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Promoting Women's Empowerment Through Access to Electricity

A Case Study of the Mini-Grid Project in a Rural Village in Myanmar



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Abstract

Men and women have different energy needs, and the lack of access to electricity could be negatively affecting women more than men by reason of women's typical gender norms in a society. However, previous studies and projects' approach rarely recognize the gender dimension on energy. The aim of this thesis is to explore how access to reliable electricity through National Electrification Project's mini-grid project has promoted women's empowerment in a rural village, Myanmar on the basis of gender needs: practical, productive and strategic needs. A qualitative case study approach was conducted with semi-structured interviews. The principle findings show clear benefits of meeting practical and productive gender needs by reducing women's household chores and promoting new income generating activities for access to electricity. But there was limited evidence on meeting strategic gender needs, which are deeply connected to empowering women. However, what can be seen in this rural village could be identified as a bottom-up process where women tried to find gender needs to promote living in a better situation by themselves. Since women's empowerment is hard to measure in a short-term, thus, there might be a possibility of positive impacts of women's empowerment in a long-term for rural women.

Key words: Energy, Electricity, Gender Equality, Empowerment, Gender Needs, Mini-grid, NEP, Myanmar

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Cover photo: Mini-grid project site in Than Pyar Chaung Village, Myanmar.

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Abbreviations

CfP	Call for Proposals
DRD	Department of Rural Development
GIZ	Gesellschaft für Internationale Zusammenarbeit
GoM	The Government of Myanmar
LUMID	Lund University Master of Science in International Development and Management
NEP	The National Electrification Project
RELEC	Promotion of Rural Electrification
RQ	Research Question
SDG	Sustainable Development Goal
SHS	Solar Home System
VEC	Village Electrification Committee

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1. Introduction

Accessing modern electricity is a critical and life-changing milestone in people's life. Today, it is hard to imagine living without electricity. The global electrification rate reached 89 percent in 2017, but 840 million people are still living without electricity access mainly located in Sub-Saharan Africa and Central and Southern Asia. (IEA et al., 2019). It means that one out of ten people does not have access to electricity to light their house and charge their electric appliances that allow women to reduce household drudgery. Many studies insist that access to modern energy has been considered as a key role in facilitating economic and social development from reducing poverty to improving gender equality in developing countries (UNDP, 2007; Habtezion, 2013; Orlando et al., 2018). The United Nations (UN)'s Sustainable Development Goal (SDG) 7: Affordable and clean energy aims at "ensuring access to affordable, reliable, sustainable and modern energy for all by 2030" (UN, n.d.). Since its formulation, energy has garnered greater attention again as it is at the overlapping with other the attainment with various other SDGs, e.g. reducing poverty (SDG 1), improving good health and well-being (SDG 3), increasing education opportunities (SDG 4), economic growth (SDG 8), as well as gender equality (SDG 5) (Nakicenovic et al., 2014; Energypedia, n.d.; UN, n.d.). However, a vital challenge remains in the most rural areas in developing countries without electricity, strongly interrelated with the attainment of SDG 5, which aims at "achieving gender equality and empower all women and girls" (UN, n.d.). These two SDGs are strongly interrelated because modern electricity access is a significant milestone in improving gender equality and women's empowerment in rural areas.

The lack of access to electricity commonly affects women more than men because of women's typical gender roles in a patriarchal family and society (Winther et al., 2019). Previous studies emphasized the positive impact of women's access to reliable electricity and their empowerment, namely, reduced domestic work time and increased time for income-generating activities, and potential benefits of women's empowerment by improving their decision making power in the household and society in a long term (Orlando et al., 2018; Winther et al., 2019; UNOPS, 2020). Myanmar has the lowest electrification rate in the world (ADB, 2017). Especially, access to electricity is extremely limited in rural areas because the national grid systems are not connected

to the most rural areas (GIZ, 2017). According to the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) report, about 34 percent of households have access to the basic electricity services in the country and only 16 percent in rural areas (2017). Moreover, Myanmar women, who live in rural areas, tend to have dual responsibility because of the gender division of labor and patriarchal cultural norms (JICA, 2013).

1.1 Problem Statement

In 2015, the Government of Myanmar (GoM) set an ambitious plan to tackle the deficit of electricity access in the country and approved the National Electrification Project (NEP). The NEP's goal is to achieve complete universal access to electricity in Myanmar's households by 2030, an endeavor that is funded by the World Bank through a US\$400 million loan (World Bank, 2017). The NEP started in 2015 by the GoM with support of the World Bank, the GIZ and many different international organizations to achieve 100 percent universal access to electricity to improve the well-being of the affected population, enable income-generation opportunities, and enhanced productivity by 2030 (World Bank, 2017b; Ministry of Electricity and Energy, 2019). Myanmar assuredly needs electrification investment in the whole country because reliable energy can be the key to Myanmar's economic development and growth (du Pont, 2019). However, the NEP not only catalyzes the country's economic development but also can be instrumental in terms of working towards greater gender equality. Access to reliable electricity would let women use time-saving modern electric appliances and it could reduce women's household drudgery, which in turn, would accelerate the expansion of new economic opportunities (Köhlin et al., 2011; Deloitte, 2014; Orlando et al., 2018).

Men and women have different energy needs. However, the approach of previous research and energy-related reports rarely recognize the gender imbalances persistent in such projects (Cecelski, 2004; Haves, 2012). Clancy et al. (2003) developed a theoretical framework for women's gender needs into energy nexus: practical, productive, and strategic needs. Raub (2013) and Haag (2017)'s case study investigated women's gender needs from access to electricity in a village of Senegal and Bangladesh. This thesis has been inspired by the above case studies that have been done previously.

This case study focuses on one of the first implemented NEP in 2018: Than Pyar Chaung village in the Magway region, Myanmar. Carrying out the present case study has started the assumption that the impact of reliable electricity access may lead women's empowerment by different gender needs.

1.2 Research Aim and Research Questions

This case study aims to examine how access to reliable electricity through the NEP has promoted women's empowerment in Than Pyar Chang villages from meeting following gender needs on energy: practical, productive and strategic gender needs.

Aim: To explore the different gender needs from access to reliable electricity and how it supports in promoting women's lives and empowerment in Than Pyar Chaung village, Myanmar.

This case study will address the following three research questions (RQ) :

- 1. How has stable access to electricity improved women's lives in terms of practical gender needs?**
- 2. How can stable access to electricity extend to women's opportunity in terms of productive gender needs?**
- 3. How does the stable access to electricity meet strategic gender needs?**

1.3 Structure of the Thesis

In the following Chapter two, Myanmar's rural electrification under the NEP, the village studied, and baseline gender dynamics will be presented. Chapter three is comprised of the literature review that will explore existing research on the gender-energy nexus. Chapter four presents a broader investigation of women's empowerment theories, followed by the main theoretical framework of gender needs. The methodology of this report will be described in Chapter five. Chapter six will present the key findings and analysis based on different gender needs: practical, productive, and strategic. Finally, Chapter seven will present the conclusion and future research opportunities.

2. Background

This chapter provides general overviews of the NEP, the village of case study, and gender in the context of Myanmar to support a better understanding of the case study.

