

SNV Niger

Improved Cook Stoves
And
Solar Energy
Market and Sector Analysis

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Improved Cook Stoves And Solar Energy Market and Sector Analysis

I. Summary

This is a report on a market study for clean energy products conducted in Niger for SNV in July-August 2012. Its objectives¹ were to study the state of the renewable energy sector in Niger, with a particular focus on clean lighting and ICS, determine the factors that influence market actors, gather information about the use of clean lighting and ICS, including end user motivators; understand the value placed on clean lighting; determine the price range each target group would pay Fr. Various lighting and cooking products; and define any microcredit products that could be used to finance renewable energy products costing between 11 and 200 dollars.

This report presents a brief description of the design and conduct of the study; findings from field research, interviews and international experience concerning lamps; findings concerning improved wood stoves; and finding and recommendations concerning choice of product, marketing channels and finance.

Design and conduct of the study

The study was carried out by an international consultant, Paul Rippey, who was in Niger for 11 days in July-August 2012. During that time, he worked with a team of three local research assistants to carry out 194 interviews, and 14 focus group discussions, in six locations in Niger, representing different predominant occupations and wealth levels: Urban and Peri-urban Niamey; urban and peri-urban Maradi; a Northern pastoral zone town, Bermo; and, a Southern agricultural zone town, Mokko. The survey results suggested that “phones per household member” was a good proxy indicator for household wealth, and using that criterion, the six locations had a wide spread in wealth.

The consultant also interviewed potential suppliers, people markets, government officials, financial institutions and savings group promoters. Finally, he conducted some rapid tests on the performance and lifespan of some solar and battery powered lamps.

¹ Please see terms of reference in Annex 1.

Findings concerning lamps

- Small solar lamps are almost completely absent in Niger, while battery/LED lamps have largely replaced kerosene as the dominant lighting product in Niger (153 out of 194 respondents had at least one battery/LED lamp). The electric network was the second most widespread source of lighting, but even people on the network had backup solar/LED lamps.
- The majority of homes had one or two battery/LED lamps, indicating that for instance a package deal with two lamps might be a suitable product for many households.
- These lamps are certainly cleaner and perhaps less expensive than kerosene, but, despite their low acquisition costs, they have high operating costs (average user in study reported spending 452 FCFA a week (\$0.87), or \$45 a year, on batteries), and create a health hazard in the form of thousands of countless dry cell batteries.
- Respondents report that the most important use of lamps is for home security, with reading and studying in a distant second place.
- The principal complaint by far with all lighting sources was high recurring costs, followed by interruptions in lighting. Specific complaints of battery/LED lamps were that they break easily and are expensive.
- About a third of respondents spontaneously mentioned solar as a source of lighting that they knew about, although none of them used it.
- Disaggregated results by location showed that in poorer neighborhoods, people saved money both by rationing the hours they used their lamps, and by having smaller lamps that used fewer batteries but give less illumination.
- Mobile phones - which are closely linked to solar lamps in the market because some lamps can also charge phones - had incredible penetration in the sample, but many people charge their phones for free. However, those who could report how much phone charging cost them reported that they paid 353 FCFA per week (\$35/year).
- People who received lamps to test over night were favorably impressed and in some cases asked seriously about the possibility of buying one.
- In the “laboratory” tests of solar and battery LED lamps, one of the battery LED lamps was by far the brightest at the beginning of the test, but after 12 hours of use it was almost exhausted. The solar lamps generally respected their advertised claims about how long they last on a charge.

Findings concerning stoves and wood

- Over half the respondents used a *malgache* stove, a circular metal stove with a circular wall, a flat bottom made of metal, and metal supports for a pan. The second most common stove was simply three stones. Only small numbers of people used any other cooking device.
- People liked three stone stoves for their low cost and stability, and disliked them for using a lot of wood, and because they can't be moved in case of rain.

(In fact, the three stones can be moved, but respondents were apparently pointing out that once the wood is burning and the stones are hot, it is the *fire* that can't be moved.)

- Respondents found malgache stoves to be “practical” and economical, while they complained that they have to be replaced frequently. Most of the stoves in the study had been purchased within the preceding year, reinforcing the comments about short lifespan.
- A large majority of respondents report that they buy their firewood, even if they occasionally gather some of it. Gathering firewood is women’s work but a non-negligible 19% of respondents said the men did it, or the men and women together.
- The average reported weekly cost of fuel for those with three stone stoves was 251 FCFA, and 204 FCFA for those with malgache stoves, pointing to a likely real fuel savings with the malgache stoves.
- In terms of wood stove choice and wood use, some areas had particularities. Not surprisingly, the urban neighborhoods of Niamey are most likely to use gas and charcoal, and residents of isolated and arid Bermo pay more for fuel than other areas.

Choice of product, marketing channels and finance

The consultant assumes that in most cases, customers of renewable energy products will be upgrading from existing products. The most common upgrade paths will be, for lighting, from battery/LED lamps to “pico” solar systems (roughly defined as electric lamps with separate or integrated solar panels with a capacity of up to ten watts). For stoves, both three-stone users and malgache users might upgrade to multi-marmites. A financial analysis of the amount that could be saved from these upgrades suggests that most consumers could pay for the upgrade within six months, which is suggested as a rough target for the amortization period for a successful marketing campaign. The cost of lamps is uncertain because of uncertainties about their customs treatment.

Other upgrade paths involving higher end products are also possible and desirable, but for immediate results the consultant suggests starting with BOP products with the possibility of large outreach and positive social impact.

Savings groups are a particularly propitious marketing channel, because they provide easy access to groups of organized people with access to lump sums, and because their trainers in Niger are independent agents, called Village Agents, who are often looking for additional sources of revenue, and new ways to increase their social standing and networks. These people can become an effective sales force. There are large, strong networks of savings groups in Niger run by Plan and by CARE.

There are a number of models for working with savings group promoters, outlined in the report. The history of using these models is one of increasing success at every iteration.

The NGO ASUSU SA, the largest MFI in Niger, showed a great deal of interest in promoting clean energy products, and has an affiliated NGO, ASUSU Ciigaba, which would collaborate in promoting lamps.

II Conduct of the study, Wealth and Demographics

The international consultant was in Niger from Sunday July 29 through Thursday, August 9, 2012. With SNV, he assembled a group of three research assistants, all of whom spoke both Djerma and Hausa, and two of whom he had worked with earlier in the year on another project in Niger. On his first work day, July 30, he met with the researchers, introduced them to a draft of the questionnaire, after which they went out to pre-test it in a peri-urban neighborhood of Niamey. The following day, they reviewed the experience with the questionnaire and modified some questions, and pre-tested it again. They made further minor modifications, and used the final version for the rest of the study. The first interviews done as part of the pre-test were discarded; those from the second pre-test were included in the survey.

The method of selecting respondents is given below in the section describing the different neighborhoods and villages.

The interviewers also conducted fourteen focus groups. The themes for the focus groups were selected by the international consultant daily in the field, based on discussions with the interviewers and consideration of what areas need to be probed.

The sample was segmented by area. The TOR called for 180 interviews to be conducted, thirty in each of six areas:

- Urban Niamey
- Peri-urban Niamey
- Urban Maradi
- Peri-urban Maradi
- Northern pastoral zone town, Bermo
- Southern agricultural zone town, Mokko.

Logistics of travel meant that the team of interviewers had to conduct all the interviews in an area in a single day, so there were some variations from these targets. In addition to the clearly urban and well off neighborhood of Dar es Salaam, interviews were conducted in Niamey in Tondibiah, Gabou Goura, Loso Goungou and Karadjé. These neighborhoods were all peri-urban but to varying extents. The Niamey neighborhood of Karadjé had a more urban character than other Niamey peri-urban neighborhoods, and was kept separate in the report.

Table 1: Location of interviews

Village or neighborhood	Number of interviews (n)
Urban Niamey well off: Dar es salam	21
Niamey peri urban but relatively urbanized: Karadjé	13
Other Niamey: various peri urban	37
Moko	30
Bermo	31

Urban Maradi: Mokoyo	32
Peri-Urban Maradi: <u>Garen Daoure</u>	30
Grand Total	194

At the end of the fieldwork, the interviewers were asked to rank the neighborhoods subjectively by wealth. The interviewers' ranking, which for them was generally clear and unambiguous, are presented in the following table, from wealthiest to poorest. The table also includes short descriptions of the villages and neighborhoods, and some indications of the conditions in which interviews were conducted.

Table 2: Description of survey locations

Neighborhood	Description
Dar es Salaam	This new quartier in Niamey was the most difficult to conduct interviews in. The interviewers had to go door to door, and in many cases, there were only maids at home, as the adults were at the offices. Even when residents were at home, they were not always welcoming to the interviewers. Male interviewers had trouble getting to talk to women who were home alone. In one case, the woman interviewer had to wait many minutes to start the interview while the woman of the house chatted on her telephone, and the interviewer finally left. People said they "had been interviewed so many times that they were tired of it." "You interview us – what do we get out of it?"
Karadjè	Interviewers described this quartier as "Relatively urban" and "well off". Respondents were mostly members of a Plan group. Members were described as well off, working in small commerce or with salaried jobs. The women were very welcoming despite not having been informed in advance of the interviews.
Other Niamey Peri-urban: Tondibiah / Gabou Goura	Tondibiah's distinction is the military camp which forms the economic focal point of the village. We interviewed a Godiamu savings group, and this was the only case where all the respondents were members of a group. Although part of greater Niamey, it felt rural; it had originally been a rural village, and the city grew around it. Members were surprisingly informed, knowing about solar energy and the electric grid. Gabou Goura is adjacent to Tondibiah and culturally similar. We had come to interview a savings group, but it turned out to be a youth group, so the interviewers went to the chief, who quickly rounded up nearby people. All but one of the respondents was male, which nicely balanced the women respondents in Tondibah.
Mokko	We had come to interview a savings group, but the presence of a vehicle with visitors drew about sixty women, and we chose at random among them, so the participants included many savings group members but not exclusively. The interviewers had the impression that the women in some cases exaggerated their poverty, as is the practice when they think there is a "project" coming.
Mokoyo in Maradi	We looked for a neighborhood in Maradi that was neither the richest nor poorest, and settled on Mokoyo. It is conservative and traditional. There are lots of very old houses. Almost all the women are earning money somehow, nonetheless one of the interviewers noted that "the men are fat and the women are thin".

Table 2: Description of survey locations

Neighborhood	Description
Bermo	This culture and economics of this pastoralist village were a surprise, if not shock, to some of the interviewers, who noted the poor road, absence of agriculture, sparse vegetation, and lack of infrastructure. Bermo had been suffering from a month of drought when the “big rain” came on the day of the interviews.
Garen Daoure	The interviewers were surprised at how poor the people were in this village, and noted that “even the chief had a three stone fire”. One person in a focus group said, “Madame, you can look in every house and you won’t find a stove”. Houses were very small, there was no apparent birth spacing, and many women couldn’t afford wood and burned millet stalks. One woman in Garen Doure had no home lighting other than matches, which she would light one at a time if she needed to venture out at night.

