

# Rechargeable Lighting

## *Guide to Selection*

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# RECHARGEABLE LIGHTING

Over 1 billion people in the world live without access to electricity, the largest number of those being in sub-Saharan Africa and Southeast Asia.<sup>i</sup> A stable source of electricity for both home and facility births is essential to maternal and newborn health and safety, which is often compromised when lighting for midwifery tasks is inadequate. Rechargeable lighting affords medical personnel the ability to improve quality of care as well as detect and respond to emergencies during births.<sup>ii</sup>

Lighting needed for health care differs from the type of lighting used for standard household tasks, and at this time no study has been done to evaluate rechargeable lighting technology specifically in regard to maternal health requirements. However, recent research indicates that there are 14 specific requirements for an off-grid, portable lighting product for maternal health applications.<sup>ii</sup> These 14 important characteristics are outlined in the following summary of rechargeable lighting technologies. These characteristics include, but are not limited to, the light's ability to provide security during the travel of the birth attendant at night, allowing freedom of both hands, minimization of shadows during medical procedures, and the ability to be easily cleaned and disinfected. Further, the light's spectral properties are important for medical applications as it is essential that these lights provide high-quality, bright, and comfortable light that allows for true color illumination of wounds and other tissue.<sup>iii</sup> The correlated color temperature, expressed in degrees Kelvin, that has been identified as the most appropriate for surgical and wound care applications is 5,000 – 6,000K, which is considered to be white light.<sup>iv</sup> However, there are many medical task lights available that are 4,000 – 5,000K and can provide sufficient lighting for non-surgical tasks.

While there are many rechargeable lighting products on the market, the quality and performance of rechargeable lighting products varies widely. The rapid introduction of new rechargeable technologies on the market has resulted in substandard performance, resulting in negative consumer perception of rechargeable lighting sources and a lowered demand for these products. Factors impacting consumer perception include durability, cost, run time, and light performance. In response to these issues, several organizations, such as Lighting Africa, have emerged in an effort to regulate the industry and improve the quality of off-grid lighting products.<sup>v</sup>

The products in this guide represent a selection of commercialized rechargeable lighting options that can aid health workers in providing safer and better care for their patients.

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<sup>i</sup> UN Secretary General: Sustainable Energy for All Initiative. Available at: <http://www.sustainableenergyforall.org/tracking-progress>. Accessed July 10, 2013.

<sup>ii</sup> PATH. Rechargeable Lighting. Available at: <http://sites.path.org/mnhtech/assessment/emergency-obstetric-care/rechargeable-lighting/>. Accessed July 9, 2013.

<sup>iii</sup> Knulst AJ, et al. Standards and Performance Indicators for Surgical Luminaires. *Leukos*. 2000; 6(1): 37-49.

<sup>iv</sup> International Electrotechnical Commission. *Particular requirements for the safety of surgical luminaires and luminaries for diagnosis* (IEC 60601-2-41 Ed. 1.0 en:2000). Geneva: IEC; 2000.

<sup>v</sup> Lighting Africa. Available at: <http://www.lightingafrica.org/>. Accessed July 10, 2013.

*Permission granted from the manufacturers for all included photographs.*

# MINI ACCENDO SOLAR LIGHT



## Basic information

Manufacturer	THRIVE Solar Energy Pvt. Ltd.
Link	<a href="http://www.thriveenergy.co.in/">http://www.thriveenergy.co.in/</a>
Manufacturer description	Uses freely available solar energy for charging...The embedded solar panel at the back of the light makes it easy to charge by just placing the lamp face down in the sun. Extremely light and durable.
Characteristics applicable to low-resource settings	Useable for general tasks; can be used for nighttime travel. NiMH batteries are high cost and have only a moderate life cycle.
Features	Built in solar panel, lightweight, durable,
Pre-/post-sales support	6-month warranty
Approximate price	US\$4

## Incorporated technologies

Energy-production technology	Solar
Energy-storage technology	Battery
Rechargeable battery technology	NiMH
Form factor	Lantern (LED)

Characteristics for community use

Security during travel	✓
Freedom of both hands	✓
Focused light where required	<b>NO</b>
Lightweight	✓
Durable and reliable	✓
Easy to use	✓
Provides bright light for 4+ hours per day	✓
Minimizes shadows	✓
Correlated color temperature of 4,000K-6,000K (white light)	✓
Not intrusive to mother	<b>NO</b>
Adjustable beam diameter	<b>NO</b>
Low up-front and operational cost	✓
Easily cleaned and disinfected	✓
Usable for general purpose activities	✓