2.1 Rural Electrification in Myanmar: The NEP

Myanmar has still one of the lowest electrification rates in the world and lack of access to electricity is one of the biggest problems in rural areas since over 70 percent of the population lives in rural locations (Department of Population, 2015; EuroCham Myanmar, 2018).

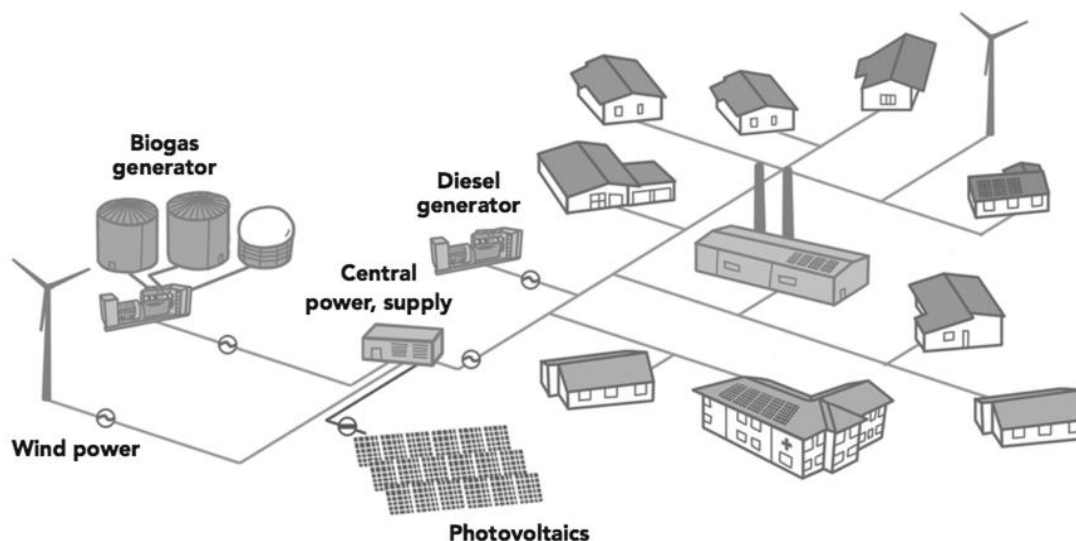
The NEP's main objective is to provide reliable electricity access to rural households that would narrow the rural-urban inequality gap by improving social-economic status in terms of education, health, social, and economics (Ministry of Electricity and Energy, 2019). However, the national power grid network only covers 4,550 villages, which is only seven percent, of the country's 65,000 villages in rural areas (ADB et al., 2016). Most rural areas in Myanmar are difficult to connect to the national grid because their location is very remote and entail exorbitant costs (World Bank, 2017b). Despite it is not expected to receive grid-based electricity service in the next 10 years (World Bank 2018: 3), it is important that rural electrification directly benefits the poor and vulnerable households in rural areas who are not covered by the national grid¹. Thus, the Department of Rural Development (DRD) has been charge the task to ensure off-grid electrification in the NEP. The total budget for the off-grid component is about US\$80 million and it aims at implementing off-grid electrification in rural areas through renewable energy, mini-grid projects², since Myanmar has abundant renewable energy alternatives, such as hydro, solar power,

¹ NEP has four components: grid extension, off-grid electrification, technical support and training to Myanmar government staff, and the contingent emergency response (World Bank 2015). To address this reality, the NEP's off-grid component aims at extending it by supporting the distribution utilities to extend distribution networks and connect villages and households to the national power grid from existing medium voltage substations and construction of new substations (World Bank, 2017b).

² Mini-grids is defined by small-scale electricity generations (from 10kW to 10MW), and the distribution of electricity to a limited number of customers via a distribution grid that can operate in isolation from national electricity transmission networks (GIZ, 2014 :12)

wind and biomass within the country (ADB et al., 2016). Solar Home System (SHS)³ and mini-grid projects are two main sources for off-grid components that enable access to electricity without being connected to the national grid connection in rural areas (World Bank, 2018).

Figure 1: A Mini-Grid system



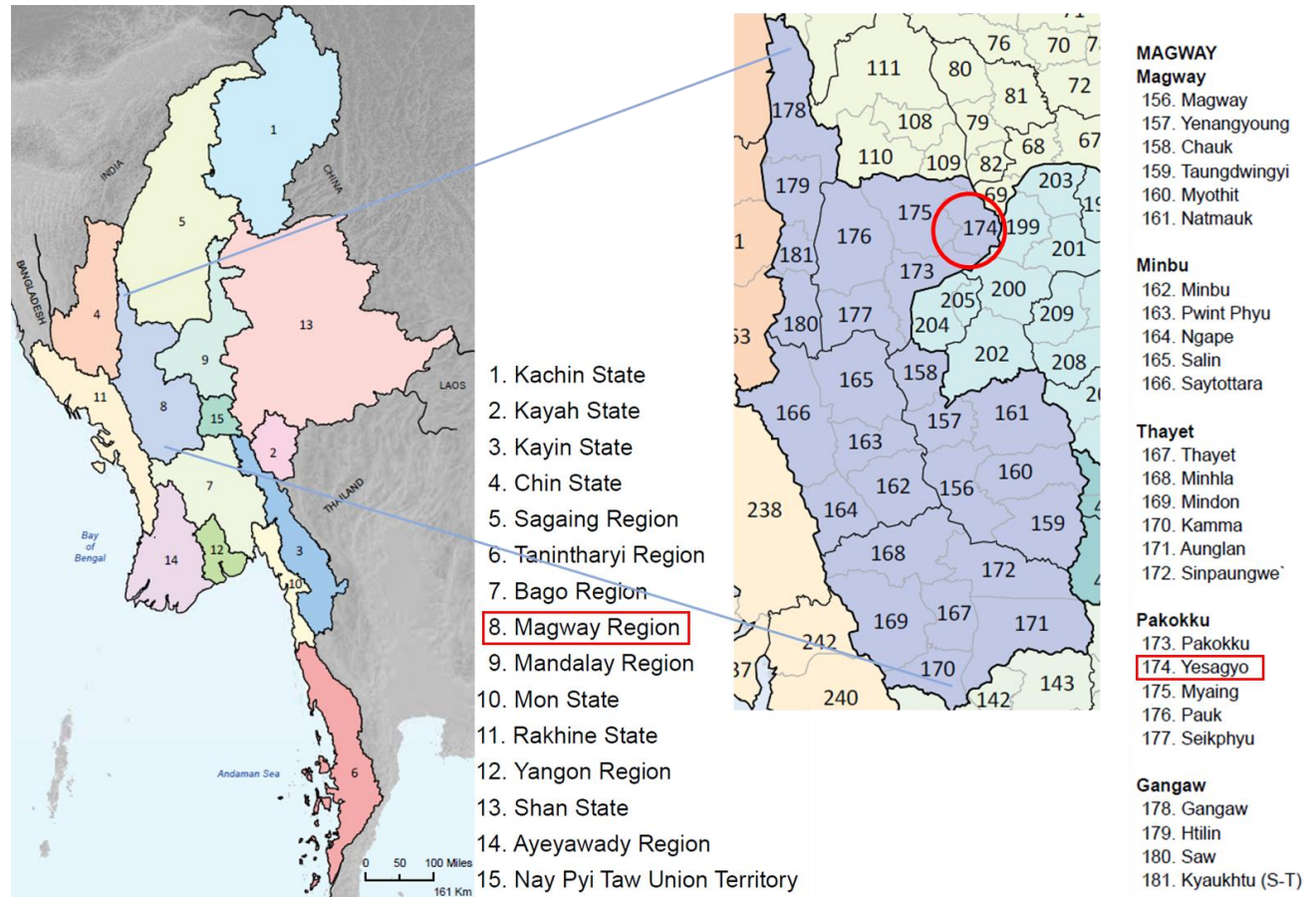
Source: Meier (2017)