In developing the questionnaire, we inserted a number of questions that were designed to produce a wealth ranking of respondents. These were questions at the beginning of the questionnaire asking how many school age children in each household went to school, whether the family was able to meet its needs through agriculture, and how many goats, sheep, cows and camels the household had. In data analysis, these criteria were tested against the subjective ranking of the villages, and in fact none of them produced a ranking that agreed with the subjective ranking. The percentage of children in school agreed fairly well, but for some reason, Mokoyo was a notable outlier, with 95% of the children in school, despite being the third poorest neighborhood in the subjective ranking.

Table 3: Household wealth indicators by location

Location	n	phones / HH member	HH members	% of kids in school	Meet needs through agriculture	Goats	Sheep	Cows	Camels
Dar es salam	21	0.44	12.5	89.5%	0	1.6	0.6	0.0	0.0
Karadjé	13	0.38	9.8	87.3%	0	0.2	1.3	0.1	0.0
Niamey peri Urban	37	0.33	9.2	92.7%	6	0.5	2.0	0.6	0.2
Mokko	30	0.24	13.1	86.9%	2	1.1	1.5	0.5	0.0
Bermo	31	0.21	9.8	76.5%	2	6.5	3.1	3.2	0.0
Mokoyo	32	0.18	8.8	95.3%	1	0.2	0.3	0.1	0.0
Garin Dawré	30	0.08	10.2	57.1%	4	0.5	0.4	0.3	0.0
Totals/averages	194	0.25	10.4	83.5%	15	1.6	1.4	0.8	0.0

We tested one other variable, however, that is a more promising indicator: the number of telephones per family member. In fact, that seems to be an excellent indicator of wealth, with a wide spread and clear delineations among villages: the richest (subjectively) neighborhood, Dar es Salaam, had 0.44 phones per household member, while the poorest, Garen Daoure, had only 0.08.

III Lighting

This section first treats aggregated data – that is, sums, averages and correlations from all 194 questionnaires taken together. A later discussion examines data for some key indicators disaggregated by neighborhood.

The lighting section of the questionnaire had a series of questions on present lighting in the household, expenses both for acquisition and operations, and for

Source of lighting	n	%
Open flame	1	0.5%
Kerosene lantern	15	7.7%
Electricity	49	25.3%
Wood	1	0.5%
Traditional torch or lantern	7	3.6%
Battery/LED	153	78.9%
Generator	6	3.1%
TOTAL	232	

The ranking given by phones-per-household-member agreed with the subjective ranking in every case except that Bermo and Mokoyo were reversed, but these two locations were very close both in phones-per-household-member and in subjective assessment. Phones-per-household-member is much easier to use as an indicator of wealth than the battery of questions that are often used in household surveys, and adequate for most economic ranking purposes. The relationships among these indicators are shown in table 4.

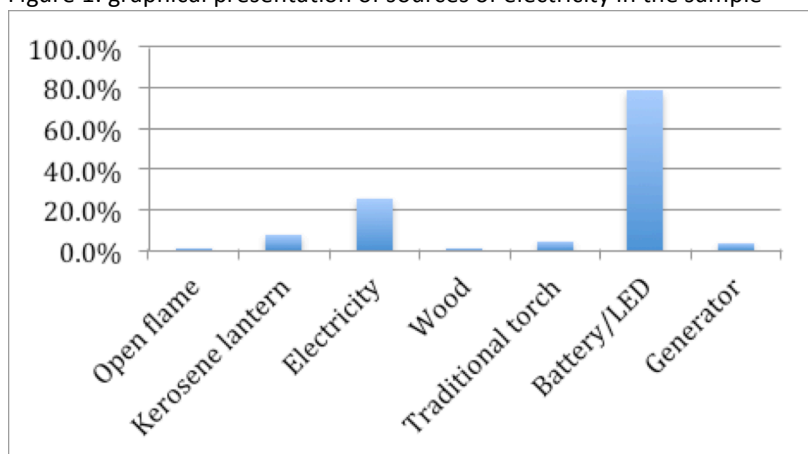
preferences and motivations. Table 4 and Figure 1 show the source of lighting in the 194 household sample; total number of sources is greater than 194 because many homes have multiple lighting sources.

The World Bank² reports that 8% of households in Niger are electrified. The percentage on the electric grid in the sample, at 25%, suggests that the sample disproportionately included either well-off people or urban people. It is certain that urban areas were over-sampled, since Niger is thought to be 17% and the sample had 53 out of 194 respondents, or 27%, from Dar es Salaam and Maradi. In addition, the peri-urban neighborhoods of Niamey are more likely to be electrified than remote rural villages. Finally, in the consultants experience in Uganda, the official statistics sometimes under report the number of households with electricity, since they report on meters, not actual households, and one meter may serve more than one household, or households may benefit from electricity through “clandestine” connections.

² Domínguez-Torres, Carolina and Foster, Vivien. *Policy Research Working Paper 5698: Niger’s Infrastructure, A Continental Perspective*. The World Bank, Africa Region, June 2011. Page 1.

The survey confirmed the strong subjective impression that the battery LED lamp has essentially replaced kerosene as the principal source of home lighting in Niger. In fact, 153 households, or 79% of the sample, had a total of 346 battery/LED lamps. This has implications for promoting other sources of lighting that will be discussed in the conclusions.

Figure 1: graphical presentation of sources of electricity in the sample



Since battery/LED lamps are the principal competition for solar lamps, it is useful to look at them in some depth. The average household which had any battery/LED lamps had 2.3 lamps. The

majority of homes had one or two lamps, but some had as many as eight. Table 5 shows the frequency of different numbers of lamps by household. A key finding is that two-thirds of the homes in the sample would be able to replace their existing battery/LED lamps with a two-lamp solar system.

Table 5: Lamps per household

number of lamps	frequency
1	53
2	50
3	30
4	10
5	3
6	3
7	2
8	2
TOTAL	153

Respondents reported using their lamps for an average total of 5.1 hours per night. The question was intended to capture the total time any lamps were used, so that two lamps each running for two hours would be recorded as four. However, there was some trouble having this question understood by the

respondents, and perhaps even by the interviewers, so the answer should be taken with some caution.

Battery/LED are quite inexpensive: households had spent on average 2257 FCFA for lamps, or an average cost per lamp of 1003 FCFA. This result is consistent with the street price of lamps purchased during the mission. However, their operations are expensive because of the constant need to replace batteries. Respondents reported spending a remarkable 452 FCFA (USD 0.87) per week on batteries. Respondent recall of recurring expenses is often overstated, and some respondents in this case might have given an answer that reflects what they spend for batteries per week, for those weeks in which they have money to purchase batteries. Nonetheless, these results show annual expenditures for batteries that on average are more than forty-five dollars a year, which even if only approximately true has positive implications for the solar market.

Respondents were asked “What is the principal use you make of your lighting?” and were given a list of seven items: Preparing meals; reading or studying; Income generating activities; security; going out to the toilets; pass-time (“divertissement” in French, intended to include relaxing or talking in the evening); and repelling mosquitos (an unlikely choice, but suggested by one of the interviewers). The interviewers recorded the order in which respondents mentioned uses. Table 6 shows the results:

Table 6: Uses of lamps

Mention	Prepare meals	Reading/ Studying	IGA	Security	Go to toilets	Pass time	Mosquitos
1	7	37	7	123	20	1	0
2	22	33	7	48	57	17	0
3	24	36	11	11	49	9	1

Security by far was the number one concern of respondents, with Reading/Studying a distant second, barely ahead of going to the toilets.

Respondents were asked two similar sets of questions, designed to elicit the qualities they liked and did not like in lamps.

The first questions asked if they were satisfied with their present lighting, and if not, what they didn’t like. Interviewers recorded the order of mention. Results appear in table 7.

Table 7: Sources of dissatisfaction with lighting

Mention	Acquisition cost	Recurring costs	Amount of light	Odor	Smoke	Dirt	Risk of fire	Noise	Interruptions in lighting	Lamp breaks	"Quality"
1	38	43	24	0	1	1	2	1	30	10	25
2	8	47	7	0	0	0	5	0	28	21	28
3	2	28	6	0	0	0	2	0	17	8	15
Totals	48	118	37	0	1	1	9	1	75	39	68

Issues around cost and quality dominated, with recurring costs being mentioned by 118 respondents, or 61%, and acquisition cost mentioned by 48, or 25%. Close behind considerations of cost, however, were considerations of quality: 39 respondents (20%) complained of lamps breaking, and 68 (35%) complaining of the generic attribute of “quality”, and 75 (39%) complained of interruptions in lighting; only 36 of these 75 people were on the electric grid – the others apparently had other reasons to complain about interruptions in their lighting, which unfortunately were not probed for.

Table 8: Lighting strong and weak points

Lighting source	n	Strong points	Weak points
candles	10	light (9)	Fire (9)
Kerosene lantern/ <i>fatila</i>	63	Almost all said some variety of “it gives light”	Smoke (30), fire (15), odor (10), expensive (19)
Generator	74	Almost all said either “bright” or “reliable”. There was only one mention of the ability to run a fan or a television.	Expensive (45), noise (28), breakdowns (7)
Battery lights (indiscriminate between LEDs and other bulbs)	31	Almost all said some variant of “it gives light” or “it gives good light”	Breaks easily (18), expensive (8)
Electric grid	71	Almost all mentioned “good light”. Three mentioned other appliances.	High cost (30), danger or short circuit (28), cuts in service (15)
Solar	66	No cost or low cost (21), good light (18), a vague “good” (12)	Expense (48), need sun to operate (2), danger (2), not bright (1)

Finally, there was a set of questions about what other lighting sources people knew of, and what they thought were the strong and weak points of each. Table 8 shows the assessments of respondents of different lighting sources; for each the number of mentions appears in parentheses after the quality. In some cases, there were complex answers giving several qualities, or related qualities, so that an exact count was impractical. In those cases, the reactions are summarized.

There were negligible (n = 1 or 2) mentions of other sources of lighting, including wood, bamboo, and gas lamps.

Some responses call for particular note: There were only 31 mentions of battery lamps because the question called for comments on electric sources the respondents did not have, and only 41 respondents lacked battery/LED lamps. The fatila, once a principal source of light, is fading from respondents' consciousness; only 63 people even mentioned it. Respondents correctly assess battery/LEDs both as giving good light, and as breaking easily and being expensive.

66 people (34% of respondents) spontaneously mentioned solar, although no one in the sample actually used solar. 21 of them (31%) liked the low cost of solar, while 48 (73%) didn't like the high cost. Clearly the former were thinking of operations, while the latter were focusing on acquisition.

During data analysis, we also disaggregated some key indicators by neighborhood, with seven neighborhoods considered (three in Niamey, since Karadjé seems to be intermediate between and distinct from Dar es Salaam and the other peri-urban neighborhoods).

Table 9 shows lighting sources, and for each the numbers and use by neighborhood, and costs of each (acquisition and operations, when appropriate).

