

## Feedback on the Performance of Off-grid Lighting Products Deployed in 36 Health Centers in Nigeria.



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*The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the Lighting Africa Program, its affiliated organizations, or the governments they represent.*

## **Executive Summary**

Lighting Africa has undertaken a small pilot project in the Nigerian Healthcare Sector where thirty-six Primary Healthcare Centers (PHCs) across the three participating states of Adamawa, Nasarawa and Ondo, received solar lanterns that have met Lighting Global's Minimum Quality Standards. The project was implemented under the Nigerian State Health Investment Project (P120798).

The pilot project aims at changing perceptions and raising awareness among users that solar technology is robust and works properly, and to build confidence among users in the health centers. The pilot project was implemented with the premise that the deployment of off-grid lighting products could improve the lighting situation in health centers and enhance 24-hour service.

The pilot project involved: (i) the procurement and distribution of solar lanterns to 36 health centers<sup>1</sup>; (ii) training Ministry of Health staff, including the midwives and primary health care staff from 36 health centers, as well as staff at the Transmission Company of Nigeria, Project Management Unit (PMU) in Abuja on the off-grid lighting products selected for deployment; (iii) monitoring the deployment and use of solar lanterns in the selected states. This report is a summary of feedback on the outcome of the deployment of solar lanterns in health centers, the benefits and impact created, as well as lessons learnt.

The findings reveal that the number of working hours for midwives increased by up to 30% with the introduction of the quality-verified solar lanterns. The solar lanterns replaced the previously used inefficient and unreliable options such as wax candles, flashlights, and fossil fuel kerosene lanterns. These options were often not bright enough and emit unhealthy fumes. The use of the quality-verified lanterns allowed for efficient use and turn-around time for patient examination, evaluation and treatment.

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<sup>1</sup> 118 solar lanterns that meet Lighting Global Minimum Quality Standards were deployed to the 36 participating health care centers. The four products deployed were: 1) Barefoot PowaPack 5W; 2) Schneider Electric In-Diya Solar Home Lighting System, 3) d.light S300 and 4) Greenlight Planet's Sun King Pro. Each of the participating centers received one micro solar home system and 2 portable lanterns for the midwives.

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The demand for the quality-verified lamps increased significantly amongst the user participants of the pilot project. This included midwives, patients, and healthcare administrators across the participating health care agencies.

It has also become evident that access to reliable electricity plays a major role in development. The findings of the pilot survey suggest that quality affordable solar lanterns would lead to considerable service improvement within the Nigerian Healthcare sector.

Following the success of the Pilot program, the Lighting Africa team recommends scaling up the activity to cover primary healthcare centers across the six geopolitical zones of Nigeria. This would not only increase awareness of the products, but would also increase the demand of the products in the public and private healthcare sectors.

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## **1.0 INTRODUCTION**

### **1.1 Background**

Lighting Africa, a joint IFC and World Bank program, seeks to accelerate the development of the commercial off-grid lighting market in Sub-Saharan Africa as part of the World Bank Group's wider effort to improve access to energy. Lighting Africa is helping to mobilize the private sector to build sustainable markets to provide the rural and urban poor in Sub-Saharan Africa with safe, affordable, and modern off-grid lighting. The longer-term goal is to eliminate market barriers for the private sector in order to reach 250 million people in Africa by 2030 with off-grid lighting solutions, who are currently without electricity, using fuel-based lighting.

The Nigerian Energy Policy Report of 2003 estimates that less than 40% of the country's total population (approximately 170 million people) is connected to the national electricity grid. Furthermore, only 10% of rural households have access to electricity. Electricity supply across the country remains unstable with prolonged periods of power outage.

Lighting Africa is undertaking a pilot project in the Nigeria health sector, deploying modern off-grid lighting products in 36 health centers to raise awareness and change the perception among the users by demonstrating that the technology is ready, robust and offers significant benefit in the provision of 24-hour service in the rural primary health care sector in Nigeria.

