MILLION SOLAR URJA LAMP (SoUL) PROGRAM

Right to Clean Light

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An Initiative of
Indian Institute of Technology Bombay

Sponsored by
Ministry of New and Renewable Energy, Government of India

Concurrent Evaluation Report of Million SoUL Program in India

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Million SoUL Program

Million SoUL Program (MSP) is an initiative of Indian Institute of Technology, Bombay (IITB). MSP headquater is located in Mumbai within the campus of IIT B. Its principle funders include Ministry of New and Renewable Energy (MNRE), Madhya Pradesh Govt., Sir Dorabji Tata Trust (SDTT), Larsen and Turbo (L&T) and Tata Motors.

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List of Acronyms

BP	British Petroleum
CEA	Central Electricity Authority
CRISIL	Credit Rating Information Services of India Limited
MDG	Millennium Development Goal
MNRE	Ministry of New and Renewable Energy
MSP	Million SoUL Program
NGO	Non Governmental Organization
IEA	International Energy Agency
IIT-B	Indian Institution of Technology, Bombay
PDS	Public Distribution System
RGGVY	Rajiv Gandhi Grameen Vidytikaran Yojana
RVEP	Remote Village Electrification Program
SDG	Sustainable Development Goal
SE4ALL	Sustainable Energy for All
SELCO	Solar Electric Lighting Company
SKO	Superior Kerosene Oil
SoUL	Solar Urja Lamps
SRC	SoUL Repair Centre
SRCM	SoUL Repair Centre Manager
TERI	The Energy and Resource Institute

Executive Summary

The Million SoUL Program (MSP) an initiative by Indian Institute of Technology (IIT) Bombay aims to bring 'right to clean light to every child' in rural India. With this vision, two year Programwas implemented in 2014-16 across four states (Madhya Pradesh, Maharashtra, Rajasthan, and Odisha) in 97 blocks with help of NGO partners who act as implementers at the ground level. In one and half years, over 7,35,000 solar study lamps called as Solar Urja Lamps (SoUL) were distributed, while 2,65,000 SoULs were distributed in five months period. This report presents results of concurrent evaluation (Round I) of the MSP conducted in four intervention states. The objective of concurrent evaluation is to bring transparency in the MSP, make mid-course corrections and assess impact of the SoUL. The concurrent evaluation, which is made by conducting household survey in sample blocks, was planned in two rounds: (a) after SoULs are distributed (so that mid-course corrections can be made) (b) 4-5 month prior to the end of program. In order to understand impacts, a comparison between treatment sample (households of students who purchased SoUL) and control sample (households of students who didn't purchase SoUL) as well as electrified and non-electrified households in both the samples was made. The project team of IITB conducted this study.

Main findings across four states indicate a shift towards use of solar study lamp from kerosene wick lamp for different tasks like studying, household chores, etc. Though, there is no major difference in terms of studying hours between treatment and control groups, however results from the survey show no dependence on kerosene based devices for studying in treatment group against continued dependence in control group. It was observed that only 4.87 percent of children in treatment households used only kerosene based devices for studying, while 22.88 percent of children in control households studied using only kerosene based device. Studying under clean lighting source can have health advantage like no exposure to soot coming from kerosene wick lamp. Differences observed between treatment group and control group in terms of kerosene consumption and overall lighting expenditure indicate the positive impact of

SoUL on beneficiary rural households. Households also report of SoUL aiding in completing other household chores and carrying livelihood activities like irrigating farms during night, which serves as an added benefit. One main concern with respect to performance of SoUL is the non-functionality rate which was above 16 percent in all the surveyed blocks. While the product quality is being observed as an important issue, inappropriate user handling also serves as a major barrier in long term functioning of SoUL. Based on this result, mid-course corrections were made in terms of campaigning about availing free servicing facility, organising lamp repairing camps in the schools and improvement in the lamp design. Unavailability or non-reliability of electricity is the key driver for requirement of renewable energy products. Amongst surveyed households, 48.23 percent of treatment households and 63.89 percent of control households displayed willingness to pay for solar PV technology based lighting devices. Results from impacts of MSP show potential of targeted renewable energy programs providing alternative solution to energy access (specifically for lighting) problem. Since purchasing power of rural communities is low suitable financial models need to be evolved so as to convert this demand into purchase and thus fulfil energy needs of the rural communities.

Chapter 1. Introduction

Energy access is an important issue to be addressed at international, national and sub-national level to accelerate development of low income communities. As the development discussion has progressed from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs), energy access became one of its central goals. UN General Assembly declared year 2012 as Sustainable Energy for All (SE4ALL) and 2014-2024 a decade for the same (UNDP 2011). In 2015, UN General Assembly adopted the agenda for Sustainable Development under which the goal 7 of SDGs aims to "*ensure access to affordable, reliable, sustainable and modern energy for all"*[1]. While focus on improving the energy access has grown in last decade, there are still billion plus population indeveloping and least developed nations across the worldthat lack access to modern source of energy (IEA 2013). Lack of access to modern energy such as electricity undermines key development indicators such as education, health and livelihoods. It is clear through literature that without access to modern energy, achieving social and economic development of countries will remain distant dream. While the energy access is multidimensional which includes houhehold (cooking and lighting needs) and productive (livelihood) needs, this report is specially focused upon the lighting needs presenting arguments and results fromevaluation of solar lighting project 'Million SoUL Program' (MSP) initiated by Indian Institute of Technology Bombay (IIT B).

1.1. Energy Scenario in India

According to BP statistics review of world energy (2015), India is the fourth largest electricity producer in the world. However, India is also home to the largest number of people without access to electricity (IEA 2013). On supply front, India faces multiple challenges in terms of making electricity available to its rural population. One of important challenge faced by the power utilities is form of under-recoveries from sale of electricity to the consumers. This results

[1] Can be read further read about the goals Sustainable Development Knowledge Platform <https://sustainabledevelopment.un.org/topics>

huge financial losses undermining the ability of the utilities to expand and improve services (CRISIL 2012)[2]. Apart from financial constraints that have burdened the state power utilities, the infrastructural challenges seem more daunting towards making electricity available to the rural communities (IEA 2011). Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), the flagship Program for rural electrification had set objective to achieve complete rural electrification of rural area by 2012, which however the Program has missed and still large population live without electricity.

Most of the people without access to electricity depend upon kerosene as their primary source of lighting in the households. Census (2011) data show around 43.2 percent of the rural households in India depend upon subsidized kerosene as the main source for lighting. Kerosene which pose substantial health risks at household level, also pose a burden on state and national financial budgets by means of subsidy (Nouni et al. 2009). For example, TERI study shows the accumulated under-recoveries on the sale of kerosene over last decade amounts to INR 188,502 crore[3] (TERI 2014).

1.2. Emergence of Renewable Energy

Renewable energy has shown potential for being alternative to energy access problem, specifically for access to electricity for lighting needs. Off-grid applications of renewable energy have been growing over past decade in context of failure of grid electrification to reach the sparsely populated rural population. Various actors – governments, NGOs and social enterprise have experimented with business models for provisioning of off-grid based services. From government standpoint while range of off-grid renewable options (like biomass based generation, wind power, solar power etc.) is available, the most preferred option under renewable energy Programs like Remote Village Electrification Program (RVEP)[4] is seen to be solar (Bhushan and Kumar 2012). As of August 2015, cumulative off-grid solar PV systems

[2] More on the under recoveries of the state power and distribution utilities can be read in CRISIL (2012).
[3] Crore is Indian number system and equals to 10 Million.
[4] Remote Village Electrification Program (RVEP) is government off-grid renewable technology electrification Program for remote villages and hamlets which could not electrified through grid electrification or covered under RGGVY.

already accounts for 279.74 Megawatt (MW)[5], of which 45.39 MW was added in the last one year (MNRE 2015). Off-grid systems are installed either through local mini/micro grids[6] or isolated solar home systems, solar lanterns. Similarly, a large range of social enterprises like SELCO, Mera Gaon Power, D.light are experimenting with solar technology as viable off-grid option through different service provisioning models. Off-grid interventions are fast becoming preferred option in rural areas over grid electrification due its reliability (Bhushan and Kumar 2012).

1.3. Literature Review

Literature is available in context of impacts of off-grid solar interventions in India specifically in small system dissemination like solar lanterns. This impact assessment report adds to the growing literature on impact of small scale technologies like solar lamps and lanterns on improvement in lives and livelihoods of the rural communities. A study on impact of solar lantern Program named LaBL[7]conducted by TISS (2013), have outlined positive impact across education, health and livelihoods through increased studying hours, lesser exposure to sooth from the kerosene lamps and aiding livelihood activities. This substantiate the potential of off-grid solar intervention to offer benefits at household level. A research by Agoramoorthy and Hsu (2009) on 100 households in tribal areas of rural India also confirms increased study duration of children by hour and half as a result of provisioning solar lantern. Similarly, their study also reports of decreased expenditure on kerosene and electricity bill expenditure of these households post purchasing the solar lanterns. Their results were important as the rural areas where study was conducted were not receiving power between 3 to 6 am in the morning and 6 to 9 pm in the evening, which are actually dark hours. Similar insights are provided by Garg (2014) on the solar lantern Programs introduced by Government of India for school going girls in rural areas. Study of solar PV electrification Program in India by Chakrabarti and Chakrabarti (2002) reveal higher willingness to pay by the sample households who currently use

[5]Megawatts are used to measure the output of a power plant

[6] Mini/micro grids are centralized generation at local village or Panchayat level

[7] Lighting a Billion Lives (LaBL) is solar lantern Program launched by TERI in 2008. More details about the Program can be found at the Program website http://labl.teriin.org/

solar energy. The study also highlights the overall change in behavior as communities are willing to move towards adoption of cleaner technology. The authors state (pp. 41), ' … (communities) have expressed their willingness to continue the use of solar power, even if diesel power is available at low cost, to avoid the air and noise pollution caused by a diesel generator'.There is also literature available on impact of other off-grid solar Programs, however systems disseminated in such cases are of larger capacity (like in case of Solar Home Systems under RVEP in India or IDCOL Programin Bangladesh) which can fulfill higher needs of the households and hence the impacts literature cannot be contextualized within the scope of MSP.

1.4. The Million SoUL Program

IIT Bombay has developed the 'localisation of solar energy model' through its Million SoUL Program (henceforth MSP). In this model assembly, distribution and maintenance of the solar lamp are done by the local people. In order to achieve scale, the model is designed such that it can be replicated in parallel in multiple blocks, across districts and states. For achievingspeed, assembly and distribution for any block is designed to be completed in 90 working days. In order to target skill development, rural people are trained in the assembling, distribution and repair of these lamps in their local areas.

The goal of the MSP is to fulfil 'right to clean light to every child' in rural areas for the study purpose during dark hours in the fastest possible way, thus reducing dependency on kerosene lamp and contribute to build a better future. The specific objectives are:

- Provide one SoUL to every student to increase their study hours
- Involve local people and develop their capabilities to assemble, sale, provide repair and maintenance service for solar products
- Generate sustainable employment in rural areas

The model is based on the solar PV technology with its inherent feature of providing off-grid decentralized energy at an individual or household level. It integrates three critical elements of speed and reach at wider scale (access) through saturation, cost effectiveness (affordability),

and sustainability. The model has three core concepts of 'partnership approach', 'capacity building' and 'financial viability'. These concepts in the model are interrelated and interdependent and they converge in to realization of localisation of solar energy.

The phase 1 of the MSP (7,35,000 lamps distributed) is implemented by IIT Bombay in 2014-15 across four Indian states of Madhya Pradesh, Maharashtra, Rajasthan, and Odisha, while phase II (2,65,000 lamps distributed) was implemented in the same states in 2015-16. The funding from the central and state governments as well as philanthropic partners contributed towards keeping the beneficiary contribution low. The actual cost per solar urja (study) lamp (SoUL) is Rs. 500, however at the subsidized cost beneficiary contribution was Rs. 120 per lamp. Any child enrolled in the school and studying between Class V to Class XII is eligible to purchase one SoUL and they can avail free servicing facility provided in their vicinity till end of the phase, i.e. December 2015 for phase I. In both phases 1 million solar study lamps called as Solar Urja Lamps (SoUL) are distributed. For localisation and ground level implementation partnership is formed with the NGOs. The MSP was implemented in 97 rural blocks (sub-districts) of the four states covering more than 10,900 villages. The capacity building of the local people has resulted into development of 350 solar entrepreneurs (called as SoUL repair centres managers – SRCM). The detailed overview of reach, vendors and saturation date is provided in Table 1.