Table 9: Lighting types, hours of use, and costs by location

Village or neighborhood	"old" elec. lamp n	"old" elec. lamp acquisition	"old" elec. lamp hours	"old" elec. lamp cost	LED n	Average LED/HH	LED acquisition	Avg cost per lamp	LED hours	LED cost
Dar es salam					20	2.0	2211	1106	3.3	590
Karadjé	2	1225	8.0	250	21	2.1	3019	1438	7.1	788
Niamey peri Urban	3	1273	3.0	108	60	2.0	2773	1387	6.6	507
Mokko	1	500	2.0	75	81	2.8	2168	774	4.9	396
Bermo	1	1200	4.0	200	47	2.2	3129	1422	4.3	310
Mokoyo					52	2.0	1473	737	5.0	475
Garin Dawré					65	2.4	1652	688	4.4	361
Total/Average	7	1139	4.4	157	346	2.3	2257	981	5.1	452

Village or neighborhood	n	Fatila n	Fatila hours	Fatila cost	Elec n	Elec acquisition	Electric cost	Gen n
Dar es salam	21				13	158333	5875	1
Karadjé	13	2	0.0	0	2			
Niamey peri Urban	37	1	2.0	25	11			
Mokko	30				5	50000	1833	1
Bermo	31	1	5.0	100	7	48460	2283	
Mokoyo	32	9	10.6	800	10	105000	2686	
Garin Dawré	30	2	10.0	525	1			4
Total/Average	194	15	8.7	598	49	81025	3296	6

Several facts are noteworthy in these tables. Fatilas – kerosene lamps – have virtually disappeared except in Mokoyo, described by the interviewers as “a traditional conservative neighborhood”.

Although Dar es Salaam has the highest percentage of people on the electric grid, only 13 out of 21 households, or 62%, were wired. There was little variation in the number of battery/LEDs per household.

Not surprisingly, the fewest hours per day of battery/LED use were reported in the richest neighborhood, where many people are on the grid, and the poorest. Note that it seems that poorer locations save money both by rationing hours of

light, and also by having lower quality light: people in the poorest locations buy the least expensive lamps, which tend to take fewer and smaller batteries and give less light, and also by using their lamps fewer hours per day.

The Karadjé sample had only two people on the grid, but confirmed the interviewers' impression that the neighborhood was well off by having the greatest nightly use of battery/LED, the greatest battery expense, and the most expensive lamps. In general, the results for Karadjé and Niamey peri-urban suggest that there is a substantial market for solar in those areas: Karadjé residents report weekly expenses for batteries of 788 FCFA (US\$1.51), or over \$78/year, all with an average of only 2.1 lamps per household.

Also, people in Niamey are spending substantially more on lamps than people outside of Niamey, with Bermo being an exception to that trend. Respondents in Karadjé reported spending more than twice as much per lamp as respondents in Garin Dawré.

We also disaggregated the principal uses of lighting by neighborhood. Results (with "mosquitos" eliminated) are shown in table 10:

Table 10: Uses of lighting by location

Village or neighborhood	n	Food prep n	%	Reading n	%	IGA n	%	Security n	%	Toilet n	%	Amusement n	%
Dar es salam	21	1	5	16	76	2	10	20	95	9	43	11	52
Karadjé	13	6	46	9	69	2	15	13	100	10	77	1	8
Niamey peri Urban	37	9	24	21	57	9	24	35	95	23	62	5	14
Mokko	30	9	30	15		11	37	27	90	26	87	5	17
Bermo	31	11	35	18	58	4	13	28	90	20	65	2	6
Mokoyo	32	8	25	20	63	1	3	31	97	23	72	6	19
Garin Dawré	30	15	50	10	33	0	0	29	97	24	80	1	3

Some results are quite predictable. The better off residents of Dar es Salaam see lighting as an asset for the education of their children, and have much more time for "amusement", than poorer people. Security is a high concern everywhere. Few people use lighting for income generating activities, although Niamey peri-urban and Mokko have non-negligible numbers.

Mobile phone charging

In other countries, charging mobile phones and solar lighting have been closely linked, because many lamps also have adapters to allow users to charge mobile phones from the same panel. In fact, in Uganda, many households pay as much or more for charging their phones as they do for lighting, making the purchase of a solar lamp as much a purchase of a phone charger. Also, phone chargers enable

poor households to make some money charging phones for neighbors. Barefoot Power has described phone charging as the “killer app” of solar lighting.

Table 11: Means of charging phones

Means	n
Electric grid	98
Neighbor’s house	44
Relatives house	1
“someone’s” house	1
Friend’s house	1
My house	1
Village	2
“Batteries”	1
Total	149

In Niger, the importance of phone charging may be somewhat less than in some other countries. Mobile phone penetration is extremely high: 157 out of the 194 respondents reported having at least one phone, and those households reported a startling total of 421 phones, or on average 2.7 per household with any phones. However, this large number of phones does not necessarily translate into high costs. When asked where they charged their phones, the answers were vague, but suggested that many people charged their phones for nothing (table 11). However, it must be noted that in many cases the respondents were women while their husbands had phones, and the women were simply not able to say how much their husbands paid.

Asked directly how much they paid for phone charging, only 24 respondents reported that they paid anything. However, those who reported what they paid, paid a lot, an average of 485 FCFA (\$US 0.93) per week, which annualizes to \$48 a year.

Radios were also common: 93 of the respondents reported having a total of 111 radios. 56 respondents reported paying for batteries for their radios, and as was the case with phones, those who were able to report how much they paid, paid dearly: an average of 353 FCFA(\$US 0.68) per week, or \$35 a year. 75 of those with radios were able to cite the price they had paid, which on average was 6820 FCFA.

Focus group results

The team conducted 14 focus group discussions, in six locations in Niger, representing different predominant occupations and wealth levels: Urban and Peri-urban Niamey; urban and peri-urban Maradi; a Northern pastoral zone

town, Bermo; and, a Southern agricultural zone town, Mokko. In order to stay focused, the groups addressed either lighting or stoves, but not both. However, the focus groups addressed stoves more often than lighting, in part because as the fieldwork progressed, questions around stoves started to seem more complex and difficult than questions around lighting, and focus groups were gathering interesting remarks about people's complex relationships to trees and firewood.

The focus groups were impressionistic, producing qualitative information rather than hard data. In two cases, when the interviewers were able to visit the same household on two successive days, they also left pico-solar lamps with people to test overnight (the lamps were a "Mandarin"³ lamp and two lamps made by Nokero⁴, the N220 and a small reading lamp, the Ed Solar Book Lamp). Significant observations about lighting from the groups and lamp tests follow.

People everywhere were aware of the waste of batteries, and people very much are pre-disposed to like the solar lamps, perhaps as much for their novelty and apparent quality relative to the available battery/LED lamps, as for any potential money savings. Those who were allowed to test the lamps were generally favorably impressed, and at least in one case the recipient seemed to have perceived the small reading lamp he used as brighter than it in fact is.

The interviewers said that people's desire for lamps was not always tempered by any thought about whether they could afford it, and they thought it was not unusual for people to want something without being able to afford it. However, several people who saw the lamps immediately asked where they could be purchased, when they would be available, what they cost, and whether they could purchase the sample lamps.

In Bermo, the chief warned the interviewers not to lend the lamps to villagers, because they were nomadic and might leave with the lamps. Instead, they lent the Mandarin lamp to the guard at the house where they were staying. The lamp continued to give light "until morning" (tests we conducted later showed that indeed the lamp functioned well much longer than the advertised time of lighting of "over 6 hours"). The guard assumed that the long life was due to the batteries and asked what brand they were. When the interviewers explained that the lamp was solar and would recharge the same batteries day after day, the guard asked where he could acquire one.

Two other anecdotes also serve to reveal the positive impression that the lamps made.

³ www.illuminationsolar.com

⁴ www.nokero.com

In one case, we left the lamp with a woman after an interview. Her husband was visiting neighbors in the evening and saw the bright light shining through the windows of his house, and immediately assumed that somehow his wife had hooked his home up to NIGELEC.

In another case, we lent a lamp to a man who reported, "When I bought my lamp home, Madame took it!" This incident reminded the interviewers of the adage that *Ce que femme veut Dieu le veut* – "God wants whatever women want."

Interviewers made two remarks that the consultant found pertinent: First they stated that there is not a village in Niger where the women aren't organized in something, and they advocated for these organizations as a channel to introduce new ideas and new products. Second, they were generally cautious about the desirability of end-user credit, and instead thought most clean-energy products would need no more than *facilités de paiement*, or flexible purchase terms, rather than formal loans. Both of these notions are developed further in the discussion of financial products.

In a focus group in Mokko with nine women, the participants were invited to prioritize activities by the question, "What are the activities that you *absolutely* need light for? What can you not do if you don't have light?"

The participants developed this list:

- Preparation of food ("everything depends on food!")
- Childbirth ("the health center has no lights! We have to bring our own.")
- Reading, studying ("Success depends on light")
- Security ("scare the burglars. If there is a lamp, a thief will run away.")
- Eating with the family
- Go to toilettes
- To travel at night
- Breaking fast during Ramadan
- Go to health center at night (also mentioned in Bermo)
- To know where to put my hands when I'm eating
- General lighting
- Go to neighbors or around the village
- Charge cell phones

One participant added, "There is a dangerous snake in the village. We need to light up the village." Another group in Garen Daoure also mentioned snakes.

Very similar lists were developed in focus groups in Garen Daoure and Bermo. The low ranking given to cell phones is striking, compared to some research the consultant has carried out and seen in other countries.

Laboratory tests of common lamps

Finally, the consultant carried out tests of the luminescence and lighting time of some popular lamps, using a timer and a luminescence meter. Before going further, it is important to stress that these tests are only indicative, and they differ from tests commissioned by Lighting Africa or other sources in many ways:

- They were not conducted by someone with professional training in the area.
- They only measured the luminescence directly in front of the lamp, and did not take into account that some of the lamps gave much more directional lighting than others. Two of the lamps - the Firefly and the Nokero - have light diffusers that give a more omnidirectional light than the others, and thus were penalized in the tests. Others, especially the “black torch”, were highly directional, and thus were favored by the testing set up.
- The tests were conducted in Oregon with ambient temperatures around 21^o C, substantially lower than those that prevail in Niger.
- Some of the products tested were fairly old, while others were brand new.
- Tests did not include the different brightness settings that lamps offer.

While luminosity was not measured in a way to allow valid comparisons about brightness, the measurements were taken at regular intervals using the same testing set up for each measurement, so the shape of the curves in Figure 2, and the duration of lighting, are reasonably reliable indicators.

The products tested were three battery LED lamps, and three pico solar lamps, described in table 12.

Table 12: Description of lamps tested

Battery/LED lamps	
“White LED Array”	This was purchased from a street vendor in Niamey for 1100 FCFA (US\$ 2.11), which included three D-cell batteries. It has two settings: one turns on a large array of 21 LEDs which give fairly diffuse light; the other turns on an array of six LEDs that are highly directional and intended to be used as a torch. We tested it using the 21 LED display. This lamp is roughly representative of many that are sold in Niger for home lighting. There is no brand on it. Build construction is poor: the first lamp of that model that was offered for sale proved not to work at all, and the battery cover of the working example will not stay on.

