

Technology Discussion Forum

On

Solar Lighting

14th Nov 2011

New Delhi, India

Lighting at a Programmatic mode	
Jawahar Lal Nehru National Solar Mission, MNRE	20 million solar lighting systems by 2022
US National program -Solid State Lighting Congressional appropriation for SSL portfolio,2003-2009	Govt-Industry partnership, create market for high efficiency lighting product to enhance quality
China's National level program in SSL(2001-2006)	\$70 m - Ministry of Sc &Tech to support SSL
Several other countries National Level programs	Catalyse energy efficiency and quality assurance of the product
Energy Star program of US-DOE	Promoting energy efficient products and practices
Lighting Africa/World (The World Bank, IFC)	off-grid lighting to 2.5m people in Africa by 2012 and to 250m people by 2030,QA programs
Energy For All (-Lighting for All),ADB	Empowering the poor through access to energy – harmonizing quality and energy efficiency standards throughout Asia
en.lighten (UNEP)	coordinate global efforts for efficient lighting
Lighting a Billion Lives (TERI)	Provide basic quality illumination to one billion lives across the globe through clean technologies
ASSIST(Alliance for Solid State Illumination system & Technology)	Research &education on lighting product quality
Energizing Development	Sustainable energy for high-quality lighting, productive use and social infrastructure and cooking

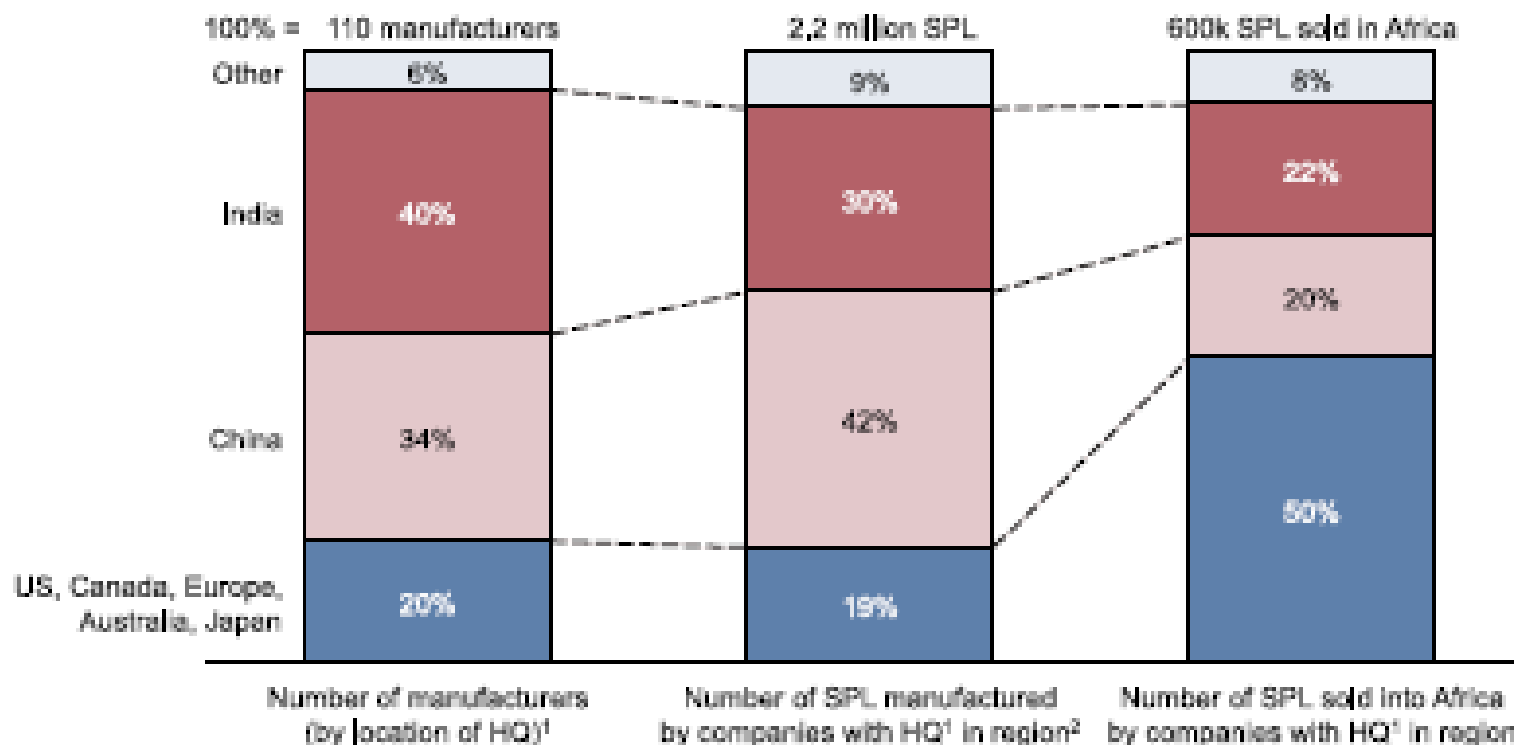
USAID	Bench marking energy saving lamps
Together for Sudan – Solar Lighting Project	Solar lighting in areas off the electricity grid, including refugee camps
One Million Light	
Isang Litrong Liwanag (A Liter of Light) –	plan to light one million homes by 2012.
Light Up the World Program (LUWP)	R&D with manufacturers for improving the quality and reducing the cost of the products
Solar Electric Light Fund (SELF) - Uganda Pilot Solar Electrification Project	
Solar Sister	Creating grass-root level solar installer, technician and Practicenior
The Appropriate Technology Collaborative – Solar Lighting to Replace Kerosene Lamps	
Christian Aid	