Mini-grids can be built to generate and distribute electricity for villages from one of the sources by solar, hydro, biomass, and wind (see Figure 1). Most of the early stage off-grid projects of the NEP have implemented solar mini-grids⁴ which usually consists of solar panels, cable, power station (charge controller, battery, inverter), AC Line to the user in a village (Smart Power Myanmar, 2019: 43). Mini-grids are said to have a greater impact than SHS, because of their ability to support not only residential loads such as lighting and using electric appliances but also larger productive uses, such as machinery for water pumps and agriculture as well as high energy-consuming appliances, such as a refrigerator (ibid). Providing stable electricity with a reasonable tariff to off-grid households is critical for Myanmar's socio-economic development since many other countries' rural off-grid projects have revealed significant social, health, and economic benefits (ibid).

³ A SHS consists of a solar panel (0.02 - 0.05KW) on a pole or a house roof and it can only provide very limited electricity to a household with lighting or charging some small electric appliances (World Bank 2018).

⁴ usually less than 1 MW capacity (equal to 1000KW)

Figure 2. The Map of Case Study, Myanmar



Source: Department of Population (2015)

This thesis will focus on Than Pyar Chaung village as a case study site. Than Pyar Chaung village is located in the Yesagyo township, Magway region in Myanmar (see Figure 2). It was one of the very first mini-grid projects under the NEP's off-grid component. The size of the project is 39kW⁵ and household tariff is MMK 500 per kWh (around 3 SEK)⁶. Before the mini-grid project, a community-owned diesel generator was the main energy source in the village and provided only two hours of electricity a day from seven to nine pm. However, now people enjoy stable electricity for 24 hours. The total households living in the village are 270 households and 243 households

⁵. There were no national records about the village's information. All information related to the village was provided by the mini-grid constructor, Pro Engineering Co., Ltd.

⁶ The exchange currency used was 10 MMK = 0.064 SEK (www.xe.com)

have been connected by the solar mini-grid system since August 2018. The Mini-grid project was implemented by Pro Engineering Co., Ltd under the NEP's second Call for Proposals (CfP).

2.2 Gender in Myanmar

According to 1947, 1974, and 2008 Myanmar Constitutions, women are to enjoy equal rights with men in the economic, social, and political spheres (Tun et al., 2019). But, “as a country enriched with more than a hundred ethnicities and almost 60 years of armed conflicts, women’s issues and their rights have long been the least priority” (ibid: 8). The cultural norms, strong religious myths, and patriarchal institutions keep Myanmar women from their entitled freedom and potential (ibid).

Myanmar society is defined by a patriarchal structure (Gender Equality Network, 2015). Men have strong responsibilities of decision making and household income while women are more taking care of household chores and children (ibid). The cultural norm is affecting a gendered division of labor in Myanmar where men are considered as breadwinner or household leaders and their work is perceived to be more valuable (Tun et al., 2019). While women are considered as caretakers of household members and the less value on their household chores because it is usually unpaid and regarded as women’s responsibility for the family (ibid). Additionally, the local decision-making and power structures are favorable toward men while women prepare in organizing social matter such as weddings, care work, funerals and religious festival in the village, but women are mostly absent in formal decision-making structure (Naujoks and Ko, 2018) This strong social norm is deep-rooted in Myanmar’s education system as well as through teachers, “where boys and men are portrayed as: tough; externally-oriented; breadwinners; focused on production; intelligent; and responsible for national affairs. Girls, on the other hand, are held up as possessing the opposite characteristics, as: quiet and well behaved; focused on reproduction; family-oriented; and modest” (Tun et al.,2019: 142).

In Myanmar, 88 percent of the population is Buddhist (Department of Population, 2015). The practice of Myanmar Buddhists is typically characterized as favoring patriarchal values (Tun et al., 2019). This can be deeply affected in society and this gender dimension of cultural norms center on male spiritual superiority, which is positioned in opposition to female worldly inferiority (ibid:

141). Thus, Myanmar's gender inequality can be observed by cultural and religious narratives that are reproduced through the patriarchal structure (ibid). According to Pascale et al. (2016), a shortage of gender statistics and research, a lack of awareness, and limited institutional capacity are the main barriers facing gender equality and women's empowerment in Myanmar.

Myanmar's patriarchal structure and gender norm are easily found in rural areas where there is a lack of electricity access. Rural women are more faced with barriers than urban women especially with lack of electricity. The lack of access to electricity is most damaging to rural women who are responsible for household chores and cooking. Because of the limited electricity, wood, kerosene, candles, and diesel generators are the major sources of lighting among the rural population in Myanmar (Solar Power Europe, 2019). Many different Surveys reported that women are mainly in charge of collecting fuelwood for the family in rural villages and spent an average of 217 hours in a year collecting fuel woods for their household in Myanmar (Mercy Corps, 2012; UNDP, 2013). Women spend a significant amount of time and effort in collecting fuelwood for cooking and heating in rural areas in Myanmar under the patriarchal structure.

3. Literature Review

Many studies have shown that access to affordable and clean energy for lighting, food processing, cooking, and heating significantly contributes to improving women's basic living conditions in many different countries (ADB, 2012). This section explores the most common findings from previous research regarding gender and energy: Reducing household drudgery, Health, Economic opportunity, Entertainment, Education, and Women's empowerment.

3.1 Reducing Household Drudgery

Many studies examine how improved access to electricity contributes to the baseline of living conditions for women in many different countries. Women tend to spend more time at home and are responsible for most of the household work that can be carried out more productive use with access to electricity (Pact Myanmar, 2018). Stable access to electricity helps women to save time by substituting for manual labor and reducing household workloads (Dutta et al., 2017; Winther et

al., 2019). Studies have shown that women are more responsible for household drudgery and they are required to spend a significant amount of time collecting traditional biomass fuels, such as wood, dung, and agricultural wastes, for house needs (UNDP 2007: 13). The average weight of firewood headloads by women is usually above 25 kilograms in Africa and women normally spend on fuelwood collection average 360 to 720 hours per year (Dutta et al., 2017: 2). These cultural constraints would lead to brutal cycles where girls are expected to contribute household work which their mother has done before and it can come out as a result of lower opportunity for a girl's future in many different ways (Köhlin et al., 2011). Moreover, women need to go to remote areas to collect fuelwood and usually leading to high rates of sexual harassment and assault while collecting fuels in India (UNDP, 2007). Rural women are having time poverty from spending plenty of their time for not only fuelwood collection but also fetching water. In rural Kenya, women spent around two hours a day collecting water (Winther et al., 2019). Time reallocation from using modern electric household appliances, such as a rice cooker, electric stove, and electrified water pumps, and et cetera, can promote women to participate in new income generation, education, and other productive activities (Orlando et al., 2018).