Table 1: Overview of NGO partners, Vendors and SoUL Distribution in India in Phase I

Madhya Pradesh						
NGO Partner	**District**	**Block**	**Vendor**	**Distributed SoULs**	**Start Date**	**Saturation Date**
Ashagram	Barwani	Pati	Thrive	10781	20-Feb-2014	14-Mar-2015
		Niwali		11672	20-Feb-2014	19-Mar-2015
		Barwani		14070	6-Apr-2014	14-Mar-2015
		Rajpur		312	20-Feb-2014	1-Aug-2014
AKRSP	Barwani	Sendhwa	Thrive	15900	11-Apr-2014	13-Mar-2015
	Khargone	Jhirnia		13789	28-Mar-2014	6-Apr-2015
	Khandwa	Pandhana		2060	22-Aug-2014	19-Nov-2014

	Khandwa	Khalwa		2920	21-Aug-2014	13-Nov-2014
CARD	Mandla	Bichiya	Sirus	16000	16-Aug-2014	15-Feb-2014
		Mandla		18700	19-Jul-2014	9-Feb-2015
		Ghughri		10800	3-Jun-2014	12-Jan-2015
	Dhar	Tirla		6600	19-May-2014	15-Nov-2014
		Nalcha		15892	26-May-2014	10-Jan-2015
		Dhar		11662	12-Sep-2014	10-Jan-2015
		Sardarpur		21000	10-Sep-2014	14-Mar-2015
GVT	Dhar	Kukshi	Sirus	9500	10-Jul-2014	23-Feb-2015
	Jhabua	Ranapur		1492	7-Nov-2014	12-Feb-2015
		Jhabua		13595	24-May-2014	28-Feb-2015
		Meghnagar		9963	24-May-2014	16-Dec-2014
		Thandla		9865	24-May-2014	5-Feb-2015
		Rama		8585	7-Nov-2014	12-Feb-2015
Sahjeevan	Shahdol	Burhar	Thrive	20663	24-Mar-2014	10-Dec-2014
		Kotma		10145	24-Mar-2014	5-Mar-2015
		Sohagpur		20940	24-Mar-2014	17-Jan-2015
		Gohparu		11757	18-Sep-2014	13-Jan-2015
CARD	Dhar	Badnawar	Thrive	4035	1-Feb-2015	9-Feb-2015
	Jhabua	Petlawad		16565	4-Nov-2014	4-Feb-2015
BAIF	Betul	Chicholi	Thrive	8638	11-May-2014	31-Dec-2014
		Betul		22153	11-May-2014	11-Feb-2015
		Athner		11355	11-May-2014	10-Feb-2015
		Shahpur		15449	1-Aug-2014	8-Dec-2014
		Ghodadongri		16554	1-Aug-2014	21-Feb-2015

Rajasthan						
NGO Partner	**District**	**Block**	**Vendor**	**Distributed SoULs**	**Start Date**	**Saturation Date**
BAIF	Udaipur	Jhadol	Gautam	19071	8-Aug-2014	20-Mar-2015
	Dungarp	Aaspur	Sirus	18084	6-Jun-2014	25-Feb-2015

	ur					
GVT	Banswara	Kusalgarh	Sirus	12400	16-Jun-2014	3-Mar-2015
		Bagidora		7563	13-Jun-2014	5-Mar-2015
		Talwara-Banswara		15686	13-Jun-2014	5-Mar-2015
	Baran	Kishanganj	Gautam	13339	13-Jul-2014	22-May-2015
		Baran		1549	13-Jul-2014	4-May-2015
		Antah		6150	13-Jul-2014	28-Feb-2015
FES	Pratapgarh	Pratapgarh	Tata	17400	16-Jun-2014	13-Jan-2015
	Chittaurgarh	Begun		9916	15-May-2014	26-Nov-2014
	Bhilwara	Mandalgarh		18770	15-May-2014	20-Mar-2015
		Mandal		20379	9-Aug-2014	16-Mar-2015
	Udaipur	Gogunda		11877	19-Jun-2014	14-Feb-2015
	Rajsamand	Kumbhalgarh		8009	1-Aug-2014	1-Mar-2015

Maharashtra						
NGO Partner	**District**	**Block**	**Vendor**	**Distributed SoUL**	**Start Date**	**Saturation Date**
BAIF	Palghar	Jawhar	Thrive	14373	13/02/2014	1/1/2015
		Vikramgad		12507	1/5/2014	6/1/2015
		Wada		12393	9/6/2014	5/1/2015
		Junnar		1500	14/11/2014	14/11/2014
		Mokhada		10525	15/04/2014	29/11/2014
		Palghar		10501	25/06/2014	16/12/2014
WOTR	Ahmednagar	Sangamner	Thrive	25028	20/02/2014	15/12/2014
		Akole		28489	18/03/2014	13/02/2015

Odisha						
NGO Partner	**District**	**Block**	**Vendor**	**Distributed SoULs**	**Start Date**	**Saturation Date**
HarshaTrust	Koraput	Kundra	Sirius	6702	21/07/2014	16/3/2015
		Jeypore		5466	8/7/2014	26/3/2015
		Bariguma		1101	10/9/2014	13/03/2015
		Kotapad		4351	25/9/2014	16/3/2015
		Baipariguda		7466	16/09/2014	24/3/2015
	Nabarangpur	Nabarangpur		6062	31/07/2014	22/3/2015
		Papadahandi		8309	30/07/2014	19/2/2015
		Kosagumda		10629	18/09/2014	23/3/2015
FES	Koraput	Bandhugaon	Sirius	393	17/09/2014	Implementation was withheld in 11 blocks due to funds constraints
		Dasmantpur		183	28/8/2014	
		Koraput		2691	9/9/2014	
		Narayanpatna		630	17/09/2014	
		Potangi		262	9/9/2014	
		Semiliguda		721	9/9/2014	
		Koraput NAC		0		
		Lamtaput		586	27/9/2014	
		Laxmipur		100	13/1/2015	
		Nandapur		361	24/10/2014	
		Sunabeda NAC		538	20/10/2014	

Chapter 2. Methodology

The MSP has influenced the sizeable number stakeholders in rural areas of four Indian states in a short span which needs to be studied in depth to gain insights about the efficacy of it. This can further contribute to up-scaling, replication, and the policy recommendations related to solar technology. Hence, the research component formed an integral part of the MSP and accordingly the concurrent evaluation of it was conducted.

The objectives of the concurrent evaluation are to:

1. Assess performance of SoUL
2. Assess socio-economic impact of the Million SoUL Program
3. Assess market potential for solar PV products in rural areas
4. Bring transparency in the project and make mid-course corrections

The objectives of the research guided to take the quantitative approach. Accordingly the survey method was applied for data collectionat the household level. The quantitative method studied households of the SoUL recipients (treatment sample) and SoUL non-recipients (control sample) who despite being eligible had not purchased SoUL. The household survey was planned to be conducted in two rounds in 20 representative sample blocks of Phase I. The round one was after SoULs were distributed and round two was 4-5 months prior to the end of Phase 1 in December 2015. In survey the same household is to be surveyed twice at two intervals. This report presents the results of the household survey for India that covers four MSP intervention states and the mid-course corrections that are required for improvement of the Program.

2.1. Sample for household survey

The sampling method employed for selecting the sample was “purposive stratified sampling”. The sampling size and plan was as follows:

- Two samples were drawn, viz. Treatment Sample and Control Sample. Treatment sample was defined as the recipients of SoUL (who have purchased SoUL from the school) studying

in class V- XII and control sample defined as the children studying in classes V- XII who have not purchased SoUL.

- 1.2% of the total population (i.e. one million students who have purchased the SoUL) was taken as the "treatment sample".
- The control sample was considered as 10% of the treatment sample.
- Total sample size was 1.32%.
- The sampling plan comprises of two stages: Purposive Sampling followed by Stratified Sampling.
- For Purposive Sampling, the blocks where the MSP has been implemented were clustered and then a representative block was chosen for the survey. This clustering was based on homogeneity of geographical and social characteristics of the population in each block. Thus, sample of 20 blocks was selected of a total of 97 blocks where one Million SoULs were distributed.
- The second stage of sampling involved dividing the population into strata and then taking a sample through purposive sampling. There were two strata, viz. electrification status of house and caste category of the household. The castes were divided into three categories, namely, Scheduled Castes (SC), Scheduled Tribes (ST) and others comprising general and Other Backward Castes (OBC). Thus, the sample (number of households to be surveyed) was arrived at by referring to Census 2011 block level data which determined the proportionate percentage of electrified and non electrified households and caste composition.
- Using database on recipients of SoUL, villages having sufficient number of SoUL recipients of the required strata were selected. During selection it was ensured that remote and relatively small villages were not left out. The percent of villages having less than 150 households, i.e. small villages, were in the following blocks of the four states in which the MSP has been implemented: Palghar (MH): 29%, Barwani (MP): 30%, Banswara (RJ): 43% and Koraput (OD): 66%. Typically, 15-20 villages are sampled, out of which at least one village in MH and MP, two villages in RJ and 3 villages in OD are remote and have below 150 households. For control samples, the caste category and number of households of the

selected villages were checked with Primary Census Abstract to make sure there were sufficient numbers of control samples.

2.2. Cluster approach and representative block for household survey

As aforementioned the distribution of SoUL in India had taken place in 97 blocks, amongst which77% of these blocks were tribal blocks (designated by Ministry of Tribal Affairs). Conducting household survey for the purpose of concurrent evaluation in all the implementation blocks was not feasible considering the geographic spread and resources required; hence 'cluster' approach was taken towards resolving this issue. The cluster of blocks was formed on the basis of their geographic and demographic similarities, and one block is selected as a representative block from each cluster for conducting the concurrent evaluation. This allowed for generalization of impacts without compromising on the validity of the research sample. There were five such clusters on basis of aforementioned criteria and five blocks were selected as a representative blocks for the concurrent evaluation. The following table 2 presents the clusters that were formed and the representative blocks in which the household survey was conducted.

Table 2: Representative Block and Block Cluster

Representative block for HH Survey in Mashya Pradesh	**Names of Blocks in the Cluster**	**District**	**NGOs Name**
Shahpur	Shahpur	Betul	BAIF
	Chicholi		
	Ghodadongri		
Betul	Betul		
	Athner		
Burhar	Burhar	Shahdol	Sahjeevan Samiti
	Sohagpur		
	Gohparu		
	Kotma	Annupur	
Nalcha	Nalcha	Dhar	CARD

	Tirla		
	Dhar		
	Sardarpur		
Jhirnia	Kukshi	Dhar	GVT
	Jhirnia	Khargone	AKRSP
Meghnagar	Petlawad	Jhabua	CARD
	Meghnagar		GVT
	Thandla		
	Rama		
	Jhabua		
Pati	Barwani	Barwani	Ashagram
	Pati		
	Niwali		
	Sendhwa		AKRSP
Ghughri	Ghughri	Mandla	CARD
	Bichiya		
	Mandla		

Representative block for HH Survey in Rajasthan	**Names of Blocks in the Cluster**	**District**	**NGOs Name**
Kusalgarh	Talwara (Banswara)	Banswara	GVT
	Bagidora		
	Kusalgarh		
Pratapgarh	Pratapgarh	Pratapgarh	FES
	Aaspur	Dungarpur	BAIF
Jhadol	Jhadol	Udaipur	
	Gogunda		FES
	Kumbhalgarh	Rajsamand	
Kishanganj	Kishanganj	Baran	GVT
Mandalgarh	Mandalgarh	Bhilwara	FES

	Mandal		
	Begun	Chittaurgarh	

Representative block for HH Survey in Maharashtra	**Names of Blocks in the Cluster**	**District**	**NGOs Name**
Vikramgad	Palghar	Palghar	BAIF
	Wada		
	Vikramgad		
Jawhar/Mokhada	Jawhar/Mokhada		
Sangamner	Sangamner	Ahmednagar	WOTR
Akole	Akole		

Representative block for HH Survey in Odisha	**Names of Blocks in the Cluster**	**District**	**NGOs Name**
Paparahandi	Nabarangpur	Nabarangpur	Harsha Trust
	Paparahandi		
	Kosagumda		
Kundra	Kundra	Koraput	
	Baipariguda		
Kotapad	Kotapad		

Chapter 3. Concurrent Evaluation Results for Four Intervention States (First Round)

For concurrent evaluation the household survey was conducted in 20 blocks of four intervention states. A total of 12,771 sample households were covered in the survey, with 11,328 treatment households and 1,443 control households. Figure 1 gives an overview of state wise sample households covered in the survey.