### **1.2 Justification for the pilot intervention**

The pilot intervention focuses on driving innovation in the provision of lighting needs in the rural health sector in Nigeria by using environmentally friendly technology, in line with the current strategic transformation of the energy sector in Nigeria, a key component of the government's Green growth socio-economic agenda (Nigerian Vision 20: 2020 Initiative). The health and energy sectors are crucial to the Nigerian economic development agenda. One of the major challenges facing rural healthcare service provision in Nigeria is the need for adequate lighting – after dark.

Lighting Africa has undertaken a small pilot project in the health sector impacting 36 health centers across 3 states in Nigeria. The 36 participating Primary Healthcare Centers in rural areas received quality-verified solar lanterns and are used as a test bed to try innovative approaches under the Nigeria State Health Investment Project (P120798).

The pilot project could demonstrate a key way to address some of the major barriers to the uptake of solar lighting technology, such as low-level awareness, lack of trust and confidence in the products, and low market penetration. This strategy is intended to stimulate demand and have a sustainable catalytic effect on the market.

### 1.3 Scope and approach

Each centre received one micro solar home system (SHS) and 2 portable lanterns for the midwives. The 4 products deployed were: Barefoot PowaPack 5W, Schneider Electric In-Diya Solar Home Lighting System, d.light S300 and the Greenlight Planet Sun King Pro.

**Figure 1: Solar Lighting Products Disseminated in 36 Health Centers in Nigeria**



End user training was provided to the Project Management Unit (PMU) of the Transmission Company of Nigeria (TCN) and to the 36 participating health care centres at the respective state primary health care agencies. After three weeks of deploying the solar lanterns, a monitoring visit was held to verify correct usage of the products.

Following the completion of deployment of the products in 36 centers, a survey was undertaken targeting staff and patients to obtain their feedback on the usage and performance of products. This report discusses the findings of the product feedback survey, providing an evaluation of the lessons learnt, challenges faced, and key issues to be addressed. This report draws conclusions on the usefulness and benefits of the Lighting

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Africa solar lantern project in the provision of a 24-hour service in the Nigerian primary health care sector.

## **2.0 Training and Deployment**

Training on the products was provided to the staff of the Project Management Unit of the TCN, staff of the participating State Health Care Agencies, as well as staff and midwives across the 36 participating health care centers in Adamawa, Nasarawa, and Ondo States in Nigeria<sup>2</sup>.

The PMU currently manages all World Bank Energy Sector Projects in Nigeria. The PMU and the State Ministries of Health in collaboration with World Bank Consultants carried out the deployment logistics, distribution and hand-over of the products to the 36 health centers across Nigeria.

The selected products for the pilot intervention lent themselves to the end-user requirements of the rural health sector in Nigeria in terms of brightness, runtime, quality and durability, and the capacity to charge phones. The four (4) products deployed to the 36 health care centers were: Barefoot PowaPack 5W, Schneider Electric In-Diya Solar Home Lighting System, d.light S300, and Greenlight Planet's Sun King Pro. Midwives and other health care staff were trained and instructed on how to use the above products in an appropriate and effective way.

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<sup>2</sup> The state primary healthcare staff in consultation with the individual healthcare centers identified key potential end-user health staff, such as (i) Midwives that work in delivery units; (ii) Nurses that attend to patients in the outpatient treatment unit; (iii) Nurses and Midwives that work the night shifts.

Figure 2: Lighting Africa Training Session at PMU



Figure 3: Lighting Africa Training Workshop at PMU Nigeria



Figure 2 and 3 show the Lighting Africa training and deployment strategy workshop held at the Project Management Unit in Abuja, Nigeria.