Moreover, access to modern electricity through mini-grid projects have shown many positive impacts on women. In Nepal, women experienced a reduced significant amount of time by using electric rice cookers and electrified water pumps (Winther et al., 2019). In rural Zanzibar showed the immediate outcome of undoubtedly reducing women's and girls' household chores from fetching water from wells located far from their village (ibid). Also, using an electric iron has become common in study areas, Nepal, India, and Kenya where women mentioned that the electric iron has reduced household chores compared with the traditional charcoal iron which takes a long time to heat it and uncomfortable to use during the raining season (ibid). In the Philippines, women could use an electric rice mill run by a mini-grid and this resulted in time-saving and reduced drudgery for women and girls (Haves, 2012).

3.2 Health

Globally, 2.9 billion people live without access to clean cooking which they still rely on traditional biomass, such as wood, dung, and agricultural wastes, to meet their cooking and heating energy

needs (IEA et al., 2019; Jain et al., 2018). Women play a significant role within the household cooking sector and have been negatively affected by cooking with traditional practice (Bloomfield, 2015). The traditional household role makes women exposed to smoke during polluting fuels from cooking and this indoor air pollution contributes about 4million deaths each year, which is more than malaria, HIV, and tuberculosis combined (IEA et al., 2019: 55). Among these deaths, 27 percent are due to pneumonia, 27 percent from ischaemic heart disease, 20 percent from chronic obstructive pulmonary disease, 18 percent from stroke, and 8 percent due to lung cancer (WHO, 2016; WHO, 2018).

There is a significant health risk for those people who use traditional fuels for cooking or heating. Women have greater exposure than men to indoor air pollution by using traditional biomass fuels while cooking (UNDP, 2007). Moreover, this is not only the major environmental health risk toward women but also to children who usually spend time in the house with their mother (WHO, 2016). Women, who use traditional cooking practice, are usually exposed to heavy indoor air pollution three times more than women who use cleaner fuels from energy access (ADB, 2012). These negative impacts of indoor air pollution risks especially affect the poor and vulnerable women in developing countries where they have less control over resources such as stable electricity or any other kind of basic infrastructure for a living (ibid).

Clean cooking is an important part to understand gender impacts on stable electricity access because the use of cleaner cooking technologies, such as an electric cooking appliance, an improved stove, and biogas, has vastly positive impacts on women's health (Haves, 2012). Many researchers have found out that access to stable electricity and modern electric cookstoves have decreased illness and morbidity among women and children who use traditional cookstoves (WHO 2006; Haves, 2012). Moreover, electricity and modern energy service support the functioning of health care clinics or hospitals since electricity connections are vital for hospital operations and the storage of vaccines in refrigerators (UNDP, 2004; IEA et al., 2019).

3.3 New Income Generating Activities

Many studies have shown that women's access to electricity and time-saving electric household appliances would help women to reduce their time and hardship from household chores and it

would facilitate common income-generating activities, such as opening a small shop or home-based part-time job (Winther et al., 2019; Haves, 2012; UNDP, 2007). When households can use reliable electricity, the light is the most popular and common to use in the house which affects the whole family by effectively extending the day (Haves, 2012). Some women, from the mini-grid electrification village, were observed using electricity for opening new businesses for poultry farming, tailoring, and improving their working conditions due to improved lightning in Nepal (Winther et al., 2019). Similar studies have shown that some women had started new home-based income-generating activities such as wrapping cigarettes and processing nuts due to time gain from access to electricity in Sri Lanka and Indonesia (Haves, 2012: 3). Moreover, another study found out that electrified households' women were more likely to work at night (Barkat et al., 2002). According to the World Bank (2007), 38 percent of households re-invested energy costs through mini-grid to buy more agricultural production for their family or used savings to seed for small enterprises and income from small businesses increased by 50 percent on average for newly mini-grid electrified households in Nepal. Haves (2012) insisted that "For women, it is not only about increased incomes, but can also challenge stereotypes about women's roles. This can result in greater gender equality" (7). Women's income-generating activities would allow them to improve their social and economic status and promote the living standards of their families (Lambrou and Piana, 2006). Moreover, there is much evidence suggesting that women have more decision-making power in their homes when they earn an income from outside (Haves, 2012).

However, the above evidence does not specifically mean that women's income-generating activities always give a positive impact on women. There are many concerns that improved income-generation opportunities through access to electricity for women would usually increase workloads and burden combined with their existing women's traditional responsibilities and newly added activities (UNDP, 2007). Some studies found that there is a knowledge gap regarding the impact of access to electricity on income generation opportunities for women that some income generation evidence based on impacts is anecdotal or based on aid projects with lack of independence and depth (Hedon, 2015).

3.4 Entertainment: Changing Gender Norms by Accessing Television

Electricity access positively affects women's life by giving entertainment and new information. Access to new information and enjoying entertainment are the major benefits identified by women through watching television and radio (ADB, 2012). Reduced household drudgery of using electric appliances has allowed women to enjoy more entertainment and access to information by the media (Winther et al., 2019). Television and radio can facilitate access to new information and expand women's horizons (ibid). Mostly, those appliances are placed in the common space, such as in the living room, of the household, and women can watch or listen to the news while taking care of household chores or children at the same time (ibid). Those devices are valuable determinants of increasing awareness and achieving knowledge for the illiterate rural women (Haag, 2017). Previous studies demonstrated that watching television or listening to the radio have modified gender norms which resulted in changing women's attitudes toward gender discriminating norms in the rural areas (Köhlin et al., 2011; Winther et al., 2017).

Television is the first commonly used of electricity and there is evidence in Brazil and India that the content of television programs affected norms that discriminate against women and it led to reducing high fertility rate in rural areas which can bring positive impacts for women in a long term (Köhlin et al., 2011; ENERGIA, 2016). Moreover, rural India's case study has proved that access to electricity positively affects girl's education through access to cable television to provide entertainment and information which helped to change girl's attitudes towards gender discriminating norms (Winther et al., 2017).

3.5 Improving Education Opportunities

Access to stable electricity improves children's school enrolment and attendance, especially for girls (Winther et al., 2017). In Zanzibar, electrified water-pumping in the village helped women and children to save up to three hours a day and it could significantly boost school enrollment for their children (Köhlin et al., 2011). Many studies mentioned access to electricity has positively affected not only women but also girls since they spend more time collecting water and fuelwood which affects low girl's school attendance in rural areas (UNDP, 2007). In Brazil, girls from electrified rural areas experienced 59 percent more likely to complete primary education than un electrified rural areas (O'Dell et al., 2014). Another research, which was conducted in Mali,

showed that girl's school performance improved due to relief from early morning duties and it led to more regular school attendance because mothers can handle domestic chores herself with access to electricity (UNDP, 2007). Some studies insisted that the biggest impacts in school are where students and teachers are getting better lighting which helps them to focus on their studying (Hedon, 2015). Also, access to stable electricity has increased women's literacy rate. Bangladesh's case study showed that women's literacy rate from electrified households is more than 20 percent higher than non-electrified households (Dutta et al., 2017).

