Sveriges lantbruksuniversitet
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Faculty of Natural Resources and Agricultural Sciences

Solar Power means Female Power?

How the introduction of electricity supports gender needs in rural Bangladesh

Jella Haag

Department of Urban and Rural Development
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- How the Introduction of Electricity supports Gender Needs in Rural Bangladesh

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Abstract

Access to energy is gendered. A lack of household energy affects women in developing countries more severely than it affects men with women spending more time in the house. Women's access to energy is additionally shaped by male decision-making on energy usage and control over resources within a household defined by women's social position and the value attached to women's labour in society. In order for energy systems to successfully meet women's needs, these gender-related concerns need to be addressed. Although this link is widely recognised, women's gender needs are still not well addressed in the planning of energy projects. For a better understanding of how electricity can impact women's gender needs, the study at hand looks at a small-scale energy project in rural Bangladesh with regard to its gender sensitivity.

The thesis includes a review of previous literature, presenting important researchers in the field of rural electrification and women's empowerment in rural areas. The theoretical contribution is a bridging between research fields, done by a conceptualization of access to resource, here electricity, combined with a gender perspective that emphasizes women's gender needs and defines how actors gain, control and maintain access to electricity and related benefits. There is also a methodological contribution and discussion that highlights the different methods used in the field to identify women's need regarding access to energy.

The empirical material is based on qualitative interviews, project site visits to two villages in Bangladesh, and a quantitative survey. The data shows that access to electricity addresses mostly women's practical gender needs. However, there is not always a clear division between women's practical, productive and strategic gender needs. Often, one facet of electricity addresses more than one need. The different aspects of access to electricity could not be clearly identified as meeting either a practical, productive or a strategic gender need only. Overall, access to electricity proved to have a great potential to meet women's gender needs, especially women's practical gender needs. Finally, the thesis discusses why productive uses of electricity will not occur as much as hoped.

While the case study of Bangladesh shows that the issue of gender sensitivity is still not high enough on the agenda, the research emphasizes how essential it is to include women and their different gender needs in all steps of the process of rural electrification. Especially in rural Bangladesh, prevailing cultural customs and traditions leave little space for women in their freedom of action, which reinforces their inability to raise their voice and claim their rights. This discrimination against women can be alleviated through enabling women access to electricity and thus improve their social status.

Key Words
Rural electrification, Gender, Bangladesh, Rural Development, Solar Energy, Access to Electricity, Women Empowerment

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Thank you!

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Abbreviations

ADB	-	Asian Development Bank
DC	-	Direct Current
IDCOL	-	Infrastructure Development Company Limited's
IEA	-	International Energy Agency
kWh	-	Kilowatt hour
MDG	-	Millennium Development Goal
ME	-	Micro Energy
MEI	-	Micro Energy International
NWDP	-	The Government’s National Women Development Policy
PO	-	Partner Organisation
PRB	-	Population Reference Bureau
PV	-	Photovoltaic
REB	-	Rural Electrification Board
SDG	-	Sustainable Development Goal
SHS	-	Solar Home System
SSI	-	Semi-structured Interviews
UNDP	-	United Nations Development Programme
UNFCCC	-	United Nations Framework Convention on Climate Change
WB	-	World Bank
WEO	-	World Economic Outlook
Wp	-	Watt peak

1. Introduction

> "Energy decides our lives … If women are going to make decisions about their lives they have to be able to make decisions about energy."
>
> (Chitaroopa Palit, Narmada Bachao Andalan social movement, 2011)

Imagine a world in which approximately 7.4 billion people are living (PRB, 2016), whereof 2.8 billion (PRB, 2016) people worldwide live on less than two U.S. dollar per day – the minimum income threshold of absolute poverty (World Bank, 2010). A world where poverty not only correlates to a lack of material wealth, but in particular to the inability of satisfying basic human needs regarding adequate access to food, education, health care, clean water and energy (Rordorf, 2011). A world where large parts of the population, especially in rural areas of developing countries, are unable to satisfy these basic human needs, which is most often a result of limited access to modern energy sources such as electricity (Rordorf, 2011). This is the world we live in today.

Meanwhile, the Western world lives by an epitome of electrification that emerged at the end of the nineteenth and the beginning of the twentieth century. It entails the extension of transmission and distribution of infrastructure and the development of large-scale centralized energy generation, of electrical energy. Today, electricity has become an implicitness in much of US', Latin American's as well as Europe's lives and its omnipresence is often given little notice. Peoples' daily lives in much of the industrial world is defined by electricity, but they barely take notice of this supportive feature (Groh. et al., 2015).

However, for many countries in the Global South, electricity is a luxury for the few. Here, considerable amounts of national incomes are invested in infrastructure development, such as the national electricity grid (Dobbs et al., 2013). While keeping in mind that energy is an inevitable factor to improve people's livelihoods[1], energy project planners fail to cater large shares of their (rural) population, as 1.3 billion (WEO, 2015) people still live without access to basic electricity. These people still rely on biomass - wood, agricultural residues and dung – as main energy sources for cooking and heating while transport and agricultural food processing is realized through human energy, particularly in rural South Asia and Sub-Saharan Africa (IEA, 2011). As population continues to grow in these regions, there is an increasing demand, especially from the rural population, for affordable, reliable and sustainable energy solutions.

Thus, vast differences can be detected among urban and rural areas. The majority, 80 % (IEA, 2016), of energy starved households are located in rural areas, in which electricity, if available, is mainly used for very basic activities such as food preparation, lighting, supplying drinking and irrigation water and for the processing of agricultural and forestry products (Legros et al., 2009). Limited access to adequate and reliable modern energy has a significant negative impact on economic development, health, education and gender equality. People with no or limited access to energy are generally poorer than those with energy access. They are less productive, face heavier work, are more exposed to health risks and lack the benefit of modern technologies and communication (Picolotti & Taillant, 2010). Therefore, poverty and a lack of access to social services impairs opportunities especially for women. As a result, a lack of sustainability[2] emerge at the local, national and global

[1] A livelihood is here defined as 'the activities, the assets (human, physical, social, financial and natural capital), and the access that jointly determine the living gained by an individual or household' (Ellis, 2000).

[2] "Sustainability can […] be defined as a state of affairs where the sum of natural and man-made resources remains at least constant for the foreseeable future, in order that well-being of future generations does not decline" (Kuhlman & Farrington, 2010).

level (UN 2005: 2). Access to energy is therefore an important driver for economic[3] and social development[4], and necessary to address these challenges as they are impeding people's development paths (Rordorf, 2011). In line with Ban Ki-moon:

> "Energy is the golden thread that connects economic growth, increased social equity, and an environment that allows the world to thrive. Access to energy is a necessary precondition to achieving many development goals that extend far beyond the energy sector eradicating poverty, increasing food production, providing clean water, improving public health, enhancing education, creating economic opportunity, and empowering women. […] In short, development is not possible without energy, and sustainable development is not possible without sustainable energy. " (Ki-moon, 2011, p. 5)

Despite the apparent success between 1990 and 2010, when 1.7 billion people gained access to national grid electricity, the global population expanded by 1.6 billion people with an increased energy demand (IEA and WB, 2014). Within the next two to three decades, almost all the growth in energy demand, aside from Latin America, China and Vietnam, will be in the developing world (Wolfram et al., 2012). Therefore, the world's poor and nearly poor will play a key role in driving medium-run growth in energy consumption (Groh et al., 2015). Energy consumption is however not only a key factor for economic growth but also the main driver of greenhouse-gas emissions (Jakob et al., 2014). Groh et al. (2015) argue that this led to a strong call to avoid carbon lock-ins and instead engage in a less-carbon intensive development path in the Global South. There is a great challenge in developing sustainable energy solutions without hampering economies while trying to avoid harming the environment (Linnemann, 2011). Considering the power demand and supply in conjunction with environmental sustainability, this concern is especially relevant to those, who are already deprived due to their low socioeconomic status and remote living environment (Rordorf, 2011). They pay disproportional high prices and are heavily dependent on natural resources, which are being degraded due to the usage of fossil fuels.

Whereas there is no doubt that such a path of developing pro-poor sustainable energy solutions is globally desirable, it remains uncertain whether a shift of economic growth and energy-related emissions is feasible given that it imposes considerable costs and is a matter of global justice (Linnemann, 2011). Decentralized energy solutions are especially important for rural electrification at different levels – global, national as well as local – as centralized energy options are usually not feasible due to high installation costs and unreliable energy supply (Groh, 2015). There need to be support schemes for the rural poor to secure the affordability of electricity and thus their livelihoods so that they are not sacrificed for market-orientated tariffs. Incentivized by gridlocked climate change negotiations within the UNFCCC, representatives from the member states at global level further discussed potential trade-offs between efforts towards electricity for all and emission reduction (Moss et al., 2014). A recent report by Practical Action[5] even argues that in order to successfully achieve universal energy access, energy must be linked explicitly with the climate agenda because only then

[3] Here defined as economic growth, which is growth in national output, consumption and material living standards. This growth can lead developing countries out of poverty and allow them to catch up with the developed world (Lewis, 1954).

[4] It refers to both, a set of goals and an analytical approach. The goals hereby encompass economic as well as social ones relating to the quality of life. Themes as health, education, resolution of conflicts, empowerment of women and the poor, poverty reduction, sustainable social structures, good governance etc. are all important of social development. As an analytical approach it describes a shift towards capturing local knowledge and increased participation of local populations on the one hand and uncovering data crucial to the success or failure of interventions on the other hand (Stockbridge & Dorward, 2014).

[5] Practical Action is an international non-governmental organization, which uses technology to combat poverty in developing countries (Practical Action, 2017).

feasibly decentralized options can gain the necessary attention to become visible for policy makers and the finance community[6] at national, which in turn is needed for a major scale-up (Leopold, 2014).

Working at the local level means enabling deprived people access to essential resources – access to modern energy in terms of technological interventions such as decentralized, off-grid power supply systems. Modern energy in this context means electricity – electricity in form of light, cooling devices, productive use devices (mills, water pumps, sewing machines, etc.) and entertainment devices (radios, televisions, etc.). Thus, the electricity main grid of the cities does often not reach out to the rural poor, where women usually need energy regarding domestic chores such as food processing, cooking, cleaning, evening studies of their children and sometime for enabling small home-based businesses. Men, in turn, use energy either at work or at home in terms of lighting and for leisure activities such as listening to radio and watching TV. As such, a paradigm change from top-down planned centralized mini-grids toward a bottom-up mini-grid approach, where the decision and managing power is up to the people and their existing resources themselves without creating a common pool resource could have a positive impact on the development of economically and technically viable localized electricity distribution infrastructures (Groh, 2014). In this scenario, people are no longer dependent on a grid extension, but can start building a local grid themselves, beginning with individual household-level systems afforded through end-user financing mechanisms. It can be expect that mini-grids, based on these concepts, will play an important role for decentralized energy supply in order to promote rural development[7]. A paradigm shift, from top-down to bottom-up, in both research and practice could break down the traditional dualistic conception of rural electrification, where grid extensions or stand-alone energy systems are competing, and enable a bottom-up energy access models (Groh et al., 2015).

The international development community, instead, is increasingly recognizing access to electricity as an enabler of economic growth and sustainable development (Raub, 2013). It is for this reason that the United Nations General Assembly has declared the years 2014–2024 to be the "Decade of Sustainable Energy for All" (United Nations Foundation 2012), underlining the importance of supporting the people living without access to electricity (Groh et al., 2015). Additionally, UN Secretary-General Ban Ki-moon has launched the 'Sustainable Energy for All Initiative', which includes the goal of universal access to sustainable energy for all by 2030 (Groh et al., 2015). Members of the United Nations (UN) gathered at the 2012 UN Conference on Sustainable Development (Rio+20), where the crucial role of energy within development processes was recognized (Raub, 2013).

Thus, the fact that gender equality is still an important part of the modified sustainable development goals (SDGs) shows its ongoing challenges of achieving gender equality, especially within the global energy sector.

> "Gender equality[8] and women's empowerment[9] are viewed as key drivers in achieving the MDGs. They have not however been seen as key drivers in the energy sector, nor has energy been viewed as critical to the gender and poverty discussion, partly due to the failure to engage both gender and energy researchers and practitioners in the same debate" (Cecelski, 2006: xi).

[6] International donors such as donors, investors, the state, national banks, credit institutes, international banks (ADB, WB) etc.

[7] According to Harriss (1982), 'rural development refers to a state-led activity in the economies of underdeveloped countries, and which is at once broader and more specific than agricultural development'. Broader because it entails more than the mere development of agricultural production and more specific as it focuses particularly on poverty and inequality. Meanwhile, rural development refers to the process of change in rural societies, which may or may not involve state interventions that aims at improving the standard of living of people living in rural areas (Harriss, 1982).

[8] Gender equality here implies 'equivalence in life outcomes for women and men, recognizing their different needs, preferences and interests, and requiring a redistribution of power and resources' (Reeves & Baden, 2000).

[9] Keller & Mbwewe (1991) describe women's empowerment as a 'process whereby women become able to organize themselves to increase their own self-reliance, to assert their independent right to make choices and to control resources, which will assist in challenging and eliminating their own subordination.'

It has been widely acknowledged that access to electricity is a prerequisite in order to achieve sustainable development[10] worldwide (UN WOMEN, 2013). Therefore, it has been commonly decided that the seventh SDG aims at ensuring equal access to affordable, reliable and clean energy for everyone (UN SDG 7, 2016).

The biggest challenge, thus, lies in providing energy for the most disadvantaged population groups, those without capital, knowledge and influence (Danielson, 2012). It is often not the poorest of the poor, who benefit from new energy inventions. Hence, energy is especially vital for women's development in terms of education, reduced time burden for collecting firewood used in cooking and heating, supporting livelihood activities, improving health and wellbeing, and providing opportunities for small enterprises and capacity-building (Mary Robinson Foundation, 2012). Having access to modern energy services is fundamental not only to achieve gender equality and women empowerment, but also to address the other sixteen SDGs. Yet, despite many successes and progresses towards empowering rural women in the Global South, they still face numerous challenges in all areas of life. Women often work longer and more and are yet paid less or left unpaid. Many girls and women are not entitled to own property or inherit land (Chan, 2010). In patriarchal societies such as Bangladesh, religion or traditional can be used as a barrier to deny women access to equal rights (Barkat et al., 2002). It is not easy to change habits and traditions that are deeply rooted and practiced for generations over generations overnight. Nevertheless, due to the readiness of the government to change, Bangladesh has been much more successful in its development programs than other South Asian countries apart from Sri Lanka in recent years showing that much can be accomplished even with lacking funds within patriarchal societies.

In light of these conditions, it is of special interest to this thesis to study the interconnections of these two goals, how gaining access to modern energy, defined here as electricity, impacts women and girls and, in turn, how social perceptions on gender by villagers affect, whether they constrain or benefit, rural energy projects' outcomes. It might be obvious that the effect of energy access on women is relevant when considering how gender equality will be achieved. Less obvious might be the effect of energy access on women relevant to ending poverty. However, women living in low-income households and being deprived of basic energy services are less likely to earn a living and stay healthy but spend most of the day performing basic subsistence tasks including time-consuming and physically draining tasks of collecting biomass fuels (Danielsen, 2012). Therefore if energy is to play an instrumental role in tackling poverty, it must meet the specific needs of women as well as men (Ashden Report, 2012).

1.1 Problem Statement

Looking back to Ban Ki-moon's words, the great potential of access to electricity has by far not been exploited. While aiming for a development towards sustainable energy provision, gender biases in every step of this process need to be addressed. The development outcomes stand and fall with the consideration of women's role in society and the inclusion of their needs. Access to electricity in Bangladesh, as one of their needs, impacts women and men differently due to their traditional socio-cultural roles including the traditional divisions of labor. Bangladeshi women are usually responsible for household tasks such as cooking, food processing, heating, water supply and washing. Providing and managing the energy sources necessary to fulfill these chores is also generally woman's responsibility (Fatema, 2005). Accordingly, it is most often women who spend more time working in the homes and shoulder most of the burden of insufficient domestic energy services (Terrapon-Pfaff et al., 2015).

[10] Sustainable development is 'the development that meets the needs of the present without compromising the ability of future generation to meet their needs' (Brundtland Commission, 1987).

The use of energy therefore, has an inherent gender bias and can have a profound influence on technology preferences (Pachauri and Rao 2013). Thus, many energy programs still fail to address women's needs even though women represent one of the most vulnerable groups to energy poverty (Raub, 2013). Energy programs are often designed and ran by male engineers with little sense of social dynamics, which leads to a disregard of the actual people in need. Mistakenly assuming that energy services affect men and women equally means failing to recognize different needs. In order to prevent further project failures, more research studies on rural women's (energy-) needs are required (Mondal et al., 2010).

1.2 Research Aim and Research Questions

It is well known that in Bangladesh, prevailing socio-cultural and religious norms impose a number of constraints on women, impeding their access to various goods and services (Fatema, 2005), including modern energy. Understanding these social dynamics and structures is a key concern to this research. Therefore, it is hoped to contribute to the slowly growing body of work on women's empowerment through energy access. Both elements have been independently recognized, but the correlation of gender and energy in poverty alleviation is less developed and has only recently gained attention (Raub, 2013). In light of these conditions, the thesis aims at contributing to a better understanding of the impact access to electricity can have on women's livelihoods based on their practical, productive and strategic gender needs. That leads us to the underlying research questions of the thesis:

1. To what extent can access to solar power meet the gender needs of women in rural Bangladesh?
   a. How can solar power help rural women practically?
   b. How can solar power help rural women in their productive lives?
   c. How can solar power support rural women's strategic needs?

1.3 Outline

The thesis is outlined as follows: firstly, the case study country Bangladesh including a general introduction of its power sector is briefly presented followed by a short description of the two case study villages. Then comes a chapter on previous research and the current state of knowledge regarding the interconnectedness between rural electrification and gender and more precisely of access to electricity and women's livelihood. In the following chapter, the theoretical points of departure of the study are presented and it is explained how the access to electricity through solar energy and its impact on women's gender needs is conceptually being bridged. The chapter ends with the research questions. This is followed by a delineation of the research's design and methods, explaining the methodological approach used and how the research has been conducted. The discussion section summarizes the findings in the two villages and refers back to the research questions – and takes them one-step further. Finally, conclusions are drawn and the way forward explained.

1.4 The case study country: Bangladesh

Map 1: Map of Bangladesh with case study villages marked (*source:www.maps.com*).

1.4.1 The Power Sector of Bangladesh

With a population of almost 170 million, Bangladesh is the world's eighth-most populous country (UNDP, 2016). While 40% of the population is without access to electricity but with a high penetration of solar home systems in its off grid areas, Bangladesh is a very strong reference for the applicability of rural electrification projects (Groh et al., 2015). It has experienced rapidly rising energy consumption over the past two decades. While economic growth and development efforts accelerate, power-generating capacity in Bangladesh has not kept pace with its demand growth (Mujeri, et al., 2014). It still heavily relies on gas as the primary energy

source. Being dependent on gas as a single source of energy for generating power has caused long power interruptions and weakened the country's energy security. This is partly due to insufficient infrastructure to supply gas and partly caused by low electricity tariffs and inefficient gas allocation among sectors. Low electricity tariffs have contributed to poor maintenance, which causes power losses and frequent breakdowns. This, in turn, leads to a wasteful use of existing fuels and leaves little space for introducing alternative fuels (Mondal et al., 2010). Moreover, more than half of the present gas supplies are from international oil companies. State-owned gas companies such as *Petrobangla* have started divesting their shares, but corporatization is still incomplete and the state-owned gas companies are not fully autonomous (ADB, 2015).

As a response, the government has initiated a reconstruction of the energy sector and put great emphasize on developing renewable energy sources (ADB, 2015). Especially, the off-grid sector in the country has gained worldwide recognition for its solar home system (SHS) based rural electrification program, the Infrastructure Development Company Limited's (IDCOL) national SHS program (IDCOL, 2016). IDCOL is a non-bank financial institution, established by the Government of Bangladesh in 1997 focusing on public private partnerships and supporting the local renewable energy industry (IDCOL, 2016). It is part of the broader rural electrification system of Bangladesh governed by the autonomous state agency, the Rural Electrification Board (REB) established in 1977, to provide electricity to the rural areas of Bangladesh (Fatema, 2005). It facilitates international support through local national institutions, their partner organisations (POs), relying on strong links with the local sector. The program is financed by the international donor community[11] which provides soft loans and grants to IDCOL, which in turn channels these loans to the developers of solar mini-grid projects for rural electrification (Groh et al., 2015).

These solar mini-grid systems with direct Current (DC) Solar Home Systems (SHS) have begun to successfully electrify Bangladeshi rural communities through IDCOL and its implementing POs. Close to 75,000 systems are being installed every month, currently amounting to approximately four million SHSs as of April 2016, making Bangladesh the fastest growing SHS market in the world (IDCOL, 2016). These SHS are designed primarily for rural off-grid households with low energy demand. While the Bangladeshi main electricity grid is characterized by power cuts due to overuse and exaggerate power demand of the urbanites, off-grid systems offer reliable and cheaper energy supply for the country dwellers. The nominal power output of those SHSs depends on the system size and typically ranges from 30 to 130 Watt peak (Wp) (Komatsu et al., 2011). The electricity generated from the photovoltaic (PV) panel is stored in a lead-acid battery and can be used for lighting and other small electrical appliances such as mobile phone chargers, radios, or televisions (Brossmann, 2013).