Private Entity driven Lighting Programs

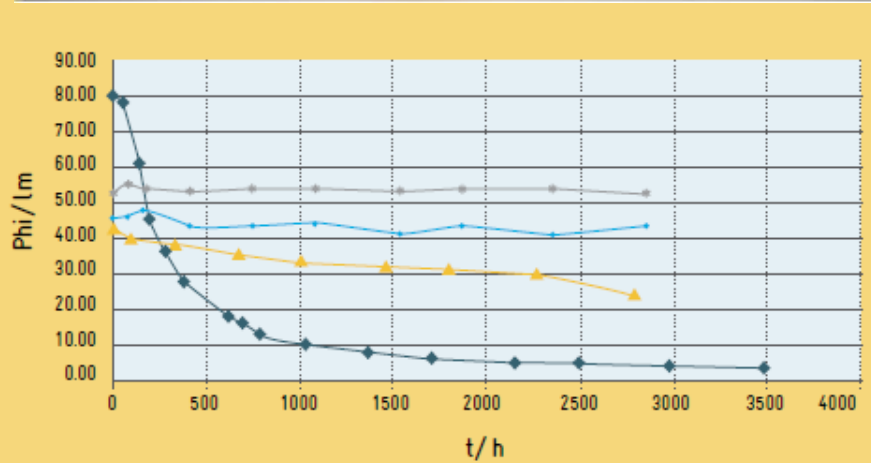
SELCO	Philips
OSRAM	d.light – Give Light
Green Light Planet	Thrive LED Home Lighting Programme
G Power, Kenya (Mini grid)	Sunlabob Renewable Energy, Laos
Solux – One Child-One Solar Light	Lights for Life International
Dissigno	Lebone Solutions
Enersa	Himalayan Light Foundation (HLF)



China and India dominate SPL manufacturing worldwide, but Western companies still account for 50% of Africa sales to date



