the environment—a block of semiconductor—rather than from a vacuum or gas tube, as is the case in traditional incandescent light bulbs and fluorescent lamps.

General Lighting Stationary Applications The definition used by ElectroniCast for General Lighting is – lighting that is used to *provide the main illumination of an area*. ElectroniCast includes Directional Lighting, Supplementary Lighting and Architectural Lighting in the General Lighting category.

LED Level Quantified in the ElectroniCast Study Below, are five levels (or “food chain”) pertaining to the LED marketplace. For the purposes of this ElectroniCast study, we quantify and provide a market forecast for “Level 4”

- Level 1 - The chip or die
- Level 2 - The LED component (component-level bulb)
- Level 3 - LED array; may include optics, heat sink and/or power supply

Level 4 - Lamp

- Level 5 - Luminaire (light fixture/lamp holder)

This report provides the 2010-2015 market data by the following functions:

- Consumption Value (US\$, Million)
- Quantity (number/units in Millions)
- Average Selling Prices (ASP US\$, each)

Market Forecast Product Categories This market forecast of consumption is presented for five major lamp-type categories. The lamp categories, in turn, may have multiple sub-categories, which are determined by lamp luminous flux and/or the physical size of the lamp. Note: lower-level products, which are indented in the list shown in Table 1, are summed-up to the higher-level product category stated above it.

Table 1
ElectroniCast Market Forecast Data Base Hierachy Structure
LED Lamp Product Category List

Total Consumption: LED Lamps

Parabolic aluminized reflector (PAR)

- PAR16
- PAR20
- PAR30
- PAR38
- PAR56
- PAR64
- PAR-Types: Other (Miscellaneous) Sizes

General Service/Decorative: Mushroom, Fancy/Candle, Panel, Other

Multifaceted reflector (MR) Compatible

- MR16
- MR11 / Other MR

Linear / Tube

- < 1200mm
- > 1200mm

Street, Parking-lot, Campus / Similar (Parks, Walkways)

Market Forecast Application Categories This market forecast of consumption is presented by three major End-User categories:

- Government
- Commercial/Industrial
- Residential/Non-Specific

The Commercial/ Industrial group is especially strong in the General Service lamps and PAR lamps; however, MR compatible lamps are forecast to begin replacing halogen-based MR lamps in many retail-type settings (displays and ceiling lighting), thus MR compatible lamps are forecast with an average annual growth rate of 74.5 percent in the Commercial/ Industrial application. Streetlight *type* of flood/ exterior lighting used in parking lots, campus and landscaping is forecast to maintain a strong presence consumption value, in the Commercial/ Industrial group, especially with the lamp's high average selling price compared to other-types of lamps.

Residential is forecast with relative strong use in the General Service lamp types; however MR compatible are also forecast with a strong market share, used in modern ceiling lighting and fixtures.

Street Lighting is forecast to dominate the Government application in terms of consumption value.

Overall, the LED-based Linear (tube) lamp category, which offers an alternative to the standard fluorescent tube lamps, are forecast to remain relatively minor, at least near-term (2010-2015).

The average selling price (ASPs) shown in the ElectroniCast market forecast for the LED lamps used in India, are not retail prices; the prices are based on the price of the LED lamp at the initial factory level (prior to FOB – Free On Board); therefore, shipping expenses and any other value-added items are not included. The consumption value is then based on the end-use application in India.

This study is based on analysis of information obtained continually over the past eight years, but updated through the end of September 2011. During this period, ElectroniCast analysts performed interviews with authoritative and representative individuals in the LED and lighting industry, plus – R&D and factory/manufacturing, from the standpoint of both suppliers and users of LED and lighting illumination products.