Despite of this success, there are certain limitations of available electrification options. Outclassing many other countries in South Asia, Bangladesh lacks to enable people access to electricity rather than the mere existence of solar home systems. Most of these systems do not reach the poorer segments of rural areas mostly for reasons of poor infrastructure and affordability (Groh et al., 2015). Often, SHSs are highly subsidized by the government and people lack realizable, financial support systems tailored to the poor. These rural poor still rely on expensive imported kerosene as well as traditional biomass resources such as wood, branches, leaves and animal dung (Mondal et al., 2010). On a long run, the relatively high investment costs of SHSs will be compensated with lower running costs compared to the constant high costs spend for kerosene. On the other hand, many households with an SHS do not fully utilize the electricity produced and thereby limit the

[11] The program receives financial support from the World Bank (IDA), the Global Environment Facility (GEF), German Technical Cooperation (GIZ), German Development Cooperation (KfW), Asian Development Bank (ADB), Islamic Development Bank (IDB), Global Partnership on Output-Based Aid (GPOBA), Japan International Cooperation Agency (JICA) and the Department for International Development (DFID).

generation potential of their systems (Kirchhoff, 2014). There is a need for more cost effective, reliable and flexible electricity supply. This is where the concept of ME SOLshare comes into play.

1.4.2 SOLshare

The fieldwork was conducted in cooperation with ME SOLshare Ltd. SOLshare is a Bangladeshi company based in Dhaka. The company was founded in October 2014 as an spin-off of the German consulting company MicroEnergy International GmbH, which is a private consulting company working with microfinance institutions in the field of sustainable energy technologies and services. SOLshare is the result of a research corporation of MicroEnergy International GmbH, Technische Universität Berlin, the United International University Dhaka, and the University of California at Berkeley, in the field of off-grid rural electrification. In the field, SOLshare is currently supported by IDCOL and its current implementing partner the local NGO Upokoli Biddutayan O Mohila Unnayan Samity (UBOMUS). UBOMUS is a local non-profit NGO, which assists vulnerable people to combat challenges of climate change. It seeks to introduce renewable energy in order to promote education, health and wellbeing of the poor people and one of the leading installers of SHS.

The underlying concept for SOLshare's core business is called Swarm-Electrification. The main idea of swarm electrification is to trade electricity within mini-grids. Many households with an SHS do not fully utilize the electricity stored in their battery, resulting in a surplus of produced energy of 30 % (Kirchhoff, 2014). At the same time, some households may require electricity beyond what their systems can supply, especially during the rainy season, while at the same time others cannot afford a complete SHS at all and remain trapped in energy poverty. The system can thus provide improved electricity access to different groups of low-income people living in rural Bangladesh. Unlike traditional micro-grid approaches, it crucially aims to make the most of existing infrastructure assets as suggested by Dobbs et al. (2013), by using people's own resources that were previously underutilized or unrecognized. Participatory inclusion of community members based on existing assets builds upon existing social acceptance of the technology and business models (Groh et al., 2015). The network is built from the bottom-up by connecting existing SHSs. Figure 1 shows a stepwise development of a swarm micro-grid. Firstly, there are individual households with DC SHS as well as houses with neither solar nor grid electricity supply. It follows the interconnection of households with SHS, whereas in a next step the remaining houses are included in the growing DC micro-grid. Finally, the micro-grid can be connected to a national or regional grid with minimal points of AC/DC conversion interfaces (Groh et al., 2015).

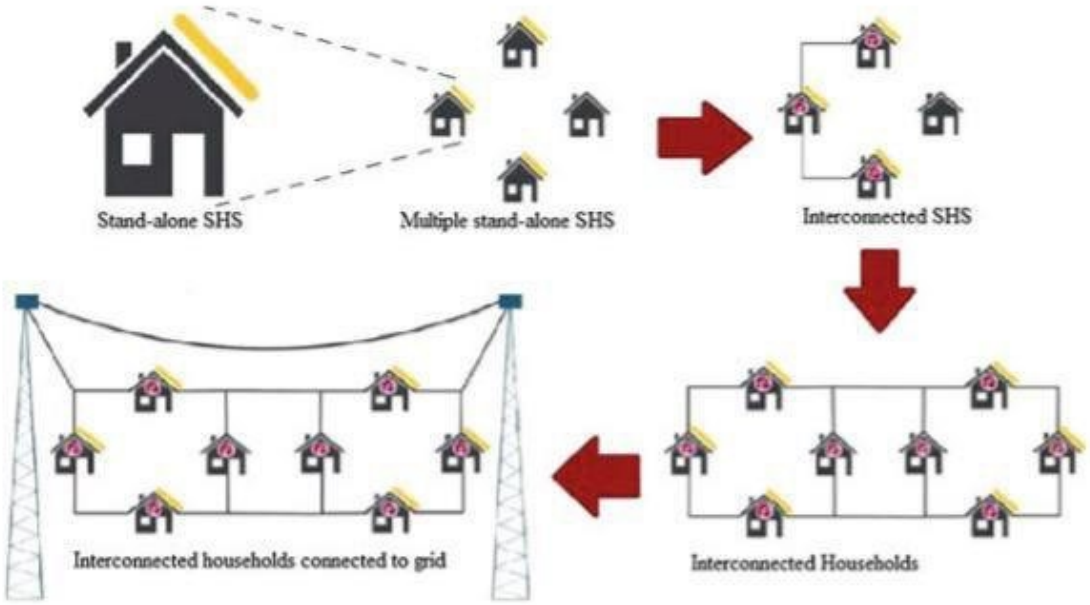

Figure 1: Stepwise concept of swarm electrification (*source:* MicroEnergy International, 2013).

In order to become part of the smart grid, poorer households, do not need to have their own SHS but a swarm controller (SOLbox) to receive electricity. Therefore, the approach represents a 'democratization' of electricity generation. The pricing scheme per unit of electricity is designed in a pro-poor approach. Until recently, people in Bangladesh pay a four greater portion of their income for energy compared to developed countries. They pay high prices for inefficient energy sources as of kerosene lamps and disposable batteries. In Germany, for instance, people pay around 0.20 EUR/kWh (0,23 USD/kWh) whereas people in Bangladesh pay approximately 1.50 EUR/kWh (~ 1,75 USD/kWh).

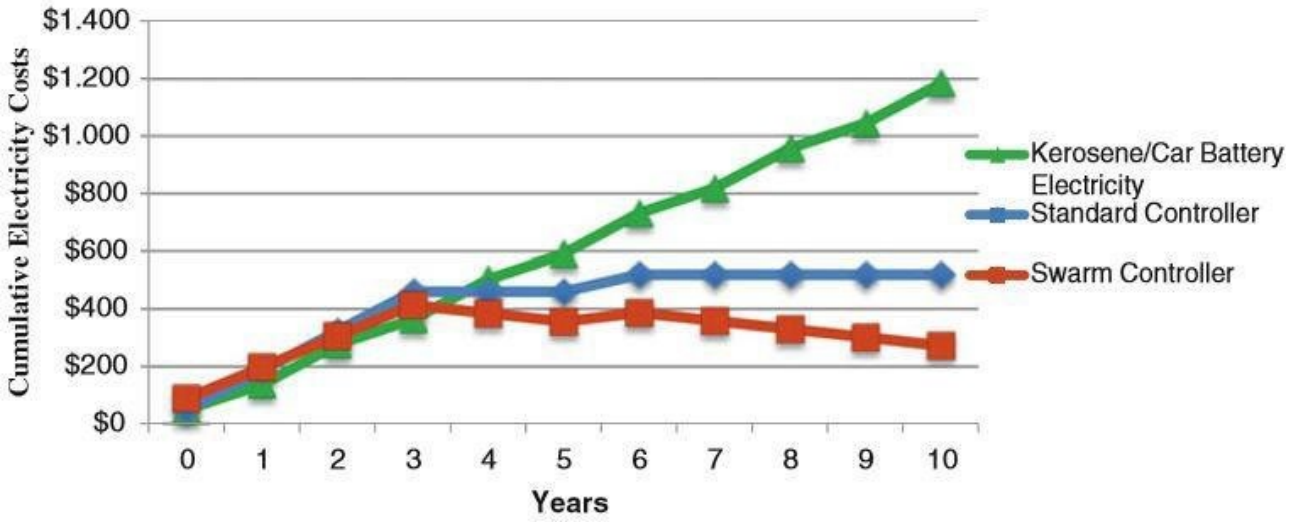

Figure 2: Cost of electricity for a 'swarm controller' scheme prosumer versus baseline (*source:* Groh et al., 2015).

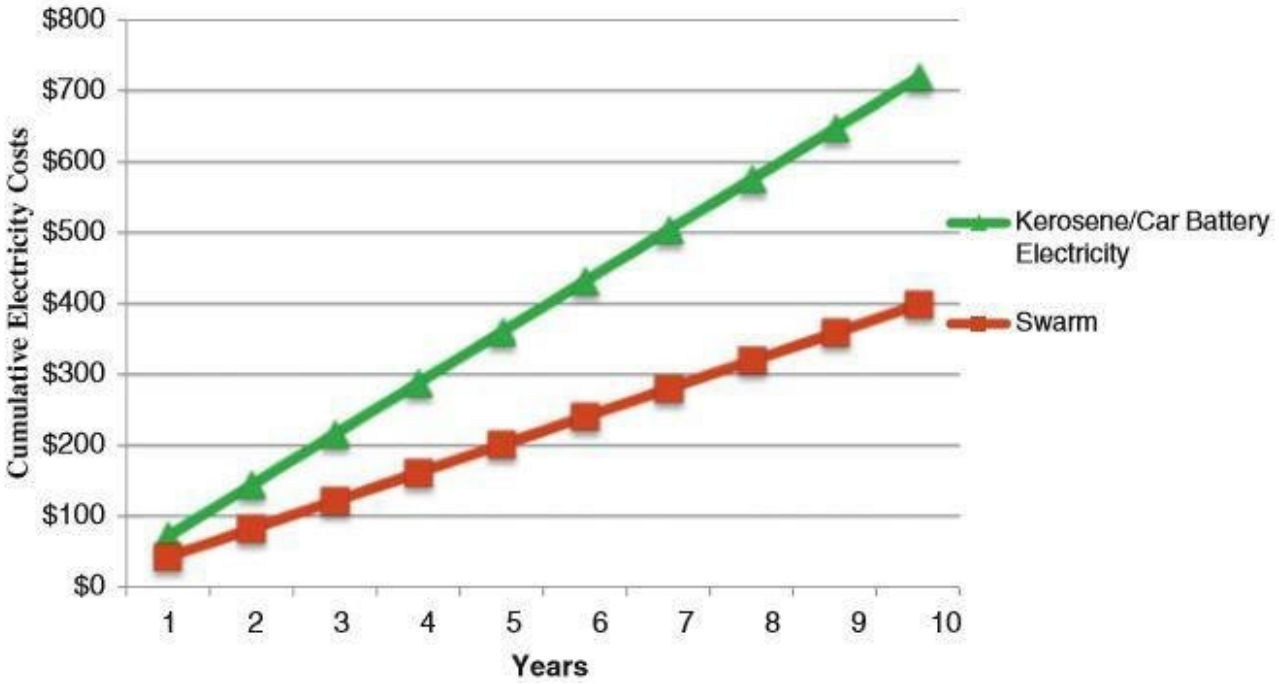

Figure 3: Cost of electricity of an "un-equipped" electricity consumer in a swarm scheme versus baseline (*source:* Groh et al., 2015).

Groh et al. (2015) suggest that the concept of swarm electrification may offer a solution planned to benefit those who are able to afford a complete SHS and those who are not and currently only have access to electricity generated through kerosene and car batteries.

1.4.3 The case study field site of the study

The field site of the study is the village of *Shakimali Matborkandi*, which is located in *Shener Char Union*, *Jajira Upazilla* of Shariatpur district, approximately 50km south of Dhaka. This village was chosen as it is one of the project site of ME SOLshare. SOLshare has chosen this field site along with its implementation partner UBOMUS and its financing partner IDCOL. Having partners and pro-poor financial solutions, such as the micro credits provided by IDCOL, are very important to enable small income households access to loans and thus electricity.

Shakimali Matborkandi is a densely populated village compromising around 200 households. The interviewed households compromised five households out of seven living in one housing cluster with, on average, five household members in each household. The five households are kindred and the head of the households are either brothers or cousins. Most of the interviewed women are from either neighboring villages or elsewhere as it is common in Bangladesh that a women, after getting married, moves into the house of her husband's family. With regard to the occupational status, three of the five household heads are working as truck drivers, one is engaged in agricultural activities and the other one is unemployed. The women living in these five households are mainly involved in unpaid work related to household activities.

However, the entire village of Shakimali Matborkandi is due to its location, separated through big rivers from Dhaka district, not connected to the national electricity grid. Distributing the main grid is economically, due to the low rate if daily energy consumption and technically due to geographical areas outside the grid

electrification master plan of REB, infeasible (Fatema, 2005). Before the micro-grid was installed, the households in Shakimali Matborkandi relied on kerosene-based devices for lighting and crop residues, tealeaves, wood, and dung for cooking. Nevertheless, due to the limited amount of households with access to electricity, and given that not all possible respondents were reachable due to time constraints, it was decided to extent the study site by adding a second village, the village of *Vobanipur* located in Bhabanipur Union, the district of Gajipur, approximately 50km north of Dhaka. This village is, as well, a project site of SOLshare, which is supported by the local NGO UBOMOS as its implementing partner, and its financing partner IDCOL. Having local partners facilitates the access to and communication with the local community.

In this village, four households have been interviewed. The four households consist, on average, of four to five household members and are not related but have relatives living in the same village. Two of the four interviewed households had no access to electricity at all. Available energy sources are here kerosene-based devices for lightning and crop residues, tea leaves, wood, and dung for cooking. The electrified household receives its electrical power for lightning from stand-alone SHS. Thus, the households still use traditional biomass, as the other households in both study villages, for cooking. The two unelectrified households are depended on mainly agricultural activities for making a living, whereas the electrified households are engaged in garment factory work.

1.4.4 Women in Bangladeshi Society

Bangladesh as a predominantly Muslim country follows the *qazi*, a traditional Muslim judge, and rights such as property rights are governed by the Muslim Personal Law (Shariat) (Abdullah et al., 2015). Muslim women in Bangladesh are governed by the Sharia Law, especially with regard to their limited, unequal right and access to resources. In particular, the existing inheritance laws impose discrimination towards women. Although women can have limited access to heritage, they rarely get what they are legally entitled to nor exercise their rights to do so, mainly due to prevailing patriarchal and social practices in rural Bangladesh societies (Jinnah, 2013). Although women might have legally the right, if there are no brothers in the family, to own the heritage of her parents, they most often do not have access to it as either her husband or sons, as the head of the household, decide about the heritage. In rural Bangladesh, the man is often considered as the head of the family, which gives him authority over decisions on property and access to resources. However, the government of Bangladesh has attempted to modify this law by introducing equal property rights for women and men, especially relating to inheritance (Fatema, 2005). The Government's National Women Development Policy (NWDP) (2011) initiated that change of law intending to provide an equal share to women in property and opportunities in work and business (Khan et al., 2016).

Despite the effort put in promoting the status of women and gender parity in education since its independence, Bangladesh's social structure is still highly patriarchal. These social structures enforce different cultural as well as religious constraints on women depending on their class, creed, age, geographical location etc. (Fatema, 2005). Women's access to social[12], economic, political and legal institutions is restricted and predominantly mandated by men. Men mostly control women's access to labor, decide about their sexuality, arrange marriages, and are in control over their income and assets (Begum, 2004). Throughout their lives, women are dependent on men – first on their father and after getting married on their husbands as well as on their sons at old age (Fatema, 2005).

[12] Social institutions here compromise cultural values, community involvement, kinship, family, neighborhood networks, social organizations as groups, marriage, household etc.

The Islamic social institution of *purdah*[13] defines not only separate spaces for women and men but restricts women's mobility outside their homestead (Fatema, 2005). Bangladeshi women spend most of their time either directly in the house or in the are immediately surrounding it and their contacts with the world outside of the family are very limited. In general, it is culturally not accepted for women to move outside their house nor going to the market or town alone – if at all. Even in case of seeing a doctor when ill or purchasing medicine for the children, women are only allowed to leave their homes if male relatives or their husbands accompany them. Women can take a sick child by themselves to the hospital only in emergency. The only time women are entitled to leave their homes is to visit neighboring houses, for collecting fuel and in their early ages for attending school. Thus, most of the girls in the villages are taken out of school after grade six in the age of thirteen or fourteen by their parents due to the inability to pay education costs, support their mothers with the chores and childcare or to get married by their parents. The parents decide how long a child should attend school and at what age and to whom a daughter marries. Although there is a law since the 1980s that sets the minimum legal age for girls at 18 and for boys at 21, child marriage is still prevailing, especially in the rural areas of Bangladesh (Fatema, 2005). Recently, in January 2017, the law regarding child marriage has been changed in Bangladesh (The Independent, 2017). The law legalizes underage marriage and therewith introduces a legal loophole that sets no age limit for wedlock. Nevertheless, social and financial customs, including the widespread practice of paying dowry with prices increasing the older girls get, make child marriage not only accepted but expected in rural, poor communities. Once married, they barely have any access to property, except of smaller things such as kitchen utensils, furniture and accessories.

1.4.5 Households in Rural Bangladesh

In general, villages in rural Bangladesh consist of several smaller, clustered housing formations. The houses are built closely together in a dense pattern, mostly based on family affiliations. Those formations have an introvert building structure as they composed of small huts around a courtyard, which is built as an extension of the indoor living areas of the houses. The courtyard not only maintains a direct and convenient functional relationship with the huts around, but also for the seclusion of women from the passers-by and male visitors. Sometimes there are little homesteads around the houses and the courtyard, where women grow vegetables and fruits for subsistence farming.

Houses in rural Bangladesh are mainly made of indigenous materials locally available, such as, bamboo, straw, grass, jute stick, golpata (nypa fruticans), mud and corrugated iron (CI) sheets. Thus, the most common material used for making the walls and especially the roof is simple CI sheet. All houses are built on a plinth for protection of rising water levels during heavy rainfall. The plinth as well as the floor is usually made of rammed earth and a mixture of mud, straw, crop residuals and cow patties. The floor has to be renewed every second week and is done by the women of the household. During the rainy season the floor is refurnished on a weekly bases, sometimes even on a daily base depending on how intense the monsoon is.

The houses in the village have a traditional rural household structure. They are organized with respect to its different functions. There are two main categories of functions:

(i) The family function, functions related to the family itself but also domestic functions such as sleeping, cooking, cleaning and eating;

[13] Purdah is understood as a set of norms and regulations that promote the seclusion of women, enforce their exclusion from public spaces, and give specific gender identities to labor. Purdah is centrally about the subjugation of women and is sustained by a potent cultural and religious system (Hossain, 2012).

(ii) The formal function, how the family interacts with the community such as socializing and receiving visitors.

The traditional rural houses in the two case study villages in rural Bangladesh are usually small. A household compromises, in average, two small rooms, whereby the one room is considered as a living and dining room, whereas the second room is the bedroom. A family of four to six people usually share two larger beds in one bedroom. The kitchen is a separated little hut next or in front of the house. They are usually built of poorer material such as mud, bamboo or straw walled. Kitchens are rarely roofed with anything but thatched and have often a quarter to one-eighth the floor space of the dwelling houses. There are no windows, only a small entrance and sometimes a little slot under the roof for ventilation and light.

However, there is not only a spatial division in the household but also a social division between female and male household members. From a young age, girls learn to accept the dependence deprivation relatively to male family members. Systems of patrilineal descent[14], patrilocal residence[15] and purdah interact to isolate and subordinate women (Schwimmer, 2003). Girls are forced to marry early as new brides are expected to behave in a shy, subservient manner and they are under pressure to prove their fertility by providing children. At this stage in their lives, they are particularly unlikely to make independent decisions related to their own welfare. Social and economic dependence on men is the normal situation for women in rural Bangladesh. With regard to purdah, women's mobility outside their homestead is restricted.

Their isolation constrains their potential to generate income and makes it difficult for them to take advantage of social services[16] and economic opportunities that may be available. According to the labor force approach[17] of Bangladesh, people were defined as economically active when working for profit, wage or salary (Cain et al., 1979). Instead, the labor of women and children is referred to as unpaid 'family labor' and therefore not relevant for the country's economy. Women are usually not involved in income generating activities and may only support their husbands next to their domestic chores. If Bengali women, however, do income-generating activities however, they tend to specialize in work that keeps them close to the homestead[18], while men specialize in work outside the homestead[19]. Of total work time men allocated most of their labor to income-generating work, whereas women allocated the largest share of their labor time to home production. The location of all the activities of home production as of housework, food preparation, childcare and hut construction, with the exception of collecting firewood, is the homestead. In general, income-generating activities, with the exception of handicrafts and some animal care and crop production, is taking place outside the homestead. Thus, most women are do small businesses connected to their homestead, so called informal cottage-industries such as dressmaking, embroidery, basket making, wall mats, household accessories, vegetable cultivation, poultry and aquaculture. Most of the women do not have an ID card, which restricts their voting rights and the possibility to find a formal job or get a loan.

[14] A kinship system in which an individual's kin group is traced through men. It involves the inheritance of property, rights, names, or titles by people related through male kin. A man's descendants are his own children and women are little recognized as ancestors (Schwimmer, 2003).
[15] It describes the postmarital residence, in which after a couple gets married, the wife joins her husband in his father's home or compound (Schwimmer, 2003).
[16] Social services here include education, health care, police, job training, community management, promoting equality and opportunities provided by either the government, private organizations or non-profit organizations.
[17] The labor force approach defines the labor force as those of the working-age population who are economically active (Cain et al., 1979).
[18] Work such as food processing and preparation, household maintenance, cultivation of crops located in or near the homestead, and animal husbandry.
[19] Occupations such as rice and jute cultivation, trading, running a shop, truck driver, other market work.