# INDIGO LED LANTERN



Basic information	Manufacturer	Freeplay
	Link	<a href="http://www.freeplayenergy.com/">http://www.freeplayenergy.com/</a>
	Manufacturer description	Indigo LED Lantern is the most dependable lantern on the market. It has no bulbs to burn out or disposable batteries to replace. Built-in crank to power it yourself when needed. Adjustable brightness that can last up to 35 hours.
	Characteristics applicable to low-resource settings	Usable for general tasks; can be used for night-time travel. Hand crank charging but also mini USB A/C adapter charging (not included). NiMH batteries are high cost and have only a moderate life cycle.
	Features	Built-in crank, built-in rechargeable NiMH battery, reinforced construction, ultra-bright white lighting, and spot beam for task/flashlight use.
	Pre-/post-sales support	1-year warranty
	Approximate price	US\$49
Incorporated technologies	Energy-production technology	Dynamo
	Energy-storage technology	Battery
	Rechargeable battery technology	NiMH
	Form factor	Lantern (LED)

Characteristics for community use

Security during travel	✓
Freedom of both hands	<b>NO</b>
Focused light where required	✓
Lightweight	✓
Durable and reliable	✓
Easy to use	✓
Provides bright light for 4+ hours per day	✓
Minimizes shadows	✓
Correlated color temperature of 4,000K-6,000K (white light)	✓
Not intrusive to mother	✓
Adjustable beam diameter	<b>NO</b>
Low up-front and operational cost	✓
Easily cleaned and disinfected	✓
Usable for general purpose activities	✓

# NIGHTSTAR jP SHAKE FLASHLIGHT



Basic information	Manufacturer	Applied Innovative Technologies (EcoCentricNow LLC)
	Link	<a href="http://www.appliedinnotech.com/">http://www.appliedinnotech.com/</a>
	Manufacturer description	The ultimate emergency preparedness flashlight is the NightStar jP, no-battery, shake flashlight. Incorporating a capacitor, powerful rare-earth magnets instead of batteries, and a high-brightness LED, NightStar jP is designed to function for decades with zero maintenance.
	Characteristics applicable to low-resource settings	Usable for general tasks, no battery backup, not hands free, short time duration for lighting (15 minutes of light per 30 seconds of shaking), can be used for night-time travel.
	Features	Shake to charge, impact resistant, waterproof and corrosion proof, 15-lumen output.
	Pre-/post-sales support	5-year warranty
	Approximate price	US\$70
Incorporated technologies	Energy-production technology	Faraday
	Energy-storage technology	Capacitor
	Rechargeable battery technology	N/A
	Form factor	Flashlight (LED)

Characteristics for community use	Security during travel	✓
	Freedom of both hands	NO
	Focused light where required	✓
	Lightweight	✓
	Durable and reliable	✓
	Easy to use	✓
	Provides bright light for 4+ hours per day	NO
	Minimizes shadows	✓
	Correlated color temperature of 4,000K-6,000K (white light)	✓
	Not intrusive to mother	NO
	Adjustable beam diameter	✓
	Low up-front and operational cost	✓
	Easily cleaned and disinfected	✓
	Usable for general purpose activities	✓

# LAERDAL LIGHT



Basic information

Manufacturer	Nuru Energy (distributed by Laerdal Global Health AS)
Link	<a href="http://www.laerdalglobalhealth.com/">http://www.laerdalglobalhealth.com/</a>
Manufacturer description	The LED light provides one of the best shine times and light intensities at its price point. It can be used both as a focused task light and as an ambient room light, and also to boost the battery of a mobile phone. The lithium ion battery allows for long shelf life and a large number of recharge cycles.
Characteristics applicable to low-resource settings	Designed with birth attendants in mind. Meets Lighting Africa standards, LED lighting, A/C and solar charging (solar panel sold separately). Focused task light provides 6 hours of light on full power. Battery life expectancy is 5 years.
Features	Focused task light and ambient room light. Five ways to use light (headlamp, desk lamp, hanging lamp, bottle mount, and neck lamp). Universal USB charging. A/C adapter and/or solar panel. Accessories include head strap, bottle mount/wall mount, A/C adapter, storage bag, mobile phone charging cable and 4 tips (mini USB, micro USB, Nokia small, Nokia large). Solar panel sold separately.
Pre-/post-sales support	1-year warranty
Approximate price	US\$19 (Countdown 2015 price for eligible countries)