Table 12: Description of lamps tested

“Green Array/Torch”	This lamp has three settings: an array of six LEDs with diffuse light, a pair of LEDs which are highly directional and act as a torch, and a single LED that flashes red and blue. We tested the array of six LEDs. The lamp takes three double-A batteries. “Fit and finish” are good although I am unable to open the batter compartment without using something metal to pry it open. No brand.
“Black torch”	This is a regular flashlight, purchased in Maradi for 600 FCFA, which ingeniously takes either 2 D batteries or two double-A batteries. Its single setting gives a highly directional light. It is included in the following table, but not in the graph, because its initial brightness straight ahead changes the scale of the graph to the point where the curves of the other lines would not be visible. It is so highly directional that it is not suitable for home lighting.
PICO solar lamps	
Barefoot Firefly Mobile	This is Barefoot Power’s best selling product. It has an array of ten LEDs which have three settings: the high setting is advertised as lasting four hours; the medium setting 7 hours, and the low setting 50 hours. We tested the high setting on a brand new lamp. The manufacturer claims the lamp will last through 1000 full recharge cycles before the batteries need to be replaced. The 1.5 watt panel will also charge most mobile phones.
Nokero N220	This is Nokero’s largest light, which has an integrated panel. It has two settings, high and low. We tested in on the high setting. The test unit was about six months old, and had had light usage during that time including several trips to Africa
Illumination Mandarin	This is another lamp with an integrated solar panel. It has 12 LEDs arranged in a circular array and a single setting. It claims to last for “over 6 hours on a single charge”. The test unit was over a year old and had traveled extensively and seen more usage than the other lamps. This model has since been replaced by a new lamp, the Mandarin Ultra, which claims better performance.

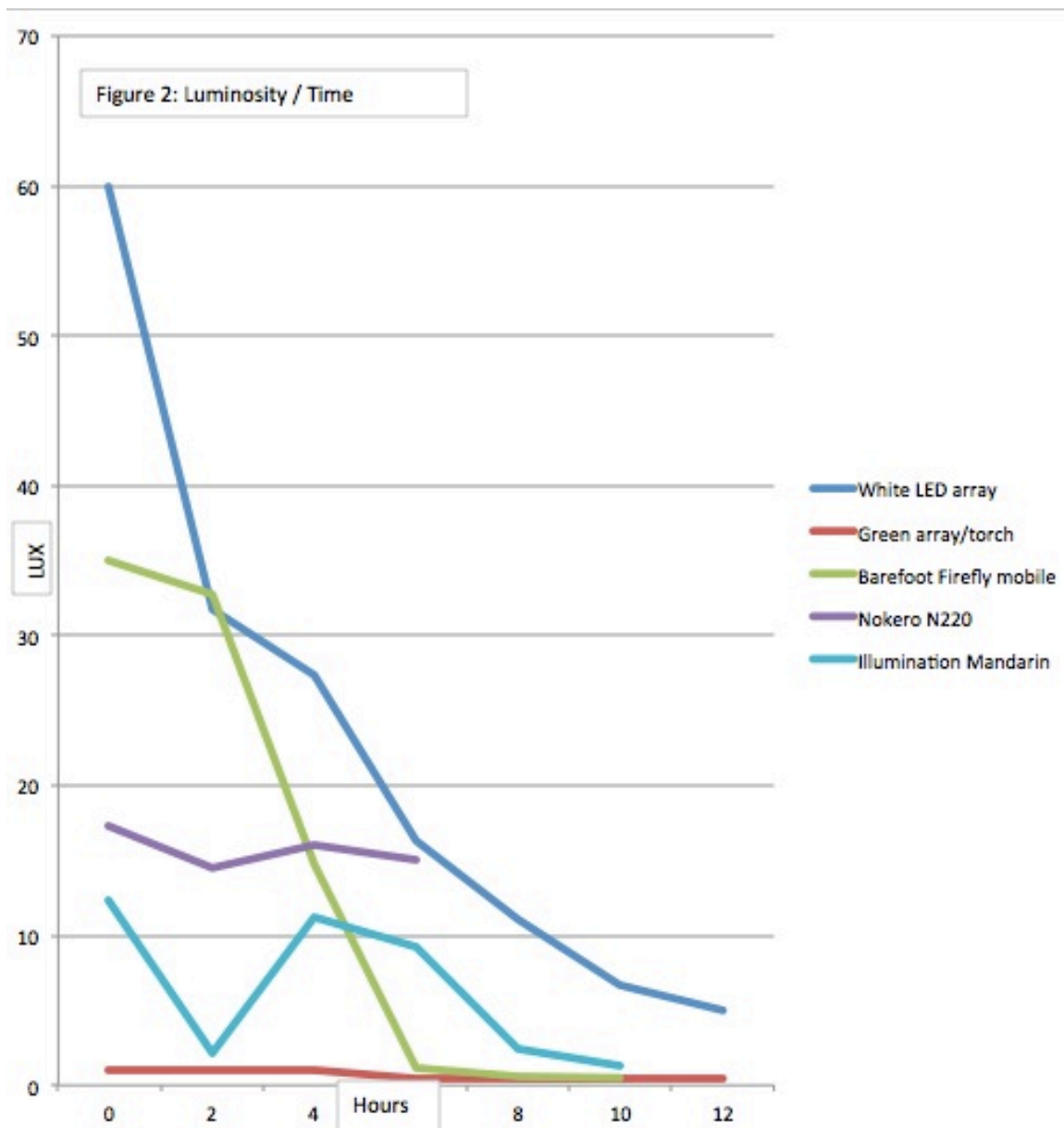
These lamps are illustrated in the lower-left photograph on the cover of this report: Top row, L-R: White LED, Green array/torch, Black torch. Bottom row: Nokero N220; Illumination Mandarin; Barefoot Firefly Mobile.

Table 13 and Figure 2 show the performance of the lamps:

Table 13: Luminosity / time

Battery/LEDs	Begin	2 hours	4	6	8	10	12 hours
White LED array	60	31.7	27.4	16.3	11.1	6.7	5
Green array/torch	1	1	1	0.4	0.4	0.4	0.4

Black torch	1,400	576	192	97	70	22	17
Pico solar							
Barefoot Firefly mobile	35	32.8	14.8	1.2	0.6	0.5	
Nokero N220	17.3	14.5	16	15.1	15	14	
Illumination Mandarin Ultra	12.4	2.1	11.2	9.2	2.5	1.3	



Some notes will help the reader understand Figure 2:

- At the two hour measurement, the Illumination lamp suddenly went dim when it was picked up, and recovered later, suggesting a loose wire; the age of the lamp, and the fact that it has traveled for thousands of miles in checked airplane baggage, should be taken into account in judging the product.
- Sometime between 6 and 8 hours, the Nokero lamp cut itself off, apparently a design feature to keep it from exhausting and damaging the battery. It still had a charge and could be relit to its previous brightness, but since it did not provide continuous lighting up to eight hours, its graph was stopped at 6 hours.

While these tests, for all the reasons given, are not a fair comparison of lighting sources, they do show three things convincingly:

- The two solar lamps that make claims about hours of light (Illumination and Barefoot), achieved the promised performance. Barefoot promises four hours of light on the high setting, and delivered six, although the amount of light was decreasing rapidly by six hours; Illumination promises over six hours, and delivered it, with the reservation noted above.
- Although the vertical axis of the chart is labeled “LUX”, that is simply because the tester used the LUX setting on a luminosity meter. The test was emphatically not an adequate test of luminosity for reasons given above.
- Battery solar lamps start off with great brightness but do not maintain it long. Respondents in the study reported buying batteries at least once a week, and that frequency is completely consistent with these tests.
- The solar lamps recharge completely every day, so that the allotted time - whether four hours or more - can be enjoyed every evening. There is a strong pressure to ration battery/LED lamps: by using them less every night, one can postpone for a day or two the next time one will need to purchase batteries again.

IV Stoves

Participants overwhelmingly cook with either three stones or the simple malgache stoves. Distribution of stoves for the entire sample is shown in table 14. Stove types used total to more than the 194 respondents because of the prevalence of users having more than one type of stove. In particular, 41 respondents, or 21% of the entire sample, have some other type of stove, usually malgache, plus three stones.

Table 14: Stove use

Stove type	n	%
Three stones	98	51%
Barka	4	2%
Malgache	125	64%
Gas	5	3%
Oven	5	3%
Mai sauki	3	2%
Multimarmite	2	1%
Charcoal	10	5%
TOTAL	252	

Households with three stone stoves typically have more than one: the 98 households using three stones had a total of 199 three stone stoves, with two being by far the most common number. Respondents with three stones say they used them for 85% of their cooking needs.

Malgache stoves present a similar profile to three stones: 125 households have a total of 260 stoves, almost exactly two per household. Respondents with malgache stoves report using for 91.5% of their cooking needs.

Respondents reported paying an average of 2509 FCFA for their malgache stoves, and of course nothing for their three stone stoves.

Respondents were invited to say what qualities they appreciated and did not appreciate in stoves. The results for three stones were telling, in that of the 98 users, 80 could give negative points, and only 69 said positive things. Table 15 gives the results.

Table 15: Appreciation of three stones

Positive qualities	n	Negative qualities	n
Rapid	27	Uses a lot of wood	33
Free or economical	15	Doesn't last	17
Stable	11	Can't be moved	11

Table 15: Appreciation of three stones

"available"	4	Sensitive to wind	9
Resistant or lasts	4	Smoke	3
"clay"	1	Not economical	2
"on sale" (?)	1	Can't cook in the rain	1
A habit (with me)	1	Risk of fire	1
(there is a?) lot of wood	1	Not rapid	1
Can use large pieces of wood	1	Wood is expensive	1
practical	1		
Enough fire	1		
Protects the fire from the wind	1		

The positive responses concerning three-stones are somewhat evenly split among the rapidity of cooking, the low acquisition cost, and the stability of the three stones for holding pots, while the negative responses begin with a strong complaint about using a lot of wood, followed by the lack of durability (a surprising response) and the fact that the stoves can't be moved if it starts to rain while they are being used.

In the case of malgache stoves, again, more respondents named negative qualities than positive ones. Table 16 shows the results.