The majority of men's income-earning labor is split between wage work such as truck or rickshaw driver and own-crop production as jute and rice. In comparison, a disproportionate amount of women's income-earning time is assigned to handicrafts. Men's home production time, in turn, is almost all accounted for shopping consumer goods. Although women have complete responsibility for preparing and processing food at home, they do not themselves go to the market to make purchases due to the strictures of purdah and the distance to the market from the village. Men spend very little time on childcare, food preparation, fire wood collection, rice processing or other kind of housework – activities that are considered as women's tasks. The chart below exemplifies typical activities Bengali women in this study have to accomplish throughout the day:

Time	**Activities**
5:00 – 6:00am	Getting up (when rooster crows), praying
6:00 – 9:00am	Making beds, sweeping the floor, feeding chicken, cleaning the yards, preparing breakfast, serving food to family members, cleaning and preparing children for going to school, having breakfast
9:00am – 1:00pm	Fetching water for washing kitchen utensils and doing laundry, hanging clothes out to dry, collecting firewood and other material for fuel, picking vegetables, fetching water for processing food and cooking for lunch
1:00 – 2:00pm	Serving food to family members
2:00 – 5:00pm	Fetching water for taking a bath, eating lunch, washing kitchen utensils, sweeping the floor, refurnishing mud floor, watering and taking care of fruits and vegetable in the homestead, taking part in religious activities and visiting neighbors
5:00 – 8:00pm	Taking care of children and other family members, processing food and cooking dinner, serving food, praying, having dinner and sharing with husband regarding family matters
8:00 – 9:00pm	Praying, bringing children to bed, Going to bed

Table 1: Daily activity chart of rural women in Bangladesh (*Source*: own graphic)

Especially childcare in rural Bangladesh is most time-intensive for women during the first few years of a child's life when the majority of a women's time input is devoted to breastfeeding. Whereas regarding women's daily activities, washing clothes and cooking are the moist time-consuming tasks of the day. Washing clothes and cooking are the most time consuming tasks of the day as both are accomplished manually by hand. The appliances used for household production such as food preparation, cooking, cleaning and house maintenance are mechanical and relatively primitive. There is no running water and just recently, some households of the village gained access to electricity through SOLshare's solar panel project. Thus, collecting fuel still remains a time-intensive activity. Unlike most of the households in neighboring villages, the households of the project side at hand have manual water pumps that are being shared among the families and save effort and time in carrying water. Food enters the households in forms that require much processing before being consumed. All activities are done manually by hand without electric appliances, which would facilitate and speed up their chores. Therefore, there is an inherent need for electricity to be integrated in women's day-to-day life.

2. The Conceptual Framework

This section presents definitions of the key concepts and terms underlying this study. The research at hand intends to use two different, thus complementary concepts. The theory of access to resources is used to understand the various ways that shape the access to, and potential impact of, electricity on women's livelihoods. On the other hand, in order to see whether or not women actually need access to electricity and how it can meet their specific needs, the concept of women's gender needs is introduced. By the end of this section, it is hoped to understand what the phenomenon of a gendered energy divide in rural Bangladesh triggers, including the exploration of women's needs. Lastly, it is hoped to motivate and convince energy planners about the need to integrate women's gender needs in the project planning process towards achieving a more sustainable and gender-aware energy project planning.

2.1 Access to Electricity

In the rural context where livelihoods are primarily based on the use of natural resources, the introduction of electricity can affect people's means to use available capitals, but also create opportunities for new strategies for making a living. Thus, electrification projects are often characterized by more and less powerful actors, whereby marginalization tends to follow existing social hierarchies based on class, gender, age and ethnicity. In a context such as rural Bangladesh, women are usually the less powerful actors due to their restricted access to resources determined by intra-household decision-making, women's inferior social position and the value attached to women's labor (Danielsen, 2012).
Nevertheless, access is a very important and crucial determinant of human's lives, well-being and opportunities to change their lives, thus affecting women and men differently (Ribot & Peluso, 2003). In order for energy projects to ensure well-being and equal opportunities to all household members the dynamics of how different resources, generated within a household, are controlled and accessed by its different members, need to be addressed. Access hereby is defined as the 'ability to benefit from […] material objects, persons, institutions, and symbols' (Ribot & Peluso, 2003: 154). Access is differentiated from the definition of property. Property is characterizes as a right in the sense of an enforceable claim to use or benefit of something' (Ribot, 1998: 310). The difference lies in the terms ability and right. The term `right' comprises an acknowledged claim that society supports through law, custom or convention. Ability, in turn, is broader than right and focuses on social relationships that can constraint or enable people to benefit from resources without focusing on property relations alone (Ribot, 1998: 310). Women as well as men are rights-holders who have a legitimate claim on the state to protect, promote and uphold their rights to access basic energy services. Thus, women and men face different barriers to the realization of their rights mainly because of gender inequalities (Danielsen, 2012). Rights of women – for instance land and property rights - are suppressed and women are not given the privilege by the Bengali society of being seen as rights-holders in their own right. However, rights and laws only partly shape who benefits from electricity and how, whilst various other mechanisms such as access to technology, capital, and social networks matter as much or even more.

Focusing on ability, instead, brings attention to these means, processes and relations that enable or restrict women to benefit from resource use rather than property relations alone (Ribot & Peluso, 2003). The concept of access aims to analyze who actually benefits from electricity and through what processes they are able to do so. Applying this definition to electricity, access in this context would be defined as the ability to benefit from access to electricity in terms of being connected to, in this case, either a SHS or an off-grid mini grid at home. Even though only a few rural people can afford a grid connection, or purchase a SHS, people can either

directly benefit by using electric appliances, or having indirect access to electricity through a relative's, friend's, neighbor's use or collective services such as village-owned water pumps or electric mills (Ahlborg, 2012). Accordingly, not having direct access to electricity does not necessarily mean that people are excluded. The ways in which people gain access to electricity are in many regards similar to how people access other resources to sustain their livelihood and are strongly dependent on power relations within a household or community (Ahlborg, 2012).

Thus, Ahlborg (2012) further argues that dynamic relations of power within a household, and external to it, affects interactions between people, as well as control and access to resources. There is an unequal distribution of power and resources among women and men within families. Men usually maintain power and control of resources such as family's property, income, women's heritage and labor, while women are generally powerless and dependent on men. These power relations, or rather 'bundles of powers' that individuals hold and can draw on, are the various means in which actors gain, control and maintain access to resources (Ribot & Peluso 2003). Powers hereby constitute the material, cultural and political-economic strands within these bundles that configure resource access. These mechanisms, or rather external factors, to resource access include a wide range of social relationships such as the institution of purdah, property right law, social status, women's preferences, social group formations and neighbors that constrain or enable benefits from resource use. Hence, Ribot and Peluso (2003) explain:

> "Different people and institutions hold […] different 'bundles of powers' located and constituted within 'webs of powers' made up of these strands. […] The strands thus shift and change over time, changing the nature of power and forms of access to resources (p.154)."

Accordingly, access to and control over resources is about power (Sikor & Lund, 2009). When applying it to electricity, it helps identifying the various ways in which people can derive benefits from electricity. It differentiates between mechanisms by which the introduction of a new energy source has disparate outcomes for different groups in society, or even different household members. Thus, Ribot and Peluso (2003) further differentiate between two mechanisms by which access is gained, controlled and maintained. On the one hand, there is 'rights-based' access, which implies the involvement of a community, state or government that will enforce the access to electricity. On the other hand there are 'structural and relational' mechanisms of access including access to technology, capital, markets, labor opportunities, knowledge and authority through social identity and access the negotiation of other social relations (Ribot & Peluso, 2003).

It is yet to be analyzed how less powerful people, such as women, gain resources or get involved in different forms of access mechanisms, and how to find out what resources they need for their different aspects of life. Access to improved energy services benefits men and women differently based on structural barriers such as women's inability to participate in decision-making, their unacknowledged rights and voice their needs. When women's energy needs are not met, the consequences are severe. These conditions create further barriers to women's ability to voice their energy concerns and needs, reinforcing their exclusion and exacerbating the problems. All other household members, including men, are negatively affected when women have limited access to modern energy services. Therefore, it needs to be identified how access to electricity can address women's (energy) needs, in particular their practical, productive and strategic needs.

2.2 Understanding Women's Gendered Needs

While women's energy consumption is often equated to cooking and other household chores, women's needs such as basic, material needs as well as needs in terms of productive activities and emancipation require special consideration (Clancy et al., 2003). Women's values, needs, interests, roles and abilities to control resources have been neglected until recently but are essential factors in addressing their energy needs. The theory of women's gender needs therefore, analyses women's practical, strategical and productive gender needs (Raub, 2013). This analysis aims to discuss how and which gender needs can be met by access to electricity. While women are primarily responsible for cooking and household management, energy efficiency, pricing and the availability of alternative fuels is a main concern for women in rural households. Due to this traditionally and socially ascribed role of women, they need renewable energies to address their needs around domestic chores such as processing crops, food preparation, cooking, food storage and small enterprises.

The focus on gender rather than on women is chosen, because it is concerned with analyzing social relationships between women and men – a relationship in which women have been systematically subordinated (Moser, 1989). According to Moser (1989), gender research studies show that these relationships are socially constructed and looks at women and men's different roles in society rather than women as a different sex and therewith their biological differences with men. Within the household there is a clear sexual division of labor in which the man of the family, as the "breadwinner", is primarily involved in productive work outside the home, while the woman as the housewife and "homemaker" takes overall responsibility for the reproductive and domestic work involved in the organization of the household.

> "Gender-aware approaches are concerned with the manner in which such relationships are socially constructed; men and women play different roles in society, their gender differences being shaped by ideological, historical, religious, ethnic, economic and cultural determinants. (Moser, 1989: 1800)."

Implicit in this is also that within the household there is a lack of equal control over resources and power of decision making between the man and the woman in matters affecting the household's livelihood (Clancy et al, 2003). In analyzing women and men's different roles in society and their varying possibilities to access and resource use, they also have different needs respectively to their distinct aspects of life. Women might have different needs regarding raising of children, household tasks and self-fulfillment than men. To identify these different needs, an examination of the household structure and the division of labor within it from a gendered point of view is required to identify the impact energy access has on women's livelihood.

A focus on gender needs means narrowing down and differentiating women's and men's livelihoods. This would mean moving away from the unitary concept of households toward looking at bargaining models and collective concepts that understand intra-household sharing, allocation and decision-making rules (Ellis, 2000). Although the linkages between gender and poverty have been explored in many studies, there are few that tackle one of the main causes for poverty – lack of energy. Poverty is characterized by having no or little choices and opportunities to earn income and obtain wealth (Kumar, 2011). Energy, in turn, is essential for any kind of work. According to Kumar (2011), the inability of using energy to work arises out of having little or no access to energy. Lack of access to energy services is an obstacle to human[20], social and economic development (Bazilian et al., 2010). Energy poverty has been defined as the absence of sufficient choice in

[20] The UNDP (1997) has defined human development as the "process of enlarging people's choices […] to lead a long and healthy life, to be educated, to enjoy a decent standard of living, […] political freedom, other guaranteed human rights and various ingredients of self-respect" (UNDP, 1997, p.15).

accessing adequate, affordable, reliable, high quality, safe and environmentally benign energy services to support economic and human development (Reddy, 2000). Energy poverty interacts with other manifestations of poverty and it is important to explore the issues that surround it, including the gender aspects.

Energy is needed for food preparation, pumping water, medical refrigeration and improved communication in order to combat poverty in many ways. Thus, access to energy services is not only about supplying electricity for lighting and improved cooking facilities for women living in despicable conditions. It is also about fostering the productive uses of energy that enable women's income generation and help empower[21] their homestead businesses in order to build economic development and growth (Bazilian et al., 2010).

However, much of the literature fails to note the key role of energy (Clancy et al., 2003). While research on gender and poverty often addresses the three aspects of access to resources, decision-making and control, gender analysis in particular aims to understand women's and men's different activities and their differences in access to and control over resources in order to understand the overall situation of women (Clancy et al. 2003). According to Clancy et al. (2003), it is questionable whether conventional gender analytic frameworks such as papers on livelihood strategy[22] (Ellis, 2000), development planning (Williams et al. 1994) or DFID's publication on 'Energy for the poor' (2002) are 'adequate to bring out the energy component in women's livelihood' (p.4). Development planning strategies are rather general and aim to give an understanding of the overall situation of women in rural areas. Current research on electricity and poverty (Groh et al., 2015; Terrapon-Pfaff et al., 2015; Leopold 2014; Mujeri et al., 2014; Raub 2013; Ahlborg, 2012; Danielsen, 2012) in turn, focuses on direct benefits of electricity rather than indirect benefits such as gender specific impacts. Hence, it is remarkable that the use of gender analysis in energy planning is virtually unknown, whereas it has been successfully used for many years in the health, water and agricultural sector. This is evidently because the gender component in energy poverty has not yet been fully recognized. Energy planners have usually equated women's interest in energy with cooking thereby not only promoting gender stereotypes but also working to the exclusion of other needs, particularly of needs related to productive activities and emancipatory goals (Clancy et al., 2003).

If project planners are not aware of or ignore the differentiated roles of women and men, and thereby their differentiated needs of energy access, they are unable to recognize that women's needs are not always the same as those of men and do not solely refer to domestic chores. They fail to recognize the necessity of relating the planning process to women's specific requirements and therewith jeopardize the success of the project (Moser, 1989). If planning is to succeed, it has to be made gender aware and develop an integrative approach, which considers women's specific requirements. Recognizing and incorporating women's roles, requirements and needs is especially relevant regarding energy project implementation as it is they (*ie* women), who spend most of their time at home and are responsible for domestic chores. A better understanding of electricity's impact(s) on women's needs is necessary.

Access to electricity, however, has a great potential to meet women's gender needs. It is therefore essential to include women and their different needs in the process of rural electrification planning (Clancy et al., 2003). Important hereby is, that different aspects of access to electricity cannot be identified by solely focusing on one need. Often electricity addresses more than one need. Therefore, research needs frameworks allowing to analyze different situations, different needs, in order to note the key role of energy. In line with Clancy et al. (2003) concerns, the thesis uses the framework of gender planning by Moser (1989), in the field of energy

[21] It emphasizes the importance of participation and social inclusion. At the micro level, it is integrated in the idea of self-efficacy and the significance of the realization by individual women that they can be the agents of change in their own lives (Bennett, 2002).
[22] "Livelihood strategies are the ways which lead to the building up of assets and capabilities to improve their livelihoods (i.e. consumption, production, processing, exchange and income-generating activities)" (Sheheli, 2012).

projects. It is a planning approach, which provides a conceptual framework for incorporating gender into planning processes (Moser, 1989).

Having addressed the argument for using a gender needs approach, it remains to clarify and expand upon the various elements of this approach. Therefore, the study aims to specifically identify women's role and the distinction between their practical, strategic and productive gender needs within rural electrification planning in Bangladesh. It identifies the potential and limitations for meeting the needs of women in rural Bangladesh.

2.3 Applying a Gender Needs Approach on Access to Electricity in rural Bengali Context

Access to energy and energy is vital to fulfill women's needs. Accordingly, if access to energy is about improving women's life, it must meet their practical, productive as well as strategic needs. Since rural Bangladeshi women are the primary energy users in the household and therefore most often affected by the lack of electricity, access to electricity must address women's gender needs regarding domestic work and job opportunities. Thus, whether women are able to access, and additionally benefit from electricity, is determined by their practical, productive and strategic gender needs. The theory of access by Ribot & Peluso (2003) helps to clarify how different resources are controlled and accessed by different household members and determines women's ability to fulfill their gender needs depending on the power they hold. The access theory further emphasizes mechanisms such as relations of power, realization of rights, social networks and stock of capital that might hinder women to benefit from electricity. Access as well as women's gender needs mediate the sought outcome of the introduction of electricity – whether it conduces to strengthen women or not. After explaining the theory of access in the above abstract, the thesis will now amplify the idea of women's gender needs. In the following Moser's concept on women's practical and strategic gender needs (1989) will be used as a framework to help analyzing the study of solar power from a gender perspective.

Practical gender needs, also known as reproductive needs, are those needs that are formulated out of specific conditions women experience, "in their engendered position within the sexual division of labor, and deriving out of this their practical gender interests of human survival" (Moser, 1989: 1803). Practical gender needs, therefore, are usually a response to their need, identified by the women themselves (Molyneux, 1985). The sexual division of labor plays an important role. It assigns women with primary responsibility of not only domestic work involving childcare, family welfare and food provision, but also for community management regarding housing and basic services. These basic services include predominant daily basic needs such as daily cooking requirements, food processing and water hauling (Clancy et al., 2003). Therefore, it is important to focus on the domestic sphere as well as community level requirements of housing and basic services in order to meet practical gender needs. In order to meet women's practical needs through access to electricity it is necessary to understand what women themselves want in terms of their fuel type. Do women want to continue to use wood/branches/leafs/charcoal, next to/instead of efficient stoves as it fits with their customs? Information regarding their preferences, whether they would prefer to use gas or electricity are important to know.

In contrast, **strategic** gender need, also known as emancipatory needs, "are those needs which are formulated from the analysis of women's subordination to men…" (Moser, 1989:1803). Formulating strategic gender needs intends to reveal and overcome women's subordinate role, which vary depending on the particular cultural and sociopolitical context (Clancy et al., 2003). This may include the repeal "elimination of the sexual division of labor; the alleviation of the burden of domestic labor and childcare; the removal of institutionalized

forms of discrimination such as rights to own land or property, or access to credit; the establishment of political quality; freedom of choice over childbearing and marriage; and the adoption of adequate measures against male violence and control over women" (Molyneux 1985:233). They aim to identify strategic gender interests regarding a more equal and satisfactory society compared to the existing paradigm, in terms of existing structures and the nature of relationships between women and men. Unlike practical gender needs, strategic gender needs are formulated indirectly through external interventions rather than directly by women in these positions (Moser, 1989).

Additionally, Clancy et al. (2003) add a third gender need – the **productive** gender needs. While in Moser's gender need concept (1989), the productive need for providing income is included into the practical gender needs, Clancy et al. (2003) identify productive gender needs as a separate need. According to Clancy et al. (2003), productive gender needs emerge out of the needs for work done by both women and men for pay in cash or kind. This makes especially sense in terms of energy interventions as it is often assumed that the access to electricity increases the possibility of income generating activities (Raub, 2013). Especially women are seen as an important 'untapped resource' for contributing to the economic development (Moser, 1989). Such activities could include the provision of lighting and power for work during evening hours as studying and running specialized enterprises so called 'cottage industries' (e.g. dressmaking, embroidery, shop keeping, internet cafes etc.).

Energy Form	**Women's Needs**		
	Practical	Productive	Strategic
Electricity	- Rice huller - Mills for grinding - lighting improves working conditions at home - Improved health through electric stoves - Less time and effort in gathering fire wood and making fuel from cow dung	- Increase of income-activities during evening hours - More flexible time schedule throughout the day - Power for light, mobile phone charging (mobile banking), for specialized enterprises such as seamstresses - Sale of electricity from SHS	- Open horizons through radio, television and internet (mobile) - Eased time schedule allows participation in other activities (evening classes, women's groups and meetings, engaging in income-generating activities etc.) - Strengthening women's social status and reputation in society
Mechanical	- Husking - Milling and grinding	- Increase of variety of enterprises - Earning their own income	- Increase of women's self-esteem and feeling valuable

Table 2: Possibilities for improving women's life though energy (*Source*: own graphic).