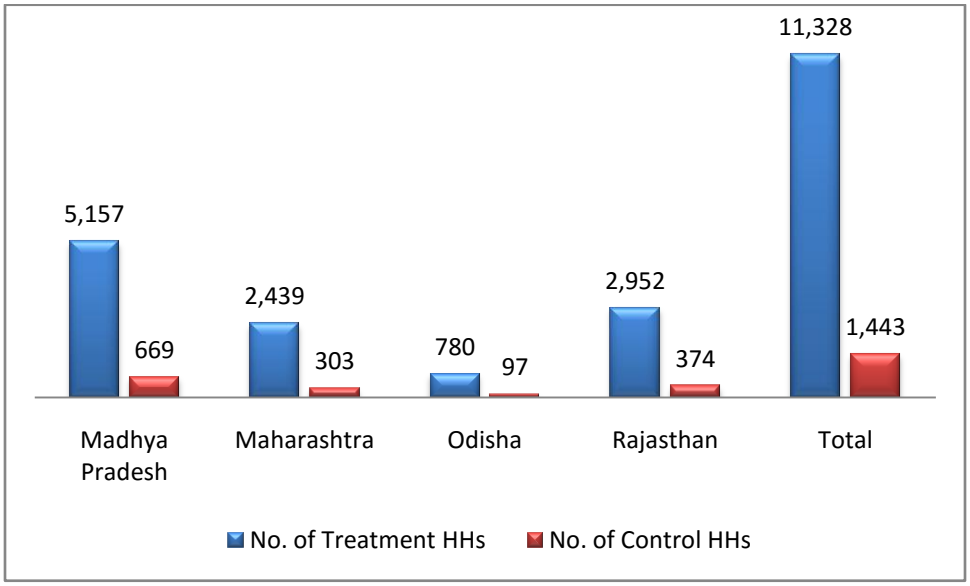


Figure 1: Sample households across four states

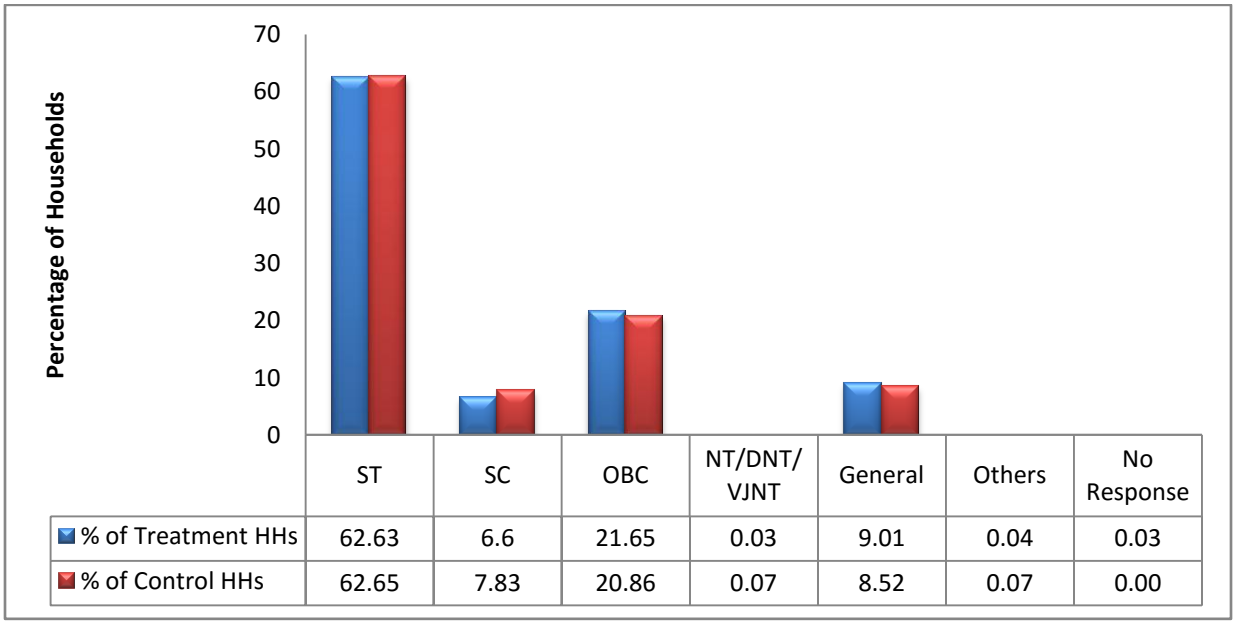
The sample households were spread across 566 villages in 371 Gram Panchayats. For state wise coverage of villages and Gram Panchayats refer table 3.

Table 3: Villages and Panchayats Covered in the Sample

States	No. of Villages	No. of Gram Panchayats
Madhya Pradesh	241	176
Maharashtra	110	90
Odisha	37	20
Rajasthan	178	85
Total	566	371

3.1. Socio-economic Background of the Sample Households in India

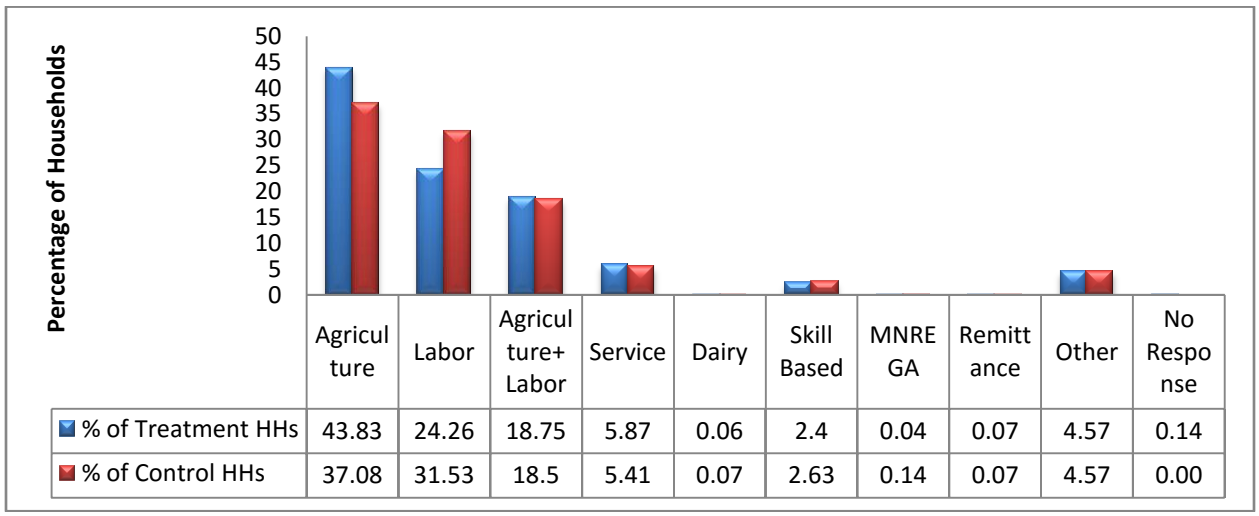
As per Census 2011, in rural India 18.45% of the population was Scheduled Caste (SC), 11.28% was Scheduled Tribe (ST), and 70.26% Others. Figure 2 given below represents the classification of sample households as per caste categories. In the sample, percentage of STs was 62 percent as intervention blocks have predominantly tribal population followed by other backward classes (OBCs).State wise distribution of sample households as per social category revealed that Madhya Pradesh has highest, 49.49 percent, scheduled tribe households followed by Rajasthan with 23.68 percent than Maharashtra 20.14 percent and Odishawith 6.69 percent.



	ST	SC	OBC	NT/DNT/ VJNT	General	Others	No Response
% of Treatment HHs	62.63	6.6	21.65	0.03	9.01	0.04	0.03
% of Control HHs	62.65	7.83	20.86	0.07	8.52	0.07	0.00

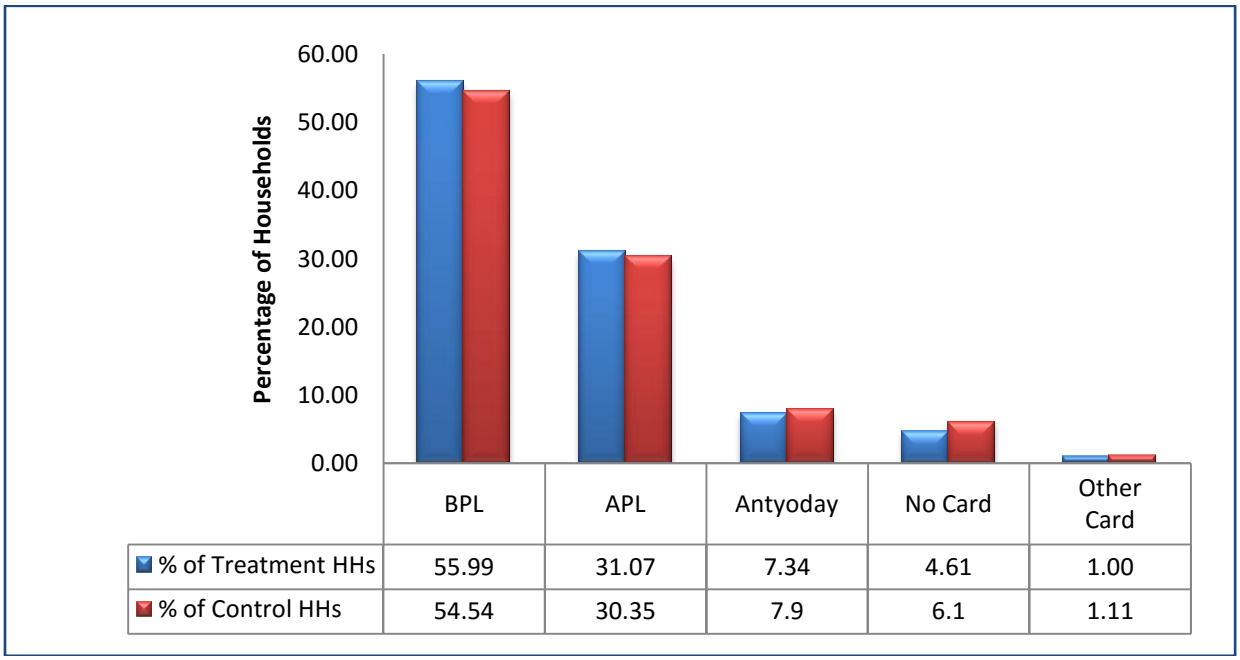
Figure 2: Distribution of sample as per caste categories

As observed in figure 3, agriculture is primary occupation for 43.83 percent treatment households and 37.08 percent of control households, followed by labor (24.26 percent in treatment and 31.53 in control). Almost 63 percent of sample households in each, i.e. treatment as well as control group are poor as they possess eitherbelow poverty line (BPL) or Antyodaya card (refer fig. 4).No electricity access or no electricity connection was reported by 25.9 percent treatment and 23.35 percentcontrol households.



	Agriculture	Labor	Agriculture+ Labor	Service	Dairy	Skill Based	MNREGA	Remittance	Other	No Response
% of Treatment HHs	43.83	24.26	18.75	5.87	0.06	2.4	0.04	0.07	4.57	0.14
% of Control HHs	37.08	31.53	18.5	5.41	0.07	2.63	0.14	0.07	4.57	0.00

Figure 3: Occupational profile of sample households



	BPL	APL	Antyoday	No Card	Other Card
% of Treatment HHs	55.99	31.07	7.34	4.61	1.00
% of Control HHs	54.54	30.35	7.9	6.1	1.11

Figure 4: Classification of sample households as per ration card

3.2. Details of school-going children in sample

Since the MSP's main aim is to provide children facility of reliable clean light so that they can study during dark hours, information regarding all school going children from class I to class XII or children between ages 5-17 was collected from the households. In all, there were total of 22,757 children in 11,328 treatment households and 2,752 children in 1,443 control

households. Gender-wise classification reveals 53.57 percent of children in treatment group were male, while same were 52.65 percent in control. Maximum percent of households (37.31 in treatment and 41.93 in control) had one school-going child which followed by households (35.43 percent in treatment and 34.03 percent in control) having two children.

Age-wise classification of children show maximum percentage of children (55.41 percent of all children in treatment sample and 51.49 percent of all children in control household) fall in the age group of 10-15 years. In treatment group, 28.65 percent of children fall in 5-10 years age group and 15.87 percent fall in age 15-20 years group; while in control group, 32.16 percent of children fall in 5-10 years age and 16.32 percent fall in 15-20 years age group. Class wise distribution show 36.81 percent of children in treatment sample study in upper primary section (6^{th} to 8^{th} standard), followed by 20.29 percent children in primary section (1^{st} to 4^{th} standard) and 20.20 percent children in secondary section (9^{th} and 10^{th} standard). In control sample 32.25 percent of children study in upper primary section (6^{th} to 8^{th} standard) followed by 23.34 percent in primary section (1^{th} and 4^{th} standard) and 17.99 percent children in secondary section (9^{th} and 10^{th} standard).

Of the total of 22,757 children in 11,328 treatment households, 62.33 percent school-going children have purchased SoUL. Amongst treatment households 84.53 percent households have purchased one SoUL, while 14.14 percent have purchased two SoULs. Reasons for not purchasing SoUL were explored in both – treatment group and control group. Main reason for not purchasing SoUL in treatment groups was 'non- eligibility' for 45.79 percent children as they studied between class 1-4, followed by 'studies from siblings' lamp' with 14.59 percent and 11.85 percent responding 'not required'. In control group, the main reasons (see Figure 5) given for not purchasing SoUL was 'did not have enough money' with almost 30.09 percent reporting it followed by 'not eligible' which is 17.53 percent. There was merely less than a half percentage of sample in control group who thought that cost of SoUL is expensive.