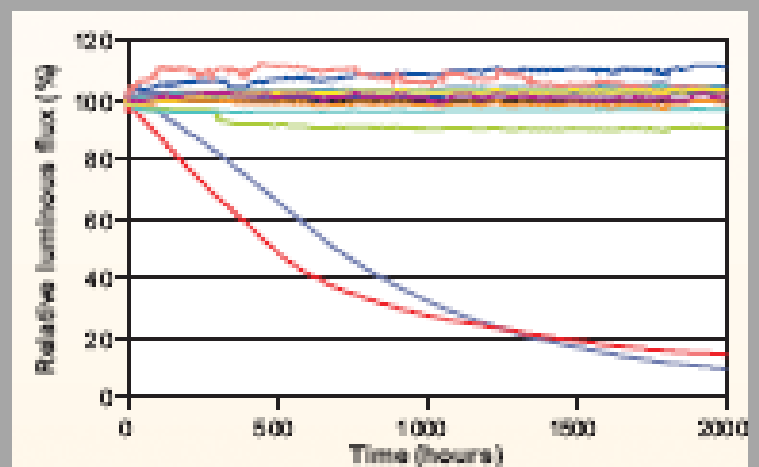
GIZ



Lighting Research Center

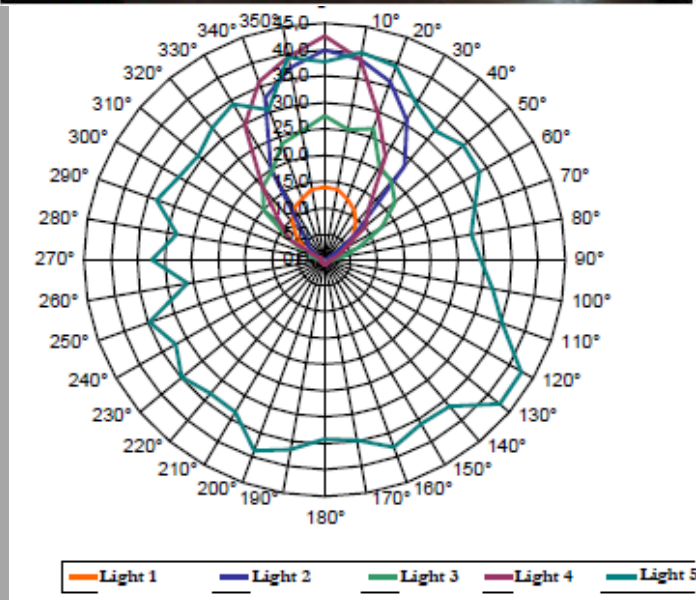


Samples of off-grid LED lighting products being tested at the LRC for the Lighting Africa program.

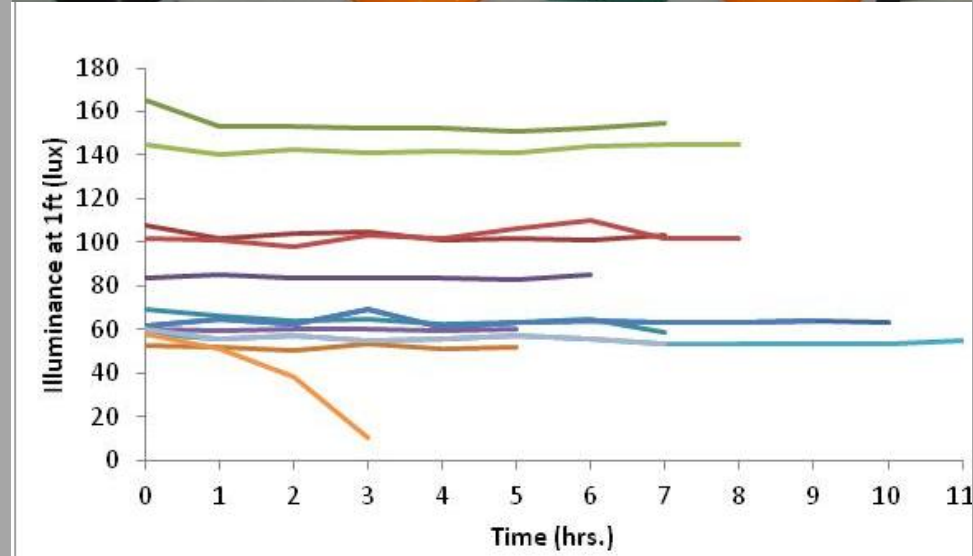


Lumen maintenance of 13 off-grid LED lighting products over a 2000-hour testing period (average of 6 samples for each product).