The theoretical approach of women's gender needs matches well within the Bengali context. Traditional norms as outlined above expect Bengali women to fulfil their daily chores and due to low household's incomes, women often have to seek an additional income. Bengali women have practical and productive gender needs. It can now be analyzed to what extent electricity impacts the fulfilment of these practical and productive gender needs. The theoretical framework, moreover, analyses whether access to electricity impacts their strategic

gender needs and allows the discussion whether Bengali women themselves perceive their gender needs to be strategic gender needs. With the help of the theoretical framework, the analysis aims to discuss how and which gender needs are met by access to electricity. However, one must be aware that the distinction between practical, productive and strategic gender needs is not clear-cut and can also depend on the context. The graphic *Figure 4* illustrates the conceptual framework and summarizes the interconnectedness of women's access to electricity, their gender needs and external factors influencing the process:

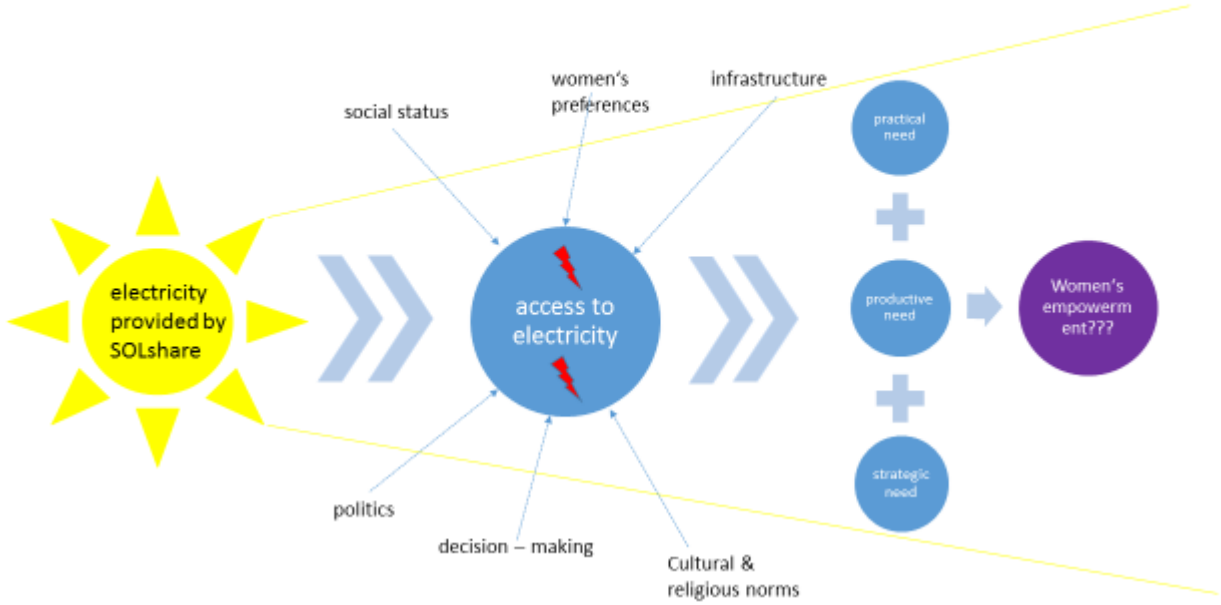

Figure 4: Illustration of the Conceptual Framework (own graphic)

3. Research Design, Methodology and Methods

In the following section, the applied research methodology is outlined. To investigate achievements and challenges of rural electrification on rural women in Bangladesh, a diverse set of methods is applied. A combined use of literature review, a mix of both, qualitative and quantitative research methods, and site visit observations offer a broad basis for relevant information on prevailing socio-cultural norms, which lead to limited access to resources for women in Bengali society.

Firstly, the research design is presented, followed by the methodology and specific methods used to collect and analyze the information gathered during the study. The research design is a type of inquiry within qualitative, quantitative, and mixed methods approaches that provide specific direction for procedures in a research (Cresswell, 2009). Therewith it provides a framework for the collection and analysis of data (Bryman, 2012). The study at hand uses a research design in form of a case study, based on two villages in rural Bangladesh. A case study entails the focused and detailed exploration of a specific case, which could be a community,

organization or person (Bryman, 2012). The aim is to study the thoroughness of a case and develop a theory. Hereby, the generation of research is in focus rather than the generalization to a broader world (Creswell, 2009). Once the case has been selected, research methods are needed to collect data. The case study at hand uses both, qualitative as well as quantitative research methods in order to focus on the depth of the examination of the complex setting.

However, the research design is determined by the *methodology*. The methodology is the overall approach to research, linked to the theoretical framework, while the *method* refers to the manner, systematic modes, procedures or tools used during the period of data collection and its subsequent analysis (Walter 2006). It is influenced by "the worldview assumptions the researcher brings to the study", in other words the beliefs that a researchers brings to a study (Creswell, 2007: 36). The worldview of the researcher in this study is shaped by how the researcher perceives gender and access relations in the local context influences the overall approach of the research at hand and consequently its outcome. Decisions about the study's ontology [23] and epistemology[24] shape the focus of the research, its research questions, specific methods of data collection, analysis, and results (Creswell, 2009). With regard to the ontological paradigm, the main study is based on a constructivist methodology. A constructivist approach typically seeks to understand the world in which we live in and is therefore influenced by subjective meanings of their experiences – of the participant's experiences. These meanings lead the researcher to look at the complexity of multiple views rather than narrowing meanings down into fixed categories. It aims to rely as much as possible on the participant's views of the situation being studied. Therefore, constructivist approaches always present a specific social reality rather than one that can be supposed as definitive (Bryman, 2012). In compliance with the constructivist approach, this research presents one such version of reality. Yet, this reality is formed through relations with others and through historical and cultural norms that operate in individuals' lives, and are therefore under constant change. Thus, there exists a possibility that the researcher will interpret the data according to his or her subjective perspective, bias and motivation (Kalof et al. 2008). A lot of care has been taken in the research design, in particular during the primary data collection stages, to avoid ontological biases, although this presents obvious limitations. The research therefore uses multiple methods, which show more or less the same results, as one way of strengthening the study via triangulation.

As Cresswell (2009) states, a constructivist approach does not sufficiently address the issues of social injustice in a subject such as rural electrification and the need to integrate previously disregarded women's gender needs while planning electrification projects. On the subject of addressing social change and injustice, the study additionally uses a transformative methodology. A transformative methodology provides a voice for the participants, raising their consciousness or advancing an agenda for change to improve their lives (Cresswell, 2007). It focuses on the need of groups or individuals that may be marginalized or disfranchised. The marginalized people themselves may help design questions, collect data, analyze information, or reap the rewards of the research advocate for an action agenda that is beneficial to them (Bryman, 2012). It provides the structure and opportunity for addressing complex questions by acknowledging the dynamic interconnections through the use of multiple perspectives and lenses, which in turn will allow for a more complete picture of the study topic (Hesse-Biber, 2010).

Epistemology, in turn, deals with the source of knowledge. Epistemology is the study of the criteria by which the researcher classifies what does and does not constitute the knowledge gained in the study (Blaikie, 2010). Concerning the epistemological perspective, this research is exploratory and uses an inductive approach, which means understanding the social world through examining the interpretation of its participants, here

[23] Ontology hereby refers to the researcher's view of reality (Blaikie, 2010).
[24] Epistemology is the study of the nature of knowledge and how we quire it (Blaikie, 2010).

interviewees (Brymann, 2012). In order to explain human actions, the researcher must gain knowledge of peoples' ways of thinking and interpret their actions according to their point of view and within their setting (Cresswell, 2007). Regarding the theory-research relationship, the underlying theory evolved out of the process of research and is the outcome of the research, which involves out of observations (Bryman, 2012). The theoretical framework of the study was adapted to the actual context and study, adding productive gender needs to Moser's (1989) framework. The study seeks to understand women's perspective of the impact of rural electrification to their life, within the context in which the reality being studied is situated and from their subjective perspectives. However, using a transformative approach, the outcome of the interviews are analyzed and understood through a prism aimed at transformational change regarding gender justice. Whilst using the individual women and their realities as an incentive to bring about change, the research makes note of the current social and cultural structures that may be impeding this change in the rural energy sector.

As social actions are meaningful to actors, they need to be interpreted from their point of view. The researcher, therefore, needs to catch the process of interpretation through which actors construct their actions (Bryman, 2012). It allows an understanding of the reality of the women regarding the rural energy sector. Their motivations, desires, perceived barriers and relationship to the wider system are entirely subjective and from individual experience. In order to better understand the overall system and answer the underlying research questions of this study, it is important to understand the contribution and interactions of women's own way of thinking and their actions.

3.1 Methods

The study employs two principal methods. The empirical part of the study, to collect qualitative data uses various methods, from interviews, to observations is twofold. Firstly, it will look at two villages in Bangladesh mentioned in 1.4.2. The second part of the empirical study, in the form of in-depth interviews and observations with selected dwellers of the villages allows detailed insights of social structures and cultural norms of rural life in Bangladesh and what access to electricity means for women.

3.1.1 Data Collection

For the collection and analysis of the data, a case study approach was used as it entails a detailed exploration of a specific case at a specific place, two rural villages in the mid-south of Bangladesh, in a specific timeframe of two months. The fieldwork was conducted in cooperation with SOLshare. As SOLshare currently predominantly consists of economists and engineers, but are planning to focus more on the social impact of renewable energy technologies, they needed a social component in their team. The decision to write the thesis with SOLshare was therefore a mutual benefit. SOLshare had the opportunity to get valuable socio-economic information and the study benefitted from facilitated organization on-site including access to a village, access to experts and coverage of travelling and accommodation expenses. Writing with a company definitely added great value as much as of providing access to, support in and of course help to make it to Bangladesh at all. On the other hand, it can be difficult to negotiate the work that the company wants the researcher to do versus what the researcher wants to do, which led to a loss of time doing work for the organization rather than on the thesis. This is why the thesis at hand ended up being rather rich of methods with more quantitative work than planned. Moreover, studying women's empowerment in a project, which is very new or currently under implementation has the advantage to integrate gender sensitive approach in the process of research and implementation from the beginning. Therefore, it would be interesting to conduct an comparative study that compares the living

conditions before and after the implementation of SOLshare's swarm electrification or an long-term impact assessment study, which was not possible for the study at hand due to the thesis time limitation. Thus, studying women empowerment within a primary technique and business oriented company, in which no gender expert is available and not even a social scientist but rather business administrators and engineers can be challenging at times. The researcher herself had no prior experiences in gender studies either, which means she had to start from the scratch.

As data collection methods, in-depth interviews, a focus-group discussion, surveys and observations were chosen. Except for expert interviews, all interviews, the surveys and the focus group discussion were held in Bengali and translated by an interpreter from Bengali to English and vice versa. In total, sixteen[25] interviews were conducted, all were face-to-face/ in-person interviews.

The respondents can be divided into five stakeholder groups:

(1) Women living in electrified household (6)
(2) Men living in electrified household (2)
(3) Women living in unelectrified household (2)
(4) Female gender expert working in an organization (3)
(5) Male rural electrification expert working in an organization (3)

A complete list of the semi-structured interview respondents can be found in Appendix II, and the SSI template in Appendix III. More precisely, six interviews were held in Saryatpur and four interviews were conducted in Gajipur. The amount of interviews was not higher since not more electrified dwellers were available. The amount of interviews in both villages varies as not all intended interviewees could be reached due to time constraints on both sides. Besides that, it is noteworthy that the SOLshare project simply did not involve more households at time of the investigation. The project finds itself still in the starting phase, which limits the scope of potential interviewees. Furthermore, six discussions with experts were held: three women (World Fish, EEP/Shiree, Ubomus) and one man (Ubomus) from different local NGO's concerning gender equality and the role of women in Bangladesh in general and related to electricity, and two interviews with male experts on rural electrification in Bangladesh working for SOLshare. In order to avoid gender biases and having one sided perspectives on the topic, both women and men were interviewed.

3.1.1.1 Semi-structured Interviews (SSI)

Semi-Structured Interviews (SSI) are used as a foundation of this study, preceding the use of observation and more informal interviewing. The interviews are composited of open-ended questions facilitated by an interview guide. In accordance with Mack et al. (2005), interviews are designed to give a vivid picture of the individuals' perspective. SSIs are an effective qualitative method for getting people to talk about their personal feelings, opinions, and experiences and therefor offer the opportunity to learn about the respondents' personal perceptions concerning electricity and their personal needs. They are also an opportunity for the researcher to gain insight into how people interpret and order the world influenced by what they have experienced and believe. SSIs are especially appropriate for addressing sensitive topics, such as domestic violence, that people

[25] Initially, seventeen interviews were planned to conduct, but one woman could not be interviewed due to absence (pregnancy) and the other one for an unclear reason.

might be reluctant to discuss in a group setting (Mack et al., 2005). Open-ended questions are added into the process as it arose from a conversation. It may stray from the focus of the research, however this is necessary to provide and identify new ways of seeing and understanding the topic. It allowed the respondents to reflect on their own answer and bring up additional aspects that they find important.
The overall belief is, nevertheless, that SSIs can provide reliable and comparable qualitative data. Thus, SSI do not aim to generalized results, but to shed light on the complexities of introducing and adapting renewable energy technologies and its impact on the women interviewed; their subjectivities and perspectives. Eventually, the results are analyzed in order to identify certain trends with the purpose of better understanding the context in which these technologies are being introduced (Cohen & Crabtree 2006). There are certain drawbacks however, to this form of qualitative data collection.

Principally, the researcher needs to ensure not to ask leading questions and not to interpret responses according to the researcher's own values or pre-conceived notions (Kvale, 2007). While conducting an interview, the researcher must be aware of her position regarding gender, social class, age or race, as this will affect the respondent's answers (Harrison, 2006). Thus, how authentic are the stories told and not just a repetition of cultural customs? It is not that much about finding the truth rather than asking why people claim it is the truth. It is more about understanding the meanings people attribute to their experiences and social worlds in order to achieve a mutual understanding. They provide us with the opportunity of exploring the point of view of the interviewee (Silverman, 2004).

Depending on the time, place, situation, and especially the intention of the interviewer, the interview may proceed in favor of the interviewer (Silverman, 2004). Certainly, doing an interview on behalf of SOLshare set the agenda of the interview. Following Silverman (2004), the 'story is being told to particular people, it might have taken a different form if someone else were the listener' (p.127). There is no one reality that can be obtained by the interviewer and interviewee, since every single person has its own perception of the situation depending on their livelihood and context. The perceptions of both, the interviewer and interviewee, are therefore bound to be subjective. However, the relation between two people changes in accordance with their interactions and it could impair the reliability, quality and validity of the data. In order to minimize this effect, the researcher must always pay attention when this effect may occur in an interview, and secondly how this may affect the quality of the data.

In this study, the SSIs were conducted to understand the i) prevailing cultural norms ii) inter- and intrahousehold relations iii) women's role in Bangladeshi society iv) energy use patterns of women v) potential impact of rural electrification in form of solar energy on women's daily life.

3.1.1.2 Focus Group Discussion

A focus group discussion, according to Mack et al. (2005) is a qualitative data collection method in which the researchers and several participants meet as a group to discuss the given research topic. It helped identifying group norms and eliciting opinions about these norms as well as evaluating information obtained and interactions (Silverman, 2004). It is therefore well suited for socio-behavioral research that will be used to develop and measure services, which meet the needs of a given population. A focus group discussion was held with thirteen girls and women from Shakimali Matborkandi. Additionally, two men joined the discussion towards the end.

The focus group discussion happened spontaneously during the first field trip to the village. Hereby, convenience sampling was used according to its unplanned nature. It was during the first visit in the field, when

most of the girls and women of the village gathered curiously around the researcher and the translator. It was a group of women of all ages, from six to eighty years. Most of them were household members of the five interviewed houses and some inquisitive neighbors. The focus group discussion intended to investigate on the hierarchically structures, their relationships with each other and what their lives in this village look like, with all their dreams and hopes. They allow a large amount of information over a relatively short period of time and are an effective data collection method for accessing a broad range of views on a specific topic, with being less intimidating and more open environment for women (Mack et al., 2005). For the researcher it was also a first good opportunity to build research relationships, rapport and trust. After asking for permission, it was also decided to record the discussion.

However, focus group discussions are not the best method for acquiring information on highly personal or socially sensitive topics. The more participants the more difficult it is to keep track during the discussion and the higher is the risk of losing valuable information. It was very useful to compare things that have been said during the group discussion in relation to what women said during the individual in-depth interviews.

3.1.1.3 Direct Observations

While there are different types of observing, the researcher took the role of a 'participant as observer', which means that the observation role is placed secondary to the participant role instead of the 'observer as participant'-type whereby the role of the researcher is known (Creswell, 2008). Generally speaking, observations are those in which researchers make careful, notes and are involved in informal conversations and interactions (Mack, 2011). It is a great opportunity for the researcher to gain first-hand experience with participants.

When using participant observation the research not only gains an understanding of the physical, social, cultural, and economic context in which the study participants live, but also their relationships among and between each other as well as people's behavior and everyday activities (Mack, 2011). During the field trip, it was possible to observe daily village life in general and the life of single household members in particular. Observations are useful in exploring topics that might be uncomfortable for participants to discuss (Creswell, 2008). Especially during the interviews, reactions and actions of the interviewees could be observed.

It is acknowledged that the observations made are not to be used as generalizations and are solely subjective; instead they are meant to add to the richness and complexity of the group of 'rural women'. The pattern that can be drawn from such an experience is to affirm that diversity is commonplace in the group of rural women in Bangladesh. Additionally, descriptive and reflective notes were taken about the housing situation, the state of the electrical devices, the location of available lamps and the behavior of the interviewed women themselves. Photographs were taken showing features of the village and were used to triangulate the findings from the SSIs.

3.1.1.4 Questionnaire

According to Mack (2004), surveys allow an understanding of quantifiable or numeric data of trends, attitudes, or opinions in a given group by studying a sample of that group. From sample results, the researcher generalizes or draws conclusions not only about the specific group, but also within a wider context. Questionnaires arguably add greater generalisation to social research than interviews or case studies (Flyvbjerg, 2004). Thus, Flyvbjerg (2004) argues that, despite many believing that a questionnaire is somehow more objective and less

deniable due to its produced numeric data than qualitative research methods such as interviews, against this common misconception. The way in which questionnaires are categorised, worded, and especially the choice of respondents they are presented to, entails an abundance of subjectivities. In order to overcome this subjectivity, the results collected from the surveys did not have profuse emphasis or weight for the study at hand.

The survey was part of the evaluation and monitoring work of SOLshare. It was a baseline survey on household level for the pilot project to understand the attitudes of the community in relation to the company as well as their current energy uses. SOLshare is planning to run the survey before and after the project is completed. The questionnaire was designed after several discussions with other experts in gender studies and the field of rural electrification.

In 2016 the household survey will be conducted only once and served as a baseline survey. The plan is to keep track of energy consumption patterns and social changes, which is why the survey is planned to be conducted at least twice a year to record changes. The survey was distributed through the researcher personally with the support of a translator and served as a supportive method for the subsequently in-depth interviews. In this way, the data could be used to triangulate the SSI results.

3.2 Sample Characteristics

The selection of the sample for all the different methods was based on purposive sampling and convenience sampling. Interviewees were selected according to the following criteria: Being a married woman between the ages of eighteen and eighty years and living in a household with access to electricity in rural Bangladesh. The age range was chosen in order to include variety in the sample and to find out if gender needs differ according to the respondents' age.

Except for the focus group discussion, younger girls were excluded from the sample as their role, responsibilities and gender needs within the household differ from the ones of women above the age of eighteen. Further, it was aimed to enhance the variety of the resulting sample by including households with different electricity levels[26]. The focus lies on married women as it makes it easier to analyze women's gender roles when a comparison to their husband's gender role can be drawn, therefore unmarried women were excluded. For the survey as well as for the questionnaire four women from the village Shakimali Matborkandi were chosen as an examples of women using swarm electrification, and, in contrast, four women out of the village Vobanipur with either access to a single SHS or no electricity at all. For the sake of comparison and minimizing one-sided perspectives, two married men were interviewed as well, even though the focus was on adult women's perspectives. Moreover, in rural areas it is uncommon for Bengali women to be still unmarried at the age of eighteen. Thus, by focusing on married women, it was hoped to conduct the research closer to Bengali reality.

In two cases, women of the chosen age range were not reachable, hence, through convenience sampling, another female member, despite being widowed, of the household was chosen. Nevertheless, due to her significant answers, it was decided to include her information in the research. In order to identify electrified households and respondents fulfilling the given criteria, snowball sampling was used.

[26] The different electricity levels are explained in detail in Appendix I.

3.3 Evaluation of the Data

The collected data of the interviews and the survey have been categorized and assed with help of the MAXQDA 12 software, a software program designed for computer-assisted qualitative and mixed methods data. The analysis of the data has been two-fold. Firstly, the data has been organized in relation to the research questions:

1. Practical Gender Needs
2. Productive Gender Needs
3. Strategic Gender Needs

3.4 Validity and Reliability

This research endeavors to be valid and reliable, despite the researcher's own biases and interest, which influenced the choice of study topic. According to Bryman (2012), validity is concerned with whether indicators (methods) adequately measure, observe and identify the underlying concept of the study. Therefore, this research will be considered valid if the findings accurately reflect the situation in the rural energy sector of Bangladesh, and the trend of empowering women[27] through access to electricity. Validity was enhanced through the selection of respondents, who collectively encompass a broad spectrum of women living in rural Bangladesh, although there are obvious limitations to this as there are many ontological differences within this dynamic stakeholder group.

In order to enhance the internal validity, the causality of rural electrification and women's gender needs, of this research and ensure the accuracy of the data, various strategies have been employed that are suggested by Creswell (2009). For instance, different data sources have been used and constant self-reflection was applied in order to outline how the discussion of the findings was influenced by the researcher's background and culture. After each interview and at the end of each field trip, field notes were taken about the happenings, the behavior of the interviewee and the researcher herself. In addition, a prolonged stay in Bangladesh, even if not constantly in the study village, enabled a deeper insight into traditional norms and gender relations, which contributed to a better understanding of the findings. Moreover, the findings of the research were presented to and discussed with the staff from SOLshare and other experts of different NGO's.

The nature of qualitative research is not to generalize findings but to generate 'particular description[s] and themes developed in context of a specific site (Creswell 2009: 193). It is particularity and not external validity that qualitative research addresses (Greene and Caracelli 1997). The study at hand uses a qualitative research design and therefore does not aim to generalize findings.

Thus, it needs to be mentioned, that there were uncertainties regarding the reliability of interviewees' responses. In many cases, it seemed that respondents said more what they thought the researcher wanted to hear and what the legal regulations are. The impact of these assertions will be analyzed in the discussion of the results.

[27] Keller & Mbwewe (1991) describe empowering women as a process whereby women become able to organize themselves to increase their bargaining power, to assert their independent righto make choices, to meet their basic needs, improving self-reliance and to control resources that will assist in challenging and reducing women's subordination.