As previously mentioned, watching television also can be evidence of electricity's positive impact as a tool of education toward women. According to the World Bank (2017a), "increased exposure to television often improves access to information and may depict new norms, such as family planning and smaller family sizes, leading to changes in desired fertility" (3).

3.6 Empowerment

According to Winther et al. (2014), "the provision of affordable and reliable electricity access to householders and businesses contributed to women's empowerment through modified social practices that enhanced daily life for women in rural areas in crucial ways (21)". The inaccessibility to reliable electricity typically affects women more than men because of women's traditional gender norms in society (Orlando et al., 2018). Thus, many benefits from access to electricity can be a stimulus to promote women's empowerment in the long term. For example, the Nepalese women's use of rice cookers has implied significant reductions in women's household chores, which has contributed to improving their human resources and making them pursue income-generation activities which gave them decision-making power after they contributed to household income by new income generating activities (Winther et al., 2014). Also, increasing girls' school attendance from access to electricity can be a catalytic effect on women's empowerment over the long term (Samad and Zhang, 2019). Haves (2012) demonstrated that; "Access to media can be a vehicle for women's empowerment. The evidence shows that those women who had access to television were more aware of their rights and were less likely to hold views that promote the subordination of women" (ibid: 4).

4. Theoretical Framework

This chapter first discusses the broader concept of women's empowerment theories. Then, the main theoretical framework of gender needs will be presented to explore different gender needs from access to reliable electricity and how these gender needs are supported to promote women's empowerment.

4.1 Gender in Development Issues

Gender relations, which are socially constructed relationships between men and women, have been investigated in terms of the way development policies change the balance of power between men and women (Momsen, 2004). Gender roles are not fixed terms and it has been more flexible with the changes brought by economic development (ibid). Different places and societies have different practices of gender relations, so it is important to know that gender relations must be understood within specific societies and based on historical and political practice (ibid). Momsen (2004), defined gender equality as "equality of opportunity and a society in which women and men can lead equally fulfilling lives (8). Globally, women still have fewer opportunities than men for economic participation, higher education, access to resources, and political representation (ibid). These led women often lose control over resources and increasing women's dependent status. Gender relations, roles, and unequal power imbue the lives of all women and girls in all societies and this disadvantage intensifies toward women and girls who live in the global South, being part of a marginalized ethnic group, or the experience of disability (Kabeer and Sweetman, 2018).

In 1995, the United Nations Development Program (UNDP)'s Human Development Report insisted that "there is no county in the world where gender equality has been achieved" and the same year women's empowerment was presented as a key strategy for development in the fourth world conference on women in Beijing (UN, 1995; Sida, 2001: 12). "Women's empowerment and their full participation based on equality in all spheres of society, including participation in the decision-making process and access to power, are fundamental for the achievement of equality, development, and peace" (UN, 1995: section 13). Therefore, Women's empowerment is a key aspect of achieving gender equality.

4.2 Women's Empowerment

Women empowerment is a fundamental condition for socio-economic development in any society. However, women empowerment came late to the development agenda. During the 1980s, the empowerment approach developed as a new approach in women and developmental discourse (Momsen, 2004). By the mid-1990s some mainstream development agencies had begun to deploy the term, but empowerment had been considered as a means for enhancing efficiency and productivity without changing the status quo (ibid: 14). The mid-1990s, Jo Rowlands sees empowerment in the process of broad development which enables people to achieve self-confidence and self-esteem that allows both men and women to actively engage in development decision-making, and Rowlands mentioned that empowerment is a bottom-up process which cannot be assigned from top-down (Momsen, 2004).

The concept of empowerment is difficult to define. According to UNDP (2004), empowerment is “aiming to transform women’s lives by promoting greater self-reliance based on increased skills, income, social status, and decision-making power and enabling women to take control of their transformation process” (32). In the ‘Assessing Women’s Empowerment: Towards a Conceptual Framework’, the author, Mosedale (2005), clearly mentioned that there are four aspects that are broadly accepted to define women’s empowerment in the literature. Firstly, to be empowered one must have been disempowered. Secondly, empowerment cannot be bestowed by a third party. Thirdly, definitions of empowerment usually include decision making on something that is important in their lives and being able to carry them out. Finally, empowerment is an ongoing process rather than a product (Mosedale, 2005: 244). Coupled with the above definition and framework of empowerment, it is clear that empowerment is essentially a bottom-up process and a third party such as development agencies cannot empower women, but women must empower themselves.

Also, empowerment is related to the word ‘power’. According to Mosedale (2005), many development interventions involve existing power relation challenges but the power relation between men and women is most strongly contested. There are many different definitions regarding the word ‘power’. In the empowerment approach, power has been identified less in terms

of domination over others, but more in terms of the capacity of women to promote their self-reliance and internal strength (Moser, 1989). This approach shows us that gaining power is the right to determine choice in women's life. Kabeer (1999) defined power is in terms of the ability to make choices: to be disempowered, therefore, implies to be denied choice (436). Additionally, Kabeer sees empowerment is bound up with the condition of disempowerment and the processes by people who have been denied the ability to make their choice and it entails a process of changes (1999). Rowlands (1997) conceptualized empowerment as decision-making power which is bringing people who are outside the decision-making process into it. Moreover, Oxaal and Baden (1997) emphasized that empowerment is not only about opening up access to decision making, but also must include processes that lead people to perceive themselves as able and entitled to occupy that decision-making space.

4.3 Women's Economic Empowerment

Women's economic empowerment is one of the important parts of contributing to gender equality. However, Women face many difficulties and obstacles to their economic empowerment (Kabeer, 2009). Still, in many countries' power relations between men and women are based on patriarchal gendered norms and structures that determine what women should follow and support men inside their house (Kabeer, 1997). Gendered power structure and social norms limit women's productivity and the ability to make their own choices to improve their situation (Sida, 2005). Sida (2005) defined women's economic empowerment as "the person increases women's real power over economic decisions that influence their lives and priorities in society" (8). In addition, Golla et al. (2011) concluded the definition of women's economic empowerment as "A woman is economically empowered when she has both the ability to succeed and advance economically and the power to make and act on economic decisions" (4). The arguments regarding why women's economic empowerment is the important part of women's empowerment, Kabeer (2009) clearly pointed out that women's economic empowerment is deeply connected to the enhancement of women's capacity for strategic choice and agency in the sphere of the economy and to the possibilities this opens up for change in other spheres of their lives. Specifically, gender inequality in the division of labor between paid and unpaid work, women have more responsibility for unpaid household chores, and the associated inequalities in access to resources and lack of opportunities are at the core of women's subordinate status in society (ibid). This leads to increased women's

lack of strategic agency, both in their life and society. Also, women's economic empowerment is a critical aspect of human development (ibid). Previous studies showed that when women have economic empowerment, their access to control over valued resources, it gives strong positive implications for the well-being of their family, and it finally helps to reduce poverty (Golla et al., 2011). Finally, women's economic development will bring a more balanced process of growth (Kabeer,2009). Economically empowering women is not only promoting women's rights but also achieving broader development goals such as economic development, poverty reduction, promoting better health, education, and welfare (Kabeer, 2009; Golla et al., 2011). Several empirical investigations have been done in different countries in Ghana, Egypt, and Bangladesh regarding women's economic empowerment. All three studies insisted that women who in paid work generally reported more positive impacts on empowerment than economically inactive women (Kabeer, 2012)

4.4 Women's Gender Needs

“Men and women not only play different roles in society, with distinct levels of control over resources but that they therefore often have different needs” (Moser, 1993: 37).