Lighting Africa

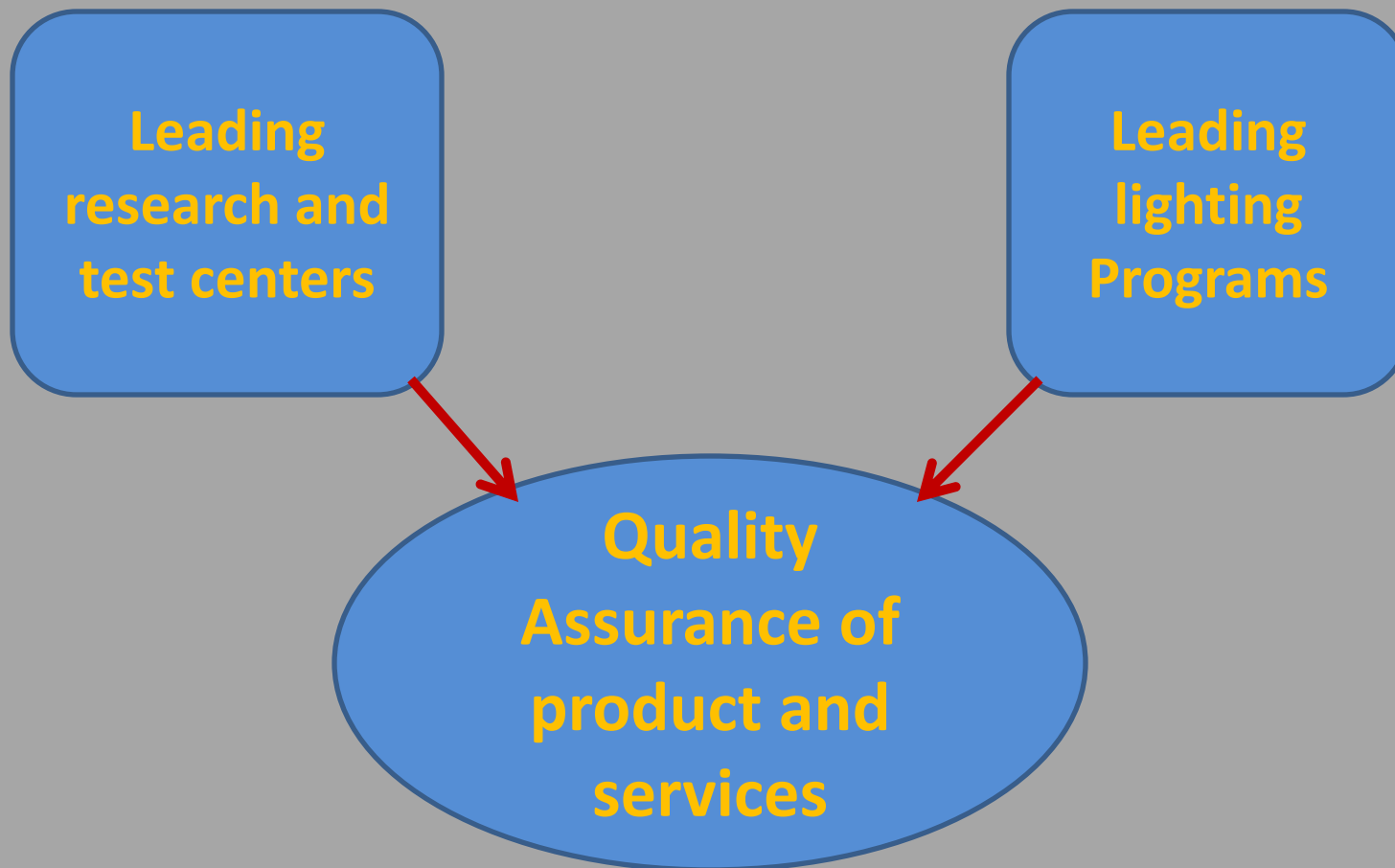


Solar Lighting lab TERI



From Leading test and research centers

- Solar Energy Center, Gurgaon
- ETDC, Bangalore
- ERTL, Kolkata
- UL solar lab
- TUV
- Fraunhofer, ISE, Germany
- Lighting Research Center, USA
- National Lighting Test Center, China
- TERI Solar lighting Lab, New Delhi
- Others evaluation centers



Performance benchmarking – Need of the hour

How to Benchmark Performance of Solar lighting product



Existing scenarios

- Lab based product testing and approval

Tests	Recommended standards
Solar module (I-V, P_{mpp})	IEC 61215 :2005(Clause 10.6) IS 14286: 1995, IEC 60904
Battery capacity	IEC 60896 -11, IEC 61951-2
Light source	LM 79
Spatial and angular illuminance distribution	IESNA lighting hand book
Luminous flux/Luminous efficacy	LM79,CIE 84,
Lumen maintenance	LM 80
System	IEC 62124
System charging time System Discharging time	ISE Fraunhofer
Durability test (switch connector and mechanical)	IEC 60947
Charge controller	IEC 62093, IEC 60068