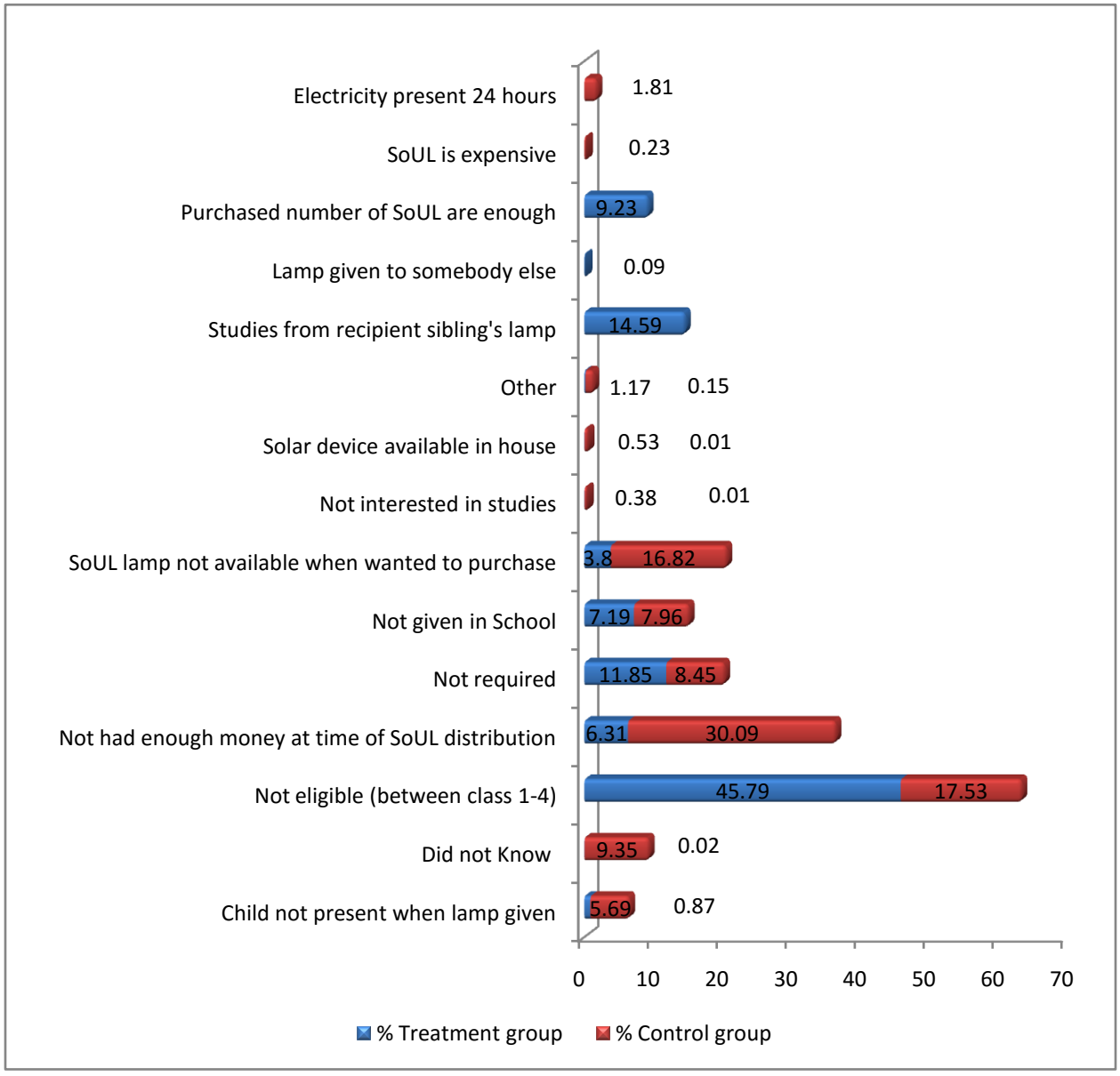


Figure 5: Reasons for Not Purchasing SoUL

3.3. Lighting: sources, devices and expenditure

3.3.1. Electricity bill:

Interval of receiving it and amount paid by sample householdsMaximum percentage of households in both the sample groups – 71.25 percent of electrified household in treatment group and 74.38 percent of electrified household in control group received the monthly bill below Rs. 300. 21.36 percent of electrified treatment household receive bill of Rs. 300-600,

3.64percent receive bill between Rs. 600-900 and 3.75 percent receive electricity bill of excess Rs. 900. In control electrified household, 17.62 percent receive monthly electricity bill in range of Rs. 300-600, while 3.68 percent receive bill between Rs. 600-900 and 4.32 percent receive electricity bill of excess Rs. 900.

3.3.2. Kerosene: purchase, expenditure and usage

The data related to kerosene purchase, expenditure and usage was calculated for only those households that purchased and consumed kerosene. Distribution of monthly kerosene purchase, usage, and expenditure was examined according to electrification status of the households to know if any differences exist.There were only 9.4% treatment and 7.9% control households that reported not purchasing kerosene at all, so most of the households in both the samples purchased kerosene. Public distribution system (PDS) was the 'only source of kerosene purchase' for 84.90% treatment and 83.37% control households making it the predominant source of kerosene purchase. There were only 2.82% of treatment and 4.78% control households for whom open market was the 'only source of kerosene purchase'. There were very few households (less than 4% each) in both the samples that purchased kerosene from both the sources.

Data from kerosene usage in both sample groups, treatment and control, indicate priority of kerosene use for lighting over cooking. Only 7.21 percent of treatment and 4.59 percent of control households do not use kerosene for lighting purposes. Out of households which use kerosene, 49.02 percent of treatment household and 47.25 percent of control household use kerosene only for lighting, while rest of households reported using kerosene for 'other purposes including lighting'.

Monthly purchase of kerosene from PDS shops reveal maximum percentage of households – 38.70 percent treatment sample and 40 percent in control sample purchase 2-3 litre of kerosene per month, followed by 27.60 percent in treatment sample and 28.65 percent in control sample purchasing 4-5 litres per month. However, trend in purchase of kerosene was

observed from market sources was little different. 37.93 percent from treatment sample and 35.71 percent from control sample purchased 1-2 litre kerosene per month from market. It was followed by 29.57 percent treatment household and 22.22 percent control household purchasing 1-2 litre.

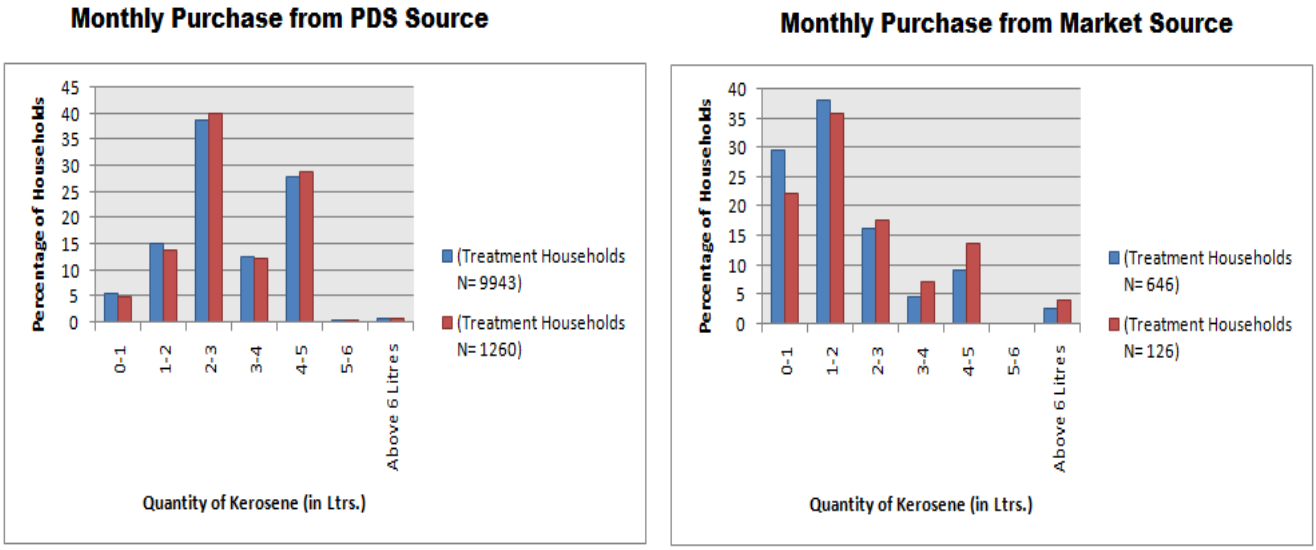


Figure 6: Monthly Kerosene Purchase from Different Source in 4 intervention states

Consumption of kerosene for lighting purposes was collected during household survey. As observed from Table 4 below both the groupsshowed similar pattern with 32.79 percent treatment household and 34.16 percent control household consuming 2-3 litre of kerosene for lighting, followed by 20.91 percent treatment household and 17.91 percent treatment household consuming 1-2 litre of kerosene for lighting. As compared to electrified households in both the groups percentage of non-electrified households is more when it comes to consumption of more than 3 litres of kerosene.Kerosene consumption for cooking purposes is very limited as 65.10 percent of treatment households and 71.48 percent control households' report of not using kerosene for cooking purposes. Out of the households that use kerosene for cooking, 22.92 percent in treatment household and 19.94 percent of control household use 0-1 litre of kerosene for cooking purposes.

Table 4: Monthly Kerosene Consumption for Lighting in four intervention states

Kerosene Consumption (in Ltrs)	Treatment Household						Control Household					
	Electrified		Non-Electrified		Total	%	Electrified		Non-Electrified		Total	%
	Nos.	%	Nos.	%			Nos.	%	Nos.	%		
0-1	1133	15.3	157	5.45	1,290	12.6	137	13.8	10	2.98	147	11.1
1-2	1615	21.9	531	18.4	2,146	20.9	186	18.7	52	15.48	238	17.9
2-3	2256	30.6	1,109	38.5	3,365	32.8	321	32.3	133	39.58	454	34.2
3-4	789	10.7	457	15.9	1,246	12.1	129	13	55	16.37	184	13.84
4-5	844	11.4	584	20.3	1,428	13.9	154	15.5	82	24.4	236	17.8
5-6	7	0.09	13	0.45	20	0.19	1	0.1	1	0.3	2	0.15
Above 6 Litres	12	0.16	16	0.56	28	0.27	4	0.4	3	0.89	7	0.53
Kerosene not used for lighting	727	9.85	13	0.45	740	7.21	61	6.14	0	0.00	61	4.59
Total	7383	100	2,880	100	10,263	100	993	100	336	100	1329	100

Use of number of kerosene based lighting devices in treatment and control households was looked into to understand if there is a difference in pattern due to presence of SoUL. Of the total 11,328treatment households 82.24 percent, while 86.35 percent of the total 1,443 control households used simple wick lamps (C*himnis*). There were only 7.94 percent treatment and 9.22 percent control households that used hurricane lamp indicating its limited usage.

Per day usage of simple wick lamps in hours presented in Table 5 showed that in treatment group 56.36 percent of households used it for less than 2 hours, followed by 22.24 percent using it for 4-6 hours, and 13.21 percent using it for 2 hours. In the control group, maximum of 50.24 percent used it for less than 2 hours followed by 33.36 percent using it for 2-4 houtrs, and 8.6 percent using it for 4-6 hours.

Table 5: Per day usage of Simple Wick Lamps in Hours for Lighting

	Treatment						Control					
	Electrified		Non-electrified		Total		Electrified		Non-electrified		Total	
Usage in No. of Hours	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
0-2	4,420	66.41	947	33.03	5,367	56.35	547	58.69	90	26.79	637	50.24
2-4	105	1.58	1,15	40.22	1,25	13.2	283	30.3	140	41.67	423	33.3

			3		8	1		6				6
4-6	1,669	25.08	449	15.66	2,118	22.24	50	5.36	59	17.56	109	8.60
6-8	321	4.82	129	4.5	450	4.72	21	2.25	20	5.95	41	3.23
8-10	96	1.44	58	2.02	154	1.61	10	1.07	4	1.19	14	1.10
10-12	44	0.66	130	4.53	174	1.82	20	2.15	23	6.85	43	3.39
More than 12 hours	1	0.02	1	0.03	2	0.02	1	0.11	0	0	1	0.08
Total	6,656	100	2,867	100	9,523	100	932	100	336	100	1,268	100

Table 6: Number of Simple Wick Lamps used in Sample Households as per electrification status

No. of simple wick lamps	Treatment HHs					Control HHs				
	Electrified		Un-electrified		Total	Electrified		Un-electrified		Total
	Nos.	%	Nos.	%		Nos.	%	Nos.	%	
1	2,882	43.3	1,079	37.64	3,961	367	39.38	102	30.36	77
2	2,927	43.98	1,431	49.91	4,358	423	45.39	179	53.27	95
3	626	9.41	272	9.49	898	110	11.8	50	14.88	21
4	178	2.67	65	2.27	243	24	2.58	2	0.6	5
5	33	0.5	16	0.56	49	4	0.43	3	0.89	1
6	7	0.11	3	0.1	10	2	0.21	0	0	0
7	1	0.02	1	0.03	2	2	0.21	0	0	0
8	1	0.02	0	0.00	1	0	0	0	0	0
10	1	0.02	0	0.00	1	0	0	0	0	0
Total	6,656	100	2,867	100	9,523	932	100	336	100	200

Unelectrified households consume and spend higher on kerosene as compared to the electrified counterparts in both the groups(Table 7). However, the results indicate overall higher kerosene purchase and average monthly kerosene expenditure by the control households as against the treatment households. Comparison revealed differences between electrified households of the treatment group and electrified households of the control group, as well as non-electrified households of the treatment group and non-electrified households of the control group. Average monthly expenditure on kerosene of electrified treatment sample was only Rs. 62.09 as against Rs. 66.14 by the electrified control group. Similarly, higher expenditure is seen in non-electrified control group with these households spending Rs. 71.56 as against Rs. 67.44 by the non-electrified treatment group. These results present a general argument towards economic benefits attained by households using SoUL as against those not using SoUL.