External reliability, whether the results of a study can be generalized beyond the research context of the two villages, is difficult to assure as in order to replicate a qualitative research, constant changing social settings had to be kept on hold. The study, by all means, did not intend to generalize, but rather motivates other researchers to apply similar research methods when electricity's impact on women is central to the study. However, confidence in the reliability of the results was increased through triangulation in two ways; i) by gathering comparable data from different respondents, and ii) by using different methods to obtain similar data. By recording all interviews, a transparent documentation of the data is granted, thus contributing to internal reliability (Bryman, 2012).

3.5 Limitations of the Research

The following assumptions were made while conducting the research; i) the participants interviewed for the SSI qualitative data collection were the most appropriate individuals to respond to the interview questions ii) the respondents provided the best and most comprehensive answers, whilst being representative of the subjects' views.

Time, resource and language constraints as well as some lack of corporation were elements that affected the research. A major limitation to the research was the language barrier, as the majority of the rural population does not speak English but Bengali, a language unknown to the researcher, and the distance to the villages. However, the research was supported by the local SOLshare office, which facilitated access to an interpreter. The interpreter facilitated the introduction to gatekeepers, the transportation with public transport and made it possible that people in the villages agreed to talk to in the first place. Nevertheless, it must be acknowledged that by using an interpreter, information gets lost during the interpreting process and that the possibility of analyzing the speaking behavior of the interviewees, such as speaking pauses, is nearly impossible.

Additionally, the communication between the translator and the researcher sometimes proved to be difficult due to a relatively low level of English skills. The transcripts of the interviews clearly elucidated that the questions being asked by the translator in Bengali differed sometimes profoundly from the initially English questions formulated by the researcher. It also seemed as if the translator did not fully understand the overall purpose of the investigation, which led to further misunderstandings. In order to minimize these communication barriers, the researcher perused the interview questions with the translator, gave a brief clarification of the purpose of the study before every interview and rephrased questions during the interview.

Moreover, my affiliation to SOLshare might have influenced the answer behavior. It could be the case that the respondents felt that they had to speak in favor of SOLshare. The interviewees seemed to say more what they thought the researcher wanted to hear. Thus, it did not seem to affect women's ability to criticize or point out negative aspects concerning the electricity provision, or sometimes even stultified the men in dealing with the new technology. Also, while SOLshare provides the equipment for the installation of the solar panels or the mini grid, it is the local main energy operator, referred to as swarm area managers (SAMs), who charges the households and is responsible for maintenance and repair. It seemed that SOLshare is playing a less central role and is perceived more as an intermediary between the operator and the village residents. Above all, the nature of this research as a scientific research for university purposes was underlined before each interview.

While Scheyvens and Leslie (2000) acknowledge the need to consult women, they illustrate various practical difficulties when interviewing women that were experienced during the research as well. Gaining access to women was difficult, not because of their lack of willingness to be interviewed, but because of their limited free time: Women were busy doing household chores, supervising children or preparing to cook. Hence, the

time frame for interviews was adapted to their daily routines with interviews. It could be observed that during the last interviews of the day, women were more in a hurry since they needed to start preparing the meal soon. While some interviews were occasionally interrupted for a short time due to some instant task, the women had to conduct or children crying, others were continued during food preparation activities. Especially the smoke was very disturbing, impaired the quality of the interview not only in terms of the recording quality but in terms of also focusing, and keep on task.

Furthermore, the presence of men can have a negative impact on the interview as women felt shy or rather intimidated to talk. Thus, asking men to leave might have caused trouble for women. Since women are less often subject to research, asking to interview women might provoke surprised or even suspicious reactions on the part of men (Scheyvens and Leslie, 2000). It could have given the impression that issues have been discussed they were not allowed to hear, sharing private information, hiding information or having secrets. In order to prevent such reactions, village chiefs were consulted first to inform them about the purposes of the research. Moreover, it proofed to be propitious to conduct the interviews with women during weekdays as the men were absence due to work. The women were less stressed about cooking lunch on time and the risk being interrupted by men was minimized. On Fridays, in turn, it was more suitable to talk to men as it is the official weekend in Bangladesh and men were more likely available. Nevertheless, the outlined behavior could be observed during several face-to-face interviews with women when her husband took it for granted to participate even though it was announced as an interview with women only. The interviews were intended to investigate how women see their role within the household, their understanding of electricity, what kind of benefits they see in rural electrification and how their own specific needs can be met. However, the presence of the men led to a situation in which the women sat quietly in the back letting the men speak, with scarce participation of women. To some extent, this limitation turned into an opportunity. Instead of having a lively discussion with the women, observations concerning the hierarchical structures of the household as well as the village between women and men could be made. Moreover, the behavior of women in the presence of men could be analyzed. These observations will be discussed in detail in the analysis in chapter 4.

3.6 Ethical Considerations

This study was conducted using ethical considerations such as respecting the needs and interests of the respondents, regarding their privacy, right to anonymity in addition to clearly explaining the purpose and motivation for the study and disclosing how their information and participation in the study would be presented and used. Before each interview and before the focus group discussion, participants were informed about the purpose of the research, their anonymity was guaranteed and spoken consent was obtained in order to record the interview. It was explained who the researcher was, the study program, the University and other information the respondent might have requested in order to feel comfortable. Each interview was preceded and followed by asking if the respondent was happy that the information they divulged would be used for the study purpose. The respondents gave their express permission to do so. It was also ensured through consultation with SOLshare that they keep the respondents anonymous. To respect further anonymity, the information and citations divulged and used in the study were kept anonymous by using fictional names.

4. Empirical Material and Discussion

The following chapter presents the empirical material and contains the analysis of the study. The underlying research questions with regard to the female face of rural energy poverty will be analyzed and hence, existing and potential problems in rural electrification using a gendered approach emphasized. The chapter is divided into three parts. It starts with the impact electricity has on women's practical gender needs and then discusses its impact on their productive gender needs. The third part outlines how women's strategic gender needs have been met so far and how electricity can further affect them. It is not always possible to clearly distinguish how the introduction of solar energy affects practical, productive and strategic needs as they interact. If not stated otherwise, sources of this chapter constitute of the information gathered during the data collection in the field.

4.1 Women's Practical Gender Needs

In Bangladesh, women carry the largest burden of domestic work (Fatema, 2005). Around 80 percent of the respondents relate their practical gender needs to cooking, grinding chili and wheat, hulling rice, diverse small-scale agricultural activities such as homestead farming, poultry and cattle, gathering firewood, drawing water and other domestic work like cleaning, washing, refurnishing the house as well as supervising children and elderly people. Moreover, the survey revealed that most of the women work throughout the day, approximately thirteen to sixteen hours per day, whereof they spend around one hour for recreational activities such as watching TV, listening to the radio, playing with their children or visiting neighbors.

> "I have to work all the day. Sometimes I cannot sleep properly. However, it is really hard to measure how many hours I work exactly because women have to do loads of domestic work. So, apart from my sleep and leisure (watching TV) I think I work almost 15-16 hours per day." – Trishna[28] (27)

These findings are in line with general estimations of Bengali women spending between thirteen up to fifteen hours per day with domestic work in rural areas (Clancy et al., 2003) and in line with the other women's responses to the questions H5 of the survey regarding women's time allocation. Interestingly, during the interviews women stated that they do not work and are not involved in any other activities other than cooking and cleaning, which was usually not considered as 'real' work since it is not paid work. Thus, while conducting the survey and asking about their assets, it came out clear that women also do poultry and homestead farming next to their domestic responsibilities. According to the respondents, the most exhausting part of women's daily work however, is to do laundry. Women complained that due to its manual way of working, doing the laundry is very tiring and physically exhausting. An electric washing machine driven by solar energy would be beneficial for women but not yet viable due to the relatively small grid size and low electricity generation. The most time-consuming work on the other hand, is around food preparation such as grinding chili and wheat as well as hulling rice. A solar mill, for instance, would be much more timesaving and could reduce a part of women's workload, although cooking would still be labor intensive. The use of a solar grinder, for instance, can allow women to grind wheat mechanically on the site and do not have to mill the wheat manually any longer. In this way not only time and effort spent can be reduced, but also costs for flour and other grinded foods from the market or long distance walks to the next grinder can be eliminated. Thus, it is doubtful whether women actually would use such a machine. Most of the interviewed women do not think that the use of

[28] With regard to anonymity other names have been chosen for the respondents.

electricity in form of productive use appliances is necessary. One reason for their reaction could be the fact that they are not used to electric appliances. Another reason might be a lack of knowledge regarding the availability of productive use appliances. The interviews revealed that most women are not aware of the options neither the benefits related to the use of electricity in their daily activities. They do not necessarily see an urgent need in changing their cooking habits, for instance, as their ancestors and they themselves have worked and cooked manually. SOLshare, for instance, recently introduced a rice huller and the reaction of the dwellers, especially those of the women, was not as expected by the SOLshare team. Firstly, the rice huller gained much more attention by men than by women. Secondly, based on the researcher's observations, the women observed the whole happening from a distance and did not participate – partly due to suspicion of new technology and partly because of men cutting in line. Women are not yet familiar with the use of advanced, electric technology. The acceptance of productive use appliances such as the rice huller is therefore still low. Skepticism and mistrust towards the unknown hereby is a great barrier for the uptake of new technology by women. Most of the interviewed women think that electricity is rather sorcery and scary. Another decisive reason why the adaption of electricity by women can be proved difficult is women's altruism. Question regarding their personal energy need were usually of secondary importance to them. Most of the women put their needs behind others. They would answer that they do not necessarily need electricity, but their children and husband. Their children for evening studies and their husband for mobile phone charging, watching TV and listening to the radio. For Trishna (27), fostering her children's education through electric lighting ranks above having a lamp in the kitchen or purchasing electric machines for productive uses. In this case Trishna prioritize less on the satisfaction of her own needs. They believe that their needs are less important, simply because they feel worthless. Therefore, it is questionable how the adoption of further technology by women will proceed.

Nevertheless, when asking the women whether they are satisfied with their tasks or whether the household work could be shared among them and their husbands, they mostly feel overwhelmed and would appreciate male support, but also explained:

> "If our husbands help us with domestic work like fetching water, collecting fire wood etc. that would be good for us, but men mostly work outside the house so they do not have enough time to take care of their children and women stay inside the house so it is her responsibility." – Neeha (88)

This shows that women are trapped in the traditional division of labor, which does not leave much space for them to work less. Hereby the traditional division of labor reinforces gender-based social disparities and women's time and human energy placed in domestic work plays a critical role (Cecelski, 2003). Within almost all households, there is a clear sexual division of labor, in which the man as the 'breadwinner' is mainly involved in income-generating work outside the house, while the woman as the 'housewife' is responsible for the reproductive and domestic work of the household.

> "No, girls cannot do all type of work, especially bad work, which is harmful for their respect and prestige. Boys can do whatever they want. Girls can do regular jobs, but not all kind of work such as farming. Domestic work such as cooking, raring children etc. are for women but cultivating land […] is prohibited here [for women] and if they do this kind of work society will consider them as bad girls." – Nishat (38)

Due to the different roles, it is very difficult for women to break out of these patterns without being socially excluded.

Despite the social challenges women have to face, there are work-relieving appliances such as electric light. Before gaining access to electricity, kerosene lamps, candles and torches were used as lighting devices. In the study at hand, women used to rely on their family members or neighbors in order to access fuel sources for lighting from the market. As the sun sets around six pm (+/- one hour) and dinner is eaten between seven and eight pm, the interviewed women tried to prevent cooking after dark and prepared most of the meal during the day. The overall benefit is that their working schedule is eased and the opportunity to work after sunset when there is no daylight.

> "When it gets dark we can't do much work if there is no power. […] I can't complete all my work during daylight." – Trishna (27)

They, indeed, acknowledged the inconveniences of cooking with limited light as it makes cooking tedious and lengthy and evokes eye problems. Access to electricity could therefore improve the working conditions of women and thus meet their practical gender need. The respondents affirm that electric lightning improved their living conditions tremendously. They argue that access to electricity reduced the amount of fire and cutting accidents caused by using kerosene lamps. While candles provide little lightning and kerosene as well as batteries are expensive, a single panel already provides enough power to illuminate three bulbs. The concept of swarm electrification, thus, allows energy sharing households, with or without solar panels, to trade electricity with each other over safe, low-voltage mini-grids. Even household who cannot afford the initial costs of a SHS, can get a lower priced SOLbox and buy electricity from neighboring houses. According to Amna (22), a great benefit of the swarm concept is its reliability, independent of weather conditions, especially during the monsoon season with heavy rainfall and thunderstorm, which last almost half of the year:

> "As I see solar energy is better because the power never cuts off. How nice it stays!" – Amna (22)

Households are less affected by supply shortages and the lamps can be switched on whenever needed. Light can be used when children do their homework, when dinner is eaten and at night that babies do not cry in the darkness and household members find their way from the their rooms to the toilets and back. The 'mini-grid' also results in more power for the grid user. It allows them to light several rooms or even the entire house instead of only one part of a room. While it is most often the men who decides on the location of the light bulbs, it is uncertain how big the actual benefit for women is. The greatest likelihood for women to benefit from electric lighting would be to illuminate the kitchen. Only three of the visited households were found to have electric lighting in the kitchen. Evidence shows that the amount of lamps is limited and that women prioritize having a lamp in the house rather than in the kitchen.

> "At night I use a kerosene lamp. I do not need electric light in the kitchen." – Puneet (17)

The preference of having the light bulbs in the house is meeting of a strategic gender needs – enabling women to read and foster their children's education. In addition, some women do not perceive the kitchen to be dark at daytime. While these women are familiar with not having access to electricity they are used to poor electric lighting. From the researcher's point of view, however, the lack of light is not only a problem after sunset but also during the day. Most kitchens are constructed as straw or bamboo hut with an open entrance without any window and very rarely a slot between the roof and the walls. As a result, the kitchen is dark even during the day. These different perceptions of darkness might derive from the different living circumstances of the respondent and the researcher. As a researcher from a European country, where electric lighting is ubiquitous, darkness is perceived differently compared to the women in Shariatpur and Gazipur. Cultural differences might lead to misconceptions. Coming from a different country and having a different cultural background, the researcher has to let go of the assumption that a kitchen needs electric lighting. While a lamp in the kitchen is

a women's request, it does not necessarily has to be their priority. Electric lighting in the kitchen definitely addresses women's practical gender needs, but other needs such as lighting for educational activities of their children have priority.

Another interesting outcome is that most of the interviewed women do not find the smoke while cooking interfering. There was only one women complaining during an interview about the smoke from the cooking stoves:

> "My clothes and body become dirty from smoke. I also feel headache and sometimes I cannot see properly." – Nadya (31)

From the researcher's as well as the translator's point of view, the smoke was a disturbing factor and led to interruptions during the interviews due to difficulties in breathing and talking. Besides, poor indoor air is one of the highest causes of premature death in Bangladesh and affects women more than men due to their cooking responsibilities (Larsen, 2016). At this point electricity in form of an electric exhaust fan would improve the air quality in the kitchen depending on what type of fuel is used. Nevertheless, there is an inherent bias between the different perceptions on smoke. Based on observations of the researcher during interviews in the kitchen, almost all women were exposed to smoke and ash. Thus, most of the interviewed women seemed to be adjusted to the smoke, while the researcher had difficulties with breathing and seeing properly. These differences between the researcher's own and the women's perceptions of fire smoke might derive from the different circumstances we are used to. As a researcher from a European country where one is used to cook with electric stoves and ovens, the researcher perceives smoke as something disturbing where these women do not. Being accustomed to not having access to electricity, the interviewed women are used to being exposed to toxic fire smoke. Additionally, while in most Western cultures cooking takes place in the kitchen, some Bengali women do not necessarily prepare the food inside the kitchen. Four out of the nine respondents simply relocate the work such as food preparation to the courtyard where there is daylight and where they can sit together and chat.

The work of cooking could be further improved through access to improved cooking stoves. In Bengali society, cooking is very time-consuming. In the villages of Shariatpur and Gazipur, women already built improved cooking stoves made out of clay compared to the traditional way of cooking on an open fire. The problem is that they mainly use crop and dung residues, leaves and branches, which cause a lot of smoke and takes a large amount of time. Electricity interventions, in turn, have not yet been able to improve women's cooking situation mainly for two reasons. Firstly, electric stoves are too costly and rather regarded as a long-term option and secondly the current power supply is insufficient to provide enough energy for lighting, cooling and cooking simultaneously. However, electricity has a potential of improving women's working conditions by providing electric lighting in the kitchen and thus addressing further practical gender needs.

Nevertheless, the impact of access to electricity for women in the two study villages is two-fold. While electricity opens many doors for women and extend their working day, it, in fact, intensifies women's practical gender needs instead of addressing them. With no doubt, it prolongs women's working day, but it also gives them the opportunity to ease their working schedule and earn money, which is more valued by the interviewed women. This study shows that for most women, access to electricity does prolong their working days, but does not necessarily increase their workload. Offering electricity services after dark, when their children are sleeping, facilitates their life by giving them the opportunity to accomplish their chores during the day less stressful and leaves room for income-generating activities. The question, whether it is the access to electricity that adds to this additional workload, or whether electric lighting simply facilitates a task that needs to be done anyway, remains. In this study, women rather divide their tasks and do not have to rush with their work and do

not necessarily work more in total. The interviews show that electric lighting simply facilitates and speed up daily tasks, which otherwise would be conducted under poorer working conditions. Thus, electric lighting meets a practical gender need. To a certain degree, it might also meet a productive need depending on whether women are engaged in income-generating activities after dark or not.

However, often policy papers suggest that time saving through access to electricity and an overall reduced workload does not only contribute to women's practical gender needs but also women's productive and therewith strategic gender needs. It is argued that the time saved allows women to contribute to income generating activities, to take part in decision- making processes within the household and/or to participate in educational activities such as evening classes or reading (UN 2005, 2010; UN Millennium Project 2005; UNDP 2004).

4.2 Women's Productive Gender Needs

Next to practical gender needs, meeting women's productive gender needs through access to electricity is important. Earning an income is a major concern for the interviewed women. Firstly to improve their living situation, and secondly to become, in their opinion, more equal to their husbands. Gender equality, as the majority of the respondents argues, signifies that both husband and wife contribute to the household's income. Almost all women, argue that having their own income may also increase women's freedom of decision and choice:

> "It is my husband who decides whether or not to bring our children to the hospital if they are sick. I would like to take that decision too, but I cannot as I do not earn my own money. If I have an income, I would take my children to the hospital without asking my husband for permission first." – Trishna (27)

Accordingly, earning an income is a major concern for the women, not just to improve their life, but also to fully fulfill their role as a woman and to become, in their eyes, equal to their husbands. Besides, most of the respondents, possible job opportunities and earning their own income has been equated with more power by the women themselves. In the case of Nishat and Nadya, for instance, their highest priority is the engagement in income generating activities. They stated that:

> "Some women have the capacity to earn money and I think this is power." – Nadya (31)

Haves (2012), who argues that earning money can foster increased gender equality through women's higher bargaining power and additionally challenge the existing sexual division of labor, also underlines this argument. The respondents regard the saved time as a possibility to take part in decision-making processes through their enhanced position once they manage to generate income and hope to participate more in village activities or potential women's groups. For some women being involved in income-generating activities means even more than power – it means freedom, being independent. As Farida (40) stated:

> "If I had the chance to work I could do whatever I want. It means not to take money from my husband or sons. I could spend the money whenever I need anything."

The study further shows that while electricity has a great potential to promote income-generating activities for women, they have very limited options for generating their own income. Prevailing social norms of what is considered an appropriate job for women compared to men reduces their possibilities:

> "Girls can't do all type of works especially bad work which is harmful for their respect and prestige. Boys can do anything whatever they want. Girls can do regular jobs but not all types of work such as farming. Domestic work such as cooking, raring children etc. are for the women but cultivating land, going to the farm is prohibited here [for women] and if they do this kind of job society will recognize them as bad girls." – Nishat (38)

As employment opportunities are rather rare in the villages and women's movement is limited, their capabilities to generate income mainly includes the establishment of their own small business, which require initial investment. At this point, SOLshare's swarm approach is becoming more interesting. Compared to a regular SHS, swarm electrification directly affects an individual household's ability to improve its income generation. A household can feed its unused energy through the SOLbox into the grid and in return gets the surplus of energy paid out in cash. On the other hand, households connected to the micro-grid without their own SHS can now buy this excess energy for approx. $ 1,80 per kWh (Groh et al., 2015). The more households are connected to the grid, the more energy can be produced, the more technical appliances for facilitating women's lives can be bought and income can be generated.

From this point of view, small-scale businesses related to the household such as owning a sewing machine or operating a solar mill would be socially accepted and meanwhile enhance the status of women within the household as well as the community. These 'cottage industries' help women earn their own income in socially acceptable ways, and thus addresses a productive gender need. For instance, women could sow bed sheets and clothes and sell these in the village. Amna was able to purchase a sewing machine through the revenue of selling their excess electricity to the local mini-grid. She is now tailoring clothes, bed sheets and curtains for personal needs, but also to sell them in the village. Her earned income is mainly used to contribute to her family's wellbeing.