Incorporated technologies	Energy-production technology	Solar and AC
	Energy-storage technology	Battery
	Rechargeable battery technology	Li-ion
	Form factor	Headlamp (LED)
Characteristics for community use	Security during travel	✓
	Freedom of both hands	✓
	Focused light where required	✓
	Lightweight	✓
	Durable and reliable	✓
	Easy to use	✓
	Provides bright light for 4+ hours per day	✓
	Minimizes shadows	✓
	Correlated color temperature of 4,000K-6,000K (white light)	✓
	Not intrusive to mother	✓
	Adjustable beam diameter	✓
	Low up-front and operational cost	✓
	Easily cleaned and disinfected	✓
Usable for general purpose activities	✓	

# TIKKA XP2



Basic information

Manufacturer	Petzl
Link	<a href="http://www.petzl.com/">http://www.petzl.com/</a>
Manufacturer description	Integrates two light sources as well as a wide-angle lens with a simple open-close feature, allowing the user to choose between a long-distance focused beam and flood-beam proximity lighting.
Characteristics applicable to low-resource settings	Water resistant, usable for general tasks, can be used for night-time travel.
Features	Compatible with a variety of rechargeable and non-rechargeable battery types. Includes strobe lighting for increased safety and red LED which provides backup lighting as well as being useful for preserving night vision.
Pre-/post-sales support	3-year guarantee
Approximate price	US\$55

Incorporated technologies

Energy-production technology	Battery
Energy-storage technology	Battery
Rechargeable battery technology	NiMH and NiCd
Form factor	Headlamp (LED)

Characteristics for community use

Security during travel	✓
Freedom of both hands	✓
Focused light where required	✓
Lightweight	✓
Durable and reliable	✓
Easy to use	✓
Provides bright light for 4+ hours per day	✓
Minimizes shadows	✓
Correlated color temperature of 4,000K-6,000K (white light)	✓
Not intrusive to mother	✓
Adjustable beam diameter	✓
Low up-front and operational cost	✓
Easily cleaned and disinfected	<b>NO</b>
Usable for general purpose activities	✓

# S300



## Basic information

Manufacturer	d.light Solar
Link	<a href="http://www.dlightdesign.com/">http://www.dlightdesign.com/</a>
Manufacturer description	The d.light S300 provides bright white light at a wide angle, enabling the illumination of an entire room.
Characteristics applicable to low-resource settings	Dual solar and A/C charging. Weather, dust, and impact resistant. Usable for general tasks. Meets Lighting Africa and Lighting Asia performance standards.
Features	Weighs less than 1 lb, lamp can charge mobile phones, fully charged in 8 hours, four light settings, lifetime is greater than 5 years.
Pre-/post-sales support	2-year warranty
Approximate price	US\$53

## Incorporated technologies

Energy-production technology	Solar and AC
Energy-storage technology	Battery
Rechargeable battery technology	NiMH
Form factor	Lamp (LED)

Characteristics for community use	Security during travel	✓
	Freedom of both hands	✓
	Focused light where required	NO
	Lightweight	✓
	Durable and reliable	✓
	Easy to use	✓
	Provides bright light for 4+ hours per day	✓
	Minimizes shadows	✓
	Correlated color temperature of 4,000K-6,000K (white light)	✓
	Not intrusive to mother	NO
	Adjustable beam diameter	NO
	Low up-front and operational cost	✓
	Easily cleaned and disinfected	✓
	Usable for general purpose activities	✓

# SOLAR SUITCASE PRIME



Basic information

Manufacturer	WE CARE Solar
Link	<a href="http://wecaresolar.org/">http://wecaresolar.org/</a>
Manufacturer description	WE CARE Solar Suitcase is an economical, easy-to-use, portable power unit that provides health workers with highly efficient medical lighting and power for mobile communication, computers, and medical devices.
Characteristics applicable to low-resource settings	Waterproof, LED medical task lighting intended for the clinical setting. Lead acid battery is low cost, abuse tolerant, readily available, and has a high overcharge tolerance. Battery life expectancy is 2 years. Solar panel life expectancy is 20 years.
Features	Waterproof case. Accessories include cell phone charger and two LED headlamps. System can be expanded to accommodate up to 200W of solar panels. Solar Suitcase Maternal (add \$100) contains Solar Suitcase Prime and a fetal doppler.
Pre-/post-sales support	1 year warranty
Approximate price	US\$1,495

Incorporated technologies	Energy-production technology	Solar
	Energy-storage technology	Battery
	Rechargeable battery technology	Lead acid
	Form factor	Surface mount (LED)
Characteristics for community use	Security during travel	N/A
	Freedom of both hands	✓
	Focused light where required	✓
	Lightweight	N/A
	Durable and reliable	✓
	Easy to use	✓
	Provides bright light for 4+ hours per day	✓
	Minimizes shadows	✓
	Correlated color temperature of 4,000K-6,000K (white light)	✓
	Not intrusive to mother	✓
	Adjustable beam diameter	NO
	Low up-front and operational cost	✓
	Easily cleaned and disinfected	✓
Usable for general purpose activities	✓	

The following rechargeable lighting products are also available on the market today. PATH was unable to obtain sufficient information from the manufacturer to include these devices in the main body of this guide. Please follow up with the manufacturer for more information.