Table 7: Source-wise per litre Kerosene cost and monthly expenditure as per electrification status in India

	Treatment HHs						Control HHs					
	Electrified		Non - Electrified		Amount	Total HHs	Electrified		Non - Electrified		Amount	Total HHs
	Amount	Nos.	Amount	Nos.			Amount	Nos.	Amount	Nos.		
Average Price from PDS Shops	17.6	7,158	17.71	2,785	17.63	9,943	17.72	943	18	317	17.79	1260
Average Expenditure on PDS	60	7,158	61.79	2,785	60.5	9,943	61.63	943	63.02	317	61.98	1260
Average Price from Market	32.23	348	31.76	298	32.01	646	31.57	75	30.29	51	31.05	126
Average Expenditure on Market	83.69	348	71.11	298	77.89	646	105.4	75	77.8	51	94.23	126
Total Kerosene Purchased*	3.44L	7,383	3.64L	2,880	3.49L	10,263	3.55L	993	3.72L	336	3.59L	1329
Total Average kerosene Expenditure*	62.09	7,383	67.44	2,880	63.59	10,263	66.14	993	71.56	336	67.51	1329

* these values have been calculated from the number of households that actually purchase kerosene

3.4. Electricity based devices used for lighting

In entire sample, 74.10 percent treatment and 76.65 percent control households had electricity connections. Within electrified households 67.69 percent treatment and 70.25 percent control household have incandescent bulbs, 53.20 percent treatment and 46.56 percent control household have Compact Fluorescent Lamp (CFL), 15.18 percent treatment household and 15.09 percent control household use rechargeable torch, 4.10 percent treatment household and 3.35 percent control household use Tube lights, just 0.74 percent treatment and 0.27 percent control household use LED lamps. With regards to number of incandescent bulbs within treatment household, 48.10 percent have one bulb, 37.31 percent have two bulbs and 10.28 percent have three bulbs, while in control households, 45.30 percent have one bulb, 38.87 report having two bulbs and 11.45 report having three bulbs within households. In terms of numbers of CFLs devices in treatment households, 31.37 percent have one CFL followed by 35.74 percent households having two CFLs and 17.17 percent having three CFLs, while 33.20 percent have one CFL, 36.89 percent have two CFLs and 16.89 percent have three CFL. Average price as reported by the households for the incandescent bulb is around Rs. 13, while for CFL is

around Rs. 136. The average life period for which incandescent bulb work is about 2 months and for CFL is 13 months.

3.5. Expenditure on lighting

In order to see the impact of SoUL on 'lighting expenditure' comparison was made between treatment and control groups. However for this analysis, data was calculated for those households which had SoUL in working condition, whereas households with non working SoULs were not considered. In order to arrive at monthly lighting expenditure monthly mean and median expenditure on various heads such as electrical lighting devices like CFL, incandescent bulb, electricity bill, and kerosene purchased for lighting purpose was calculated separately and then the total mean and median lighting expenditure was calculated.

3.5.1. Monthly expenditure on kerosene used for lighting:

For four intervention states it was observed that the 'mean of monthly kerosene expenditure on lighting' was lesser in treatment group than in control group and this difference were of Rs. 5.48. The mean and median of monthly kerosene expenditure on lighting in treatment and control group across four intervention statesis represented in Figure 7.

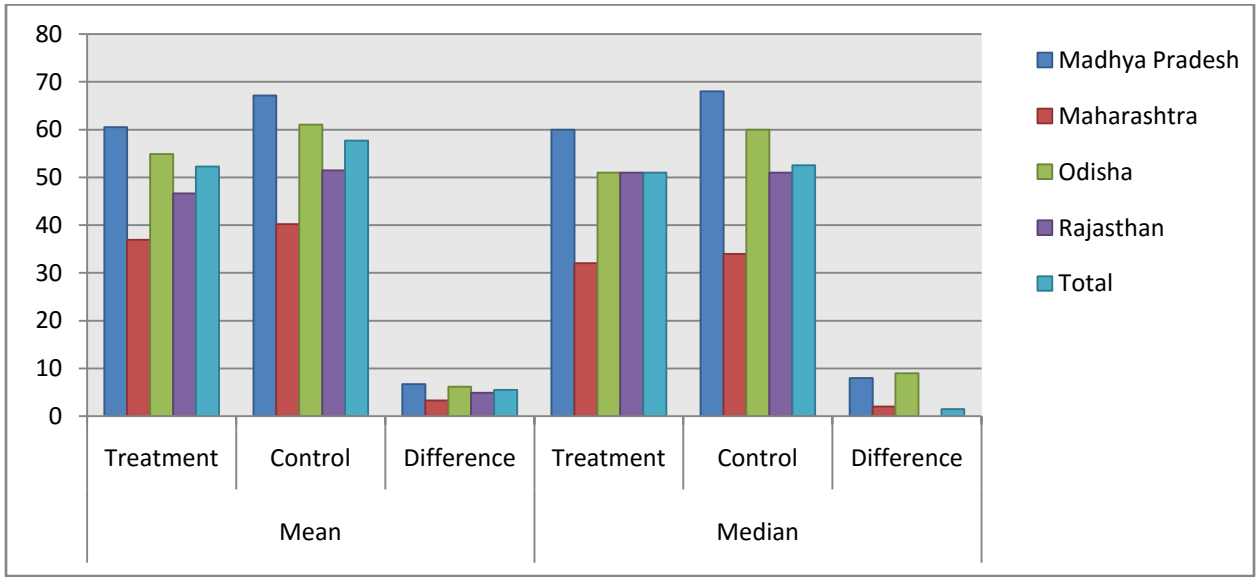


Figure 7: Mean & Median of Monthly Kerosene Expenditure (in Rs.) on Lighting in Treatment & Control groups in India

Table 10 given below makes two comparisons about kerosene expenditure on lighting: (a) electrified treatment and electrified control group (b) non-electrified treatment and non-electrified control group. Two factors used for comparison are mean and median of monthly kerosene expenditure for lighting.

Table 8: Monthly Expenditure on Kerosene for Lighting as per electrification status across four states

	Treatment				Control				Difference			
	Electrified		Non - Electrified		Electrified		Non - Electrified		Electrified		Non - Electrified	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Madhya Pradesh	57.89	54	66.47	68	65.87	68	70.72	72	7.98	14	4.25	4
Maharashtra	34.94	30	43.7	36	36.11	30	54.95	53	1.17	0	11.25	17
Odisha	49.78	40	61.14	60	52.13	48	68.1	64	2.35	8	6.96	4
Rajasthan	42.74	51	56.23	52.5	48.24	51	63.47	54	5.5	0	7.231	1.5
Total	48.91	51	60.12	54	54.57	51	66.41	60	5.66	0	6.29	6

It was found that mean and median expenditure of non-electrified control group is higher than the treatment group. Similarly, mean and median expenditure of electrified control group is higher than the treatment group. Thus, the pattern shows higher expenditure on monthly kerosene purchase by electrified as well non-electrified control than the treatment group (Table 8).

3.5.2. Monthly expenditure on electric devices:

Data on mean and median monthly expenditure on electrical devices showed that treatment group spent slightly more than control.State-wise differntitation reveal control households in Odisha spent almost Rs. 127 higher on electric devices as compared treatment households (Table 9).

Table 9: Monthly Expenditure on Electric Devices across fours states in India

Treatment		Control		Difference	
Mean	Median	Mean	Median	Mean	Median

Madhya Pradesh	35.4	24	33.66	20	-1.74	-4
Maharashtra	52.65	30	52.17	29.58	-0.48	-0.42
Odisha	21.77	13.97	148.15	20	126.38	6.03
Rajasthan	39.8	29.16	32.42	25	-7.38	-4.16
Total	40.16	25	41.97	24	1.81	-1

3.5.3. Monthly expenditure on electricity bill:

Data on mean of monthly expenditure on electricity bill showed that it is higher for control group than treatment group and the difference is of Rs. 6.14. In Maharashtra and Odisha, the mean expenditure on monthly electricity bill is higher in control group than the treatment group and the difference is quite large (refer table 10).

Table 10: Monthly Expenditure on Electricity Bill across four states

	Treatment		Control		Difference	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
Madhya Pradesh	333.91	250	328.37	200	5.54	-50
Maharashtra	294.64	250	366.07	240	71.43	-10
Odisha	168.31	129	331.08	155	162.77	26
Rajasthan	321.22	250	280.63	250	-40.59	0
Total	315.99	250	322.13	216.66	6.14	-33.34

3.5.4. Monthly expenditure on lighting:

In four intervention states, both mean as well as median monthly expenditure on lighting was more in control group than in treatment. The difference in mean is Rs. 14.25, while it is Rs.3 in median. Although the treatment and control group level broad findings showed mixed results, however data as per electrification status revealed expected results whereby monthly lighting expenditure of non-electrified control group was higher than the treatment.

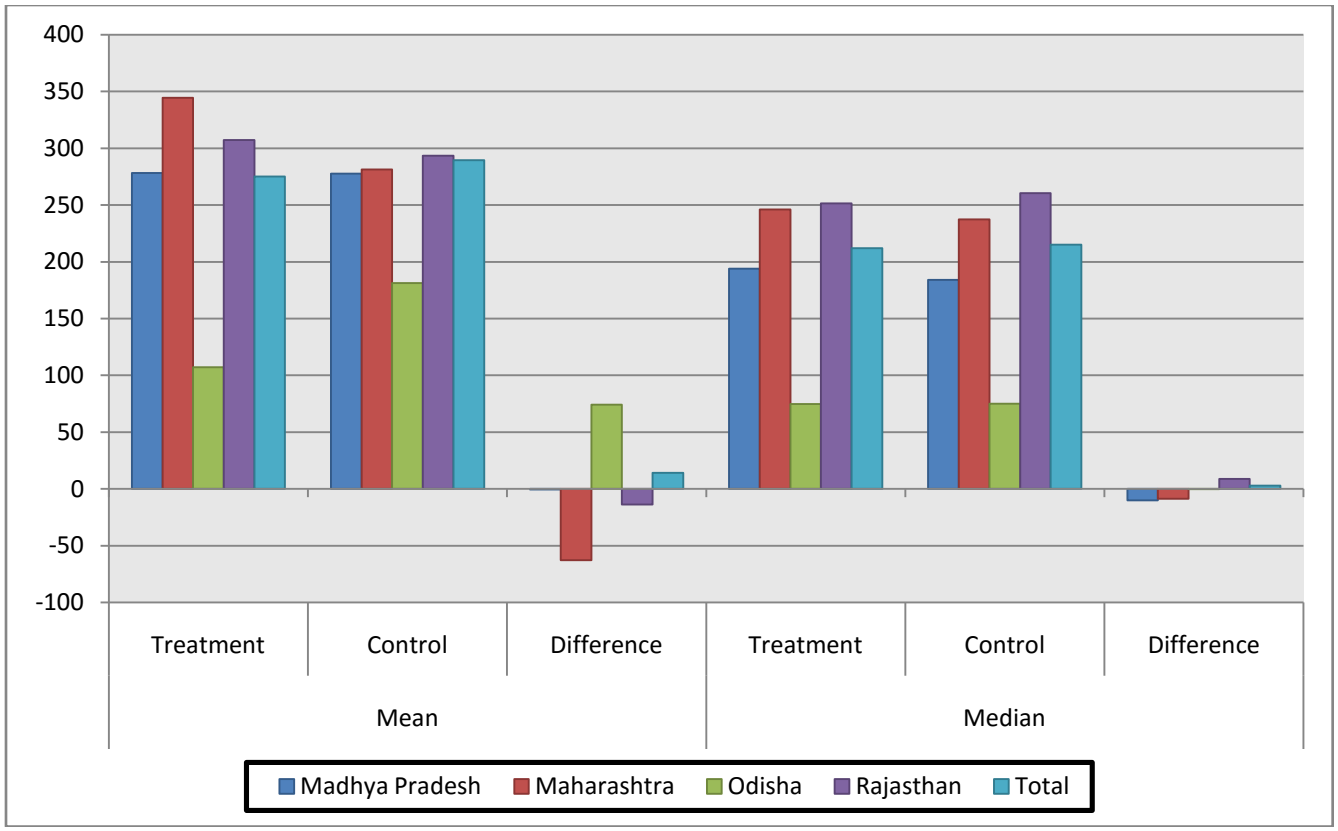


Figure 8: Total Expenditure on Lighting

As observed in table 11 below 'mean monthly expenditure on lighting' was more in electrified control than electrified treatment in Maharashtra and Odisha. The difference in these 2 states is significant. The mean monthly expenditure on lighting was more in non-electrified control than non-electrified treatment in fourstates (Table 11).

Table 11: Monthly Expenditure on Lighting in Electrified and Non-electrified Households across across four states

	Treatment				Control				Difference			
	Electrified		Non - Electrified		Electrified		Non - Electrified		Electrified		Non - Electrified	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Madhya Pradesh	360.3	300	64.82	68	345.19	276.33	70.29	72	-15.11	-23.67	5.47	4
Maharashtra	328.39	277.5	42.41	35	404.31	287.5	54.95	53	75.92	10	12.54	18
Odisha	143.64	92.41	61.14	60	323.48	92	68.1	64	179.84	-0.41	6.96	4

Rajasthan	381.93	306	54.43	52.5	343.8	294.66	63.47	54	-38.13	-11.34	9.04	1.5
Total	357.38	276.91	58.65	54	347.44	287.5	66.22	60	-9.94	10.59	7.57	6

T-test for statistical significance

T-test was conducted for checking the statistical significance of the differencein monthly expenditure on lighting between two sample i.e. treatment group and control group and the related heads. Furthermore t-test was also conducted in order to see any differences between electrified and non-electrified households across both groups. In the t-test mean treatment was subtracted from mean control to observe whether the differences are statistically significant or not. The expected outcome shall be that the expenditure on lighting in treatment should be less than those in control group. Table 12 given below presents t-test results, which were run for two samples, i.e. treatment and control, by calculating 'the mean' for total expenditure on lighting and for related heads separately.