Existing Scenarios

No on-field testing standards

On-field testing – *not a part of approval process*

Energy STAR Qualified LED Lighting

Product should have the following Characteristics

- **Brightness is equal to or greater than existing lighting technologies**
- **Light output remains constant over time** *-only decreasing towards the end of the rated lifetime*
- **Excellent color quality**
- **Efficiency is as good as or better than fluorescent lighting.**
- **Light comes on instantly** *when turned on.*
- **No flicker** *when dimmed.*
- **No off-state power draw.** *The fixture does not use power when it is turned off, with the exception of external controls, whose power should not exceed 0.5 watts in the off state.*

efficient lighting for developing and emerging countries

en.lighten

UNEP

Generic product performance requirements (example)

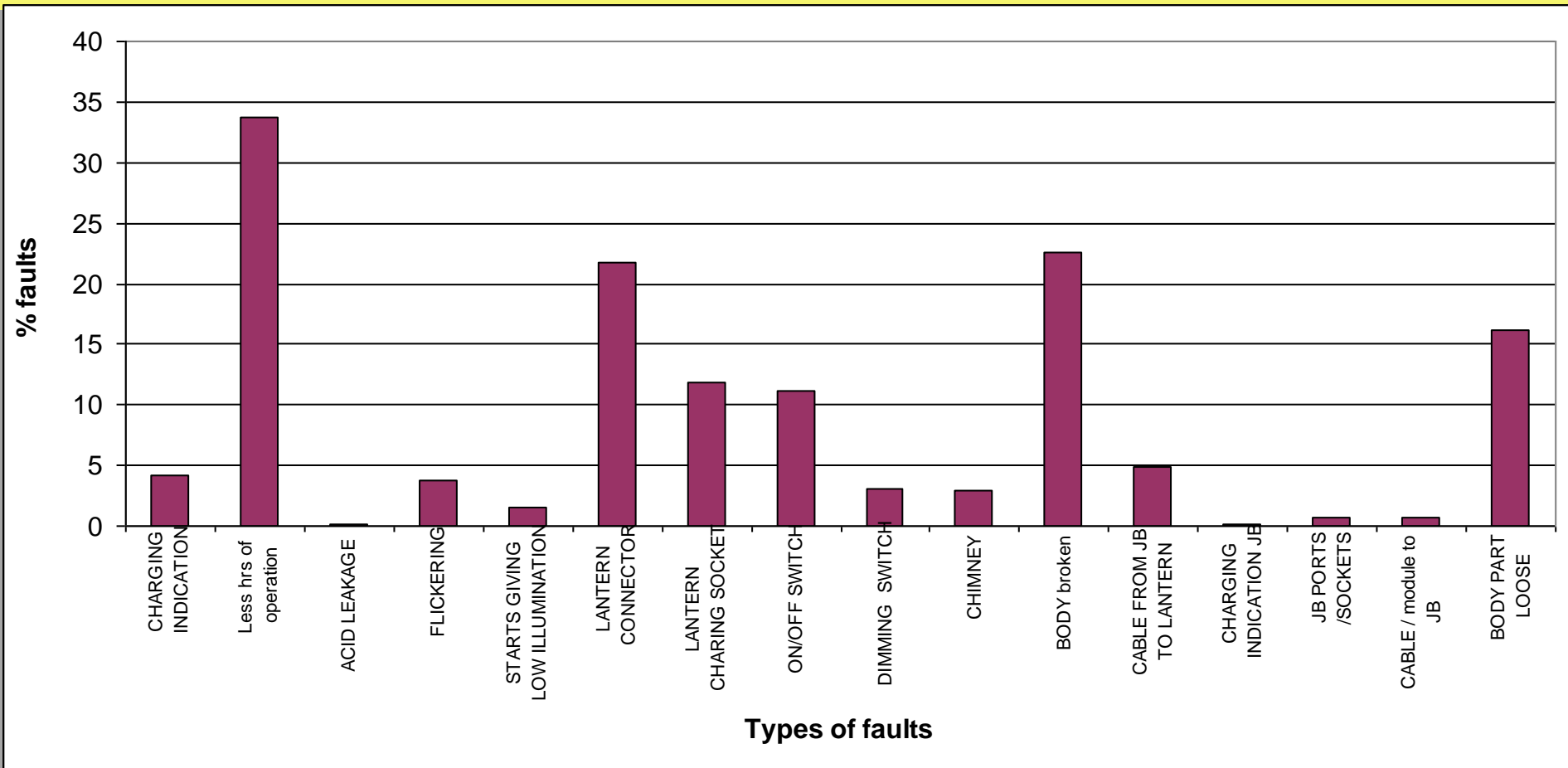
Essential product performance criterion	Measurement Units
Luminous efficiency	Lumen/Watt
Product life time	Hours
Lumen maintenance	Percentage @ hours
Mercury content	Milligrams
Operating voltage	Volts to Volts
Switching withstand	Number of switches over life
Colour rendering Index	Value
Optional product performance requirement	Measurement Units
Start up time	Seconds
Run up time	Seconds