> "If both, men and women can earn money it would be very helpful for the economic wellbeing of the family. […] They can spend money for their children's education, meet the basic needs of the family and helps to tackle financial crises." – Amna (22)

Thus, there is a limited uptake of such electrical appliances by rural women in Bangladesh and Amna remains one of the few, who has her own small business. Despite the fact that electricity has the potential to reduce their workload, the interviewed women were rather concerned with their lack of financial resources in order to start their own business. Larger purchases such as a fridge, freezer, sewing machine or mill run by solar power exceed most household's income. In order to reduce impeding initial costs, women could launch an association in which several women purchase one electric device such as a mill or sewing machine together and produce and sell products on a rotating basis. They could get support from Building Resources Across Communities (BRAC), who is known for its micro-credit programs tailored for rural women to engage in income-generating activities in Bangladesh. Furthermore, due to the early stage of the pilot project the concept of swarm electrification in its current scale does not produce enough power to feed a refrigerator or deep freezer and would only allows the users to connect rice hullers, mills, sewing machines and other low-power electrical devices such as ventilators, light bulbs, TV's and radios. Moreover, SOLshare's idea of trading excess energy, sharing power among neighbors, selling and buying energy

Despite women's requirement to earn their own income, illiteracy and the lack of business skills prevent them in the aspiration for income generating activities. In the two villages in Bangladesh, the majority of the interviewed women is illiterate. This shows that while electricity enable women to meet their productive gender needs, factors regarding illiteracy, high initial investment costs and the lack of business skills reduce the

chances to fulfill women's productive needs. When introducing technical appliances such as mills, sewing machines or refrigerators, technical trainings for women needs to be given in order to avoid short term use due to technical defects and ensuring that primarily women responsible for devices tailored to their needs. These trainings should impart very basic ideas on business and bookkeeping.

However, access to electricity has the potential to address productive gender needs, but factors such as technical knowledge and high initial costs and men's authority can impair the realization of productive gender needs. Apart from these productive gender needs, practical gender needs in the form of electric mills and sewing machines can be addressed by improving women's working and living conditions.

4.3 Women's strategic gender needs

Decisions within the household and the community are still mainly taken by men. Women's decision-making power is restricted to what Bengali society considers female domains such as cooking and managing the household. There were some women arguing that she and her husband would take all decisions commonly, but indirect questions during the interviews showed the contrary. With regard to household expenditures such as food and medication, it is the husband, son or father-in law who goes to the market and decides what to buy. Three out of eight women stated during the survey that in case of buying medication for themselves and food for cooking, it is she and her husband, who would go to the market and acquire the necessities. Thus, while conducting the personal interviews with exactly these three women and asking the same questions just less straightforward and hidden in a little story around the subject, they admit that it is actually the man who goes to the market and buys medication and groceries. Even when it comes to family planning, the husband's decision should be given priority and it is women's responsibility alone not to get pregnant. Sometimes also village doctors or parents-in-law might decide when and how many children the women should get. Thus, direct questions concerning women's actual decision-making power, might have evoked answers that depict women's role in a negative way and could have caused trouble. This might be because respondents feared to be represented as what society considers an immoral woman. Consequently, almost all women gave similar answers, that decisions are made commonly and that they are satisfied with their ascribed tasks:

> "Taking care of my children and husband is the most important thing in my life. I have to follow my husband's order, need to be obedient and also need to take care of my Father and Mother-in-law." – Puneet (17)

While men and women often decide commonly about domestic issues, the man has the final decision about major decisions at home such as larger expenses and children's education. At the end of every interview, it came out clear that the man has the final word and withholds his approval. Such patriarchal norms as the traditional roles of women and men as well as their assigned decision-making power proved to be very prevalent in the case study villages. Interestingly, when asking the interviewed women whether they actually like to make major decisions they usually affirmed, but also that their husbands do not really care about it.

The study further shows that earning their own income not only fulfils women's productive needs but also their strategic gender needs by increasing women's bargaining power and challenging the sexual division of labor. Being involved in entrepreneurial activities may raise women's self-confidence and would help, according to the respondents, to acquire reputation within the community. Moreover, even if the majority of the interviewed women do not yet earn individual income, the aspiration of earning their own income affects their role within the household and makes them feel more valuable. This argument is also underlined by Haves (2012) who

explains that earning money can also foster increased gender equality through women's higher bargaining power and the challenge of sexual divisions of labor. In this regard, electricity addresses further strategic gender needs.

On the other hand, women might be sometimes restricted in their decision on what to spend the money on. Having a job does not necessarily mean that women can keep their income and automatically benefit. Leyla (30), for instance, is, together with her husband, running a market stall, where they sell fruits and vegetables from their garden. Working as a woman at the market is an exception rather than the rule, but due to her husband's drug addiction Leila is forced to work to sustain the family. At the end of each day, she has to hand over her earned income to her husband as she would be threatened with violence otherwise.

While facilitating women's access to electricity and thus their job opportunities, it is necessary to consider men's reaction to women's improved social status. Would men accept women's higher status, which is gained through income generating activities? Moreover, even though women own something, who ensures that it is also operated and managed by women? The study at hand shows that while a rice huller was introduced to the village to release women's manual work of husking the rice, the husbands and sons were operating it. Even though the rice huller is linked to domestic work and suppose to benefit women, men are the ones operating it. The researcher's own observations during the field work and the focus group discussion concerning prevalent hierarchies and women's behavior towards men can be seen as recognition and respect if not even feelings of intimidation and fear towards male authority.

> "Women should keep their opinions to themselves in order to keep peace in their household, […] because women always want peace in their house. […]Women should tolerate violence in order to keep her family together." – Nadya (31)

It can therefore be assumed that the women accept decisions made by men with regard to who the "operator and manager" of the household is. Besides, the majority of the interviewed women would probably not raise any potential opposition in public and thus their personal opinion will remains hidden from this research. Leyla is an exception. She was one of the few who revealed information about domestic violence and complained about her husband's drug addiction. In her case, she is also the one earning most of the income by selling fruits and vegetable in the market.

> "He beats me up, asks for money. Where do I get the money from? […] He was not around for three years. I had to sell off all my belongings. […] He said he was going to do a job, but he never worked. He is just taking drugs, beats me up and asks for money. If I fail to give him money, he is doing it more often. Recently, I set up the shop for him." – Leyla (30)

However, the discussion on whether technical innovations for rural electrification actually addresses women's strategic gender needs in increasing their social status and self-confidence or whether women's self-confidence has been decreased by demonstrating their lower social status and limited voice.

Additionally, business opportunities can further address women's strategic gender needs in the sense of their empowerment. The majority of the interviewed women argued that women's empowerment is characterized by the contribution of both, women and men, to the household's income. Interestingly, there have been similarities with western ideas on women empowerment, especially regarding equal job opportunities and taking decisions. They considered women's empowerment as freedom – the freedom to speak, attend meetings and earn money whenever they want. On the contrary, western concepts of women's empowerment are

indicative of, for instance, the sexual division of labor at home. Thus, almost all respondents reject the idea of a husband performing household chores:

> "A woman should do the domestic chores like cleaning, cooking, washing clothes, refreshing house and a man should do outside works. If my husband helps me with the household affairs like cleaning, refreshing the yard, people laugh at him, even when my son helps me people laugh at him." – Farida (40)

Similar to power gain through income applies to power gain through education. The majority of the women see education as a key for gaining more power, for being more independent. Thus, the majority of the interviewed women did not see education as a solution for themselves, but rather for their children. It seems as if they already gave up on themselves and accepted their role society attributed to women.

> "Women are mostly illiterate and they don't earn money. If men don't earn money how will women survive? Women have no ability to do outside work such as shop keeping, doing business etc. So the man is the sole earning member and they manage everything so they normally take the important decision." – Mohammed (50)

They do not consider the saved time as mean to address their own strategic gender needs but those of their daughters. They do not use the spare time to engage in educational activities. The reasons for this are the very high illiteracy rate among the respondents that prevents them from reading. The lack of infrastructure constitute an additional constraint. Although primary schools exist in both villages, evening classes for adults are not yet offered. Thus, facilitating access to education for their children, and especially for their daughter, is now a priority for them. Fatema (2005) adds that the high workload attributed to female household members in Bangladesh engenders that daughters or other female household members in school age attend school irregularly if at all.

> "It was not possible for the women to get education earlier. When I was young, my father told me that if I go to school he would abandon me. In our time, the family did not allow girls to go school, but had to support her mother with household work and child care." – Leyla (30)

In all visited households, the domestic chores are shared between daughters, sisters-in-law or mother-in-law and only half of the respondents' daughters in school age are going or have been going to school. Moreover, the prevailing custom of arranged marriages in early age keeps young girls away from school. Although there is a law that prohibits marriages under the age of 18, it is still very common in rural Bangladesh. It is partly practiced because the family would like to give their daughters security and partly to save money. The younger girls are the more dowry is being offered.

> "If they [daughters] do well in school they can continue, but if Allah wishes and we get any good proposal, we'll marry them off." – Trishna (27)

However, not only attending school can meet women's strategic gender needs, but also women's access to information and entertainment devices such as televisions and radios. The use of television and radios is generally appreciated for leisure and entertainment purposes. Thus, they can also facilitates the access to information and broadening women's horizons. Although men usually own TVs and radios, women do benefit indirectly benefit as well. Mostly, those devises are placed in common spaces so that women can watch or listen to the news even while taking care of children, cooking and cleaning. Especially in rural areas, where the majority of the women is illiterate, television and radio are valuable determinants of increasing awareness

and acquiring knowledge. While access to internet and newspaper is rather in rural villages in Bangladesh, television and radio provide interviewees the possibility to obtain news beyond their village and establish links to the outside world.

Next to information and entertainment devices, electricity can improve women's access to communication devices such as cell phones. As cell phones need to be charged, access to electricity is essential. All respondents of this study have access to a cell phone, but only half of them possess their own one. The other half uses a cell phone from another household member if necessary. The majority of the women had their own cell phone already before gaining access to solar powered electricity. Even though electricity was not an incentive to buy a cell phone, it decisively facilitated the usage of it. Whereas without electricity, the owners of cell phones had to reach the closest town, a town with access to electricity, or send it with someone else in order to charge the cell phone, now charging can be done at home at the SOLbox. Women do not depend on their husband or neighbors anymore in order to charge their phones. Through the access to electricity, women's living situation is improved and thus a practical as well as a strategic gender need is met.

The interviewed women use cell phones for communication purposes rather than for mobile banking compared to men. Mobile banking such as cash payments is common in Bangladesh (Groh et al., 2015). It can be assumed that cell phones can meet productive gender needs by providing phone services or cell phone charging stations. In the study at hand, cell phone charging can be considered as a possible income generating activity. Through the multiple function of the SOLbox trading of energy is possible. It allows people to buy and sell energy. Households with a solar panel can sell excess energy to poorer households without a SHS. In this way, access to electricity could benefit productive gender needs. However, it is usually the husband or the son managing and therefore benefiting from the SOLbox. Nevertheless, electricity facilitates the charging of cell phones and thereby facilitates the communication and contact to relatives or friends living elsewhere. Electricity, thus, not only meets a practical gender need, but also addresses a strategic gender need by increasing the possibility to gain access to information via cell phones.

Overall, it can be stated that access to electricity cannot be defined as either a practical, productive or strategic gender need, but a rather complex interaction of all gender needs. There is no clear division between the three gender needs and the definition of practical, productive as well as strategic gender needs depends on the respective context. While electricity reduces women's workloads, contributes to the saving of time, facilitates access to job opportunities and thus earn income, it depends on the women and the specific context whether it is translated into practical, productive or strategic use. This study could identify four influencing factors: The available infrastructure, the financial background, traditional norms and women's motives. In the case of women's decreased workload through access to electricity, all three women's gender needs could be met through the introduction of solar power.

5. Conclusion

While the recognition of the importance of access to electricity is growing, 1.3 billion people still lack access to electricity, whereof 80% are located in rural areas (WEO, 2015). In Bangladesh, there is an ample need for rural electrification as well as for an amplified integration of gender aspects in energy programs and policies, which is crucial in order to meet the energy needs of both women and men as access to electricity impacts them differently (Fatema, 2013). This study at hand therefore, analyses how solar powered electricity impacts women's life in rural Bangladesh. In doing so, it determines women's gender needs and whether they can be met through the energy solution provided by SOLshare Ltd. Thereby, the thesis combines the theory of access by Ribot & Peluso (2003) with Moser's (1989) gender needs theory to identify the causality of access to electricity and its means to meet women's gender needs. Electricity is being provided but whether or not women are able to access it, and additionally benefit from it, is determined by women's practical, productive and strategic gender needs. The findings in this thesis are based on in depth interviews, a survey, a focus group discussion and direct observations during a three months fieldwork in Bangladesh.

To begin with, it is found that although rural women are often assumed to be the principal beneficiaries of improved energy technologies, solar power does not automatically induces female power. Access to electricity has by far not been exploited, especially not in addressing women's (energy) needs. Electricity remains unused by the majority of rural Bangladeshi women, partly due to their constrained socio-cultural roles in society and on the other hand due to the lack of the assessment of women's practical, productive and strategic gender needs.

Yet, solar energy has certainly a great potential to improve women's lives when rural electrification initiatives align their technologies to women's specific needs. In the case of the interviewed women, their primary concern lies on reducing workload and improved working conditions given the inordinate amount of time and energy that they expend in necessary household drudgery. Labor-saving devices are therefore a priority for rural women and thus meeting their practical gender needs. In the case of Bangladesh, electricity meets practical gender needs through electric rice hullers and grinding machines that reduce women's manual work and save time during food preparation. Electricity further addresses practical gender need by providing electric lighting, which facilitates food processing at night. Electric light bulbs improve living conditions at home and when installed in the kitchen facilitate cooking conditions. Despite the respondents' acknowledgement for a practical gender need for electric lighting in the kitchen, other needs are of higher importance. The women prefer light in the rooms instead of the kitchen to enhance the education of their children. Additionally, women in Bangladesh are accustomed to not having light in the kitchen and relocate parts of the food preparation outside. Regarding work at night, the question of whether electric lighting prolongs women's working days evolved. However, women have to accomplish food processing and preparation with or without access to electricity. By providing better lighting and thus accelerating the process, electric lighting improves their working conditions. Moreover, electric access to electricity facilitates the use of cell phones, namely the charging of cell phone batteries and operating the SOLbox. Before, women had to walk to the next town or send their cell phone to another town with access to electricity. Regarding women's workload and limited time, access to electricity thus met another practical gender need. Lastly, while electricity through street lighting can increase women's mobility (Cecelski, 2004), findings from the study at hand could not determine remarkable changes in Bengali women's behavior at night. This can be related to women's already restricted mobility due to socially attributed norms that women are not allowed to move alone outside the house. Nevertheless, the interviewed women attributed an increased feeling of security to street lighting.

Further, electricity has the potential to meet productive gender needs by enabling the uptake of entrepreneurial activities. Even more important to the interviewed women than solely saving time is using the gained time for additional income generating activities in order to contribute to the household income and be more independent of their husbands. Purchasing solar driven electrical appliances for home based businesses such as sewing machines or a cooling boxes enables women to earn their own income. The study at hand shows that as a result of being connected to the SOLshare mini-grid, Amna (22) had the chance to save money that she used to buy an electric sewing machine. While trading electricity within a SOLshare mini-grid by itself is an option to make a living, using the extra money to start one's own small business offers Amna to earn her own income. With the help of the sewing machine and electric lighting, for instance, she is now sewing bed sheets and clothes in the evening that can be sold off and allows her to earn a small income. While this does prolong women's workday, it also provides them with an opportunity to earn their own money. Since women highly value possibilities to contribute to the household's income, it can be concluded that in this case, electric lighting is rather appreciated for meeting productive gender needs than disapproved for prolonging the working day. However, meeting women's productive gender needs is affected by women's high illiteracy rates, high investment costs, the lack of business skills and technical knowledge as well as doubts and suspicion towards technical devices, which leads to a rather little uptake of income-generating activities by women so far.

Finally, findings also show that electricity addresses women's strategic gender needs. This paper revealed that income generating activities do not only have the potential to meet productive gender needs but also address strategic gender needs. The interviewed women stated that by providing an additional income to the household they feel more valuable within the household and consider themselves more equal to their husband. Further, their decision-making power and self-esteem may increase. However, women also face various constraints regarding their role as entrepreneurs. In the case of Bangladesh, women own but do not necessarily manage and operate the solar huller themselves. It is therefore questionable if their self-esteem was increased since apart from owning the huller, their participation and decision-making power remains rather limited. Furthermore, Bengali women need electricity to foster their education and broaden their horizon. Since the majority of the interviewed women are illiterate, being educated and informed is highly valued among all of them. Having access to electricity means access to light for evening studying and access to information devices such as a TV and radio. They see education as a key to gain power and a way to claim their rights and take decisions. Although the interviewed women do not see education as an option for themselves, they highly value it for their children especially their daughters to become more emancipated. While the limited scope of this study does not allow for an in-depth analysis of the linkages between information devices and women's stances, the findings indicate a positive impact of television and radio concerning traditional gender roles. Women with access to radio and television claim equal access to education and job opportunities for both, women and men. For instance, women got to know that marrying off their daughters before the age of eighteen is prohibited by law and prosecutable, which led to less child marriages. Not only information and entertainment devices, but also communication devices such as cell phones enable access to information, thus addressing a strategic gender need too.

Overall findings elucidate that the different aspects of access to electricity cannot clearly meet either a practical gender need, a productive gender need or a strategic gender need. Often, one aspect of electricity addresses more than one gender need. Nevertheless, it came out clear that electricity addresses above all practical gender needs. This can be related to the fact that women's primary concerns revolve around practical needs. While access to electricity can reduce women's workload, facilitates job opportunities and strengthen their empowerment, it depends on the women and the specific context if this savings of time is translated into practical, productive or strategic benefit. This study could identify four influencing factors: available

infrastructure, financial background, traditional norms and prevailing customs, as well as women's motives. Meeting women's gender needs depends on whether they are able to access, own, manage and operate electric devices, but also whether they have access to loans or opportunities to earn their own income in order to acquire labor-saving appliances. This depends on whether women are able to break down existing norms and customs that limit their decision-making power, rights and reinforce their low social status in society. Lastly, women's preferences, whether they want to be the primarily beneficiaries or they want their children or husbands to benefit first is an important determent.

As demonstrated in this thesis, access to solar driven electricity and improved electric appliances can yield time- and cost saving benefits, which are especially relevant for women, who often bear the burden of most household responsibilities. Further, the underlying theory suggests that access is about women's ability to benefit from electricity and thus meeting their practical, productive and strategic gender needs. According to Ribot & Peluso (2003), women's ability hereby is strongly determined by their capital, social networks and existing power relations within a household, which enable or restrict them to benefit from electricity. Thus, structural and relational mechanisms of access including access to technology and therewith job opportunities as well as knowledge allows women to fulfil their gender needs and be empowered. Accordingly, in order for women to benefit from electricity, they have to be given more power of authority choices about energy use, especially household energy use. Enabling choices for women warrants a sustainable livelihood and poverty alleviation through access to time-saving devices, access to less physically exhausting devices, and access to income generating activities. Women should be able to act upon the energy choices available to them. Such a transformation in decision-making requires not only women's social but also political empowerment. If rural electrification projects are to be successful, their policies must target women specifically. There is a need for development organizations and government agencies to increase the promotion of policies that encourage the use of solar mini-grids and reduce the dependence on biomass and kerosene in rural areas. One such policy should be the amplification of development projects that promote rural electrification technologies tailored to women's needs and preferences. Due to their role as the manager of the household, women are the main users of these technologies and can play a substantially part in raising awareness and demand for rural electrification. Rural electrification policies therefore need to incorporate women's needs and preferences into the design and implementation process of their programs. The rural energy sector needs to provide equipment, which is tailored to women's needs in terms of reducing and facilitating their drudgery, and that at affordable prices. This is definitely not an easy but feasible challenge not only for Bangladesh's energy sector but also for other developing countries. Designing productive appliances that are easy to use in order to encourage women to abandon traditional methods and adopt improved technologies should have hereby priority. Mostly, women in Bangladesh are hardly aware of the possibilities of solar energy carriers, nor of the potential that these energy sources open up. What is known is that women in general place a high priority on electricity, but primarily for lightning, communication, information and entertainment. What many organizations do not consider is that women will not use devices that do not suit their needs and preferences. To accurately assess women's preferences and to ensure a higher uptake, organizations must provide women with sufficient information on the benefits and conduct follow up questions, as many technologies require maintenance and to evaluate the impact on a regular and long-term basis. Unfortunately, very little information is currently available on how women use improved solar energy technologies in the developing world, and there is even less information on the social and economic impact of the productive use on the lives of female users of these technologies. Besides, the collected data should be accessible to all organizations worldwide, which allows them to make more informed choices and allows scientists, development workers, engineers and politicians to learn from each other's successes and failures. Data on successful and unsuccessful technology interventions is necessary to systematically formulate effective policy and eradicate poverty in general and energy poverty in specific.

This study hoped to show that rural electricity programs can yield social as well as economic benefits that have the potential to improve the lives of women. Nevertheless, it should be noted that electricity is not always the best form of energy for meeting women's gender needs neither their energy needs. As discussed earlier, it is not the cheapest mean of cooking, as most of the current cooking fuel is collected free in the nearby forest. Neither does electricity, produced by solar energy, has yet a high efficiency in providing process heat for many production processes, nor for serving fridges or freezers to keep food and medications safe.

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Appendix

Appendix I: Level of Electrification

Level I	Unelectrified
Level II	With standalone SHS
Level III	Without SHS but connected to the mini-grid
Level IV	With SHS and connected to the mini-grid

Appendix II: Main Characteristics of Interviewees in Rural Households

	Name	Sex	Age	Marital Status	No. of Children	Level of Electrification
1.	Puneet	Female	17	Married	2	Level IV
2.	Nishat	Female	38	Married	8	Level III
3.	Farida	Female	40	Married	6 (2 died of cancer)	Level IV
4.	Neeha	Female	88	Widowed	10	Level IV
5.	Mohammed	Male	50	Married	6 (2 died of cancer)	Level IV
6.		Male	45	Married	4	Level III
7.	Leyla	Female	30	Married	4	Level II
8.	Amna	Female	22	Married	2	Level II
9.	Trishna	Female	27	Married	3	Level I
10.	Nadya	Female	31	Married	3	Level I

Appendix III: Interview Guide for Respondents in Rural Households

Interview

Thank you for agreeing to take part in this interview. My name is Jella Haag and I writing my Master thesis for a company that is conducting research on energy access and use in your area. We are conducting interviews amongst people in your community and we are talking to you because you live in this area. During our discussion, I will ask you questions about your everyday life, your relation to other people and your energy usage.