Table 12: Two Sample (Treatment & Control) T-test results for India

	Exp on Electricity Bill		**Exp on Electric Devices**		**Exp on Kerosene used for lighting**		**Total Exp**	
	t- test	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**
Consolidated India	0.5084	0.6112	0.6718	0.5017	6.8221	0.0000	1.5237	0.1276
State Wise								
	t- test	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**
Madhya Pradesh	-0.2613	0.7939	-0.7916	0.4286	6.1967	0.0000	-0.0363	0.9710
Maharashtra	2.9334	0.0034*	-0.0618	0.9507	1.6024	0.1093	2.9613	0.0031*
Odisha	3.0696	0.0025*	4.2389	0.0000*	2.3516	0.0190#	3.2855	0.0011*
Rajasthan	-2.3626	0.0182#	-1.9662	0.0494#	3.7916	0.0002*	-0.837	0.4026

(* indicates value significant at 99 percent; # indicates values significant at 95 percent; @ indicates value significant at 90 percent)

T-test result for difference in 'total lighting expenditure' though did not show any significance, however statewise results showed some variation. In Maharashtra and Odisha, it was significant at 99% confidence level, while it was insignificant in Madhya Pradesh and Rajasthan (Table 12).

Two sample (treatment & control) t-test results with electrification status as a constraint:

As mentioned earlier electrification status was put as a constraint to explore whether there were any differences between the expenditure pattern of electrified and non electrified households in control and treatment groups. As observed in table 13, t-test results for 'expenditure on kerosene used for lighting' for four states was significant at 99 percent confidence level for electrified as well as non-electrified households indicating higher expenditure on kerosene for lighting by control electrified and non-electrified households than the treatment. The t-test results for total expenditure on lighting for India were significant at 99% confidence level for non-electrified households indicating higher expenditure on lighting by control households than the treatment households. Statewise differences have also shown significance at various levels as seen in table 13.

Table 13: Two Sample (Treatment & Control) T-test Results – Electrification Status as a Constraint

	Exp on Kerosene used for lighting				**Total Exp**			
	Electrified		**Non- Electrified**		**Electrified**		**Non- Electrified**	
	t- test	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**	**t- test**	**P-Value**
Consolidated four states	6.2183	0.0000*	4.0195	0.0001*	0.8706	0.3840	4.6473	0.0000*
State Wise								
Madhya Pradesh	6.3333	0.0000*	2.1288	0.0335#	-0.8246	0.4096	2.5672	0.0104#
Maharashtra	0.5198	0.6033	2.4794	0.0136#	3.1392	0.0017*	2.7341	0.0065*
Odisha	0.7003	0.4842	1.8242	0.0690@	4.1603	0.0000*	1.8242	0.0690@
Rajasthan	4.6147	0.0000*	2.1133	0.0350#	-2.0795	0.0377#	2.5251	0.0118#

(* indicates value significant at 99 percent; # indicates values significant at 95 percent; @ indicates value significant at 90 percent)

3.6. Studying during dark hours: lighting devices, electrification status, gender differentiation (studying during dark hours henceforth referred as studying in night)[8]

[8]Dark hours are defined as the time when there is no daylight and there is darkness and lighting devices are required for the illumination. The dark hours pertain to hours from dusk (darker stage of twilight) to dawn (the first appearance of light in the sky before sunrise). These hours will vary from season to season for example in winters it becomes dark early in the evening and the nights are longer as sun rises late and vice-versa during summer.

As children attend day schools, most of them study and complete their school related work either in late evening or at night. This was reflected in the data collected where 93.29 percent of children in treatment households and 92.61 percent of children in control household were reported to be studying at night on daily basis. For all those who reported of 'not studying at night', the main reason given was 'not interested in studying' for 69.80 percent children in treatment group. The basis for this could be various including illiteracy/lack of interests of parents to help children in studies or child is in primary section and the work load/home work could be less.

Various lighting source/device used for studying were found in both households – treatment and control samples. The impact observed was determined through – 'SoUL as main and/or one of lighting source/device' in treatment group and 'Kerosene as main and/or one of lighting source' between the treatment group and control group. SoUL was predominant lighting device used for studying in treatment households with 82.18 percent of children using SoUL.Less dependence on kerosene as lighting source for studying purposes is clearly evident in treatment households. There were 22.88 percent children from control households who used kerosene as only lighting source for studying purpose, whereasin treatment households this percentage was only 4.87.

3.6.1 Study hours during night

Daily studying hours in treatment group show children majorly study for 0-1 hours where 44.65 percent reporting of such, followed by 43.06 percent reporting 1-2 hours and 9.71 percent stating 2-3 hours of daily studying time. Similar trend is observed in control households where 41.69 percent of children study between 0-1 hours, followed by 44.79 percent studying 1-2 hours and 10.55 percent studying 2-3 hours daily. While no major difference in terms of studying hours between treatment group and control group is seen; the gender wise differentiation too do not reveal any difference between treatment and control samples.

Table 14: Studying Hours amongst Children in four states

Treatment Household	Control Households

	Electrified		Non-Electrified		Total		Electrified		Non-Electrified		Total	
Hours Studies	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
0-1	6,105	47.03	1,501	37.03	7,606	44.65	775	40.13	249	47.43	1024	41.69
1-2	5,402	41.61	1,934	47.72	7,336	43.06	881	45.62	219	41.71	1100	44.79
2-3	1,193	9.19	461	11.37	1,654	9.71	217	11.24	42	8	259	10.55
3-4	209	1.61	121	2.99	330	1.94	41	2.12	9	1.71	50	2.04
4-5	50	0.39	26	0.64	76	0.45	8	0.41	3	0.57	11	0.45
5-6	18	0.14	9	0.22	27	0.16	8	0.41	0	0	8	0.33
More than 6 hours	5	0.04	1	0.02	6	0.04	1	0.05	3	0.57	4	0.16
Total	12,982	100	4,053	100.00	17,035	100.00	1,931	100	525	100	2456	100.00

3.7. Performance of SoUL

Performance of SoUL was judged on basis of number of functional lamps and defective components. Out of 13,250 SoUL received by 11,328 sample households in four intervention states, 81.65 percent of SoULs were found to be functional and rest were completely non-functional. Most of non-functional lamps functioned for ‘one month’, followed by ‘two months’ (Fig. 9).

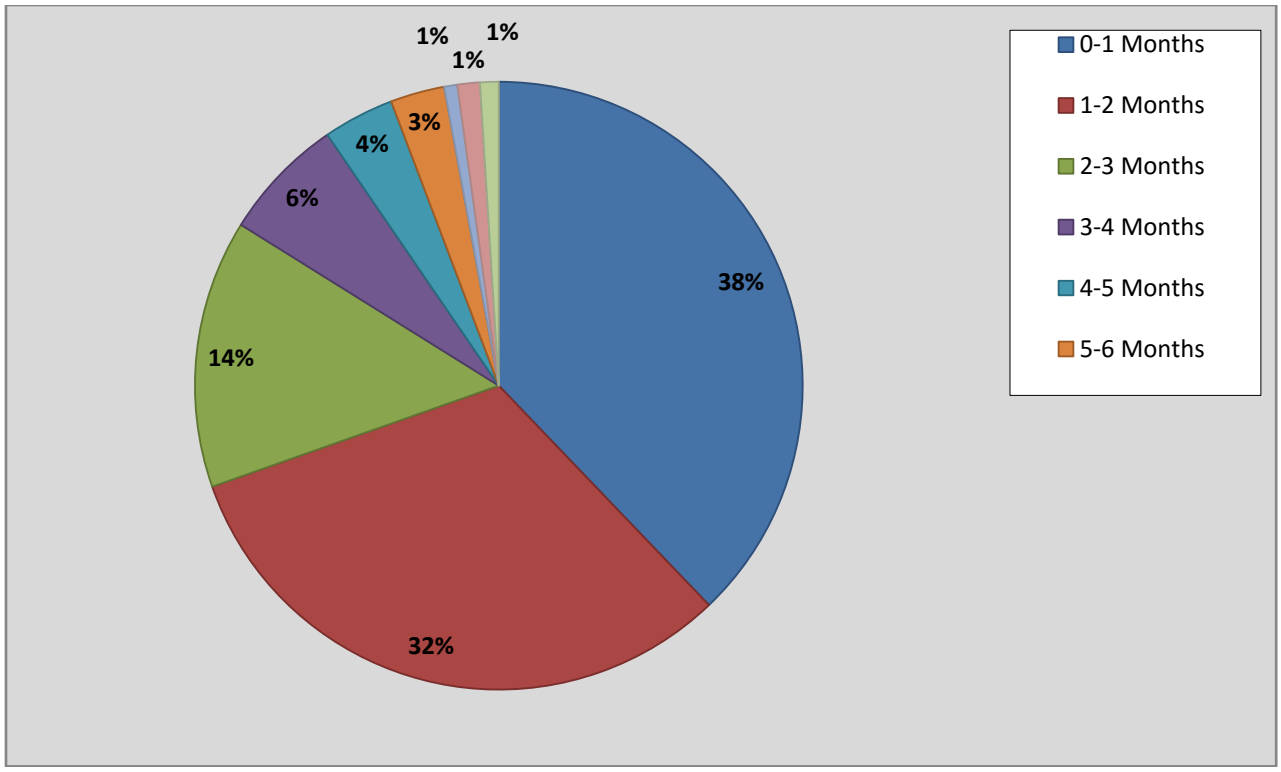


Figure 9: Percentage of SoUL and Number of Months they functioned before stop functioning in India

Functional SoULs were checked for defective parts if any. Out of 10,819 functional SoULs, 19.77 percent had atleast one of the parts as defective. Among the functional SoULs with defective parts, the main problem was 'loose connection' which was observed in 10.8 percent of SoUL followed by 'green light'[9] not working in 5.44 percent lamps while 'switch' problem represented almost 4.92 percent of defective parts. The back-up provided by the SoUL on full charging was also determined through asking the average back-up time provided by SoUL. 19.43 percent reported to provide back up for 'above 7 hours', followed by '4-5 hours' which was stated by 18.1 percent and '5-6 hours' reported by 17.97 percent (Fig. 10).

[9] Green Light indicate the SoUL Lamps are completed charged and are ready to be disconnected.

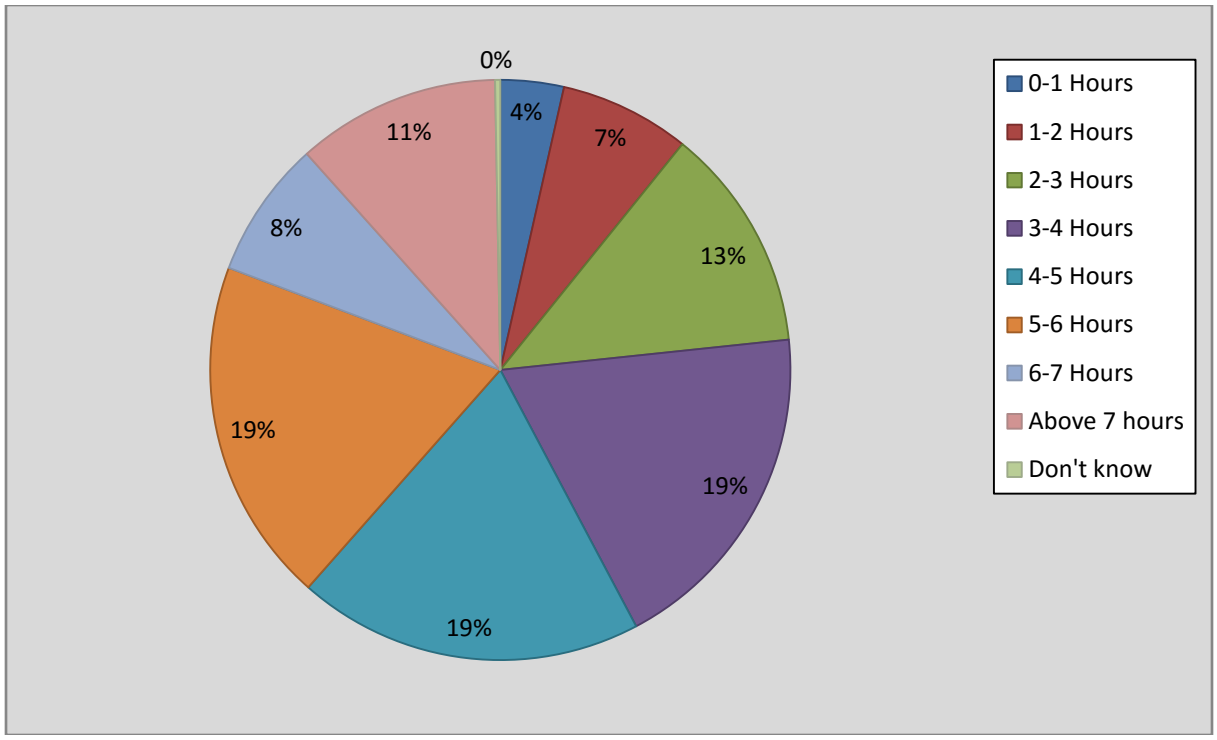
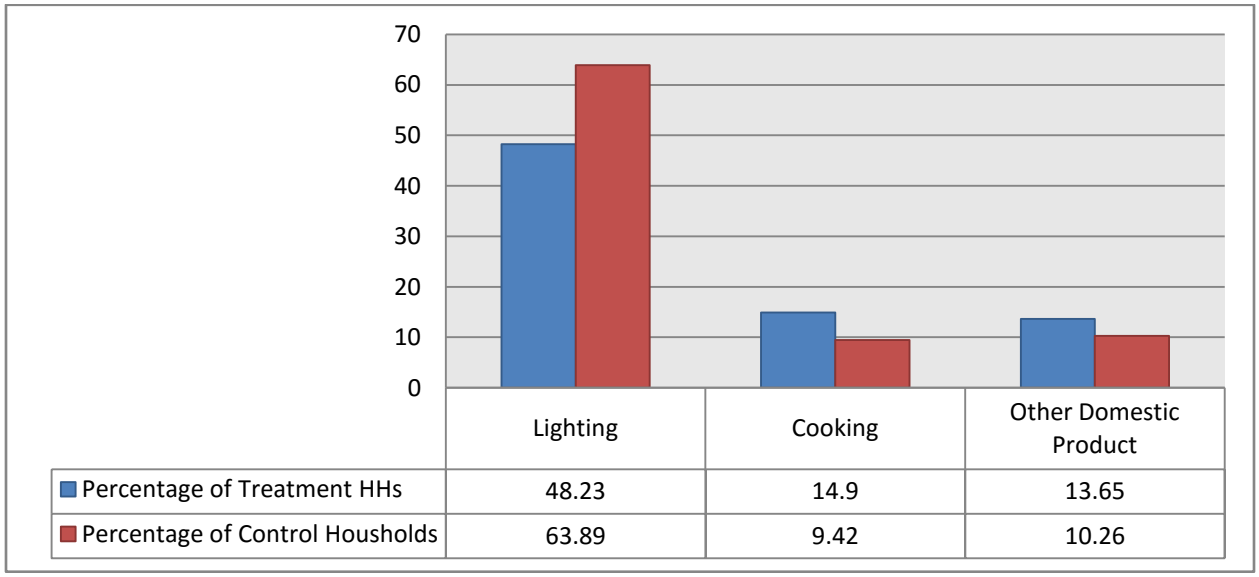