Note : International, regional and national requirements exist on specific product information to be shown on the product (packaging) or in leaflets or

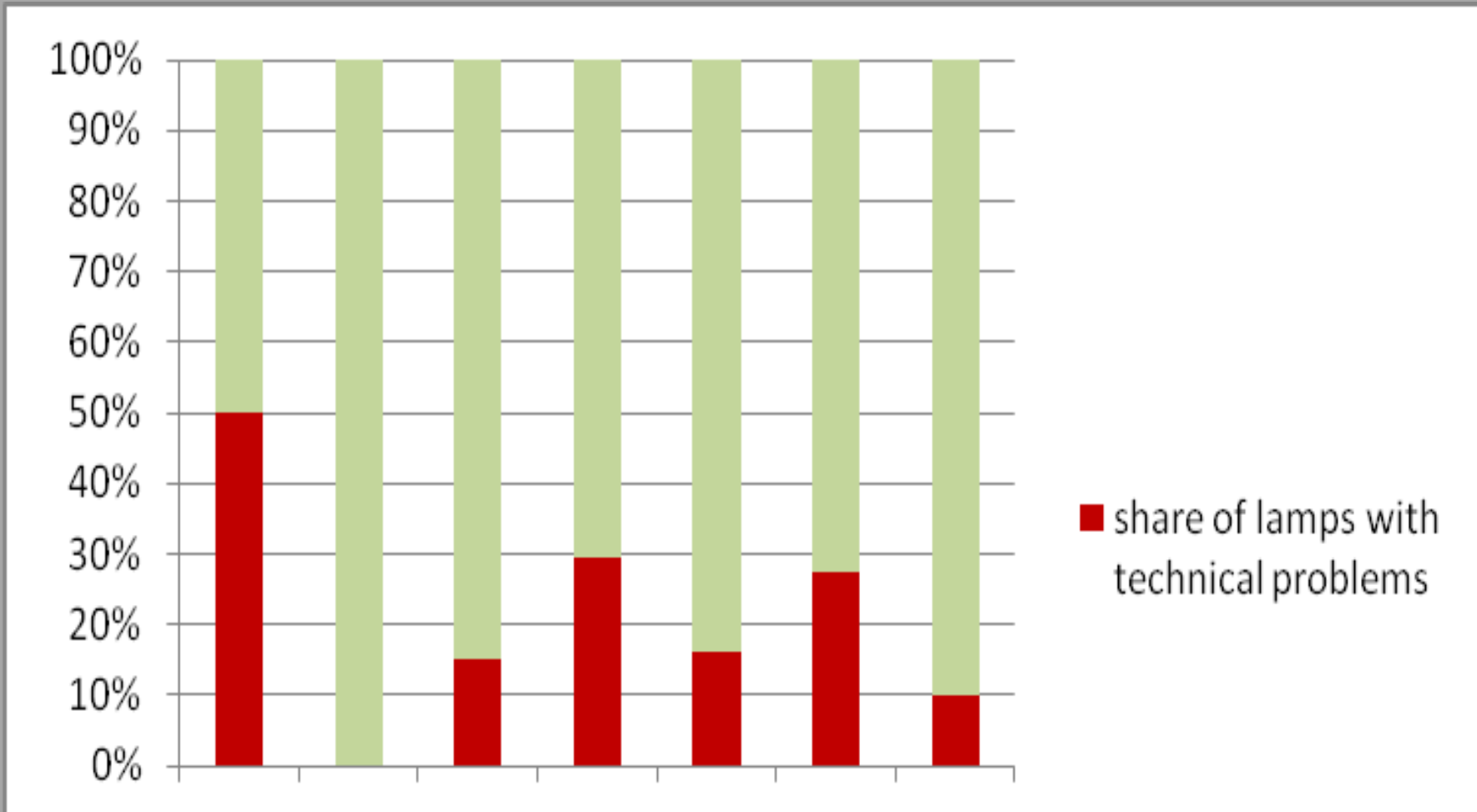
Other product performance requirements (example)