Table 1 : A summary of the number of persons trained under the pilot intervention

Agency	Number of Persons Trained
Project Management Unit, Transmission Company of Nigeria	12
Adamawa State Primary Healthcare Agency	19
Nasarawa State Primary Healthcare Agency	19
Ondo State Primary Healthcare Agency	40
<b>Total</b>	<b>90</b>

## 2.1 Nigerian Energy Project Management Unit (PMU) Abuja

A formal training of trainers (TOT) workshop was held at the PMU office in Abuja targeting twelve engineers and three Procurement officers as part of this initiative. The training was very successful and the participants had no difficulty in appreciating the proper use of all four products.

Figure 4: PMU Training Session Abuja



Figure 5: PMU Training Workshop Abuja



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Figures 4 and 5 show the training workshop carried out at the PMU Abuja, Nigeria as part of this study.

## 2.2 Adamawa State Primary Health Care Agency

Nineteen midwives and six other health care staff participated in a formal training workshop held at the Adamawa Primary Health Care Agency in Yola, Nigeria. Due to the relatively large number of interested participants, two workshop sessions were held. The training was generally successful; the participants were mainly female midwives.

The participants were impressed with all the products and wanted to purchase them, although they had difficulty connecting one of the products. A focus group discussion was held after the training session. Participants could immediately see how these solar lanterns could be of benefit to their health centers. Primary Health Care (PHC) Staff were of the opinion that the lanterns could provide lighting for health centers, enabling the performance of major tasks at night. The products could be beneficial to their lifestyles, both at work and at home through provision of light and charging mobile phones. The ability to communicate by mobile phone was crucial in the health care sector round-the-clock service provision. The lanterns offer clean light, and are thus effective for children and users with respiratory difficulties. Figure 5 and 6 show participants, during the training exercise described above.

Figure 6: Training at Adamawa PHA



Figure 7: Training at Adamawa PHA



Figures 6 and 7 show the training workshop carried out as part of this study – at the Adamawa Primary Healthcare Agency, Yola.

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### 2.3 Ondo State Primary Health Care Agency

Forty midwives and three healthcare administrators were trained in a formal workshop session held at the Ondo Primary Health Care Agency in Akure Nigeria. Four workshop sessions were held due to the large number of participants who were mainly female midwives (thirty five female and five male midwives). The midwives had no difficulty with the understanding of the operation and use of the four products, although they had challenges connecting one of them.

The participants liked all the products and were interested in purchasing the samples. A focus group session held with the trainees indicates that the lanterns could benefit the PHCs in offering effective round-the-clock services by providing clean lighting. As in the other states, the trainees envisaged the beneficial role of lanterns to their lifestyles both at work and at home. They particularly liked that these products had the capability to charge their phones. The midwives argued that the ability to communicate with patients was a plus in meeting their overall objectives in Ondo State Primary Healthcare Agency.

Figure 8: Lighting Africa Training Workshop Ondo PHA



Figure 9: Lighting Africa Training Ondo PHA



Figures 8 and 9 show the training workshop carried out at Akure, Ondo State, as part of this pilot study.

### 2.4 Nasarawa State Health Care Agency

Nineteen midwives and four other health care staff were trained in a formal workshop session held at the Nasarawa Primary Health Care Agency in Lafia Nigeria. Two workshop sessions were held due to the large number of participants. The training was generally successful; the participants were mainly female midwives. The midwives had no difficulty with the operation and understanding of the proper use of three of the four products, but had difficulty configuring one of them.

The PHC staff were pleased with the quality-approved solar lanterns. Participants could envisage how the products could be of benefit to the health care sector in providing lighting

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at night to enable them perform key tasks and procedures more efficiently and effectively. At maximum, the lamps are able to provide over 10 hours of light. The participants expressed how these lanterns could be beneficial to their lifestyles both at work and at home. They were particularly impressed with the capability of these products to charge mobile phones. The ability to communicate by phone is crucial in the health care sector.