Figure 10: Percentage of SoUL and Back-up provided by SoUL in India

3.8. Need for solar energy based products and willingness to pay

The household survey tried to explore the household level solar energy related needs and in case of presence of such needs then willingness or capacity to pay assuming there is no subsidy available and they are to purchase it from the market. The exploration of needs was linked to assessing market potential for the solar products in rural areas. However, households in the SoUL program implementation areas being rural and tribal had less exposure to solar technology and solar products. So the barrier about knowing or visualising the product and state some cost that they think they can afford to pay was anticipated. In order to overcome this barrier a placard illustrating pictures of solar products like solar light, solar torch, solar home lighting system, solar fan, and their approximate costs in the market at present was prepared. While administering the questionnaire it was shown to them and care was taken to inform and assure them that any kind of marketing of solar products was not intended and there is no commitment to purchase it when they state they can afford certain amount.

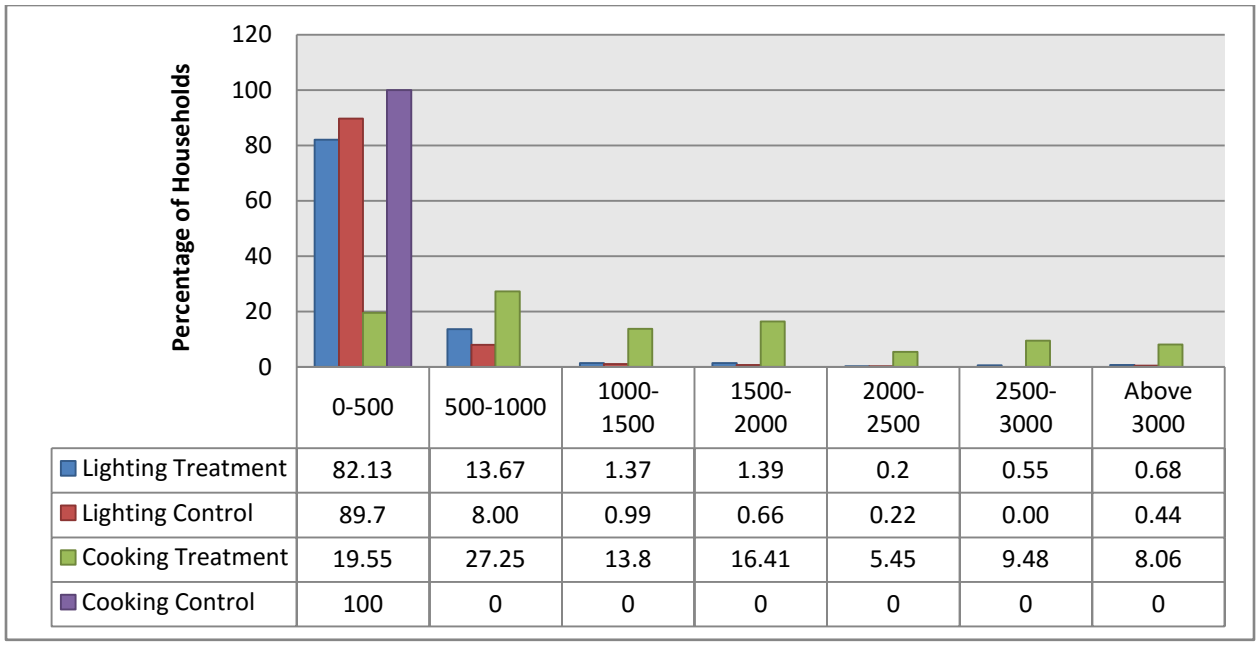
Need for solar energy based products mainly covered three types of needs: lighting, cooking and other domestic products like fan.



	Lighting	Cooking	Other Domestic Product
Percentage of Treatment HHs	48.23	14.9	13.65
Percentage of Control Housholds	63.89	9.42	10.26

Figure 11: Percentage of HHs expressing Needs that are to be addressed by Solar Technology in India

As observed from the figure 12 below, amongst the households that expressed need for solar lighting, in both the groups treatment and control, maximum percentage of household showed willingness to pay up to Rs. 500. The need for solar cooking was stated by 1,688 treatment and 136 control households. Maximum percentage of households in treatment group were willing to spend Rs. 500-1000 for fulfilling their cooking needs, with few ready to spend even more than Rs. 2000. However, households from control showed limited capacity to pay for cooking needs with all households willing to pay upto Rs. 500.



	0-500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	Above 3000
Lighting Treatment	82.13	13.67	1.37	1.39	0.2	0.55	0.68
Lighting Control	89.7	8.00	0.99	0.66	0.22	0.00	0.44
Cooking Treatment	19.55	27.25	13.8	16.41	5.45	9.48	8.06
Cooking Control	100	0	0	0	0	0	0

Figure 12: Capacity to Spend on Solar Lighting and Cooking Needs in India

Chapter 4. Conclusions and Recommendation

Much has been written in the literature over the energy access and energy poverty. MSP is one such initiative that works on targeted approach to eliminate the darkness from school childrens lives. The evaluation have shownmixed to positive results with observed kerosene expenditure lower in the households of SoUL users as against the non-users. As asimple device, the SoUL has impacted various facets of life of the users. For one, school going children are now able to study in safer environment. Better luminosity provided by SoUL has enabled a sense of freedom amongst the children. Though the results do not indicate difference in study hours from both groups, however the dependence on kerosene devices are very less in the treatment sample as compared to control samples. Having said, indirect health benefits accrued cannot be disregarded as children have less strain on eyes and less exposured to soot arising out of kerosene wick lamps due to use of SoUL. Kerosene purchase is seen to be lesser in the treatment group as compared to the control group which further advances our stance that SoUL lamp has positive impact on kerosene consumption and overall household expenditure on lighting. Overall total lighting expenditure as observed is higher in control group compared to treatment group with differenceshowing significance at 99 percent confidence. The difference observed in terms of savings can be argued by some to be small, but however overall lighting need seem the household is much larger (with multiple rooms) and SoUL is able to fulfill only a part of such need. The households generally consists of 2 or more rooms, thus there is need for kerosene for lighting in emergency situation which can be one reason for not complete eradicaton of use of kerosene. SoUL also aids household activities through providing lighting to accomplish tasks like cooking, cleaning, etc which has been reported by large percent of households. While difficult to quantify, such result only point towards the multi-purpose usability of SoUL.

One result from the survey which was consistent in every state block the high non-functionality rate of the SoUL. The non-functionality rate may hamper the confidence of the rural

communities on the technology. Long term sustainence of the technology based solution to rural people depend upon multiple factors including provision of on-site service. The project has tried to address it through establishment of SoUL Repair Centre (SRC), however lack of information about SRC amongst the users seems to be main reason for SoULs not being repaired rather than inability of SRCs to provide post sale provisions. Appropriate Information, Communication and Education (ICE) needs to be designed so as communitcate every facet of the Program to the befeciaries. Given the demand and willingness to pay for solar products only shows how the technology has the potential to be drawn on wider scale looking at different needs of the communities. Demonstration of solar technology on such large scale and relative impacts observed only induce confidence in the technology and Million SoUL Programstruturewhich was drawn to make such solutions available at affordable rates. Support through appropriate institutional and financial mechanism is necessary for wider adoption of solar technology inorder to eradicate the energy poverty persisting in rural communities.

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Annexures

A1. Household Impact Survey

State	[Pre-printed]	District	[Pre-printed]	Block	[Pre-printed]

Form Number													Interviewer's Name	Date	Gram Panchayat	Village	Hamlet
			/					/									
Block code [Pre-printed]			/	Village code				/	Serial number								

A. Household Details						
A1	Full Name of respondent		A3	Full Name of head of household		
			A4	Sex of head of household	◯ Male	◯ Female
A2	Relation of the respondent to the beneficiary		A5	Mobile Number		
			A6	Number of Members in the Family		
			A7	No of rooms in the house(including kitchen)		

B. Children's Details (Irrespective of receipt of SoUL lamp, applicable to all children from 5 to 17 years or up to 12th Class)										
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
S. No.	Full Name	Age	Sex (M/F)	Does he/she go to school? (Yes/ No)	Class	Has he/she received SoUL lamp? (Yes/ No)	If **"Yes" for B6**, specify the **lamp code** here. If only one child has bought and others are applicable why other children have not brought SoUL?*	Which devices** do you use for studying (Specify all the devices, else specify the reason for not studying in the dark hours)	If, **for B8**, one of the devices is SoUL lamp, specify **time** of **study using SoUL lamp**. If, **for B8**, none of the devices is SoUL lamp, specify the **reason for not using SoUL lamp** for studying	If the SoUL is working, and the child is using Chimni/Electricity with SoUL, mention the reason for using the same?
1										
2										
3										
4										
5										
6										

*If unable to obtain the lamp code, state the reason in B7

** If studying in street light or community light (in temple) etc. then specify in B8

C. Performance of SoUL lamp (Interviewers can themselves check SoUL lamp for following details)											
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
S. No.	Lamp Code	Is the SoUL lamp working? (Yes/ No) **If "Yes" go to C4**	If No, for how much time did it work? (days/weeks/ months) **Specify and go to E1**	Is the Switch working? (Yes / No)	Is LED working? (Yes / No)	Is red light in indicator working properly? (Yes/ No)	Is green light in indicator working properly? (Yes/ No)	After one day of charging, for how much time SoUL lamp works?	Is there any loose connection? (Yes/ No)	Is the panel broken? (Yes/ No)	State other problem, if any. If SoUL is not working; then state the problem with it?
1											
2											
3											
4											

D. Usage of SoUL lamp									
D1 Lamp code	D2 Do you charge SoUL lamp with mobile charger? (Yes/ No)	D3 What is the usage of SoUL in hours per day for purposes **other than Studies**?	D4 For what other purposes **other than Studies** SoUL lamp is used & used by whom **(Relation to the beneficiary)**						
			Other purpose 1	Used by whom	Other purpose 2	Used by whom	Other purpose 3	Used by whom
E. Repair and Maintenance of SoUL									

S. No.	E1 Lamp code**(Repeat the lamp code again if R&M availed more than once)**	E2 Have you availed R&M service?[#] (Yes/ No) **If Yes, Go to E4**	E3 If **E2 is "No"**, & SoUL lamp is not working then why service is not availed? **Specify and go to E11**	E4 If **E2 is "Yes"**, what was the problem in the SoUL lamp before repair?	E5 Was it repaired at SoUL R&M centre? (Yes / No)	E6 Where was it repaired? (Shop name, Village name, Gram Panchayat name)	E7 When did you avail R&M? (Month & year)	E8 In how many days was SoUL lamp repaired?	E9 How much did you pay for it? (Rs.)	E10 Are you satisfied with R&M service? (Yes/ No)
A										
B										
C										
D										
E										
F										

E11 If any of the SoUL lamps have been repaired at home (yourself), was it successful? (Yes/ No):

E12 Specify which component was not working before repair at home (yourself):

F1 Kerosene Purchased					
S. No.		Litre/s per month	Avg. Price per litre	Frequency (Number of trips for purchase per month)	Generally collected by whom? (specify whether Adult woman/Adult man/ Girl child/boy child)
1	Purchased from Govt. Ration shop - PDS				
2	Purchased from Market				

F2 Kerosene Used				
	Lighting	Cooking	Heating water	Other (Please specify)*
Consumption (litre/s per month)				

*Other use may also include resale, in vehicles, etc.