Table 16: Appreciation of malgache stoves

Positive qualities	n	Negative qualities	n
"Practical"	43	The bottom	31
Economical	15	breaks quickly	19
Movable	8	smoke	10
"good"	6	pot supports	9
Easy to use	6	fragile	7
Not delicate	4	expensive	6
Fast	4	sensitive to water	4
Good metal	2	uses too much wood	3
Inexpensive	2	not very big	2
Saves wood	2	not fast	2
accessible	1	Difficult to light	2
saves energy	1	Can't be fixed	2
Doesn't smoke	1	Not stable	1
TOTALS	95		98

The most commonly named positive characteristic of malgache stoves was a non-specific "practical", which summed up general impressions of ease of use. The overwhelming majority of negative comments concerned the speed with which the bottom of the stove, or the *bras*, the metal supports which hold up the pot, break. The answers "the bottom", "breaks quickly", "pot supports", "fragile",

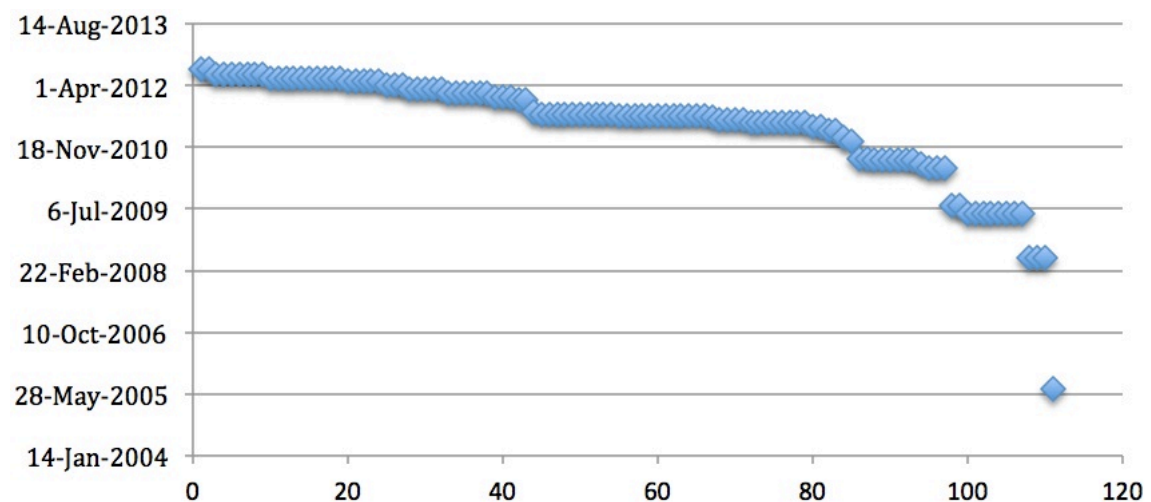
“sensitive to water”, and “can’t be fixed” all point in the direction of dissatisfaction with the quality and durability of typical malgache stoves, and direct observation bears out those findings, as seen in Figure 3, a stove for sale in Maradi whose bottom already had holes in it, before it had been sold.

Respondents were asked when they had purchased their stoves. The date of the last purchase gives an indication of the typical lifespan of stoves. The date of the last purchase are graphed in Figure 4 . When respondents gave only a year – “last year” or “2011”, the date was estimated as June of the year in question, that is, the midpoint of the year, which explains the flat lines in the chart. The overwhelming majority of stoves had been purchased within the preceding 12 months, suggesting that most stoves do not last even a year.

Figure 3: Malgache stove from Maradi market



Figure 4: Dates of last purchase of Malgache stoves



Respondents were invited to mention up to four other types of stoves they were familiar with but did not use themselves, and for each to give their strong and weak points.

The stove that wasn’t used, but that most people knew about, was by far the gas stove, mentioned by 79 people. Table 17 gives non-gas stove-owning respondents’ appreciation of strong and weak points.

Table 17: Appreciation gas stoves by non users

Positive qualities	n	Negative qualities	n
Rapid	41	Expensive	37
“good”	9	Dangerous	13
“practical”	6	Risk of fire	7
No smoke	5	Expensive, risky	3
Less tiring	2	“for rich people”	3
Practical and rapid	2	Inaccessible	1
Easy to use	1		
Modern	1		
Rapid and doesn’t smoke	1		
Easy and doesn’t smoke	1		

While answers overlapped and were sometimes vague, the overwhelming advantage of gas was clearly its speed and ease of use.

The questionnaire distinguished between gas stoves and gas ovens. There were only five cases of each in the sample, and owners’ appreciation did not differ significantly, and are here grouped together. Just as clearly, gas has an image problem, being seen as both expensive and dangerous.

The “multi-marmite” stove was mentioned by twenty people. Their appreciations are shown in table 18:

Table 18: Appreciation of multi marmite stoves by non users

Positive qualities	Negative qualities
Double usage (7)	Expensive (1)
Rapid (3)	Breaks (1)
Practical (1)	Smoke (1)
Economy (1)	Not available (1)

Charcoal stoves only had ten users. Responses for qualities that were liked and disliked are shown in table 19.

Table 19: Appreciation of charcoal by non-users

Positive qualities	Negative qualities
Easy to use (2)	Expensive (2)
Saves wood (2)	Smoke (1)
Economical (1)	Slow in rainy season (1)
Fast (1)	Fragile (1)

Intimately related to questions of stove preference are questions about sources and costs of wood. 184 out of 194 respondents said they used at least some wood to cook. They were asked about how they obtained their wood. The first question was whether they purchased it or gathered it. The responses appear in table 20:

Table 20: Wood source

Source	n
Pay	145
Gather	33
Pay and gather	4
"forestier"	2

Respondents were then asked who gathered firewood, for those who gathered it. Table 21 shows that more people answered that question than originally said they gathered firewood, suggesting that many people gathered at least some firewood, even if their principal source was purchasing it. Thirty people responded to the question of how long they spent in a typical day in gathering wood. The average time was 65 minutes, just over an hour; the longest time reported was two and a half hours.

Table 21: Who gathers?

	n	%
Woman	59	68%
Man	14	16%
Children	6	7%
Woman and children	5	6%
Man and woman	3	3%
Total	87	

People were asked where they gathered wood. The responses are given in Table 22.

Table 22: Source of gathered wood

	n	%
Forest	78	27%
Bush (" <i>brousse</i> ")	60	21%
Millet stalks	6	2%
Total	144	

Table 23 addresses the important question of how much people pay for firewood. The answers are given by type of stove, and then aggregated. The average fuel cost for malgache stoves (204 FCFA/week) is 19% less than the reported fuel cost for three stones (251 FCFA), suggesting fuel savings. The other types of stoves have so few users that it would be inappropriate to even begin to draw any conclusions, and it goes without saying that much more comprehensive expert field testing of fuel consumption, taking into consideration *what* is being cooked for *how many people*, and at *what price* for firewood, before any firm conclusions could be drawn.

Table 23: Fuel costs

Stove	n	average fuel cost per week
3 stones	69	251
Albarka	3	167
mai sauki	2	200
multi marmite	1	200
malgache	97	204
Total/Average	172	204
gas stove	3	83
gas oven	5	1315
charcoal	4	163

The reported costs of non-wood sources are given also in table 23. Note that the samples are extremely small, and that the costs for gas oven are very high due to one reported high expense that is very likely an unexplained error.

Respondents were asked what size pots (“*marmites*”) they use, as this is important to understand the needs of the market for different size stoves. 187 respondents out of 194 were able to respond, reflecting the preponderance of women in the sample. They claimed a total of 400 pots among them; many or most respondents use two pots at a time, one for the sauce, and one for the millet or rice or whatever constitutes the main food. Distribution of sizes is shown in Table 24.

Table 24: Pot sizes

size	n	size	n
1	24	7	39
1.5	2	8	1
2	85	9	1
2.5	1	10	9
3	98	15	2

4	41	20	1
5	86	50	2
6	8	TOTAL	400

The study also looked for differences in stove use by location. Tables 25 a and b show the results from the study.

Table 25 a: Wood and stove segmentation by location (1)

Village or neighborhood	n	3 stones	3 stones expense	Albark an	Albarka expense	Malgach en	Malgache acquisition	Malgache operations	Gas n	Gas acquisition	Gas expense s
Dar es salam	21	3	175			17	2471	213	2	13250	60
Karadjé	13	1				11	3695	218	1	30000	120
Niamey peri Urban	37	21	225	1	100	31	2069	198			
Mokko	30	18	159	1	200	27	2325	117	2	30000	70
Bermo	31	21	388	1		10	2972	332			
Mokoyo	32	13	227	1	200	20	1579	193			
Garin Dawré	30	21	265			9	2889	267			
Total/Average	194	98	251	4	167	125	2406	204	5	23300	83

Table 25b: Wood and stove segmentation by location (2)

Village or neighborhood	Oven n	Oven acquisition	Oven operations	Mai sauki n	Mai sauki acquisition	Multi n	Multi acquisition	Charc n	Charcoal acquisition	Charcoal operations
Dar es salam	3	2300	2125					3	2250	183
Karadjé	2	7000	100	2	3750			2	1675	
Niamey peri Urban								3	3000	
Mokko								2		100
Bermo				1	0					
Mokoyo						2	1875			
Garin Dawré										
Total/Average	5	5433	1315	3	2500	2	1875	10	2308	163

The tables distinguish between *acquisition* costs, or procuring the stove, and *operations* costs, or the daily amount people say they spend for fuel, whether gas

or wood. The sample sizes for use by location of *albarka*, gas, ovens, *Mai sauki*, multi-marmite and charcoal are very small and are presented for information, but it would not be wise to draw any conclusion from single-digit samples. Even for the types of stoves with larger numbers of users - three-stones and *malgache* - few trends are apparent, other than that relatively isolated and arid Bermo appears to be paying substantially more than any other areas for fuel, and is paying the second highest amount to acquire a *malgache* stove. Mokoyo's acquisition costs are the lowest, consistent with their location on the border with Nigeria, although many or most of the stoves sold there are made in Niger and not in Nigeria.

Table 26: Sources, cost and finance of wood by location

Village or neighborhood	n	Pay for wood	Collect wood	Sometimes collect, sometimes pay	Minutes/day spent collecting	Can afford stove out of pocket	Can afford with family help	Can borrow for stove	Can't buy stove
Dar es salam	21	18	0	21		13	6		
Karadjé	13	11	0	13		12			1
Niamey peri Urban	37	30	4	37	90.0	20	11	1	3
Mokko	30	11	18	30	66.2	18	3	2	8
Bermo	31	21	9	31	56.5	20	4	2	5
Mokoyo	32	31	0	32		8	19	3	2
Garin Dawré	30	25	2	30		9	13	6	2
Total/Average	194	147	33	194	65.3	100	56	14	21

Table 26 shows the sources, cost and finance of wood by location. In the urban and peri-urban areas, no one avoids paying for wood. Respondents who paid for wood often also said they “sometimes” collected wood. Those who collect wood in the Niamey peri-urban neighborhoods report spending an hour and a half a day looking for it. The vast majority of respondents said they could afford a stove, either paying out of pocket or with family (usually husband's) help. Many respondents answered “yes” to several of these financing options. Only 14 (7%), concentrated in the poorer areas, said they would need to borrow to buy a stove, and 21 (11%) said they could not afford to buy a stove.

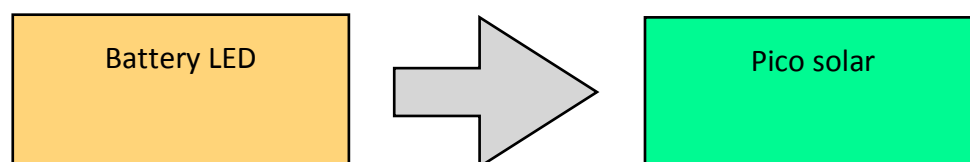
V. Marketing Clean Energy Products in Niger

Overview

The outreach of clean energy products in Niger is quite particular. Unlike most other African countries, solar lamps seem to be essentially non-existent, and yet, battery/LED lamps have gained incredible penetration in the country, apparently higher than in other countries, although there does not appear to be any source of comparative information. Similarly, while the number of people using three-stone fires is high, the somewhat improved *malgache* stove is widespread.