**Figure 9: Lighting Africa Training at the Nasarawa PHA**



**Figure 10: Focus Group at Nasarawa PHA**



Figures 9 and 10 show the training session carried out at the Nasarawa State PHA as part of this study.

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## 3.0 Monitoring and Evaluation

### 3.1 Overview

The World Bank consultant conducted structured baseline interviews with midwives, patients and other Primary Health care staff before implementation. Preliminary interviews were carried out during the training and deployment phase. This was aimed at obtaining baseline opinions and attitudes and awareness of the 4 products. Focus group meetings were also carried out as part of this study.

After the products had been deployed for four weeks, visits were made to 12 health care centers to monitor the usage of the solar lanterns. Interviews were carried out with midwives and patients.

### 3.2 Result of Baseline Evaluation Studies

The training, deployment and use of the products at the health care centers raised awareness of and exposure to the 4 products among the Primary Healthcare staff and patients. The solar lighting products deployed in the 36 PHCs provided an adequate level of lighting/ illumination for the PHC staff to perform their activities more accurately and also more quickly.

#### 3.2.1 Outcome of the intervention

- **Awareness creation:** The training, deployment and use of the products at the health care centers raised awareness of and exposure to these 4 products among the Primary Healthcare staff and patients.
- **Replacement of unreliable lighting options:** The deployed solar lighting products replaced the inefficient and unreliable alternatives, such as wax candles, flashlights and kerosene lanterns, that were previously used by PHCs. These unreliable lighting alternatives, which are carbon emitters, also provided poor quality lighting. This sort of lighting slowed down the pace and quality of the midwives' work in tasks such as: childbirth, suturing, incision and drainage, and other minor surgical procedures.
- **Increase in Efficiency:** The PHC see an average of ten patients after nightfall every day. The bigger centres attended an average of 15-20 patients after nightfall each day, whilst the smaller PHC tend to see between 5-10 patients after nightfall per day. These numbers have largely remained the same before and after the intervention. All the Primary Health Care centers (PHCs) that took part in the survey already provided a 24-hour round-the-clock service. However, the quality-verified products improved the efficiency with which midwives attended to patients after dark in the health centers. This was highlighted in exit interviews and focus group discussions across the participating centers.

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### **3.2.2 Overall Product performance:**

#### ***(a) General satisfaction with products***

PHCs that took part in this study were generally satisfied with the products surveyed. However, they did indicate some concerns with one of the products. In particular it was noted that one product was more complex to set up than the others. Furthermore, this product took longer to charge, and yet discharged in less time than the others.

#### ***(b) The adequacy of the lighting levels for task performance:***

All four products were evaluated and found to be generally satisfactory. The brightness/adequacy of the lighting levels were sufficient to examine and evaluate patients after sunset / at night at all the PHCs that took part in this study. All four products were said to be bright enough to assist with childbirth and other tasks performed at the PHCs after sunset. This observation is consistent across the 36 PHCs that took part in the survey.

#### ***(c). Battery charging and discharge***

The average length of time taken to fully charge batteries for the deployed lanterns was evaluated. The products took, on average, between 8 – 10.5 hours to charge, although one product took relatively longer, needing 12 – 14 hours for a full charge.

On average, it took the products relatively fewer hours to recharge the batteries in Nasarawa and Adamawa State as compared to Ondo state. The reason for this may be attributed to the fact that Nasarawa and Adamawa have more sun hours per day – approximately 5 - 5.5 hours a day – than in Ondo state, which has 3.5 – 4 sun hours per day. Ondo state is also characterized by cloud-cover, particularly during rainy seasons. The northern states of Adamawa and Nasarawa mainly have clear skies in most parts of the year.

The four products were used for an average of between 10 – 12 hours daily in grid connected PHCs and slightly longer in off-grid locations. However, one product can go for up to 100 hours on the “bed light” setting, and another could only be used for approximately 7 – 8 hours once the battery was fully charged, even though this product took nearly twice as long as the other systems to fully recharge its battery in the same locations

This was the experience amongst the user groups in most of the PHCs across the participating state primary health care agencies. The State Primary Healthcare Agencies that took part in an exit interview indicated that they would like to use the product for an average of 12 hours daily, as did the PHCs.