India Solid-State Lighting General Lighting LED Lamp Market Forecast – Tables of Contents –

1.	Executive Summary	1-1
1.1	Overview	1-1
1.2	LED Chips Used in General Solid-State Lighting (SSL)	1-28
1.3	LED Lamps & Light Fixtures Used in General Lighting	1-32
2.	LEDs – Technology Overview	2-1
3.	SSL General Lighting LED Lamp Consumption	3-1
3.1	Overview	3-1
3.2	Parabolic Aluminized Reflector (PAR) LED Lamps	3-61
3.3	General Service (A-Type): LED lamps	3-69
3.4	Multifaceted reflector (MR) Compatible LED Lamps	3-77
3.5	Linear/Tube LED Lamps	3-83
3.6	LED Lamps: Street-lighting/Parking-Lots/Campus/Parks/Similar	3-89
4.	Company Profiles of LED and Related Companies – (Over 290 Companies)	4-1
5.	Market Research Methodology	5-1
6.	Definitions and Standards	6-1
6.1	Acronyms, Abbreviations, and General Terms	6-1
6.2	Lighting Standards and Protocols	6-75
7.	ElectroniCast Market Forecast Data Base – Introduction/Explanation of Excel Worksheets	7-1
7.1	Overview	7-1
7.2	Tutorial of the Excel Worksheets	7-3

– List of Tables –

1.1.1	ElectroniCast Market Forecast Hierarchy Structure: LED Lamp Product Category List	1-3
1.1.2	List of ELCOMA Members in India	1-9
1.1.3	LED Lamps Used in SSL General Lighting India Forecast, By End-User Category (\$ Million)	1-15
2.1	LED Color Variety – Selected Examples	2-9
2.1	LED Color Chart	2-11
3.1.1	LED Lamps in SSL General Lighting India Forecast, By End-User Category (\$ Million)	3-19
3.1.2	ElectroniCast Market Forecast Hierarchy Structure: India LED Lamp Product Category List	3-20
3.1.3	LED Lamps in SSL General Lighting India Forecast, By Product Category (\$ Million)	3-22
3.1.4	LED Lamps in SSL General Lighting India Forecast, By Product Category (Quantity/Units)	3-22
3.1.5	LED Lamps in SSL General Lighting India Forecast, By Product Category (ASP, \$ Each)	3-23
3.1.6	Calculation of the Cost of Manufacturing Facility Downtime	3-43
3.1.7	Comparison of Lighting Technologies	3-44
3.2.1	PAR Lamp Designation and Nominal Diameter	3-61
3.2.2	PAR LED Lamps in SSL General Lighting India Forecast, By Product Category (\$ Million)	3-63
3.2.3	PAR LED Lamps in SSL General Lighting India Forecast, By Product (Quantity/Units)	3-64
3.2.4	PAR LED Lamps Used in SSL General Lighting India Forecast, By Product (ASP, \$ Each)	3-64
3.2.5	LED Lamps Used in SSL General Lighting India Forecast, By End-User Category (\$ Million)	3-65
3.3.1	General/Decorative LED Lamps in SSL Gen. Lighting India, By End-User (\$ Million)	3-76
3.4.1	MR-Compatible LED Lamps in SSL General Lighting India Forecast, By End User (\$ Million)	3-82
3.5.1	Linear/Tube LED Lamps in SSL General Lighting India Forecast, By End User (\$ Million)	3-88
3.6.1	LED Street Lamps in SSL General Lighting India Forecast, By End User (\$ Million)	3-94
7.1.1	ElectroniCast Market Forecast Database Product Category Hierarchy List	7-2
7.2.1	ElectroniCast Market Forecast Database Application Category Hierarchy List	7-3