F3 Usage of other oil for lighting (For example, if used for lighting purpose, any of the cooking oils like groundnut, mustard, sunflower, etc.)			
Name of oil	Consumption (litre/s per month)	Avg. Price per litre	Device/s used

F4 Devices using kerosene/ other oil					
S. No.	Device	Do you use the device? (Yes/ No)	Quantity used*	Number of hours per day	Number of days per month
1	Chimni (Simple wick lamp)				
2	Hurricane lamp				
3	Wick stove				
4	Other (Please specify)				

*By "Quantity used" we mean number of devices they are actually using for lighting purpose and NOT the number of devices they possess.

F5 Do you have electricity at home? If "No" go to F10	◯ Yes	◯ No
F6 Do you have electric meter/ one point connection/ shared connection?	◯ Yes	◯ No

F7 Interval of electricity bill receipt		
◯ Not applicable	◯ Every month	◯ Every 3 months
◯ Every 6 months	◯ Every year	◯ Other (Please specify)

F8	**Electricity bill amount paid as per the above mentioned interval (Rs)**	

F9 Features of electric lighting devices (bulbs/ tubes) used at home				
S. No.	Type of device	Number of devices	How much period (days/weeks/ months/ years) does this device last for?	Avg. price of device (Rs per unit)
1	Incandescent bulb			
2	CFL			
3	Tubes			
4	LED			
5	Chargeable torch			
6	Other (Please Specify)*			

* If using torch in mobile phone specify that also as other electric lighting device.

F10 Features of candle		
Number consumed/ month (Specify candle or pack)	Usage in hours per day	Avg. price of candle or pack (Rs per unit)

F11 Features of battery torch at home (non-rechargeable)				
	Number of cells	Number of times cells replaced per month	Avg. price of torch (Rs per unit)	Maintenance Cost (Rs per unit)**
Torch 1				
Torch 2				
Torch 3				

** If use-and-throw (Chinese) torch, then in 'Maintenance Cost' write **not applicable**

F12 Features of renewable energy devices other than SoUL used at home								
S. No.	Name of device	Purchase inspired by SoUL lamp (Yes/ No)	Number	Capacity	Initial investment (Rs)*	Working (Yes/ No)	Maintenance Cost (Rs per unit)	Year of purchase
1								
2								
3								

* If no investment has been made (grant/ donation), then in 'Initial investment' write **not applicable**

G. Willingness to pay for other Solar Products (Please tick in the appropriate circle)			
G3	**What are the solar energy related needs**	**Energy Needs**	**As you are aware, actual cost of SoUL lamp is Rs 500 but due to subsidy it is available for students**

	of the household?		**at Rs 120. Keeping this in mind, how much you are willing to invest for the following uses?**
		◯ Lighting	
		◯ Cooking	
		◯ Irrigation	
		◯ Others (Please specify)	
		◯ None	

G.3.1 Preference of Lighting in the household			
G3.1	**What is the preferred source of lighting for the Household- Electricity; Kerosene Source; Solar Product? (Eg. Rank1 given to first preferred source etc.)**	**Energy Needs**	**Preferred Source of Lighting**
		Rank 1	
		Rank 2	
		Rank 3	
		Remarks (if any)	

G.3.2 Solar Needs		
G3.2	**Does SoUL lamp satisfy your child's study lighting needs? If No, then why?**	

H. Community Details (Please tick in the appropriate circle)		
H1	**Type of Card Holder (Please tick in the appropriate circle)**	
◯ Below Poverty Line (BPL)	◯ Antyoday	◯ Other (Please specify)
◯ Above Poverty Line (APL)	◯ No card	

H2	**Primary Source of Income (Please tick only one)**	
◯ Agriculture	◯ Labor	◯ Agriculture + Labor
◯ Service	◯ Dairy	◯ Skill-based occupation (carpentry, pottery, etc.)
◯ MGNREGS	◯ Remittance	◯ Other (Please specify)

H3	**Religion (Please tick only one)**		
	◯ Hindu	◯ Muslim	◯ Christian
	◯ Sikh	◯ Buddhist	◯ Jain
	◯ Other (Please specify)		

H4	Social Group (Please tick only one)	
	◯ Scheduled Tribe (ST)	◯ Scheduled Caste (SC)
	◯ Other Backward Caste (OBC)	◯ Nomadic/ Denotified Nomadic Tribe/ Vimukta Jati Nomadic Tribe (NT/ DNT/ VJNT)
	◯ Open (General)	◯ Other (Please specify)

H5	Name of caste/ tribe you belong to	

H6	Wealth Indicator					
Name of the asset	**#**	**Name of the asset**	**#**	**Name of the asset**	**#**
Radio		table		other asset 1	
Bicycle		chair		other asset 2	
motorcycle/scooter		mattress		other asset 3	
washing machine		bullock cart			
Fans		thresher			
Heaters		tractor			
colour television		buffalo			
b/w television		Cow			
telephone set/ mobile phone		bullock			
sewing machine		goats			
pressure cooker		cock/hen/duck			
Watches		Pigs			

H7 Household type: Tick the correct option		
Kacchha	**Semi- Pakka**	**Pakka**

H8: Preferred Activity for the children in the family					
How do all *MALE* children spend their non-schooling hours? Enlist three activities in which he spends most of his time and the number of hours spent on the same	**Activities**	**No. of Hours**	**How do all *FEMALE* children spend their non-schooling hours? Enlist three activities in which he spends most of his time and the number of hours spent on the same**	**Activities**	**No. of Hours**
Remarks (if any)			**Remarks (if any)**		

Signature of the respondent		Signature of the interviewer	

Please note the suggestions and complaints by the respondent below.

Interviewer's Notes:

A2. Household Control Survey Form

State	[Pre-printed]	District	[Pre-printed]	Block	[Pre-printed]

Form Number												Interviewer's Name	Date	Gram Panchayat	Village	Hamlet
			/					/								
Block code [Pre-printed]			/	Village code				/	Serial number							

A. Household Details						
A1	Full Name of respondent		A4	Full Name of head of household		
A2	Mobile Number		A5	Sex of head of household	◯ Male	◯ Female
A3	Number of Members in the family		A6	No of Rooms in the House(including Kitchen)		

B. Children's Details (Irrespective of receipt of SoUL lamp, applicable to all children from 5 to 17 years or up to 12th Class)								
	B1	B2	B3	B4	B5	B6	B7	B8
S. No.	Full Name	Age	Sex (M/F)	Does he/she go to school? (Yes/ No)	Class	Why has he/she not received SoUL lamp? (Specify the reason)	Which devices* do you use for studying (Specify all the devices, else specify the reason for not studying in the dark hours)	If, **for B7**, devices are used for studying, specify **time** of **study (mins/hours)**. If, **for B7**, no devices are used for studying, **go to C1**
1								
2								
3								
4								
5								
6								

*If studying in street light or community light (in temple) etc. then specify in B7

C1 Kerosene/ Other oil Purchased					
S. No.		Litre/s per month	Avg. Price per litre	Frequency (Number of trips for purchase per month)	Generally collected by whom? (specify whether Adult woman/Adult man/ Girl child/boy child)
1	Purchased from Govt. Ration shop - PDS				
2	Purchased from Market				

C2 Kerosene Used				
	Lighting	Cooking	Heating water	Other (Please specify)*
Consumption (litre/s per month)				

*Other use may also include resale, in vehicles, etc.

C3 Usage of other oil for lighting (For example, if used for lighting purpose, any of the cooking oils like groundnut, mustard, sunflower, etc.)			
Name of oil	Consumption (litre/s per month)	Avg. Price per litre	Device/s used

C4 Devices using kerosene/ other oil					
S. No.	Device	Do you use the device? (Yes/ No)	Quantity used*	Number of hours per day	Number of days per month
1	Chimni (Simple wick lamp)				
2	Hurricane lamp				
3	Wick stove				
4	Other (Please specify)				

*By "Quantity used" we mean number of devices they are actually using for lighting purpose and NOT the number of devices they possess.

C5 Do you have electricity at home? If "No" go to C12	◯ Yes	◯ No
C6 Do you have electric meter/ one point connection/ shared connection?	◯ Yes	◯ No
C7 Do you have inverter at home?	◯ Yes	◯ No
C8 Do you have generator at home?	◯ Yes	◯ No

C9 Interval of electricity bill receipt		
◯ Not applicable	◯ Every month	◯ Every 3 months
◯ Every 6 months	◯ Every year	◯ Other (Please specify)

C10	Electricity bill amount paid as per the above mentioned interval (Rs)	

C11 Features of electric lighting devices (bulbs/ tubes) used at home

S. No.	Type of device	Number of devices	How much period (days/weeks/ months/ years) does this device last for?	Avg. price of device (Rs per unit)
1	Incandescent bulb			
2	CFL			
3	Tubes			
4	LED			
5	Chargeable torch			
6	Other (Please Specify)*			

* If using torch in mobile phone specify that also as other electric lighting device.

C12 Features of candle

Number consumed/ month (Specify candle or pack)	Usage in hours per day	Avg. price of candle or pack (Rs per unit)

C13 Features of battery torch at home (non-rechargeable)

	Number of cells	Number of times cells replaced per month	Avg. price of torch (Rs per unit)	Maintenance Cost (Rs per unit)**
Torch 1				
Torch 2				
Torch 3				

** If use-and-throw (Chinese) torch, then in 'Maintenance Cost' write **not applicable**

C14 Features of renewable energy devices used at home

S. No.	Name of device	Number	Capacity	Initial investment (Rs)*	Working (Yes/ No)	Maintenance Cost (Rs per unit)	Year of purchase

1							
2							
3							

* If no investment has been made (grant/ donation), then in 'Initial investment' write **not applicable**

D. Willingness to pay for other Solar Products (Please tick in the appropriate circle)			
D1	**What are the solar energy related needs of the household?**	**Energy Needs**	**As you are aware, actual cost of SoUL lamp is Rs 500 but due to subsidy it is available for students at Rs 120. Keeping this in mind, how much you are willing to invest for the following uses?**
		◯ Lighting	
		◯ Cooking	
		◯ Irrigation	
		◯ Others (Please specify)	
		◯ None	

D.2 Preference of Lighting in the household			
D.2	**What is the preferred source of lighting for the Household- Electricity; Kerosene Source; Solar Product? (Eg. Rank1 given to first preferred source etc.)**	**Energy Needs**	**Preferred Source of Lighting**
		Rank 1	
		Rank 2	
		Rank 3	
		Remarks (if any)	

E. Community Details (Please tick in the appropriate circle)		
E1	**Type of Card Holder (Please tick in the appropriate circle)**	
◯ Below Poverty Line (BPL)	◯ Antyoday	◯ Other (Please specify)

◯ Above Poverty Line (APL)	◯ No card	

E2	Primary Source of Income (Please tick only one)		
◯ Agriculture	◯ Labor	◯ Agriculture + Labor	
◯ Service	◯ Dairy	◯ Skill-based occupation (carpentry, pottery, etc.)	
◯ MGNREGS	◯ Remittance	◯ Other (Please specify)	

E3	Religion (Please tick only one)		
	◯ Hindu	◯ Muslim	◯ Christian
	◯ Sikh	◯ Buddhist	◯ Jain
	◯ Other (Please specify)		

E4	Social Group (Please tick only one)	
	◯ Scheduled Tribe (ST)	◯ Scheduled Caste (SC)
	◯ Other Backward Caste (OBC)	◯ Nomadic/ Denotified Nomadic Tribe/ Vimukta Jati Nomadic Tribe (NT/ DNT/ VJNT)
	◯ Open (General)	◯ Other (Please specify)

E5	Name of caste/ tribe you belong to	

E6	Wealth Indicator					
Name of the asset	**#**	**Name of the asset**	**#**	**Name of the asset**	**#**
Radio		table		other asset 1	
Bicycle		chair		other asset 2	
motorcycle/scooter		mattress		other asset 3	
washing machine		bullock cart			
Fans		thresher			
Heaters		tractor			
colour television		buffalo			
b/w television		cow			
telephone set/ mobile phone		bullock			
sewing machine		goats			
pressure cooker		cock/hen/duck			
Watches		pigs			

E7 Household type: Tick the correct option		
Kacchha	**Semi- Pakka**	**Pakka**

E8: Preferred Activity for the children in the family					
How do all *MALE* children spend their non-schooling hours? Enlist three activities in which he spends most of his time and the number of hours spent on the same	**Activities**	**No. of Hours**	**How do all *FEMALE* children spend their non-schooling hours? Enlist three activities in which he spends most of his time and the number of hours spent on the same**	**Activities**	**No. of Hours**
Remarks (if any)			**Remarks (if any)**		

Signature of the respondent		Signature of the interviewer	

Please note the suggestions and complaints by the respondent below.

Interviewer's Notes:

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