Please say what you think and be completely honest. This is not an interview or exam. There are no right or wrong choices or answers. If there is something that is unclear, it is our fault, not yours, and you will be helping us by pointing it out. So please, if you do not understand things, or find things unclear, tell me.

All the information you give us is anonymous and confidential. Any data used or shared will be done so anonymously with no personal details unless specifically requested, so please speak freely.

Do you want to ask me anything about this survey before we begin? It will take around 1 hour.

Interview questions (open-ended):

1.) What does women empowerment mean for you? (Explanation of empowerment required)
2.) What are the most important things you wish you could have done in your life?
3.) How long have you lived in in the present location?
4.) What was the reason for moving to the present location?
5.) Do you have the feeling as being a daughter of your husband's parents living together can be sometimes quite difficult? (Relation daughter in law and parents in law)
6.) Do you think there are some social behaviours which are only seen as appropriate for women? If yes, what behaviours?
7.) Do you think there are some social behaviours which are only seen as appropriate for men? If yes, what behaviours?
8.) In what aspects of life, do you think it is easier being a girl/woman or a boy/man? Why?
9.) Do you think the responsibilities of a mother are the same as the responsibilities of a father to their families?
10.) Do you think you have the same responsibilities as your husband? What are their responsibilities?
11.) What jobs do you think are appropriate for men but inappropriate for women? (5 options, 5 jobs: 1. putting seeds in the ground, 2. collecting cow dungs, 3. sells stuff at the market, 4. dealing with suppliers, 5.) 12.) What jobs do you think are appropriate for women but inappropriate for men?
13.) Who do you think has an easier life, women or men? Why?
14.) When a woman and a man are together, who does most of the talking?
15.) Do you actually like making decisions?
16.) Who decides what to spend the income for? Who decides what to buy?
17.) What do you spend your income for?
18.) If you earn money, do you give all of your income to your husband, spend it all for yourself, share it with your family? Do you keep some for you?
19.) If you want to buy medicine for yourself, do you have to ask your husband for money or can you afford it yourself?
20.) Where do you keep your savings? Does your husband know about it? 21.)
Who is registered? Boys and girls? (Aspiration)
22.) What future do you see for your daughter?
23.) What would you wish for your daughter's life? How do you want your daughter's life to look like? Should it be different from you own life?
24.) How should your daughter be treated by her husband?
25.) Do you think boys and girls should be brought up differently? (differently in terms of role distribution, food distribution – should boys get food first? Etc.) Why?
26.) Do you think there are different expectations for sons and daughters? Why?
27.) What do you wish for your children's life? For your son? For your daughter?
28.) Question for children: What do your dream of becoming in your life?
29.) What does electricity mean for you?
30.) Who decides what to use the electricity for?
31.) Who decides which electric appliances to purchase?
32.) Have you or your family experienced any health problems related to smoke/dirt from kerosene lamps?

Appendix IV: Questionnaire for Respondents in Rural Households

Household Questionnaire modules for Women's Empowerment in Energy Access Example Questionnaire for Bangladesh:

Informed Consent for Women's Empowerment in Access to Energy

DUPLICATE: *Enumerator: Tear out this page, and leave it with the household.*

Informed Consent: *Before beginning the interview, it is necessary to introduce the household to the survey and obtain their consent to participate. Make it clear to them that their participation in the survey is voluntary. Please read the following statement in the language of interview:*

Thank you for the opportunity to speak with you. We are a research team from ME SOLShare working in collaboration with the Upokulio Biddutayan O Mohila Unnayan Samity (UBOMUS). We are conducting a survey to learn about energy consumptions and needs, intra household relations and wellbeing of households in this area. You have been selected to participate in an interview which includes questions on topics such as your family background, dwelling characteristics, asset ownership and income earning activities. The survey includes both a section to be asked about the household generally, in addition to sections which will be asked to a primary adult male and female in your household if applicable. These questions in total will take approximately 1 hour to complete and your participation is entirely voluntary. If you agree to participate, you can choose to stop at any time or to skip any questions you do not want to answer. Your answers will be completely confidential; we will not share information that identifies you with anyone. After entering the questionnaire into a data base, we will destroy all information such as your name which will link these responses to you.

We will also interview other households in your community and in other parts of Bangladesh. After we collect all the information we will use the data to make a study about how access to electricity can be most helpful to the people in this area. Do you have any questions about the study or what I have said? If in the future you have any questions regarding study and the interview, or concerns or complaints we welcome you to contact Daniel Ciganovic by calling +8801709-275350. We will leave one copy of this form for you so that you will have record of this contact information and about the study.

Please ask the participants (male and female) if they consent to the participation in the study (check one box):

Participant 1:	YES ☐	NO ☐		Participant 2:	YES ☐	NO ☐	

I _____, the enumerator responsible for the interview taking place on _____, 2016 certify that I have read the above statement to the participant and they have consented to the interview. I pledge to conduct this interview as indicated on instructions and inform my supervisor of any problems encountered during the interview process.

If the household does not give consent to all of the data collection, stop the interview and inform your team leader. Team leaders will discuss the reason for this refusal and decide whether a partial data collection is possible for this household.

Consent form approved by ME SOLshare on 05.05.2016 and by UBOMUS on 05.05.2016.

LISTING OF SURVEY MODULES			
HOUSEHOLD LEVEL QUESTIONNAIRE		**INDIVIDUAL LEVEL QUESTIONNAIRE**	
Module A	HOUSEHOLD IDENTIFICATION	**Module H1**	INDIVIDUAL IDENTIFICATION
Module B	HOUSEHOLD LISTING AND DEMOGRAPHICS	**Module H2**	ROLE IN HOUSEHOLD AND DECISION-MAKING
Module C	HOUSEHOLD ASSETS	**Module H3**	DECISION-MAKING AROUND PRODUCTION AND INCOME GENERATION
Module D	HOUSEHOLD INCOME	**Module H3**	
Module E	HOUSEHOLD EMPLOYMENT STATUS	**Module H4**	ACCESS TO CREDIT
Module F	CONSUMPTION AND CONSUMPTION HABITS	**Module H5**	TIME ALLOCATION
Module G	DWELLING CHARACTERISTICS	**Module H6**	LEADERSHIP AND INFLUENCE IN THE COMMUNITY

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE A: HOUSEHOLD IDENTIFICATION

[redacted]

A13	MAIN ETHNIC GROUP OF THE HOUSEHOLD (enter CODE 4)	☐☐	

Respondent ID:

CODE 1: ELECTRICITY ACCESS	**CODE 2: Religion**	**CODE 3: Language**	**CODE 4: Ethnic group**	**CODE 5: Outcome**
Household without access to electricity.....1 Household with Solar Home System (SHS)...2 Household with SOLbox……..3	Muslim……1 Hindu……..2 Christian-Protestant…….3 Christian-Catholic…….4 Other (specify)……..5	Bengali……1 Marmarn……2 Barman……..3 Chakmathun……4 Monipurian……....5	Garo……1 Shaota……2 Marma……3 Chakma……4 Monipuri……5	Completed……1 Incomplete……..2 Absent……..3 Refused……4 Could not locate……..5

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE B. HOUSEHOLD LISTING AND DEMOGRAPHICS (REQUIRED).

Enumerator: Ask these questions about all household members.

Respondent ☐☐ *ID:*

First, we would like to ask you about each member of your household. Please list the names of everyone considered to be a member of this household, starting with the primary respondent.

ID CODE	How many people are living in the household? ☐☐ Name of household member? [start with primary respondent, continue with the secondary respondent, and other members in descending order of age]	What is [NAME's] sex? 1 = M 2 = F	What is [NAME's] relationship to the primary respondent? **(CODE 1)**	What is [NAME's] age?	What is [NAME's] marital status? **(CODE 2)**	If married, in which age?	If early marriage, why? **(CODE 5)**	If married, was it a love marriage or did [NAME] parents decide whom to marry? 1= Love 2= Arranged	What is the best age for girls to get married? [*Choose number from 1025*]	Can [NAME] read and write? **(CODE 3)**	Is [NAME] currently attending school? 1 = Yes 2 = No	What is the highest level of education completed by [NAME]? **(CODE 4)**
	B01	**B02**	**B03**	**B04**	**B05**	**B06**	**B07**	**B08**	**B09**	**B10**	**B11**	**B12**
1												
2												
3												
4												
5												

6												
7												
8												
9												

Code 1 (B03): Relationship to primary respondent	**Code 2 (B05): Civil Status**	**Code 3 (B10): Literacy**	**Code 4 (B12): Education level**	**Code 5 (B07): Reasons for early marriage**
Primary respondent……1 Spouse……..…....2 Son/daughter……..……..……3 Son/daughter-in-law……..4 Grandson/granddaughter…..……5 Mother/Father..……....6 Brother/sister……7 Nephew/niece……..……8 Nephew/niece of spouse…….....9 Cousin of primary respondent…10 Brother/sister-in-law…….....11 Mother/father-in-law……..……12 Cousin of primary respondent's spouse ……...……..13 Other relative……....14 Maid……...15 Other relationship (specify).....16	Single/never married.....1 Divorced.....2 Separated.....3 Widowed.....4 Customary marriage, monogamous.....5 Customary marriage, polygamous.....6 Religious marriage, monogamous.....7 Religious marriage, polygamous.....8 Civil marriage, monogamous.....9 Civil marriage, polygamous.....10 Cohabiting, single partner.....11 Cohabiting, multiple partners.....12 Not applicable.....98	Cannot read and write……1 Can sign (write) only……..2 Can read only…….3 Can read and write …….4	No school.....0 Primary level 1.....1 Primary level 2.....2 Primary level 3.....3 Primary level 4.....4 Primary level 5.....5 Primary level 6.....6 Primary level 7.....7 Senior Secondary 1……8 Senior Secondary 2.....9 Senior Secondary 3.....10 Senior Secondary 4.....11 Tertiary after O-level.....12 Secondary 5.....13 Secondary 6.....14 Diploma/ Univeristy degree or above……15 Technical or vocational……16 Adult literacy only (no formal education)….....17 Koranic/religious only (no formal education)……18 Don't know……..…..…....97	Prevalence of customs, values, traditions…....1 Economic hardship……2 To save money on dowry……..……...3 Difficulty supporting and caring for many children……4 Security concerns for the girl……..…5

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE C: HOUSEHOLD ASSETS

Respondent [|] *ID:*

	ASSET TYPE	Does anyone in your household currently have any [ITEM]?	Who **owns** it? **(CODE 1)**	Who is the **main** user? **(CODE 2)**	Who would you say can decide whether to sell, give away, mortgage or rent [ITEM] most of the time? **CIRCLE ALL APPLICABLE**	Who would you say can decide whether to purchase a new [ITEM] most of the time? **CIRCLE ALL APPLICABLE**
		D 01	**D 03**	**D 04**	**D 05**	**D 06**
	a) WORKING ASSETS					
	Rickshaw	YES……..1 NO……..2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER ....4 NOT APPLICABLE……..98
	Push cart	YES……..1 NO……..2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Bullock	YES……..1 NO……..2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Boat	YES……..1 NO……..2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98

	Permanent asset of shop	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4

					NOT APPLICABLE…….98	NOT APPLICABLE…….98
	Temporary asset of shop	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	b) PRODUCTIVE ASSETS					
	Adult Cattle / Buffalo	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	Calf	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	Goat / Sheep	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	Poultry (chicken)	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	Pigs	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98
	Other (including fishing net)	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE…….98

	Mortgage land	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Homestead (vegetables)	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Other productive assets (Tree, fruits tree, vegetables, jute, turmeri	YES……..1 CNO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3

	ginger, any seeds etc.)				OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Cottage Industry Equipment including: handloom, spinning reel, potter's or blacksmith's equipment.	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Agricultural Equipment including: plough, spade, shabal, axe, sickle etc.	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Water pump	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Sewing machine	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	c) NON-PRODUCTIVE ASSETS					
	Fan	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98

	TV	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Radio	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Mobile Phone	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Bicycle	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Wardrobe	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Chairs	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Mattress	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Bed	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Other Household Items including: water container, clothes rack, pots and pans, umbrella, torches, crockery and plastic items.)	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER …….3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98

	Other permanent asset	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Other temporary asset	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98
	Other (specify)	YES……..1 NO……2			SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98	SELF .....1 PARTNER/SPOUSE .....2 OTHER HH MEMBER ……...3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE……98

	CODE 1 (D03): Ownership	**CODE 2(D04): Usage**
	I own it……1 My husband owns it……2 My wife owns it……3 My spouse and I own it jointly……4 My mother owns it ……5 My father owns it……6 My mother-in-law owns it ……7 My father-in-law owns it ……8 My cousin owns it……9 My neighbor owns it……10 The community owns it……11 Other (specify)……12	I own it……1 My husband owns it……2 My wife owns it……3 My spouse and I own it jointly……4 My mother owns it ……5 My father owns it……6 My mother-in-law owns it ……7 My father-in-law owns it ……8 My cousin owns it……9 My neighbor owns it……10 The community owns it……11 Other (specify)……12

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE D: HOUSEHOLD INCOME

Respondent | | | *ID:*

	What is the monthly income of the HH (Taka)?			
	How much is the wife/husband earning?	Husband: _____	Wife: _____	
	Who decides what to spend the income for? **(CODE 2)**			
	If a HH faces income constraints, what do you think is the best coping strategy? **(CODE 3)**			
	Income Source	**Cash Income (Taka)**	**In-Kind Income (Taka)**	Who is contributing to the income? (**CODE 1**)
01	Agricultural Daily Labour			
02	Other Daily Labour			
03	Domestic Work			
04	Rick/van/boat/bullock/pushcart			
05	Owned Rick/van/boat/bullock/pushcart			
06	Rented Rick/van/boat/bullock/pushcart			
07	Skilled Labour (Specify)			
08	Own Agricultural Produce			

09	Veg producer on homestead land			
10	Veg producer on khas char land			
11	Farmer on leased in land or waterbody			
12	Farmer on temporary lease of khas arable land or water boc			
13	Farmer on own land or waterbody			
14	Fishing / Aquaculture			
15	Livestock / Poultry / Ducks			
16	Industrial / Garment Labour			
17	Petty Trade (Specify)			
18	Other Trade / Business (Specify)			
19	Grocery shop			
20	Other shop (tea)			
21	Purchased firewood seller			
22	Repair vehicles			
23	Cottage Industry / Handicraft			
24	Service / Job (Specify)			
25	Transport Worker (Bus & Truck)			
26	Begging			
27	Rag picking / Scavenging			
29	Motorised Van			
30	Fuel Sales (Without purchased firewood)			
31	Child Labour			
32	Rural Maintenance Programme			
33	Foreign Remittance			
34	Donation from Relatives			
35	Fetra / Zakat			

36	Government Allowance (Including: disability allowance; VGD / VGF; widows allowance; old age allowance; freedom fighter allowance; education allowances.)			
37	Training Allowance from NGO			
38	SOLshare Relief			
39	UBOMUS Relief			
40	Other NGO Relief			
41	Loan Taken			
42	Savings Withdrawal			
43	Other (Specify)			

CODE 1 **Contributors of income**	**CODE 2** **Spending income**	**CODE 3** **Income constraints**
Me……..1 My husband……..2 My wife……..3 My mother…...……...4 My father……...5 My father-in-law……...6 My mother-in-law……7 My son……..8 My daughter…….....9	Me……..1 My husband……..2 My wife……..3 My mother…...……...4 My father……...5 My father-in-law……...6 My mother-in-law……7 My son……..8 My daughter…….....9	Sending children to work……1 Marry off my daughter before the age of 18…….2 Stop sending children to school……3 Only adults should be affected by income contraints……..4

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE E: HOUSEHOLD EMPLOYMENT STATUS

Enumerator: Ask these questions about all household members <u>over the age of 5</u>.

The respondent should be the one most knowledgeable about the employment activities of household members.

Respondent [ ][ ] *ID:*

ID CODE	Name (First)	What was the employment status of [NAME] in the past 7 days? **(CODE 1)** **if 5-11 >> next member**	What is [NAME]'s primary occupation in terms of how much time you spend? (**CODE 2)**	What is [NAME]'s secondary occupation in terms of how much time you spend? (**CODE 2)**	Does [NAME] migrate for work? 1 = YES 2 = NO	If migrate, why? (**CODE 3**)	If migrate, for what work? (**CODE 4**)	If migrate, to where?	If migrate, for how long? (**CODE 5**)
		D01	**D02**	**D03**	**D04**	**D05**	**D06**	**D07**	**D08**
1									
2									
3									
4									
5									

6									
7									
8									
9									

CODE 1 (D01): Employment status	CODE 2 (D02; D03): Main Occupation	CODE 3 (D05): Reasons for migration	CODE 4 (D06): Type of work	CODE 5 (D08): Duration of work

Worked for pay (salary, wage, self-employed: see code 5 categories)……..…1
Worked without pay (apprentice, family business, agriculture own land) ……..……2
Did not work but have a job……..3
Did not work but looked for a job……..4

Did not work because:
Only studied (student)…….....5
Too young (not student)……6
Too old/retired……..7
Home/household work (incl live-in servant)……8
Disabled/invalid……9
Don't need to……..……..10
Other (specify)……..……11

Wage labor
Agricultural day labor 1
Factory worker 2
Transport worker (e.g. bus/truck helper)……3
Earth work labor ……...4
Construction labor 5
Sweeper.....6
Scavenger 7
Tea garden worker 8
Apprentice.....9
Other Wage labour 10

Salaried worker
Government/ parastatal 11
Private enterprise (e.g. sales person, manager)…….....12
Housemaid.....13
Teacher (Primary school) 14
Teacher (High school) 15
Teacher (College/university) ……16
NGO worker 17
Other salaried worker 18

Self-employment
Milk collector 19
Feed supplier 20
Animal Breeder 21
Veterinary doctor 22
Para veterinary doctor 23
Fisherman 24

Driver /Boda boda 25
Tailor/seamstress 26
Potter/brickmaker 27
Blacksmith 28
Welder 29
Hair cutter 30
Cobbler 31
Clothes washer 32
Repairman (appliances)……33
Carpenter 34
Mason 35
Contractor 36
Doctor/Engineer.....37
Herbal doctor.....38
Lawyer/deed writer/.....39
House tutor 40
Religious leader (Imam/ Muazzem/Paster).....41
Plumber 42
Electrician 43
Mechanic (vehicles/bike) 44
Midwife 45
Beggar 46

Production
Food Processing 47
Brewer/alcohol processing…….48
Handicrafts..... 49
Other small industry 50

Trader
Small trader (roadside stand or stall)….51
Medium trader (shop or small store……52
Large trader (large shop or whole sale).53

Farming
Working own farm (crop production)….54
Share cropper (crop production)…….....55
Fish farming/fish pond .....……..56
Raising poultry.....57
Raising livestock .....……..58

Other self-employed (specify)……..…..59
No primary or Secondary occupation……..……98

Debts……..1
Natural catastrophe (flood, drought)….2
Quality of soil……3
Crop failure……..4
Shortage of work opportunities…….5
Better jobs elsewhere…….6

Truck driver……1
Rickshaw driver.....2
Domestic made……3

Every day.....1
Several days.....2
Several weeks.....3
Several months….4

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE F: CONSUMPTION AND CONSUMPTION HABITS

Enumerator: Ask this section to the female head/spouse or member who has the most knowledge on food preparation.
*(This section should be administered to **women only**)*

Respondent [ ][ ]

Question		CODE	Response
H01	In the past 4 weeks was there ever no food to eat of any kind in your house because of lack of resources to get food?	1 = Yes 2 = No (if No >>H03)	
H02	How often did this happen in the past 4 weeks?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (> 10 times)	
H03	In the past 4 weeks did you or any household member go to sleep at night hungry because there was not enough food?	1 = Yes 2 = No (if No >>H05)	
H04	How often did this happen in the past 4 weeks?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (> 10 times)	
H05	In the past 4 weeks did you or any household member go a whole day and night without eating anything at all because there was not enough food?	1 = Yes 2 = No (if No >>H07)	
H06	How often did this happen in the past 4 weeks?	1 = Rarely (1-2 times) 2 = Sometimes (3-10 times) 3 = Often (> 10 times)	

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE G: DWELLING CHARACTERISTICS

Respondent | | |

C01. ENUMERATOR: OBSERVE (DO NOT ASK) Roof top material (outer covering): **(CODE 1)**		**C09.** Does this dwelling have access to electricity? 1=Yes 2=No	
C02. ENUMERATOR: OBSERVE (DO NOT ASK) Floor material: **(CODE 2)**			Amount
C03. ENUMERATOR: OBSERVE (DO NOT ASK) State of the dwelling: **(CODE 3)**		**C14.** How many lights do you have?	
		Kerosene lamp	
		LED	
		Oil lamp	
		Torch	
		Incandescent lamp	
		Candle	
		Energy saving lamp (CFL)	
		Others (specify) _____	
C04. How many rooms are there in this dwelling? (Do not consider bathrooms, hallways, shelter etc.)		**C10.** Do you offer services where electricity is used for? **(CODE 7)**	
C05. How many rooms are used exclusively for sleeping?		**C11.** If yes: which household member?	
C06. What is the main type of toilets your household uses? **(CODE 4)**		**C12.** If yes: Where do you receive the electricity from?	
C07. What is the main source of water for general use of the household? **(CODE 5)**		**C13.** If yes: Do you create any income from these services and how much?	
C08. What is the main source of cooking fuel for this household? **(CODE 6)**		**C.14** What fuel or energy do you use to get lighting or power these lights and/or appliances you just mentioned? **CODE 8 (**	
		C15. What is your monthly household spend on each of the energy sources you use for lighting, powering electrical appliances or cooking, on average?	