It is useful to conceptualize the choice of products and markets in terms of *upgrade paths*, that is, looking at the products people are using now, and what might be the appropriate next step for them. Upgrades should be significant enough to make a real difference in consumers' lives, and yet should not be so great as to be beyond their pocketbooks, or their imagination.

In the case of lamps, the most likely upgrade path is this:



This upgrade path would apply to everyone, even those on the electric grid, because they would be better served supplementing their irregular Nigelec service with solar than with battery/LED.

Pico solar lamps might retail for as little as 5000 FCFA (<\$10), if they can find very favorable customs treatment, and if an entrepreneurial private sector partner is willing and able to invest in gaining a large BOP market with low margins. However, that price is quite optimistic. A more likely scenario would be to offer a range of products between 10,000 and 20,000 FCFA. A possible product range might include a low-cost integral lamp, like the Illumination Mandarin Ultra, or the Nokero N200, and a higher end product that includes phone charging, like the Barefoot Mobile, or, even more desirable, following the experience in Mali, a Barefoot mobile “Mom and Pop” kit, with an extra lamp added to the kit⁵.

SNV has wisely decided to choose among lamps products certified by Lighting Africa. The planned market test may provide further guidance in product selection, but in fact the range of available solar lamps all present fairly similar characteristics, and similar advantages.

The final selection of lamps should be made by the private sector partners, who rightly will consider questions of the reliability of supply, financial terms, warranty, and offered assistance in promotion and marketing.

Higher End Products

This report is oriented strongly towards bottom-of-the-pyramid products in the very poor country that is Niger. However, there is a market for higher end products.

In lighting, there are small home systems, which can also be used in schools, health clinics and restaurants. However, that market will be much smaller than that for pico solar, and will not have the social or carbon reduction benefits of massive marketing of pico-solar lamps.

In cooking, there are imported stoves, both the Envirofit (www.envirofit.org) stove (and its imitators) and the potentially revolutionary Biolite stove (www.biolitestove.com).

Both high end products should find their place in the market in Niger. This report simply suggests starting with the easier products which can reach larger numbers of people.

Selection of cooking products

The situation with wood stoves is more complex.

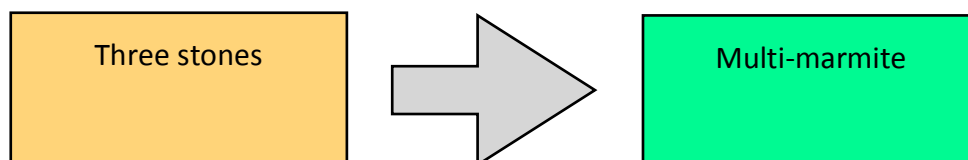
⁵ In Mali, ACCION's Energy Links project asked Barefoot to add a second lamp to the Firefly Mobile after having a Barefoot solar panel tested in Bamako, and discovering that it surpassed the advertised wattage by 40% in the bright Malian noon time sunlight. The second lamp added little to the cost of the kit, and the panels were able to charge two lamps and a phone on most days. It produced a very high value product for customers, who often wanted two lamps for one home, but who sometimes split the two lamps between two homes, and shared the charging responsibilities.

The policy of the government, while recognizing the role of improved cookstoves, places more emphasis on substitution of other fuels for wood, notably fossil fuels - gas and coal - produced in Niger. The use of natural gas for cooking can have a positive effect on emissions if it leads to less deforestation. Gas stoves are perceived as dangerous and expensive; it would not be unreasonable for SNV to find ways of promoting them. Even though they are not technically renewable energy, their use might help villagers save trees, which of course *are* a source of renewable energy.

If it promotes cookstoves, SNV must be certain that the gains that appear in the laboratory will really be reflected in the field, and perhaps the most credible recent study⁶ questions the reduction in firewood use through the introduction of improved cookstoves is quite spotty. However, that study concerned the introduction of a fixed Rocket stove which requires regular maintenance and changes in cooking habits. The transition from three stones to *malgache*, or *malgache* to, say, multi-marmite, is less difficult, and requires little specialized training or maintenance.

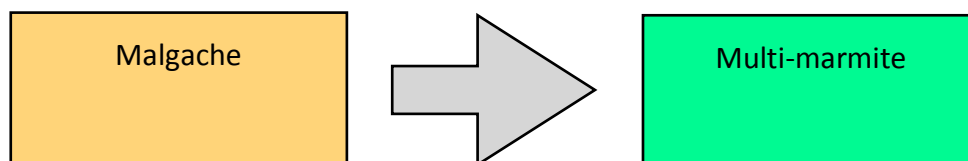
In addition, happily, the survey suggests that the improved stoves now being used produce modest but real reductions in firewood use. The only two kinds of stoves that have large numbers of users in the survey - three-stones and *malgache* - exhibited a significant reported difference in wood expenses: three stone users reported spending 251 FCFA/day for wood, while *malgache* users reported spending 204, or 19% less. This figure corresponds reasonably well with the 12% savings reported for *malgache* in a SNV reference document⁷. Nonetheless, monitoring real world changes in wood consumption with the introduction of new stoves would be desirable. As the afore-mentioned study states, “this study underscores the need to test environmental and health technologies in real-world settings where behavior may temper impacts, and to test them over a long enough horizon to understand how this behavioral effect evolves over time.”

This consultant assumes that appropriate stove upgrade paths for many Nigerien consumers would be one of these:



⁶ Notably Hanna, Rema; Duflo, Esther; and Greenstone, Michael: Up in Smoke: The Influence of Household Behavior on the Long-Run Impact of Improved Cooking Stoves. Massachusetts Institute of Technology, Department of Economics..

⁷ *Repertoire des différents types de foyers améliorés*. Tchiémogo Hama, SNV. Shared with consultant.



Do these upgrade paths make financial sense for families who might adopt the recommended clean energy products? In thinking about this question, we propose a time horizon of six months as the approximate cutoff by which a new technology should amortize the additional acquisition costs, through decreased operational costs. The period of six months is admittedly arbitrary, and should not be taken rigidly; it was chosen because that has been a typical payback period for solar lamps in other countries, and is one that consumers can afford, even if they find it psychologically difficult to make the investment of present cash against a distant payback. Of course, that doesn't mean that seven months is impossible, or that five months is always an easy sale, nor does it suggest that all consumers have the same timeframe.

Table 27: Affordability of clean energy products

	Proposed upgrade	Weekly expenses with old technology	Possible percentage saving with new technology	Possible weekly cash savings	Six month savings - possible price point	Other advantages
Lighting	Battery -> LED to solar	452	100%	452	11752	"cool", bright, no rationing
Stoves	three stones -> multi-marmite	1757	36%	633	16446	better quality stove less smoke
	Malgache -> multi-marmite	1428	24%	343	8911	convenient, better quality

That said, Table 27 analyzes present expenses and possible savings against the six-month horizon:

The *proposed upgrade* refers to the products that people are now using, and the products that they might be encouraged to buy. The *present weekly expenses* are from the survey, aggregated across all locations. The *possible percentage saving* is 100% for solar, because solar lamps can completely replace battery/LED; it is 31% percent for *three stones to multi-marmite*, since the previously mentioned reference document estimates 29-43% wood savings by switching to multi marmite from three stones - we use 36% because it is halfway between 29% and 43%. The other possible stoves progression, from malgache to multi-marmite, is estimated to produce a 24% savings (the difference between the 36% savings of

multi-marmite over three stones, less the 12% gain of malgache). The *weekly cash savings* are the weekly expenses times the possible savings, and the six-month savings are the weekly savings times 26 weeks.

If we were to rely on these financial projections alone, the case for solar lamps would be possible for people in the sample whose battery expenses are at the average point or above, and difficult for people whose present expenses are significantly below the average. 11,752 CFA might just buy a Barefoot two-lamp system, or two Illumination lamps. This may not be a constraint to marketing lamps, however, for reasons given below.

Stoves, on the other hand, would seem to be a more desirable product, based simply on the financial analysis in Table 27: the amount theoretically saved in wood purchases can easily pay for a stove in six months. Of course, people who *gather* wood rather than *pay for it* will assess their gains differently: using less wood will reduce women’s labor, but the calculation of opportunity cost and collateral benefits for gathering wood depends on social factors that are difficult for an outsider to understand.

Motivation

The field work confirms that the objectives that motivate donors and NGOs in introducing clean energy are different from those of the consumers who are intended to purchase clean energy products. The differences might be characterized as shown in the following table:

Table 28: Convergence of objectives of donors and NGOs, and consumers

	Donors and NGOs	Consumers
Objectives unique to one or other of the two parties	Carbon emissions reduction Reduce black carbon Reduce indoor air pollution Reduce litter from discarded batteries	Cool factor Quality factor Reliability Not having to buy all those batteries
Common objectives	Improve household finances Better home lighting Reduced deforestation	

The survey showed that households have very low acquisition costs of energy products, and quite high operating costs. In some cases, respondents seemed to express a willingness to pay more up front to save money in the long run. However, there is an extremely large difference in cost of even the cheapest solar lamp, and the battery/LED lamps that people are buying by the thousands. It goes without saying that messaging must concentrate on consumer concerns, not on donor or NGO concerns.

The research suggests some messages that could be part of a consciousness raising campaign in favor of solar lamps:

The main complaints expressed in any number by respondents about the battery/LED lamps is that they are of low quality break easily, and are expensive to operate because of constant battery replacements; secondary complaints were poor light and acquisition cost. Messaging should acknowledge these facts and stress the relatively high quality and warranties of solar lamps, and the possibility of being free from battery purchases for a long time. “Poor light” seems to be related to the cost of batteries: battery LED lamps give excellent light with new batteries, but that only lasts for a few hours, and the amount of light rapidly deteriorates.

The most important benefit of lighting expressed by respondents was security, followed by studying/reading, going to toilets or going out at night, and preparing food and eating. Marketing should address these issues, and present images of families secure because they have bright light, can take lamps with them as they go out at night; images of women preparing, families eating, and children studying with bright light should all be stressed.

The largest hurdle that marketing must get over is that the acquisition cost of solar is many times that of battery/LED, and people already complain about the cost of battery/LED lamps. While the argument can be made that people save “in the long run” by buying solar, that argument is unlikely to be convincing in itself to people who are used to counting their francs and living day to day. It is likely that some consumers will figure out the “total cost of ownership” advantages themselves, but the motivation to buy solar lamps is more likely to be the positive contribution it can make to their lives.