#### ***(d) Phone charging***

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The phone charging capacity was found to be very useful and innovative. The products were used by staff and patients to recharge their phones, therefore enabling effective communication between PHC staff as well as patients, particularly in off-grid locations. The lanterns provided the opportunity to charge their phones at work. Some staff who live in off-grid locations previously charged their phones with commercial phone charging vendors. However, with the introduction of these products they can now charge their phones at work, saving both time and money.

Grid-connected PHCs in the rural areas experience several hours, sometimes several days of mains power outage. In the rainy season the power outage in grid-connected PHCs tends to be more frequent and last for longer periods. Therefore, the phone charging facilities of the lantern was very useful in 33 of the 36 PHCs that took part in this pilot.

**(d) Levels of satisfaction with products**

Levels of satisfaction with the products for both lighting a mobile charging were recorded. The overall performance was scored by the 36 PHCs that took part in this study on a scale of 1-5, where 1= Not Satisfactory; 3= Satisfactory; and 5 = Very Satisfactory.

In general, the levels of satisfaction were high, with 3 products receiving ratings above “Satisfactory.” Thirty-one (31) out of the thirty-six (36) respondents rated two of the products as very satisfactory (5 on the scale), whilst 5 of the respondents scored them a 4. This was attributed to the relatively short time it takes to fully recharge the batteries, the duration it takes for the batteries to completely discharge while the lamp is in continuous use, the adequacy of the lighting level, and the user friendliness of these products.

**(e) Product design, durability, affordability and aftersales support**

A qualitative survey was carried out as part of this study regarding overall performance and product quality. The respondent generally scored ‘After Sale Support’ very low because they were not aware of any after sale support services offered by the suppliers of these or similar products. However, a few of the respondents where made to understand by word-of-mouth that two of the companies offered support services in Abuja and Lagos.

The Health Care Agencies were provided with the contact details of the suppliers of these products, and advice was given to them on how they might get support with regards to these products.

**3.4 Impact of Products on PHCs Service Delivery**

There was no evidence to suggest that a higher number of patients were seen after nightfall following the introduction of the quality-verified solar lanterns. The PHCs essentially offer a round-the-clock service.

However, the task and activities across the 36 PHCs were now performed much more efficiently and effectively following the introduction of the quality-verified solar lanterns in

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this pilot activity. The activities that recorded significant benefits following the introduction of these products after dusk, include the following:

- Childbirth
- Suturing
- I&D
- Circumcision
- Minor surgical procedures
- Patient clerking
- Examination and Evaluation of patients
- Drug dispensing.

The use of the lanterns allowed for efficient turn-around time for patient examination, evaluation and treatment. This experience was widely observed by midwives across the 36 participating health centers in Nigeria. The main drivers for the success of the lanterns in this study was mainly attributed (by the users) to the brightness of the products, and the duration it takes the battery to completely discharge. The energy-use of the lanterns is free and renewable, this came across as a significant economic and environmental benefit – as indicated by 93% of users in a survey carried out as part of this study (midwives, patients and healthcare administrators).

### **3.5 Increased demand of products/ private sales**

There is anecdotal evidence of increased demand. The demand created during training and demonstration of products led to the state coordinators to compile names of people interested in purchasing solar lanterns. Orders for quality-verified products were placed with vendors whose details were provided by trainers at the request of state coordinators. About 100 products were sold by vendors to health staff in the first 6 weeks. Total petrol stations in participating states confirmed an increase in demand of quality-verified products such as the Sunking Pro, but were not able to provide numbers of products sold.