The links between gender and poverty have been researched by many cases in livelihood strategy and development “best practice” (Clancy et al., 2003: 4). However, not that many studies have tackled an element of poverty that is highly affected by rural women's life: energy (ibid). Clancy et al. (2003) emphasized that energy provision can contribute to moving women and their families out of poverty. The traditional approach to energy in development used to assume gender-neutral which insisted energy projects or programs would benefit both women and men equally under their practical needs (UNDP, 2004; ENERGIA, 2019). However, men and women have varying degrees of access to resources and decision making (ibid). Women's decision-making within the household and community is very limited and it usually restricts women's capability to influence resource allocation on many issues including energy (Clancy et al., 2003). Under these circumstances, the benefit of electricity access for women and men could vary greatly. Moreover, women and men have very different perceptions regarding the benefits of energy, women usually identify electricity as providing means for reducing household chores, better health, and spending less expenditure, whereas men see the access to electricity mostly as a benefit for enjoying leisure, quality of life,

and giving better education for their children (ibid: 11) Therefore, it is important to recognize that men and women have different energy needs.

The theoretical framework of the women's gender needs has been developed by Molyneux, Moser, and Clancy et al., and emphasized practical, strategic and productive needs are important to analyze women's actual needs on access to electricity. Moser (1989) developed the theoretical framework for women's gender needs of practical and strategic from Molyneux's (1985) conceptualization of distinction between women's practical and strategic interests. Clancy et al (2003) finally developed Moser's women's gender needs into the energy needs and explained how access to energy addressed the practical, productive, and strategic needs of women based on Moser's theoretical framework.

Moser (1989) identified **practical gender needs** as a “needs which are formulated from the concrete condition women experience, in their engendered position within the sexual division of labor and deriving out of this their practical gender interests for human survival” (1803). Practical needs are related to women's condition which is their current workloads and responsibilities in the household or community. Clancy et al (2003) defined practical gender needs are related to women's everyday problems which can be easily identified such as unsatisfactory living conditions and lack of resources; cooking, food processing, water hauling, health, and education. Women usually have household chores duties in the family within the sexual division of labor and meeting practical needs aims to achieve women's lives easier and more pleasant. Practical needs thus can be met by access to energy simply with lightning, access to modern electric cooking appliances, and space heating or cooling which make life easier and help to reduce household drudgery (Clancy et al., 2012). Moser (1989) clarifies that getting practical gender needs is a technical matter that supports women in a better situation which they need to do. However, it does not challenge the role of women in their household or society, even their gender relations (Khamati-Njenga and Clancy, 2005). It means that traditional gender power or authority remains as it is.

Productive gender needs were developed by Clancy et al (2003) and insisted it is “work done by both women and men for pay in cash or kind. It includes both market production with exchange value and subsistence/home production with actual use-value and also potential exchange value”

(3). Moser (1989) defined gender needs into two different needs: strategic gender needs and practical gender needs and included income into practical needs, but Clancy et al (2003) recognized productive gender needs should be separated from the practical needs. It fits gender needs in energy interventions because access to electricity increases the possibility of income-generating activities (Raub, 2013). Access to electricity can open up new business opportunities and within productive gender needs, women can involve more time for productive activities which gives them income. Clancy et al. (2003) mentioned productive gender needs can help women to bring extra money into their household which can change their status and promote gender relations. However, it is important to know that boundaries between practical, productive, and strategic needs are not fixed and depend on different societies (Khamati-Njenga and Clancy, 2005).

According to Moser (1989), **strategic gender needs** identified to overcome women's subordination will vary depending on the particular cultural and sociopolitical context within which they are formulated (1803). Strategic gender needs are related to changing women's position which may include equal access to decision-making power, education, or shared responsibility with men for their childcare (Williams, 1994). Unlike practical needs, strategic needs are hardly identified or less obvious by women because it is more closely linked to women's position such as more opportunities or equal participation with men while practical needs only emphasize actual use-value (Cecelski, 2004). For instance, although skill training such as teaching, nursing, and tailoring often meets income-generating needs, this does not challenge the gender division of labor because those jobs are more considered as women's work (Moser, 1993). However, some training which is usually considered as men's work not only widen employment opportunities but also break down current occupational segregation which will meet strategic needs and support women's empowerment in the long term by challenging men's traditional works (ibid). Strategic needs are related to promote women's position in society and lead women to gain more equality with men, and finally, it can transform gender relations in the future. These changes can be possible through laws, equal rights to land or property, prohibiting violence against women, or earning income which can help women to make decision making or control over resources within their household and community in a long term (Khamati-Njenga and Clancy, 2005). Moreover, it can help women towards empowerment in all its senses (Clancy et al., 200).

The theoretical framework of gender needs is used as the basic foundation of this thesis. This thesis uses not the only gender needs framework but also different concepts of women's empowerment to investigate how different gender needs from access to reliable electricity have supported in promoting women's empowerment in this case study: Than Pyar Chaung village in Myanmar.

5. Methodology

This chapter presents the methodology of this case study. Following the epistemological foundation, the research design, data collection, and analysis, ethical consideration, and limitation will be outlined.

5.1 Ontological and Epistemological Foundations

The epistemological foundation of this thesis is grounded in feminist epistemology: feminist standpoint theory. According to Brooks (2007), "feminist standpoint epistemology is identified as 1) see and understand the world through the eyes and experiences of oppressed women and 2) apply the vision and knowledge of oppressed women to social activism and social change" (55). Thus, feminist standpoint epistemology requires to place women as a center of the research process and emphasized that women's concrete experiences give the starting point of knowledge building (ibid). Feminist standpoint epistemology thus well fits for this thesis since this case study explores different women's experiences by access to reliable electricity in Myanmar's rural village. Feminist standpoint epistemology highlights women's actual lived experience to achieve an accurate understanding of women's lives and this case study will follow individual women's lived experiences to understand their life (Rose, 1997; Brooks, 2007).

5.2 Research Design

A qualitative case study was mainly chosen for this thesis in order to investigate how access to electricity affected and promoted women's empowerment in Than Pyar Chaung village under the NEP. A paper survey was also conducted by 41 people in the village but given small numbers of the survey only could provide a glimpse of the perceptions among people who live in the village. So, the paper survey aimed at receiving background information about the village and people's perception on energy after gaining access to reliable electricity. The total households living in the

village are 270 households, so these 41 paper surveys are very limited evidence to be used as a mixed method in this study case, but details of paper survey conducting will be elaborate in the below section 5.3.3. Thus, this thesis is primarily based on interviews and identified as a qualitative case study.