	Not applicable / do not use	0 – 50 tk	50 – 100tk	100 – 200tk	200 – 500tk	More than 500tk
Firewood						
Kerosene						
CNG						
Coal						
Batteries						
Grid connection						
Mini-grid						
Diesel grid						
Own diesel generator						
Own SHS						
Shared SHS						
Others (specify)						

CODE 1: (C01): Type of roof	CODE 2: (C02): Type of floor	CODE 3: (C03): State of dwelling	CODE 4: (C06): Type of toilet
Tile ……1 Wood……2 Corrugated metal……3 Plastic sheeting……4 Thatched/vegetable matter/sticks..5 Mud/cow dung……6 Other, specify……7	Earth/mud……1 Concrete/flag stone/cement……2 Tile/bricks……3 Wood……4 Other, specify……5	In excellent repair, no sign of wear……1 In good shape, some minor wear-and-tear or damage……2 In moderate condition, some damage and moderate wear-and-tear……3 In poor shape, much damage……4 In very bad shape……5	Flush, shared……1 Flush, private……2 Ventilated improved pit latrine (VIP)……3 Pit latrine……4 Community toilet……5 Pan / bucket……6 No toilet……7 Other, specify……8

CODE 5: (C5): Water source	CODE 6: (C08): Cooking fuel	CODE 7: (C10): Services	CODE 8: (C14): Services
Piped into dwelling ……1 Piped into plot/yard……2 Public tap (someone else's private tap)…3 Tube well/ borehole……4 Protected dug well……5 Protected spring……6 Rain water collection ……7 Unprotected dug well/springs……8 River/ponds/streams ……9 Tankers-truck/vendor ……10 Bottled water ……11 Other, specify ……12	Electricity ……1 Piped or liquid propane gas (biogas)……2 Kerosene……3 Charcoal……4 Firewood……5 Brushwood (thicket)……6 Leaves……7 Chipped woods……8 Animal dung……9 Agricultural crop residue……10 Other, specify……11	Electric vehicle……1 Phone charging……2 Barbour shop……3 Tailor shop……4 Tea shop……5 Shop with a fridge……6 Restaurant……7 Food processing……8	Firewood……1 Oil lamp……2 Kerosene lamp……3 Coal……4 CNG……5 Batteries……6 Connected to main grid……7 Connected to mini-grid (solar)……8 Connected to diesel grid……9 Own diesel generator……10 Own SHS……11 Connected to shared SHS……12 Other (please specify)_____.....13

Household Questionnaire modules for Women's Empowerment in Energy Access

MODULE H: INDIVIDUAL LEVEL QUESTIONNAIRE

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H1: INDIVIDUAL IDENTIFICATION

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H2: ROLE IN HOUSEHOLD DECISION MAKING

Now I have some questions about making decisions about various aspects of household life.

		Respondent ID:

		When decisions are made regarding [ACTIVITY] who is it that normally takes the decision? **CIRCLE ALL APPLICABLE** NOTE: DO NOT ASK G5.02 IF SELF IS THE ONLY RESPONSE	To what extent do you feel you can make your own personal decisions regarding [ACTIVITY] if you want(ed) to?
	ACTIVITY	**H2.01**	**H2.02**
A	Spending income	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
B	Your own (singular) wage or salary employment	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
C	Major household expenditures (such as a large appliance for the house like refrigerator, furniture)	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
D	What electrical appliances to buy (lamps, fan, water pump, rice huller etc.)	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4

E	Installing Solar Home System	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
F	What to use electricity for?	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO NEXT ACTIVITY	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
G	Minor household expenditures (such as food for daily consumption or other household needs)	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO MODULE G5(B)	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
H	Expenditures for clothes	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO MODULE G5(B)	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4
I	Family planning (i.e. when to have children and how many to have etc.)	SELF……1 → SKIP TO NEXT ACTIVITY IF SELF IS ONLY RESPONSE SPOUSE ..... 2 OTHER HH MEMBER ..... 3 OTHER NON-HH MEMBER ..... 4 NOT APPLICABLE ..... 98 → SKIP TO MODULE G5(B)	NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT 4

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H3: ROLE IN HOUSEHOLD DECISION-MAKING AROUND PRODUCTION AND INCOME GENERATION

Respondent ID: | | |

"Now I'd like to ask you some questions about your participation in certain types of work activities and on making decisions on various aspects of household life"		Did you yourself participate in [ACTIVITY] in the past 12 months (that is, during the last [one/two] cropping seasons), from [PRESENT MONTH] last year to [PRESENT MONTH] this year?	When decisions are made regarding [ACTIVITY], who is it that normally takes the decision? **CIRCLE ALL APPLICABLE** **IF THE RESPONSE IS SELF ONLY SKIP TO QUESTION H3.05**	How much input did you have in making decisions about [ACTIVITY]? **USE DECISION CODES FOR H3.03/H3.05** **IF NO DECISION MADE, ENTER 98 AND MOVE TO THE NEXT ACTIVITY**	To what extent do you feel you can make your own personal decisions regarding [ACTIVITY] if you want(ed) to? **CIRCLE ONE**	How much input did you have in decisions on the use of income generated from [ACTIVITY] **USE CODES FOR H3.03/H3.05**
ACTIVITY CODE	**ACTIVITY DESCRIPTION**	**H3.01**	**H3.02**	**H3.03**	**H3.04**	**H3.05**
A	Food crop farming: *These are crops that are grown primarily for household food consumption*	YES ..... 1 NO ..... 2 → *ACTIVITY B*	SELF……..1 SPOUSE……..…2 DAUGHTER……..…..3 SON……4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*		NOT AT ALL..... 1 SMALL EXTENT..... 2 MEDIUM EXTENT..... 3 TO A HIGH EXTENT..4	
B	Cash crop farming: *These are crops that are grown primarily for sale in the market*	YES ..... 1 NO ..... 2 → *ACTIVITY C*	SELF……..1 SPOUSE……..…2 DAUGHTER……..…..3 SON……4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*		NOT AT ALL .....1 SMALL EXTENT .....2 MEDIUM EXTENT .....3 TO A HIGH EXTENT..4	

C	Non-farm economic activities: *Including things like running a small*	YES ..... 1 NO ..... 2 → *ACTIVITY D*	SELF……..1 SPOUSE……..…2 DAUGHTER……..……..3 SON……4		NOT AT ALL…..1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT..4	

	business, self-employment, buy-and-sell		FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*			
D	Domestic work: cleaning the house, washing dishes, washing clothes, cooking, child care, elderly care, care of sick HH member,	YES ..... 1 NO ..... 2 → *ACTIVITY E*	SELF……..1 SPOUSE……..…2 DAUGHTER……..……..3 SON……4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*		NOT AT ALL…..1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT..4	
E	Refurbishment	YES ..... 1 NO ..... 2 → *ACTIVITY F*				
F	Gathering firewood	YES ..... 1 NO ..... 2 → *ACTIVITY G*	SELF……..1 SPOUSE……..…2 DAUGHTER……..……..3 SON……4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*		NOT AT ALL…..1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT..4	
G	Fetching water	YES ..... 1 NO ..... 2 → *ACTIVITY H*	SELF……..1 SPOUSE……..…2 DAUGHTER……..……..3 SON……4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……98 → *NEXT ACTIVITY*		NOT AT ALL…..1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT..4	

H	Food processing (grinding, milling, hulling rice etc.)	YES ..... 1 NO 2	SELF……..1 SPOUSE……..…2 DAUGHTER……..…..3 SON……..4 FEMALE ELDERS……5 MALE ELDERS……6 OTHER NON-HH MEMBER……..7 NOT APPLICABLE……..98		NOT AT ALL…..1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT..4	

H3.03/H3.05 DECISION CODES:

NO INPUT OR INPUT IN FEW DECISIONS……..……01
INPUT INTO SOME DECISIONS……02
INPUT INTO MOST OR ALL DECISIONS……..03 NO DECISION MADE ……...98

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H3.06: ROLE IN HOUSEHOLD DECISION-MAKING AROUND PRODUCTION AND INCOME GENERATION

Respondent ID:

Please tick the boxes whether you agree, partially agree, or disagree with the statement			
	Totally agree	Partially agree	disagree
1. Cleaning babies, giving kids a bath, feeding the kids are a mother responsibility only.			
2. Cleaning the house, cooking and other domestic activities (such as collecting fuel and water) are female responsibilities only.			
3. Taking care of the sick or the elderly is a female responsibility only.			

4. It is a woman responsibility to avoid getting pregnant/use birth control methods.			
5. A man should have the final word about major decision in his home.			
. Wo e ha e e ough k o ledge to pro ide their opi io /ad ice i a discussio .			
. Wo e should keep their opi io s to the sel es i order to ai tai peace i their households ask o e as ell !!! .			
8. A woman should tolerate violence in order to keep her family together.			
9. There are times where a woman deserves to be beaten.			
10. A woman being abused (beaten or physically mistreated) by a family member should seek for legal assistance.			

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H4: ACCESS TO CREDIT

	Respondent ID:

"Next I'd like to ask about your household's experience with borrowing money or other items in the past 12 months."		Would you or anyone in your household be able to take a loan or borrow cash/in-kind from [SOURCE] if you wanted to?	Has anyone in your household taken any loans or borrowed cash/in-kind from [SOURCE] in the past 12 months? **CIRCLE ONE**	Who made the decision to borrow from [SOURCE] most of the time? **CIRCLE ALL APPLICABLE**	Who makes the decision about what to do with the money/ item borrowed from [SOURCE] most of the time? **CIRCLE ALL APPLICABLE**
LENDING SOURCE NAMES[29]		**H4.01**	**H4.02**	**H4.03**	**H4.04**
A	Non-governmental organization (NGO)	YES.....1 NO.....2 → *NEXT SOURCE* MAYBE.....3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE 98
B	Formal lender (bank/financial institution)	YES.....1 NO.....2 → *NEXT SOURCE* MAYBE.....3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER.....4 NOT APPLICABLE 98

[29] To adapt to country context, locally relevant examples may be given within lending sources categories.

C	Informal lender	YES.....1 NO……..2 → *NEXT SOURCE* MAYBE……..3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98
D	Friends or relatives	YES.....1 NO……..2 → *NEXT SOURCE* MAYBE……..3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98
E	Group based microfinance or lending	YES.....1 NO……..2 → *NEXT SOURCE* MAYBE……..3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98
F	Informal credit/savings groups such as merrygo-rounds, tontines, funeral societies, etc.	YES.....1 NO……..2 → *NEXT SOURCE* MAYBE……..3	YES, CASH ..... 1 YES, IN-KIND ..... 2 YES, CASH AND IN-KIND ..... 3 NO ..... 4 → *NEXT SOURCE* DON'T KNOW 97	SELF ..... 1 SPOUSE ..... 2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98	SELF .....1 SPOUSE .....2 OTHER HH MEMBER .....3 OTHER NON-HH MEMBER……4 NOT APPLICABLE 98

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

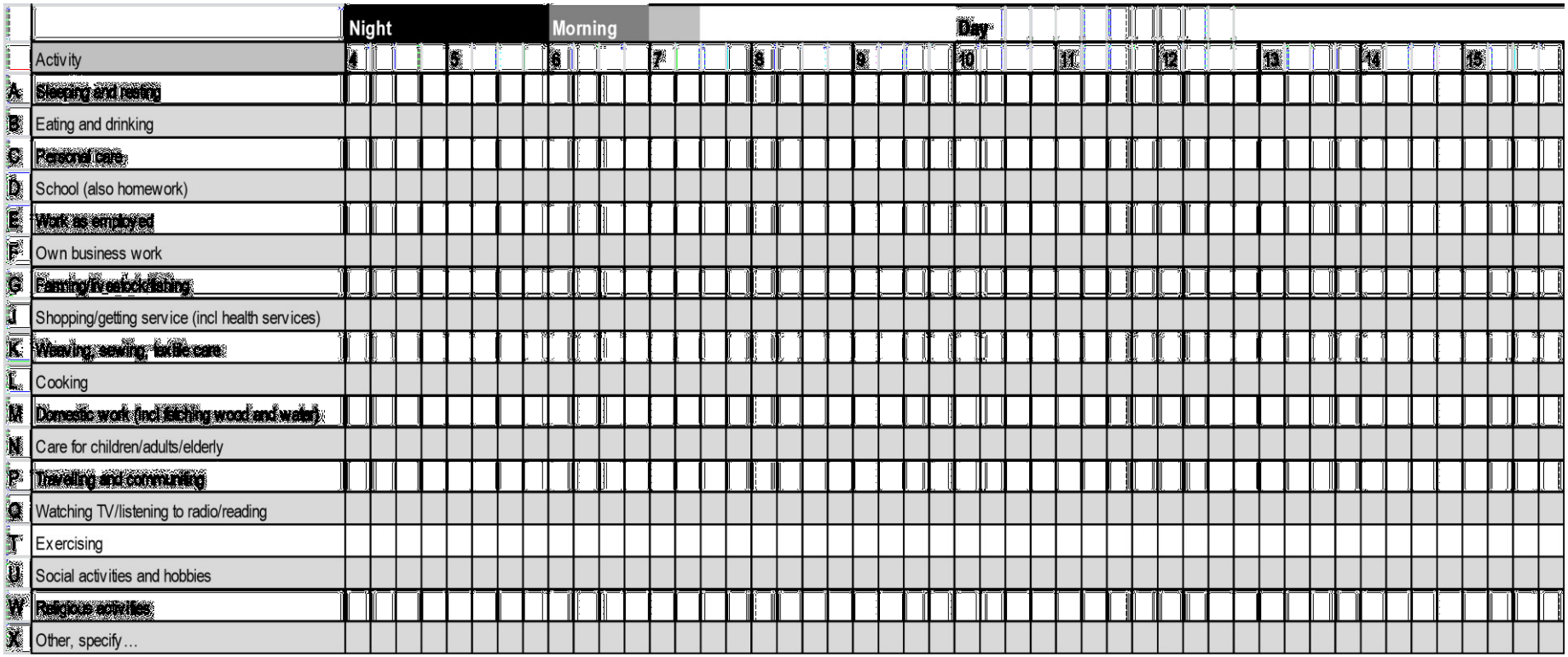
H5: TIME ALLOCATION

Respondent ID:

PLEASE RECORD A LOG OF THE ACTIVITIES FOR THE INDIVIDUAL IN THE LAST COMPLETE 24 HOURS (STARTING YESTERDAY MORNING AT 4 AM, FINISHING 3:59 AM OF THE CURRENT DAY). THE TIME INTERVALS ARE MARKED IN 15 MIN INTERVALS AND ONE ACTIVITY CAN BE MARKED FOR EACH TIME PERIOD BY DRAWING A LINE THROUGH THAT ACTIVITY.

Now I would like to ask you about how you spent your time during the past 24 hours. We will begin from yesterday morning, and continue through this morning. This will be a detailed accounting. I'm interested in everything you do (i.e. resting, eating, personal care, work inside and outside the home, caring for children, cooking, shopping, socializing, etc.), even if it doesn't take you much time.

MODULE H5 continued: TIME ALLOCATION



		Evening												Night																							
	Activity	16				17				18				19				20				21				22				23				24				1				2				3			
A	Sleeping and resting																																															
B	Eating and drinking																																														
C	Personal care																																														
D	School (incl. Homework)																																													
E	Work as employed																																														
F	Own business work																																														
G	Farming/livestock/poultry/fishing																																														
H	Homestead farming (self supply)																																														
J	Weaving, sewing, textile service																																														
K	Shopping (food etc.)																																														
L	Food processing (hull, grind etc.)																																														
M	Cooking																																														
N	Fetching water, collecting firewood																																														
O	Cleaning																																														
P	Care for children/adults/elderly																																														
Q	Travelling and commuting																																														
T	Watching TV/listening to radio/reading																																														
U	Social activities and hobbies																																														
W	Religious activities																																														
X	Other (specify)_____																																														

QNO.	QUESTION	RESPONSE
H5.01	In the last 24 hours did you work (at home or outside of the home) more than usual, about the same as usual, or less than usual? [Please circle the answer]	MORE THAN USUAL……1 ABOUT THE SAME AS USUAL……2 LESS THAN USUAL……3
H5.02	Which of these activities are the most time consuming for you to accomplish? [*Please enter the respective letters of the activity from the chart above*]	
H5.03	Which of these activities are most physically exhausting? [*Please enter the respective letters of the activity from the chart above*]	
H5.04	Which activities could be done during the evening/night with the support of light? [*Please enter the respective letters of the activity from the chart above*]	
H5.05	How many hours of extra light per day do you need?	

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H5.05: SATISFACTION WITH TIME ALLOCATION

Respondent ID:

Next, I am going to ask you a question about how satisfied you are with the time you have to yourself to do things you enjoy.
Please give your opinion on a scale of 1 to 10. 1 means you are not satisfied and 10 means you are very satisfied.
If you are neither satisfied nor dissatisfied, this would be in the middle, or 5, on the scale.

QNO.	QUESTION	RESPONSE OPTIONS/INSTRUCTIONS
G5.02	How satisfied are you with your available time for leisure activities like visiting neighbors, watching TV, listening to the radio?	SATISFACTION RATING:

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H6.01: INDIVIDUAL LEADERSHIP AND INFLUENCE IN THE COMMUNITY

| | | *Respondent ID:*

Now I have a few questions about how comfortable you feel speaking up in public when the community needs to make important decisions. Please answer yes or no to the following question. [Yes = 1, No = 0]

QNO.	QUESTION	RESPONSE
A	I feel comfortable speaking up in public to help decide on infrastructure (like solar panels, connection to the grid, water pumps) to be built in your household or community.	
B	I feel confident that there are people outside my family that I can rely on for help	
C	I feel frightened of moving alone outside my village	
D	I feel confident that I can face whatever the future brings/holds	
E	I feel I have enough information about the government programmes that are designed to help the poor	
F	I feel confident that I am able to join any community group as I wish to.	
G	I feel comfortable speaking and participating in community groups	
H	I feel comfortable addressing Chairmen/Members/Ward Commissioner	
J	I fear people would think they would laugh at their husband doing some of the domestic work	
K	I feel in case of income constraints, I would marry off my daughter at an early age to save dowry money. I am afraid that the dowry will increase when my daughter gets older.	
L	I feel I may face disapproval if I move alone outside my village	

TIME CHECK: [__|__]:[__|__] CIRCLE ONE: AM/PM

MODULE H6.02: GROUP MEMBERSHIP

	Respondent ID:

"Now I'm going to ask you about groups in the community. These can be either formal or informal and customary groups."		Is there a [GROUP] in your community?	Are you an active member of this [GROUP]?
	GROUP CATEGORIES	**H7.01**	**H7.02**
A	Agricultural / livestock producer's group	YES .....1 NO .....2 → *GROUP B* DON'T KNOW……97	YES .....1 NO 2
B	Water users' group	YES .....1 NO .....2 → *GROUP C* DON'T KNOW……97	YES .....1 NO 2
C	Forest users' group	YES .....1 NO .....2 → *GROUP D* DON'T KNOW……97	YES .....1 NO 2
D	Credit or microfinance group	YES .....1 NO .....2 → *GROUP E* DON'T KNOW……97	YES .....1 NO 2
E	Mutual help or insurance group (including burial societies)	YES .....1 NO .....2 → *GROUP F* DON'T KNOW……97	YES .....1 NO 2
F	Trade and business association group	YES .....1 NO .....2 → *GROUP G* DON'T KNOW……97	YES .....1 NO 2

G	Civic groups (improving community) or charitable group (helping others)	YES .....1 NO .....2 → *GROUP H* DON'T KNOW…….97	YES .....1 NO 2
J	Religious group	YES .....1 NO .....2 → *GROUP J* DON'T KNOW…….97	YES .....1 NO 2
K	Other [women's/men's] group (only if it does not fit into one of the other categories)	YES .....1 NO .....2 → *GROUP K* DON'T KNOW…….97	YES .....1 NO 2
L	Other (SPECIFY)_____	YES .....1 NO .....2 DON'T KNOW…….97	YES .....1 NO 2

M	members are voting? (CODE 1) When elections, which household 1. 2. 3. 4. 5.	**Gender** (1 = Male; 2 = Female)	**Age**

M	If not voting, why? (CODE 1)		

CODE 1 (H6.02 M): Reasons for not voting
Women are not allowed to vote……..1
No ID-card……..2
Too young……..3
Not interested……4
Do not know which party to vote……5

END OF QUESTIONAIRE. FILL OUT COVER PAGE OUTCOME H1.05.

Declaration

I hereby solemnly declare that I have prepared the Master thesis on the theme 'Solar Power means Female Power? - How the introduction of electricity supports gender needs in rural Bangladesh' myself. I also declare that this thesis do not contain any copy of other research work.
Where necessary sources of information have been used, they are acknowledged.

Jella Haag, Uppsala, 21 Februrary 2017