Product performance criterion	Measurement Units
Equivalent (Incandescent) lamp power	Watt
Power factor	value
Colour temperature	Kelvin
Colour rendering Index	value
Product life	Hours

Outdoor performance assessment – brings insight



Outdoor performance assessment – brings insight



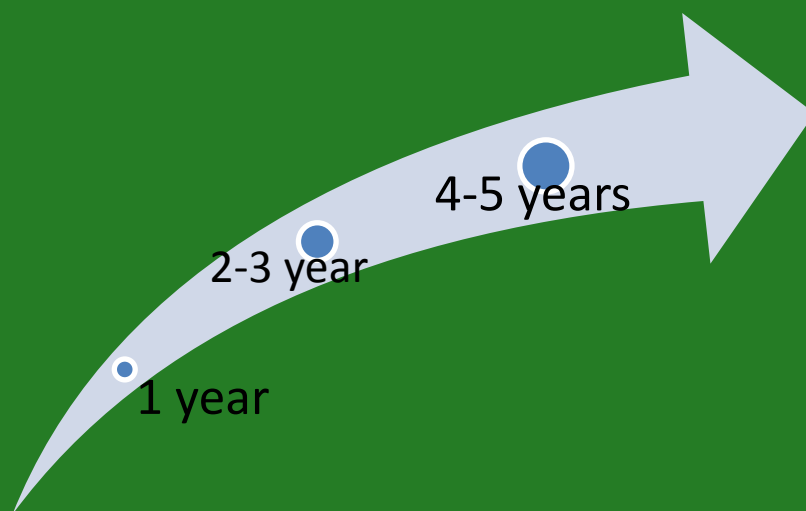
GIZ assessment on “How do the solar lamps perform technically?”

Criteria for Performance bench-marking

What should be the criteria for Performance benchmarking? Should it be based on

Quality of light	How well the light spreads, light distribution happens, comfortable to eye
Overall system efficiency	High, moderate etc
Reliability	How reliable and safe the system is
Durability	How long the product should last without any deterioration in the performance
Sustainability	how well the product addresses economic, social, environmental needs, how easily the product can be disposed
Serviceability	How easy the installation of the product and its maintenance
Overall cost	

What should be the Research Focus & Research Roadmap for solar lighting



Research focus

Illumination & quality of light

- Light source (*Luminous efficacy*)
- *CRI, Colour temperature*
- *Luminary design*
- *Heat sink*
- *Driver circuit/Electronics*

Durability and Serviceability

- Battery
- Material
- Switch/connector
- Plug and play type connectors
- Assembly and system integration
- Grass-root level serviceability