It is clear that even poor people in Niger are capable of finding money for something they want, even if they do not absolutely need it - the evidence is the extraordinary penetration of the mobile phone in Nigerien households. In the survey of 194 respondents, 157 households, or 81%, have at least one phone, and those 157 have a total of 421 telephones. It is unlikely that most of these phone purchases were *necessities*. It has been observed⁸ that “Africa is not impervious to new trends and influences that are fast shaping consumer behaviors and consumption patterns. Africans are also aspirational. African consumers want the same as consumers elsewhere – a mobile phone, a bank account, and the latest Beyonce CD bought in a store at a shopping mall.” It is a widely circulated and credible belief that “there are more cellphones than toilettes in Africa”. There is substantial information and theory available on the internet about the advantage of positioning products as aspirational products, or products that one wants to have even if one cannot afford them immediately.

⁸ “Deloitte on Africa: The Rise and Rise of the African Middle Class”, Deloitte & Touche 2011.

The difference between an aspirational message and a utilitarian message is that the former focuses exclusively on the positive contribution that the product makes to the quality of one's life, whereas a utilitarian message focuses on comparisons with the present product, or on technical specifications, or on cost. The following two ads, (Figure 5) one for the Apple iPod, and the other for a similarly priced Dell MP3 player, illustrate the difference.

The Dell ad on the left emphasized value and technical specifications, while the Apple ad on the right emphasized the lifestyle that was implicitly promised to iPod purchasers. In this case, the aspirational ad was more successful.

Figure 5: Utilitarian and Aspirational Ads



The advantage of creating the image of solar lamps as lifestyle enhancing products that people will want even if they can't afford them, is that in fact most people can *afford them*, since the total cost of ownership over a year is likely to be less for solar than for battery/LED. The question of how people can capture those economies by getting past the barrier of high acquisition cost is discussed below in the section on *Finance*.

Again, with stoves as with lamps, one must address the needs and desires of consumers. The overwhelming complaint of consumers with their present stoves is the poor quality of the stoves that they buy. A higher quality stove will cost more, but should amortize itself within the six month horizon.

Sales Mechanisms

There are many different markets in Niger, as SNV recognized in designing this study, and not all markets can be served in the same way. For small home systems (SHSs), qualified installers may be necessary, and the amount of the purchase is such that SHSs can be sold through existing retail channels, as they now are. Any consciousness raising or publicity that SNV creates for solar will benefit all solar products at all levels.

But for reaching large numbers of people, other means are necessary and desirable. Solar is finding success in other countries, notably Mali near Niger,

being sold through savings groups. Other pre-existing rural networks are also candidates for being sales mechanisms.

As one of the interviewers said, “There’s not a village in Niger where women aren’t organized into *something*”. Harnessing those networks is a potential channel to get significant outreach. The arguments in favor of using savings group networks have been presented elsewhere, and were presented in a report co-written by the consultant, and the following thoughts are paraphrased from it.

The Center for Financial Inclusion’s Energy Links project developed the following definitions in Table 29 (updated, and adapted to the Niger case) to help classify energy use at the base of the pyramid, and from that starting point to categorize the types and sources of financing needed.

Table 29: Market levels, products, and finance

Market Level	Needs and Types of Systems	Costs and Financing	Finance Providers
Basic Domestic (0.3 to 5 watts)	Lighting, cooking, cell phone charging, radio Portable solar lanterns for task lighting with chargers Improved stoves	\$11 to \$60 Out-of-pocket purchase. Savings. Loans	Savings groups ROSCAs (tontines) Microfinance institutions SACCOs
Convenience and Home Improvement (5 to 20 watts)	Room light in the house, radio, TV, hot water. Fixed panel solar home systems, Solar water heaters, Biogas production	\$100 to \$1,000 Savings Loans	Microfinance institutions SACCOs, banks
Productive Energy (20 to 500 watts)	Longer working hours, new products, faster/better production Even basic packages can improve productivity (through work after dark). Machinery (e.g. refrigerators, water pumps) requires more power. Large solar home systems, larger biogas systems, solar water pumps.	Up to \$10,000 Microenterprise fixed asset loans	Banks Microfinance institutions SACCOs
Community Energy (over 500 watts)	Micro-grids at the village or multiple village level allow households to tap into a common generation source; Community services: water pumping or street lighting. Micro-hydro, solar or wind farm, biodiesel	Larger, long term project finance	Banks Microfinance institutions SACCOs Special investment funds

Energy SME (the providers)	Small and medium sized enterprises supply energy devices: manufacturers, importers, and distributors. Microfranchising	Equity Working capital Fixed asset loans Import-export loans and facilities	MFIs can finance microfranchising and very small producers or distributors. Most energy SMEs will require banks as partners
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In the off-grid areas of Africa, the biggest demand is for products at the first level -- basic household energy. These products are suited to all but the very lowest and highest income households, although even high-income households buy solar lamps to help them through electricity cuts, and many may prefer to cook with wood also.

It is useful to consider the difference between SACCOs and Microfinance institutions, such as ASUSU, and Savings Group programs, like Plan and CARE. MFIs provide financial services, mainly loans, on a fully or largely financially sustainable basis – that is, they make and recover loans, charging an interest rate that allows them to cover costs and thus keep operations going. Even when they are authorized to accept deposits, their profits come from credit operations, and they encourage lending more than saving. In 2011, Niger’s leading MFI, ASUSU SA, had⁹ a portfolio of \$9.4 million in loans, as compared with \$4.4 million in deposits, of which a substantial part is “compulsory savings”, actually cash collateral for loans.

MFIs have much of the cost structure of banks, are often subject to control by the central monetary authority, and are responsible to their shareholders or investors for profitability. ASUSU, for instance, has several international investors, including AFRICAP, which usually demand board representation and hold the institution to goals in both financial performance and social benefits. This is why the first product most MFIs have explored is a solar home system financed with a microloan, and they are not likely to finance pico solar.

Savings groups networks such as Plan Niger’s VSLAs and CARE’s Mata Masu Dubara Project on the other hand are made up of women and men who come together to save, borrow, and often provide basic insurance services by creating a separate *social fund*. The NGOs that promote savings groups do not participate in the financial transactions, but only facilitate them through training members. The NGOs that promote savings groups usually have other social missions which are compatible with clean energy marketing.

⁹ <http://www.mixmarket.org/mfi/asusu-sa>

There are two main bottlenecks to developing the market for clean energy devices in rural areas: making the products physically available, and financing the purchase. MFIs and savings groups can potentially address both bottlenecks. If this is possible, it reduces the number of actors involved, thereby simplifying the the incentive and distribution systems. MFIs and savings groups serve different though overlapping markets and complement each other well.

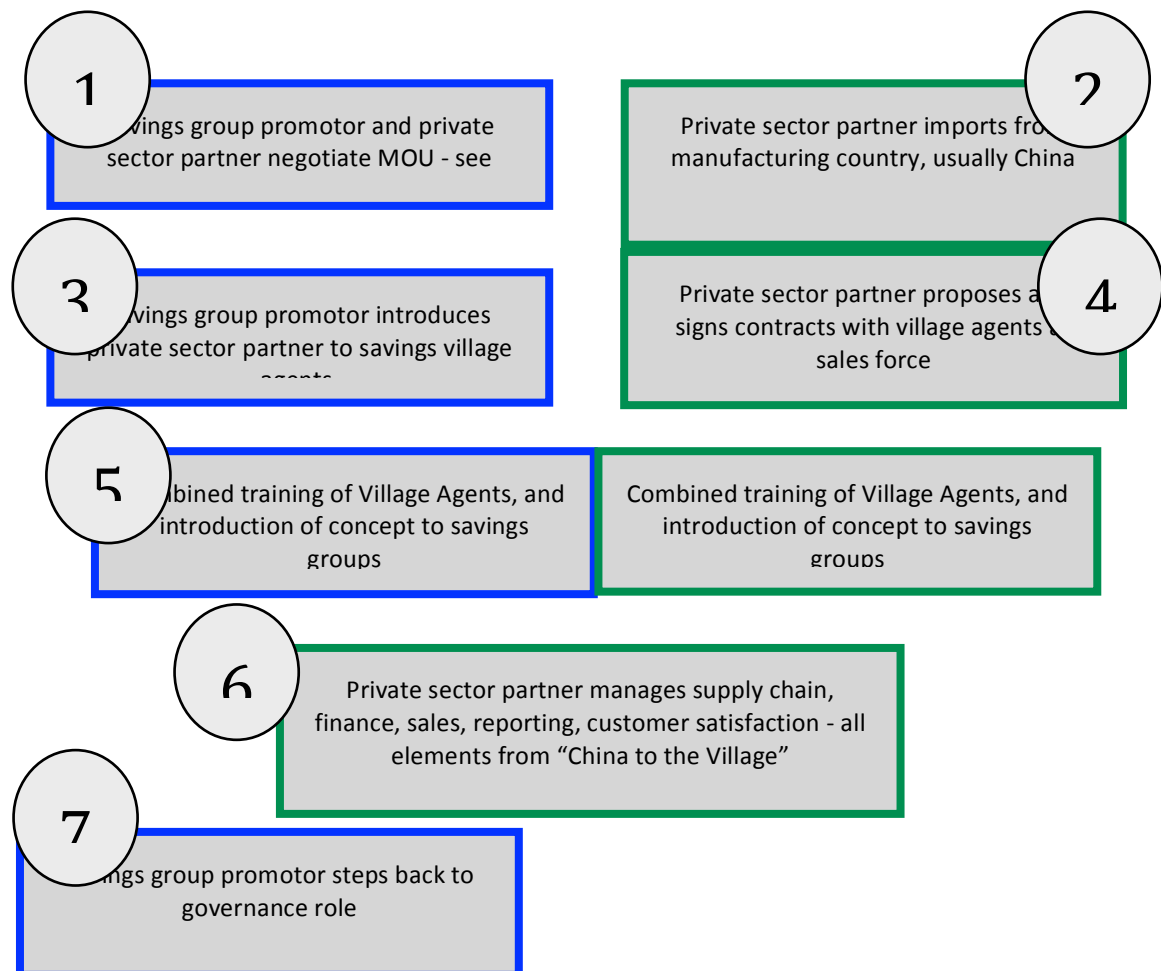
The Savings Group Channel

Savings groups have these several qualities which make them well suited to the marketing of clean energy products:

- They have wide outreach in rural areas, often more than any other potential distribution channel. Niger is a leader in savings groups, which began in their modern form in that country, and where there are reported to be over a quarter million members, directly reaching about 15% of households, and indirectly reaching many more.
- Savings groups allow members to accumulate the lump sums necessary to acquire new technologies through savings and credit.
- Savings groups are given a broad mandate by their owner-members to improve the lives of the members, and find that clean lighting fits easily within that mission. In addition to financial services, many groups set social goals for their members, and some groups in other countries have set the goal of all members having clean lighting by a certain date set by the group.
- Savings groups are trained by people who have the confidence of group members, and therefore are credible sources of new information. They are ideally placed to educate members about the existence of clean energy products, assisting them to identify suitable products, and distributing or selling the desired product to consumers.
- Savings groups in Niger are largely trained by village agents or community based trainers who are semi-volunteers, working with groups partly as a civic duty, partly for the contacts, networking and prestige that comes with the job, and partly in exchange for the small amounts of money that the group members are expected to give to them in exchange for training. These semi-volunteers are eager to take on the role of marketing clean energy products because they contribute to all of these objectives: they serve the community; they increase the trainers' prestige; and they can be an additional source of income for them.