A qualitative case study approach has been used because a single example can be very useful in the preliminary of an investigation (Flyvbjerg, 2006). Also, a qualitative approach has helped the researcher to listen to individuals' different experiences to research on this topic. As mentioned before, women's empowerment is hard to be measured because it is not just finding a single indicator but more complicated within the power relations (Momsen, 2004). Denscombe (2009) demonstrated that "a case study has the opportunity to make detailed findings that can be difficult in a survey. It focuses on social relations and processes that are linked together and gives an understanding of what factors lead to a special result" (cited in Kautto 2015: 15). This thesis examines how women's different needs, in the energy uses, are helping to promote women's empowerment in a small rural village in Myanmar. The theoretical framework of women's needs is used to understand women's empowerment in this thesis. The Investigator's goal of the case study is to expand and generate theory out of the findings which are analytic generalization but not to enumerate frequencies which is a statistical generalization (Yin, 1994; Bryman, 2012). Thus, it is important to note that this case study cannot generalize the strong relationship between women's empowerment and access to electricity, but it could be useful evidence which can be extended to future gender impact research of the NEP.

5.3 Data Collection

Data collection took place in the Than Pyar Chaung village, Yesagyo Township, Magway Region, Myanmar between January 7th and 8th, 2020. Women are the target group for this thesis and 16 women semi-structured interviews have been done (see Appendix I). 41 paper surveys also were randomly conducted in the village but used only for having information about the village's situation.

5.3.1 Site Sampling

In 2019, 33 mini-grid projects had implemented under the NEP off-grid component during the first and second CfP by GoM (GIZ, 2019). Most of the mini-grids projects recently implemented, so it was difficult to find a village where I can start to research on this thesis topic of women's empowerment which doesn't show within a short period. During my internship in GIZ's Promotion of Rural Electrification (RELEC) project from the end of August 2019, I supported variety training for the mini-grid developers in Myanmar and had plenty of chances to discuss their NEP project experience. The thesis topic focuses on rural women's empowerment through access to electricity, so I wanted to find a village where I can listen to how women's lives have been changed by using reliable electricity. Every Mini-grid project had implemented in rural areas where the national grid connection cannot be connected due to geographical difficulty and expensive connection costs. In November, I met an engineer from the private mini-grid developer company: Pro Engineering Co., Ltd during the financial training session by RELEC. She explained to me about the project site where they recently implemented the mini-grid project: The Than Pyar Chaung village. This village was selected as a case study site due to the below reasons. First, this project was one of the first implemented mini-grid sites under NEP. The solar mini-grids of Than Pyar Chaung village has been operating since August 2018. I was planning to conduct this thesis's data collection in January 2020, so it meant that I could track some possible evidence of women's lives changing over a year which is quite enough time to investigate it compared to other new mini-grid projects which were implemented a few months ago. Second, the high number of electricity connections at the village level made me choose this village as my qualitative case study site with my assumption was that people might be very active to use electricity based on the high connection rate in the village. The Than Pyar Chaung village is a rural village comprising 270 households and 243 households are currently connected to the solar mini-grid connection. It is quite a high number of connections since the household needs to pay its connection fees, about \$300 (USD)⁷. Thus, I assumed that I could find more productive use of energy at the village level which can give more opportunities to women in the village as well.

⁷ The connection cost is depending on the population density and other situation of the villages. This cost was provided by the mini-grid constructor, Pro Engineering Co., Ltd during the data collection period.

5.3.2 Semi-Structured Interviews

Semi-Structured individual interviews were conducted with 16 women who are in age from 26 to 59 years old who live in the Than Pyar Chaung village. Semi-structured interviews are most typically linked with the collection of qualitative social data when the researcher is interested in people's experiences, behavior, and understanding and how and why they experience and social world in this way (Matthews and Ross, 2010). The interview guide was prepared with open-ended questions to listen carefully to what these interviewees say or do in their actual life setting (Creswell, 2007) (see Appendix II).

All 16 interviewees do not speak English, so all interviews were conducted English to Burmese with support from an interpreter. Before I started to interview, I explained briefly about my research and information in the consent form in English then the interpreter started to translate my words in Burmese. All interviewees agreed to sign the consent form before we started to conduct the interview (see Appendix III). The interviews were conducted at each interviewee's own house, so it was possible to conduct their actual lived experiences using electric appliances and economic activities at home. Semi-structured interviews are partially structured with conversational in tone based on predetermined questions and the interviewer and interviewee determine the flow of the conversation, exploring responses and emergent topics (Hammett et al., 2014: 141). Based on my semi-structured interview questions, I was able to explore from unexpected responses to more interesting responses which made me elicit information, feelings, and opinions from the interviewees using additional questions and interactive dialogue (Matthews and Ross, 2010). Finally, this semi-structured interview process helped me to understand each interviewee's different gender needs and experience on access to electricity.

5.3.3 Participant Observation

This thesis's data collection has been used for participant observation during the time in the village. All interviews were conducted at each interviewee's own house or their working place. Matthew and Ross (2010), defined participant observation as "a data collection method in which researcher achieves intimate knowledge of the group of people who are the subjects of the research, in the natural setting of the group" (478). Through participant observation, I was able to gain some insights into women's lives in the village on electricity access. I examined women interviewee's

different needs in using energy by seeing them use electric appliances in their house and especially in the kitchen. Moreover, I engaged in participant observation and tried to examine and learn what life is like for my interviewees which is ‘insider’ while remaining, myself as an ‘outsider’ within the community (Mack et al., 2005: 13). These given circumstances made me understand not only general women’s life in the rural areas but also the life of each woman’s life on access to electricity in particular. During the observation, women were spending a lot of time in their kitchen to prepare meals for their family and I was able to check every house’s kitchen which proved very useful for understanding the local context and women’s different needs of electricity.

5.3.4 Paper Surveys

A survey was developed to receive background information and people’s different perceptions and situation on access to electricity in Than Pyar Chaung village. The survey was conducted in the format of a paper survey with 18 questions (see Appendix IV) and distributed randomly in the household. In total, 41 households answered the survey from January 7th to 8th, 2020. The questions are asking the household’s economic status such as income and number of economically active family members in the household and the most useful electric appliances in their life. Also, how people use electricity and the main source used for cooking practice before and after the project. However, the quantitative surveys were conducted to gather greater baseline information of the village background and were intended to complement the semi-structured interviews, the latter being the main sources of my findings considered. As mentioned, given small numbers of the survey only could provide a glimpse of the perceptions thus, this thesis primarily is based on qualitative case study with interviews and not on a mixed methods approach.

5.4 Data Analysis

I used narrative data, which was an audio recording during my interviews, so I was able to concentrate on listening and responding to the interviewee without being distracted by writing notes. I started my thesis’s data analysis to transcribe the audio recording into written form by myself. It was a very time-consuming process, but it was an important process for me because it helped to get to know my data and can find particular data easily (Matthew and Ross, 2010). Since the Interviews were conducted in Burmese to English in simultaneous translation by the interpreter, I started to make it a written document in English. I used NVivo software for my data coding

because NVivo is the most commonly used software which makes the coding more efficient and enables me to work with the data rigorously and creatively (Matthew and Ross, 2010). All of the thesis interviews were coded into 15 different nodes using NVivo (see Appendix V).

