

# LIGHTING AFRICA

*Catalyzing Markets for Modern Lighting*

## Solar Lantern Testing to PVGAP PVR511A MAIN RESULTS AND LESSONS LEARNT

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## Purpose of Solar Lantern Testing

- Assess effectiveness and ease of conduct of solar CFL lantern testing according to PVRS11A: *Portable solar photovoltaic lanterns - Design qualification and type approval*
- Screen lanterns for consideration of future award of PV-GAP Quality Mark by IECCEE (requires additional testing)
- Evaluate lanterns for bulk procurement in World Bank-financed rural electrification programs



# Market Survey (2008)

COUNTRY	LED Light Source		CFL	
	<u>suppliers</u>	<u>products</u>	<u>suppliers</u>	<u>products</u>
China	13	44	7	12
India	12	17	8	18
Europe	8	10	5	10
Other	3	13	1	7
<b>TOTAL</b>	<b>36</b>	<b>84</b>	<b>21</b>	<b>47</b>

## Solar lantern market segments

“Weekender” market: **Used occasionally**

“Daily user” market: **For daily/frequent use to replace kerosene lanterns**



# Selection criteria

10 PV Solar Lanterns scoring highest selected for testing

- Competence and capability of the manufacturer
- Capabilities, integrity and design of lantern
- Performance and utility of the PV charged lanterns
  - Autonomy days
  - Lighting hours/day
- Price



# Lanterns Selected for Testing

<u>Manufacturer</u>	<u>Type of Lantern</u>	<u>Price (2008\$)**</u>	<u>Country</u>
Aditiya Energy	Deep II A	90	India
Ammini	SunLite 7W	120	India
Conergy	Solar Lantern	92	India
Sollatek	GS5-10Wp	130	UK
Maharishi	Big Solar Type III	120	India
Noble Energy	Aiswarya-5Wp	36	India
Shanghai ROY*	SRY 101L	21	China
Tata-BP	TD4-12Wp	65	India
Tritec Int.	Logic Lantern	168	Germany/Netherlands
Vimal Electronics	Solar Lantern	101	India

\* LED lantern – Tested inadvertently!

\*\* Price differentials reflect differing service levels. E.g.,

- Shanghai Roy: Autonomy = 1.5 days, std. output = 224 lumens-hours/day
- Ammini: Autonomy = 3.2 days and std. output = 3216 lumen-hours/day

Std. output: Lighting output equivalent to 5 peak sun-hours per day



# Solar Lanterns



Ammini



Aditya



Coenergy



Maharishi



Noble



Shanghai Roy



Sollatek



Tata-BP



Tritec



Vimal



# Testing Laboratories

- Laboratory selection criteria:
  - Testing Laboratory accredited to ISO/IEC 17025 with the Scope of Photovoltaic Systems
  - Should have experience in testing PV home systems
- No testing laboratory with experience in testing lanterns per PVRS11A
- Selected testing laboratories:
  - Photovoltaic and Wind Power System Quality Center - Institute of Electrical Engineering, Chinese Academy of Sciences - Beijing, China
  - TÜV Rhineland - Cologne, Germany
- Considerable effort needed to develop test report format and clarify test procedures



# Tests Conducted

- 7.1 Solar lantern completeness
- 7.2 The PV module
- 7.3 Battery (manufacturers certification)
- 7.4 The lamp: Initial light luminous flux; Power consumed by light
- 7.5 Open circuit test of ballast and charge controller; Protection against reverse polarity of PV module and of battery
- 7.6 Fuses
- 7.7 Switch and module connectors
- 14 Shipping vibration test
- 7.8 System performance tests
- 7.9 Visual evidence of a major defect



# Principal Findings

- PVRS 11A useful in quality screening and problem detection
- Two lanterns from India passed all tests
- Main failures:
  - **Vibration test:** 4 out of 10 Lanterns failed - mechanical and structural integrity (e.g. components from circuit boards got detached)
  - **System performance test:** 6 out of 10 failed - mainly insufficient battery recovery
  - **Initial luminous light test:** 8 out of 10 failed - manufacturers claimed more light output than the lamp produced
- PVRS11A can be amended relatively easily to accommodate LED-based solar lanterns



## Current Status

- Results shared with manufacturers
- Follow up process initiated to improve the quality
  - Suppliers have set up task forces to examine failures
  - Several will fix problems and retest the lantern at their own expense
- PVRS11A specification minor revision required:
  - Clarify vibration testing done for lantern in packaging
- Final report due June 30, 2008

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