– List of Figures –

1.1.1	LED Lamps in SSL General Lighting India Market Forecast (Value Basis, \$ Million)	1-4
1.1.2	LED Lamps in SSL General Lighting India Market Forecast (Quantity Basis, Million/Units)	1-5
1.1.3	LED Lamps in SSL General Lighting India Market Forecast, by Product (\$ Million)	1-12
1.1.4	LED Lamps in SSL General Lighting India Market Forecast, by Product (Million/Units)	1-13
1.1.5	LED Lamps in SSL General Lighting India Market Forecast, by Product (ASP, \$, each)	1-14
1.1.6	Single-die LED: 1000 lm at 100 lm/W at 3A	1-23
1.1.7	LED Packaged Chip/Bulb	1-24
1.1.8	LED Packaged Chip/Bulb	1-24
1.1.9	LED Packaged Chip/Bulb Surface Mount Variations	1-25
1.1.10	LED Packaged Chip/Bulb	1-26
1.1.11	High Brightness LED Packaged Chip/Bulb	1-27
1.2.1	Diagram of a typical LED chip	1-28
1.2.2	Diagram of a typical LED chip	1-29
1.2.3	LED Chip Cross-Sectional Structure	1-30
1.2.4	ESD Protection Diodes	1-31
1.3.1	A19 Bulbs (Consumer-Level Bulb/LED Lamp)	1-33
1.3.2	Obstruction Bulbs (Lamps) - Flashing - 138 red or amber LEDs	1-34
1.3.3	LED Lamp – Down-light Retrofit Module	1-35
1.3.4	Miscellaneous LED Lamps	1-36
1.3.5	LED Light Bulb (Cool White)	1-37
1.3.6	Complete Fixture and Replacement Bulb - Streetlight (Lamp)	1-38
1.3.7	Samples of Lighting Fixture Types	1-40
2.1	LED Chromatic Chart	2-10
2.2	Evolution of Research Emphasis During Technology Life Cycle	2-12
2.3	LED Chip: Metal Layer (Thin Film Technology)	2-13
2.4	Vertical LED Chip	2-14
2.5	AC LED Technology on a Wafer	2-20
2.6	Ultra High Bright LED Chip	2-21
2.7	Ultra-Thin LED	2-24
2.8	Solid-State Lighting LED	2-25
2.9	LED Module with High Light Quality	2-26
2.10	Transparent and flexible inorganic, organic hybrid n-type: Thin Film Transistors (TFTs)	2-30
2.11	Lumiramic Phosphor Technology: Thin Film Flip Chip (TFFC) technology	2-31
2.12	Wire-to-Board LED Connector	2-34
2.13	Next-Generation Light Emitting Diode Module	2-38
2.14	4-Leaded RGB LED	2-40
2.15	Vertically Conducting Advanced LED Structure	2-44
2.16	AlGaInP LED Efficacy	2-46
3.1.1	LED-Based Operating Theater Lighting	3-25
3.1.2	LED-Based Operating Theater Lighting	3-27
3.1.3	LED-Based Operating Theater Lighting	3-28
3.1.4	LED-Based Airfield Runway Edge Lighting (Solar Powered)	3-32
3.1.5	LED-Based Solar Powered Airfield Light	3-33
3.1.6	LED Technology for Stage Lighting	3-35
3.1.7	Entertainment & Architectural Lighting: Multiple Colors LED in a Surface-Mount (SMT) Package	3-36
3.1.8	Color Mixer Reflector for LED Technology Lighting	3-37
3.1.9	LED Technology for Under-Cabinet Lighting	3-39
3.1.10	LED-Based Linear Lamps used in Warehousing Application	3-40
3.1.11	48-inch Fluorescent Replacement Style LED Light Fixture	3-45
3.1.12	DIP T8 – Linear Tube Lamps With Plastic End-Caps	3-48
3.1.13	SMD T8 and T5 – LED Linear Tube Lamps With Plastic End-Caps	3-49
3.1.14	DIP-Type LED Linear Tube Lamps with Plastic End-Caps	3-52
3.1.15	DIP-Type LED Linear Tube Lamps with Metal End-Caps	3-53
3.1.16	SMD-Type LED Linear Tube Lamps with Metal End-Caps	3-54
3.1.17	SMD-Type High-Output LED Linear Tube Lamps with Plastic End-Caps	3-55
3.2.1	LED-Based PAR 30 Lamp	3-62
3.3.1	General Service LED-based Lamp (A-Style Bulb Category)	3-69
3.3.2	Decorative (Candle-Style) LED-based Lamp (C-Style Bulb Category)	3-70
3.3.3	LED Round Panel Light	3-71