SOLAR BASE CHARGER		FEATURES
MANUFACTURER	Applied Innovative Technologies (EcoCentricNow LLC)	Solar base charger with NiMH batteries. Base charger resembles a flashlight and powers multiple accessories, including an LED mirror inspection light for hard to see areas and flex-tube light for hands-free operation. Run time is 7 hours.
FORM FACTOR	Flashlight	
ENERGY PRODUCTION	Solar	
COST	US\$19.95 (base model)	
HEALTH USE	Community	
<a href="http://www.appliedinnotech.com/">http://www.appliedinnotech.com/</a>		

CONNECT		FEATURES
MANUFACTURER	Barefoot Power	Barefoot Power designs lighting products specifically for low resource settings. Using a roof mounted solar panel, the easy to install Barefoot Connect system provides lighting that is useful for clinics. Run time is 6 hours when using all lamps.
FORM FACTOR	Surface Mount	
ENERGY PRODUCTION	Solar	
COST	Unknown	
HEALTH USE	Facility	
<a href="http://www.barefootpower.com/">http://www.barefootpower.com/</a>		

REVOLT		FEATURES
MANUFACTURER	Black Diamond	Requires NiMH rechargeable batteries and recharges using a USB cable that can be plugged into a variety of devices. Includes distance, close-up, and night vision modes. Weather resistant. Run time is 12 hours on highest setting.
FORM FACTOR	Headlamp	
ENERGY PRODUCTION	Battery	
COST	US\$59.95	
HEALTH USE	Community	
<a href="http://blackdiamondequipment.com/">http://blackdiamondequipment.com/</a>		

DIVA		FEATURES
MANUFACTURER	Ecco	Designed and manufactured in India. The unique base allows the Diva to be used as a flashlight, mounted to the front of a bicycle, placed on a table, hung from a ceiling, or mounted to a wall. Run time is 5 hours on highest setting.
FORM FACTOR	Multiform	
ENERGY PRODUCTION	Solar/Electricity	
COST	Unknown	
HEALTH USE	Community	
<a href="http://www.ecco.in/">http://www.ecco.in/</a>		

WAKAWAKA LIGHT		FEATURES
MANUFACTURER	WakaWaka	Designed specifically for low resource settings, the lamp uses NiMH rechargeable batteries and recharges via a built-in solar charger. Run time is 8 hours on highest setting.
FORM FACTOR	Lamp	
ENERGY PRODUCTION	Solar	
COST	US\$39	
HEALTH USE	Community	
<a href="http://us.waka-waka.com/">http://us.waka-waka.com/</a>		

The following devices are currently in development and may prove useful for the provision of maternal health in low resource settings.

GRAVITYLIGHT		FEATURES
DESIGNER	Deciwatt	A hanging lamp powered by gravity. A bag filled with rocks or sand slowly drops to the floor to power the light. There are three brightness settings which are controlled by the drop time (15 minutes for maximum power to 25 minutes for the minimum power). Not easily portable due to weight of gravity bag when full.
FORM FACTOR	Lamp	
ENERGY PRODUCTION	Dynamo	
HEALTH USE	Community/Facility	
<a href="http://deciwatt.org/">http://deciwatt.org/</a>		

MWANGABORA		FEATURES
DESIGNER	Evans Wadongo	Designed in Kenya, the MwangaBora is a solar powered LED lantern made of 50% recycled materials.
FORM FACTOR	Lantern	
ENERGY PRODUCTION	Solar	
HEALTH USE	Community	
<a href="http://sustainabledevelopmentforall.org/">http://sustainabledevelopmentforall.org/</a>		

This guide to selection is part of a six-piece series of Survive and Thrive guides, including birthing and cesarean section simulators, continuous positive airway pressure (CPAP), fetal monitors, portable ultrasound, rechargeable lighting, and thermoregulation devices. You can search for any of these guides in the PATH Publications Catalogue at <http://www.path.org/publications/index.php>.

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