Research focus

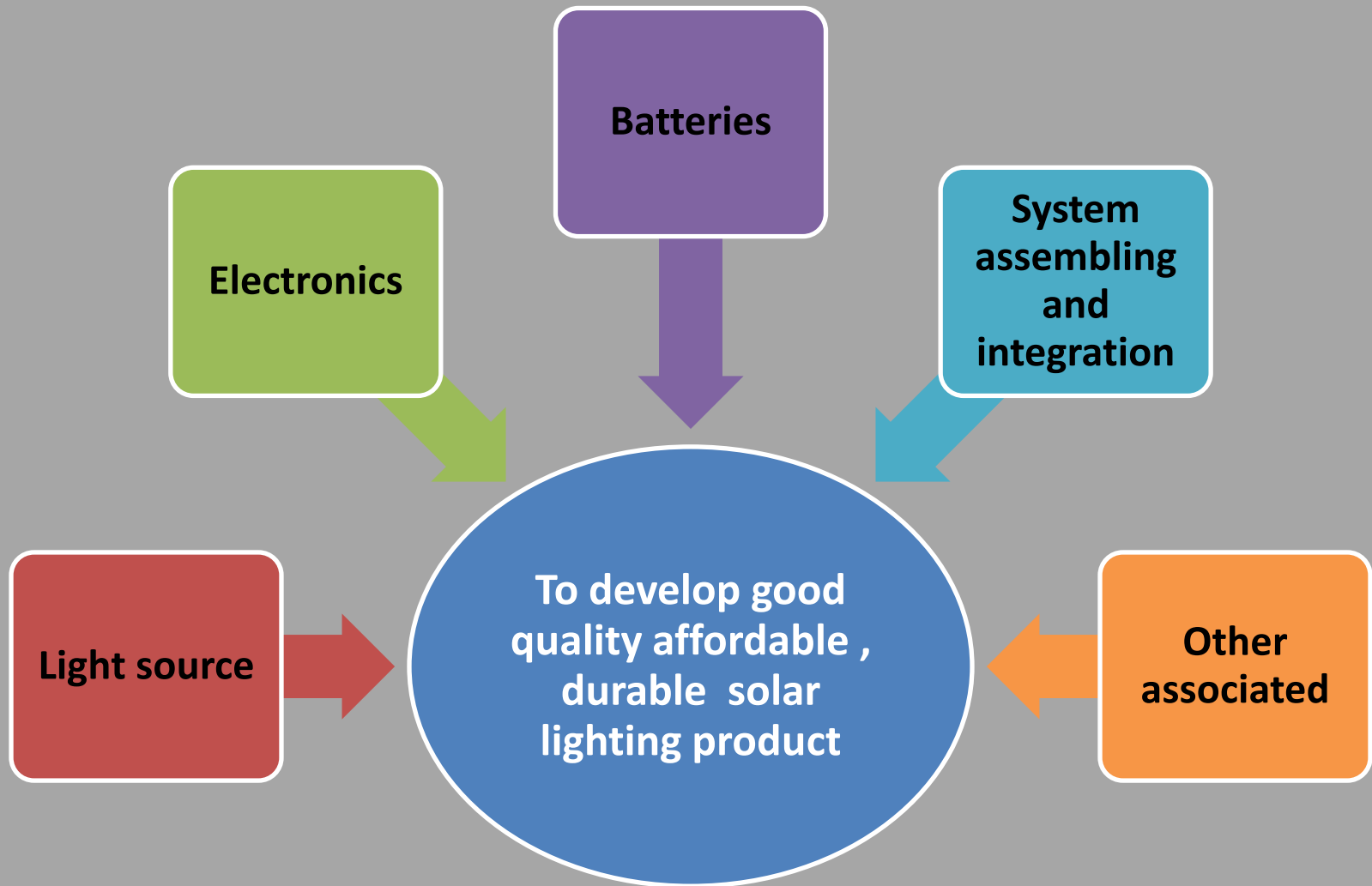
Sustainability

- Recycling
- Life cycle analysis
- Replicable and sustainable business models

System design

- Overall system efficiency improvement
- Multi-purpose
- Multi-task
- Compact, Light weight

Research Focus

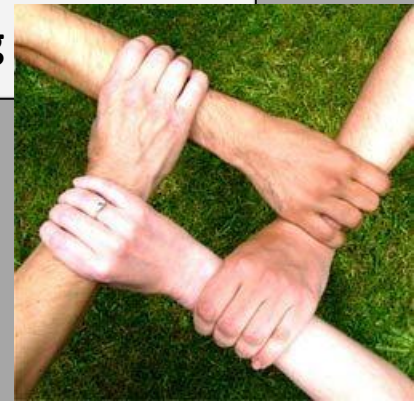


Objective

- To collectively discuss a way forward – by creating a framework for quality benchmarking for solar lighting system and by identifying key technical areas for research in the near future

Expected outcome

- To collaborate and assist in the development of performance benchmarks for solar lighting at a national level
- To collaborate on new system designs and concepts in solar lighting



THANK
YOU