However, while Savings Group networks are a good channel for marketing of clean energy products, their sponsoring NGOs are usually not good choices to run a commercial clean energy operation. Their time frames are usually too short, their mission tilted towards the social end, and their culture too donor-oriented to allow them to carry out businesses successfully. A private sector

partner is necessary to deal with importation, finance, payments, incentives, regulations, and day to day management. Usually, the marketing chain is more or less like the following figure:



The intensive work of the savings group promoter is in the beginning, as it defines the concept and agrees on the basic documents. Once the project has begun, it should progressively pull back, but not abandon the governance role of receiving reports and making as sure as possible that consumers' interests are being protected.

The relationship between the sponsoring NGO and the private sector partner has been described as one of "selling ones mailing list". In this analogy, access to the trainers and through them the groups is analogous to the mailing list. In exchange for "selling the mailing list", that is, giving the private sector access to the groups, the NGO demands payment, not in cash, but in terms of guarantees that the business will meet certain minimum standards set by the NGO. These guarantees are formalized in a signed document, which usually includes many of these elements

1. The private sector partner manages the entire chain from the port of importation to the village.
2. While the choice of products is ultimately the prerogative of the private sector partner, the NGO often participates in that choice at least initially.
3. The private sector partner agrees to provide products of good quality at reasonable prices.
4. The private sector partner must offer reasonable and enforceable warranties, and a system of redress for other complaints, as well as reasonable access to repairs and replacement parts after sale.
5. Customers must be fully informed of what they are buying, with no false advertising or inflated claims made.
6. Sales must be made free of any pressure, or enticements tying the purchase of clean energy products to other products or services.
7. The private sector partner agrees to provide basic information about outreach, products and prices, and customer satisfaction to the NGO at specified intervals
8. The NGO can discontinue giving the private sector partner access to new groups at any time.

There have been a number of projects which have used some of these elements, but most have a short track record, or are under documented, or more likely both. Known cases of such projects are:

Table 30: Some experiences marketing through savings groups around the world

Program	Importer	Upcountry distributor	Discussion
Uganda UWESO	Barefoot Power subsidiary BASE Technologies	A former agent from UWESO's savings group program became the country's leading distributor for a while, both selling directly, and through other trainers.	The former agent received no support in managing his business, shared few profits with his sales staff, and eventually moved on to salaried employment, leaving disappointed customers behind. There were few written records and formal agreements and it is difficult to know exactly when and how things went sour.
Uganda CREAM	Barefoot Power subsidiary BASE Technologies	The local NGO CREAM in a very remote location buys lamps and provides them to their unpaid village agents for resale.	This project has continued for several years. Recent price hikes have led to low sales, and CREAM reported they were looking for a new supplier.

Table 30: Some experiences marketing through savings groups around the world

Mali	HORONYA, a local firm dealing in solar since 1996	Most lamps are being distributed by EPIC Ankilais, a local single proprietor firm whose owner was a former consultant to the ACCION Energy Links project.	Project has been fairly successful, in that there have reportedly been seven container loads of Barefoot and d-Light products imported and sold, mostly two-lamp-one-panel systems from Barefoot. EPIC Ankilais's owner buys at near-wholesale prices from HORONYA (which itself sells some lamps at retail) and resells through informal networks of savings group promotors, and others. The sales do not all respect the conflict of interest guidelines of the NGOs, in that staff are making some money selling to groups. The NGOs look the other way, given the social benefit, but are unwilling or unable to formalize the relationship.
CARE Rwanda	CARE, Digitech	CARE directly managed a test in 2011 of selling small numbers of lamps through village agents, and on the basis of that success, has negotiated an MOU with Digitech, a local firm, for a significant expansion.	On the basis of the last available information, CARE and Digitech about to sign the MOU, which would call for a one-year pilot, after which the program might expand to cover all of CARE's 200,000 VSLA members.
CARE East Africa	Various	CARE has been selected to carry out a USAID-funded project, wPOWER, to market clean energy products through savings groups in Tanzania, Kenya and Rwanda.	CARE has signed letters of intent with stove and lamp suppliers in all three countries, and selected a project manager, a Tanzanian with broad experience with stoves and some experience with lamps. The one million dollar, three year project will experiment with slightly different models in each of the three countries.

Table 30: Some experiences marketing through savings groups around the world

Tanzania	Illumination	Illumination	Illumination sells their Mandarin low-cost but high specs integrated pico-solar lamp, through various channels, including savings groups. They reported having sold 30,000 lamps in the Arusha area, of which 20,000 were sold through savings groups. They offer a substantial discount to their already-competitive prices for bulk purchases of 30 or more, which leads many savings groups to commit to purchasing for each member. Illumination reports that “most customers buy two lamps”. The company is now expanding from its origins in Tanzania to nearby countries.
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These experiences are presented in roughly chronological order - they at least reflect the order in which this consultant became aware of them. They differ significantly in outcomes, from the beginning tests with UWESO in Uganda, which left unsatisfied customers, to the experiences in East Africa that now are delivering products on a regular basis to presumably quite satisfied customers, and at the same time beginning to move, at least in the CARE example, from the easier solar lamp market to the more challenging cookstove market.

The MFI Channel

MFIs are only good partners for clean energy marketing if several conditions are met:

- They have to have a real social objective in addition to their sustainability objectives.
- They must have enough organizational strength to be able to design and test appropriate financial products.
- They must have sufficient outreach to make it worth the effort of developing new products.
- They must have enough financial strength to be able to sustain a project over several years if necessary before it produces a positive cashflow.
- Ideally, they have some segregation of functions, so that marketing and social promotion do not fall too heavily on the shoulders of people whose normal jobs are managing financial products.

Fortunately, there is such a potential partner in Niger, in the form of ASUSU SA¹⁰. This is the largest MFI in Niger measured by assets and loans outstanding, with 53,511 borrowers at the end of 2011, and 221,308 depositors. The MFI has three offices (*agencies*) around the country, with antennas (*guichets*), located as follows:

- The Niamey office serves antennas in Niamey, Ballafon, Dosso, Liberté, Gaya, Loga, Doutchi, and Balleyara.
- The Maradi office serves antennas in Maradi, Madarounfa, Konni, Guidan Roundji, Madera, Tahoua and Mahayi.
- Finally, the Zinder office serves the antennas of Diffa, Tanout, Magaria, Matameye, and Zinder.

ASUSU SA is closely linked to ASUSU Ciigaba, an NGO, and the two regularly collaborate on social programs that involve financial services. For instance, the pair have launched together projects called One-Loan-One-Tree (*un crédit un arbre*) and “gaz de cuisine”, both designed to reduce deforestation.

The Network Manager, Mr Abdourahamane Adamada Kodo, expressed a great willingness and interest to collaborate in a clean energy project. There are several possible institutional structures that might work. In one, ASUSU Ciigaba would take over the marketing and promotion of clean energy products, but would have access to ASUSU SA’s branches and client role. Just as in *un crédit un arbre* the institution urged every customer to plant one tree, the two ASUSU entities could urge every customer to “say good-bye to batteries” or “save wood”. And the discussion of ASUSU leads directly to the question of finance.

Finance

For lighting, finance is needed at several points along the chain from China to village. Among solar manufactures, enough of them have acquired the lines of credit they need to manufacture and ship good products reliably. And apparently the two solar dealers contacted in Niamey have sufficiently “deep pockets” to be able to bring in interesting quantities of lamps: both have experience importing container-loads of product. For stoves, it is assumed that in the short run stoves will be manufactured semi-artisanally in Niger, and will not need large amounts of capital.

The more interesting question for this project is about end-user and up-country-salespeople finance.

¹⁰ Information presented here is from an interview with Mr. Abdourahamane ADAMOUCODO Responsable réseau, kody_zr@yahoo.fr, +227 20 755 365, the Mix Market (<http://www.mixmarket.org/mfi/asusu-sa#ixzz25XuHYI7L>), and ASUSU reports.

In the savings group channel, group members choose among several options for purchasing clean energy products. In Uganda, researchers encountered five ways that savings group members paid for solar lamps, described in Table 31¹¹.

Table 31: Methods used by savings group to finance clean energy

Financing Method	Description
1. Cash from Share Out	At the end of each cycle (typically 9-12 months), Savings Groups distribute all accumulated assets to the members. CBTs report strong sales at this time; they also report that many members are waiting for share-out to place their order.
2. Cash out of pocket	Out of pocket payment, unrelated to the group cycle, is most common among non-members who account for approximately 25% of overall sales. A few male group members also reported paying cash out of pocket.
3. Standard group loans	Although data is not available for all sales, interviews with CBTs and SG members about their sales and purchases respectively yield a rough estimate of a quarter of members who borrow from the regular group fund to buy a lamp. Often the cost of a lamp is included in a larger loan
4. Social fund	At least one group decided to consider lighting as an emergency, and has allowed members to take loans from the social fund (typically one month, interest free loans) to purchase lamps.
5. ROSCA	The idea of creating a ROSCA to finance a lamp for every member surfaced several times during our discussions with CBTs, and two of the groups interviewed had done so. In one group of 23 women, 11 had already purchased a lamp.

Presumably members of savings groups in Niger would discover similar methods of financing, and it is generally recommended that they be left to find their own solutions.

One innovation that comes from Tanzania that can encourage sales to savings groups is that of offering a discount for purchases of thirty lamps, a typical number of savings group members. Doing so provides a strong incentive for members to commit to each having a lamp, which can dramatically increase sales.

Village agents who become sales people may be asked to pre-pay stock for sales, and typically have very little money themselves. While the typical village agent is a married woman in a village, and very unlikely either to fail to honor her obligations and even less likely to take her stock and disappear, suppliers are typically either unable or unwilling to supply much supplier credit. In some set ups, all sales are made by cash in advance; the advance payments go to the village agent who purchases the lamps wholesale and then delivers them to the

¹¹ Taken from Rippey, Paul and Nelson, Candace, *Beyond Financial Services - Marketing Solar Lamps through Savings Groups: Emerging Lessons from Uganda*. Aga Khan Foundation, April 2011. Pp 32-33.

group. This has the great disadvantage, depending on the distance from the storage facility to the village, of causing long waits between the order and the reception of the product, which has been reported to be a great hindrance to sales. Ideally, the Village Agent would be able to prepay (perhaps with a percentage of supplier credit) enough stock to make all her predictable sales in the period of a month or a week. This is where either savings groups or MFIs can come into the picture in a useful way, if they are willing to partially fund some of the working capital needs of these sales agents. ASUSU SA expressed an openness to this idea.

ASUSU SA also was interested in end-user finance. In general, most clean energy products are too inexpensive to be interesting credit objects, and implementers should not encourage the MFI to make loans that are not profitable, because such a structure is unlikely to be sustainable.

IV Annexes

Annex 1: Terms of Reference