## **4.0 Conclusions and recommendations**

The pilot project has been successful in demonstrating and raising awareness among the health service providers and users that modern off-grid lighting technology is robust and works properly, and in building confidence of users in the health centers. When healthcare facilities invest in better lighting, patients and staff not only see better, they feel better too. Good lighting can do far more than just improve visibility—it can actually improve caregiver performance. Installing the proper lighting products can help patients relax, nurses become more efficient, and doctors focus more easily on the tasks at hand.

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The use of off-grid solar lighting systems by the health centers has demonstrated the role of modern lighting products in increasing the quality of health care provided; improving patient diagnoses through brighter task lighting.

Following the success of the Pilot program, the Lighting Africa team recommends scaling up of the activity to cover primary healthcare centers across the six geopolitical zones of Nigeria. This would not only increase awareness of the products, but also increase the demand of the products in the public and private healthcare sectors.

In designing a scale-up program, there would be a need to quantify all PHCs in the 6 regions; evaluate the lighting energy demand for the health care centers; evaluate and select off-grid lighting products/options to be deployed, based on their suitability to perform different tasks, resource availability and geographic location.

The scale-up program should highlight procurement and logistical procedures to reach all the relevant PHCs. Institutional aspects of policy, planning, management, financing, community participation, private sector participation and user interface would be critical to the successful use of any chosen off-grid lighting product.

To ensure long term sustainability and reliability of off-grid lighting solutions, the proposed scale-up should be a coordinated strategy between the federal ministry of health and the state ministry of health. A policy framework to integrate solar off-grid modern lighting into public health care should be supported with political will and commitment.

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## 5.0 Appendices

The following documents may be found in the appendices

**Appendix 1: Distribution List of the Quality-Verified Solar Lanterns deployed**

**Appendix 2: Questionnaire**

## Appendix 1: Distribution List of Quality-Verified Solar Lanterns deployed

Distribution List Products	Adamawa State	Nasarawa State	Ondo State
<b>Barefoot</b> PowaPack 5W	8	6	6
<b>In Diya</b> Lighting System	8	6	6
<b>d.light 300</b> Lantern	16	12	11
<b>Sun King Pro</b> Lantern	16	12	11
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<b>Remarks</b>	Trained on 6.4.14	Trained on 14.3.14	Trained on 24.3.14

Appendix 2: Questionnaire

**EVALUATION QUESTIONNAIRE, LIGHTING AFRICA SOLAR PILOT PROJECT<sup>3</sup>**  
**NIGERIAN MEDICAL SECTOR**  
**WBG/IFC Pilot Project**

Name of Primary Health Centre: \_\_\_\_\_  
State: \_\_\_\_\_  
Date: \_\_\_\_\_

Product Surveyed:      1. Barefoot      2. In-Diya      3. d.light 300      4. Sun King Pro

- 1a. Has solar lighting extended typical working hours. [ ] Yes    [ ] No
- 1b. What were the typical working hours in the period/days before solar lighting? [ ] hours
- 1c. What are the typical working hours now, following the introduction of Solar Lighting? [ ] hours.
- 1d. How many patients did you (or the health centre) receive after sunset yesterday? [ ]
- 1e. Is this typical? Yes [ ]      No [ ] if No give  
reason.....
- 1f. How many patients, typically, did you (or the health centre) receive after sunset before solar lighting? [ ]

**2. Adequacy of light levels for Task Performance**

2a. Is the light bright enough to perform minor surgery or similar procedure?

(Tick as appropriate) ✓

- Barefoot      [ ] Yes      [ ] No
- In-Diya      [ ] Yes      [ ] No
- d.light 300      [ ] Yes      [ ] No
- Sun King Pro      [ ] Yes      [ ] No

2b. Is the light bright enough to examine/evaluate patients after sunset/at night?

(Tick as appropriate) ✓

- Barefoot      [ ] Yes      [ ] No
- In-Diya      [ ] Yes      [ ] No

<sup>3</sup> Error in the product names and designation corrected for publication. This change in no way impacts the results of the survey.