– List of Figures – Continued

3.3.4	General Service/Decorative LED Lamps in SSL General Lighting India Forecast (\$ Million)	3-73
3.3.5	General Service/Decorative LED Lamps in SSL General Lighting India Forecast (Quantity, Million)	3-74
3.3.6	General Service/Decorative LED Lamps in SSL General Lighting India Forecast (ASP, \$)	3-75
3.4.1	1W 12V GU5.3 / 2 Pin MR16 LED Replacement Lamp	3-78
3.4.2	MR Compatible LED Lamps in SSL General Lighting India Forecast, by Product (\$ Million)	3-79
3.4.3	MR Compatible LED Lamps in SSL General Lighting India Forecast, by Product (Quantity)	3-80
3.4.4	MR Compatible LED Lamps in SSL General Lighting India Forecast, by Product (ASP, \$)	3-81
3.5.1	Linear Tube LED Lamps in SSL General Lighting India Forecast, by Product (\$ Million)	3-85
3.5.2	Linear Tube LED Lamps in SSL General Lighting India Forecast, by Product (Quantity)	3-86
3.5.3	Linear Tube LED Lamps in SSL General Lighting India Forecast, by Product (ASP, \$)	3-87
3.6.1	LED Street Lamps Undergoing Test Operations	3-89
3.6.2	LED Street Lamps in SSL General Lighting India Market Forecast (\$ Million)	3-91
3.6.3	LED Street Lamps in SSL General Lighting India Market Forecast (Quantity)	3-92
3.6.4	LED Street Lamps in SSL General Lighting India Market Forecast (ASP, \$ each)	3-93
3.6.5	Solar LED Street Lighting (India)	3-95
3.6.11	LED Street Lighting (India)	3-96
4.1	PCB Assembly	4-23
4.2	LED Backlit Display	4-26
4.3	Rugged Touch Screen with NVIS Capability	4-42
4.4	LED Down light with 102 Lumens per Watt Fixture	4-56
4.5	LED Lighting Military Solutions	4-59
4.6	LED Lighting in Railway Station	4-61
4.7	LED Technology Safelight Design	4-73
4.8	LED Lighting (water flow stream)	4-77
4.9	NVIS/LED Control Panel	4-81
4.10	Integrated Weapons Delivery System	4-82
4.11	Cockpit Modular Display/Panel	4-91
4.12	Cockpit Large Area Display	4-92
4.13	Traffic Lamp LED	4-99
4.14	High Power LED Lamp	4-99
4.15	Surface Mount Type LED	4-100
4.16	Surface Mount Type LED	4-104
4.17	Exterior Aircraft LED Lighting	4-108
4.18	LED/CCD Barcode Readers	4-121
4.19	Surface-Mount Multi-layer Ceramic Packages	4-126
4.20	LED Linear Optical Array	4-132
4.21	Solid-State NVIS Lamps	4-144
4.22	LED Escalator Light	4-148
4.23	Nanostructures Designed for Different Color Emission	4-152
4.24	LED Array Lighting – Lamp	4-158
4.25	Light-Measurement Device	4-167
4.26	SSL LED: Replacement for Halogen Lamp in Spotlights	4-174
4.27	LED-Based Digital Billboard (Signage/Display)	4-189
4.28	Diagram of Backlight LED Drivers	4-192
4.29	Diagram of Multifunction Backlight LED Drivers	4-193
4.30	Diagram of White Backlight LED Drivers	4-194
4.31	Diagram White Backlight LED Drivers	4-195
4.32	Rotary Wing Aircraft Cockpit Display	4-197
4.33	Ultra-Thin LED	4-209
4.34	Quality Management System in LED Manufacturing	4-212
4.35	Military and Harsh-Environment LEDs	4-232
4.36	LED-Based Marine Biology Lighting Device	4-237
5.1	ElectroniCast Market Research & Forecasting Methodology	5-3