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d.light 300     Yes             No

Sun King Pro     Yes             No

2c. Is the light bright enough to assist with childbirth after sunset/ at nights?

(Tick as appropriate) ✓

Barefoot             Yes             No

In-Diya             Yes             No

d.light 300         Yes             No

Sun King Pro       Yes             No

2d. How would you rate the brightness of the light? Answer on a scale of 1 – 5 as follows:

[1]. Not Bright Enough to Perform Any Tasks; [2]. Not Bright Enough to Perform Most Tasks; [3]. Bright Enough to Perform Some Tasks, but Not Bright Enough to Perform Difficult Tasks, Such As Surgery; [4]. Bright Enough to Perform All Tasks; [5]. Brighter Than Necessary to Perform All Tasks

Barefoot:            1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

In-Diya:            1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

d.light 300:        1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

Sun King Pro:      1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

### 3. Overall Product Performance

3a. How long does it take to fully recharge the battery? (Tick as appropriate)

Barefoot             hours

In-Diya             hours

d.light 300         hours

Sun King Pro       hours

3b. How many hours do you use the product per day?

Barefoot             hours

In-Diya             hours

d.light 300         hours

Sun King Pro       hours

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3b. How many hours would you like to use the product per day?

Barefoot      [ ] hours

In-Diya        [ ] hours

d.light 300    [ ] hours

Sun King Pro   [ ] hours

3c. From your experience, how would you describe the product's daily battery life?

Answer on a scale of 1 – 5, as follows: [1] far too short, [2] too short, [3] short [4] the right amount of time, [5] long, [4] longer than necessary. (Tick as appropriate) ✓

Barefoot:      1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

In-Diya:        1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

d.light 300:    1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

Sun King Pro:  1[ ]    2[ ]    3[ ]    4[ ]    5[ ]

3d. Give example(s) on how these products help you to perform your daily activities/job

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3e. List of activities that you would not have carried out without these products.

3e. List of activities that you would not have carried out without these products.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3f. Was the phone charger feature important for your daily activities/job?      [ ] Yes [ ] No

3g. Were you able to use your phones in more effective ways?                      [ ] Yes [ ] No

if yes, please provide examples in the box provided below:

\_\_\_\_\_

\_\_\_\_\_

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3h. Has your travel time and charge expenses decrease since you could charge the phone at the center?

Yes  No if yes, how much?

3i. Do you use the product to recharge the mobile phones?  Yes  No

*(Tick as appropriate) ✓*

3j. How many phones were charged by the product yesterday?

Is this typical?  Yes  No, if No give reason.....

3k. In your opinion, please indicate the overall product performance on a scale of 1 - 5 as follows -

[1] Excellent, [2] Very Good, [3] Satisfactory [4] Fair [5] Poor

Barefoot: 1[ ] 2[ ] 3[ ] 4[ ] 5[ ]

In-Diya: 1[ ] 2[ ] 3[ ] 4[ ] 5[ ]

d.light 300: 1[ ] 2[ ] 3[ ] 4[ ] 5[ ]

Sun King Pro:1[ ] 2[ ] 3[ ] 4[ ] 5[ ]

3l. Please indicate improvements or new features you would like to see (in terms of performance) in the appropriate boxes provided below:

**Barefoot:**

**In-Diya:**

**d.light 300:**

**Sun King Pro:**

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Any other comments or questions you would like to share with us regarding the solar light?

4 .Please complete the table below if these data exists at your primary health care centre/

<b>Events in Health Care Centre</b>	<b>No. Before Solar Lighting</b>	<b>No of Success cases Before solar lighting</b>	<b>No After Solar lighting</b>	<b>No of success cases After solar lighting</b>
No of patients seen at night				
No of surgeries performed at nights				
No of emergency surgeries performed at nights				
No of Childbirths attended at nights				