5.5 Ethical Consideration

During the data collection, the following ethical consideration has been made under the outlines in the LUMID Ethical Guidelines. First, all interviews were conducted after getting a signature on a written informed consent form from all interviewees. The informed consent was written in English and translated verbally to Burmese by the interpreter to the interviewee. Also, I explained this data collection's purpose to provide clean and adequate information of this research in which interviewees can make sure and understand what they are consenting to (Creswell, 2007).

Second, power relationships were deeply considered during my data collection. I was extremely aware that the participants see me as 'powerful'. Matthews and Ross (2010) explained that if the researcher may be seen as 'the expert' or considered 'powerful' and thus participants will not want to disagree with the researcher (77). I kept being aware of this issue and tried to explain to my interviewees that my main purpose of data collection is listening to their own story after they could access reliable electricity.

Third, Confidentiality was considered in this thesis. Matthews and Ross (2010) insisted that "participants should be assured that they will not be identified in the research and their input to the project will be confidential (78)". Thus, I decided not to use their name but a combination of 'I' to state the interviewee category followed by a numerical value to identify the interviewee in this paper, resulting in the nomenclature e.g. I1, I2, I3...I16 which will be used in chapter 6. Moreover, their names do not appear in this paper nor the interview transcriptions.

5.6 Limitation

Several limitations of this thesis have been identified. First, the major limitation was the language barrier. All 16 interviewees do not speak English and I do not speak Burmese as well. So, all interviews were undertaken with an interpreter and I had to depend on his help to continue the

interview. Also, there was the potential of misinterpretations or misunderstandings during the process of translation which I can't figure out due to the language barrier.

Second, my interpreter was a young Burmese man who was working in GIZ's RELEC staff. Also, I am a foreign woman from a university in Europe. This can be stated that we both entered the research from the position of power (Hammett et al., 2014). Nonetheless, we tried to be aware of such existing power dynamics during the data collection period. Also, RELEC's main task is to provide technical advice on mini-grid projects under the NEP. This project site is one of the NEP's mini-grid project sites. It was our first time to visit the village and RELEC did not have any control over the village. However, people who are in charge of handling the project in the villages and supported us to identify the women interviewees. Due to these situations, there are possibilities that some of the results have been biased.

Third, this case study was conducted village where were the majority of the population is Burmese, which is the majority ethnicity in the country, thereby it does not reflect or consider the ethnicity tensions of the country. This is important to note because gender roles are also influenced by ethnicity, so other villages can show different results based on their socio-economic status based on their ethnicity (Khamati and Clancy, 2005). For this reason, this case study's scope is limited to the female Burmese-majority rural experiences with electrification.

The last limitation was time, I was only able to spend two days collecting data in the village, allowing me to conduct 16 interviews and 41 paper surveys. If time permitted, I could have done more paper surveys. Framework of a mixed methods approach would have covered a representative sample of the households in this case study and it could be used as a strong, more in-depth mixed method case study of the village.

6. Findings and Analysis

6.1 Practical Gender Needs

Practical gender needs are defined as the needs of women that are related to their current responsibilities or workloads associated with their traditional gender roles in society (Moser, 1993). Responding to practical gender needs, this case study has presented women's better quality of life

after access to reliable electricity in Than Pyar Chang village by reducing their household chores. Electrification has greater positive impacts on women in their daily life which has helped them reduce the drudgery of housework in Than Pyar Chaung village. Most interviewees answered that they bought electric cooking appliances after the mini-grid project. Rice cookers and Electric Stoves were the most popular appliances bought and have been used by the women in the village, freeing women's time from household duties.

6.1.1 Reducing Women's Household Chores

In Myanmar, a classic gender division of tasks exists where women primarily take care of the household chores, such as cooking, cleaning, and children-caring, whereas men are usually considered to perform as the main income provider for the household (Lambrecht and Mahrt, 2019). It was possible to observe how women spend significant time cooking, cleaning, and children-caring during this case study's interviews in Than Pyar Chaung village.

Electrification has greater positive impacts on women in their daily life which has helped them reduce the drudgery of housework in Than Pyar Chaung village. All 16 interviewees answered that they bought electric cooking appliances such as an electric rice cooker, an electric stove, or an electric kettle after the mini-grid project. The village used to have a village-owned diesel generator which ran two hours per day, seven to nine at night, only providing the basic lighting and charging mobile phones to the household. Thus, it was impossible to use various electric appliances at the household due to a lack of electricity supply from the village's diesel generator.

The most interesting findings from interviews was an electric rice cooker. A rice cooker was found as the first electric appliance which freeing women's time from traditional cooking practice since rice is the staple food in Myanmar. 13 out of 16 interviewees stated that they bought many various electric appliances by their own needs after electricity access. According to the paper survey, 97 percent of respondents answered that firewood was the main source used for cooking before electricity access and 34 percent of respondents now use a rice cooker for cooking (see Appendix VI). It stated that Women usually had to go to remote areas to collect firewood and store in their house before using these electric cooking appliances. Also, many interviewees mentioned that they used open fires as their primary means of cooking and needed to spend most of their time in front of firewood. Controlling the flame from open-fire cooking is not easy. Therefore, women need to

pay attention while they are cooking to put extra firewood or blow air onto a fire to the flame burning. If they are not paying attention to open fires, rice easily burns. Thus, cooking over an open flame makes women stay in front of the flame three times a day: breakfast, lunch, and dinner.

“The stable electricity, especially for the housewife, is now very convenient and makes life very easier. Especially when they cook using the electric cooker, they simply switch the button on and doing some other activities without paying attention the whole time /.../ it makes them much more convenient and then it saves both time and energy. So, I think that women’s lives, in terms of everything, are much more comfortable than before.” (I7).

Many women agreed that making steamed rice by a rice cooker reduced a significant amount of their time because all they need to do now is just click the button to make rice. Moser (1993) insisted that “Practical needs, therefore, are usually a response to an immediate perceived necessity which is identified by women within a specific context” (40). The gender division of labor within the households in Than Pyar Chaung village gives women primary responsibility for household works including cooking (Moser 1989). Practical gender needs are defined something related to women’s everyday problems of unsatisfactory living conditions (Clancy et al., 2003). Expanding the use of a rice cooker by many women in the village clearly shows that how a rice cooker meets practical gender needs in the village with improving women’s living conditions by reducing women’s energy and time from exhausting traditional cooking practice.

“There are many households who are purchasing a lot of electric appliances because now they have stable electricity and want to use it. Also, the households are competing now who have already purchased electric appliances and others want to buy the same thing as well. This has impacted and changed women’s life because they are mostly housewives and these electric appliances make their life much easier” (I10).

Raub (2013) stated that time saved by electricity access has not only decreased women’s workload but also has contributed to women’s practical gender as well as women’s productive and strategic gender needs. Many previous studies also supported the above argument that time-saving through electricity enables women to find new income-generating activities that improve women’s

decision-making process not only within the intra-household but also at the community level (UNDP, 2004; UNDP, 2007; Raub, 2013; ENERGIA, 2019).

I2 mentioned how women have reduced household chores by using electric appliances; “it saves women’s time and energy so that they can have less time doing household works and focus on some other stuff that they can participate in a lot of meetings, community works, and social welfare”. The above comment showed that meeting women’s practical gender needs has led toward women’s potential productive and strategic gender needs because now they can spend their extra time toward new opportunities other than spending on household chores. More details would be explained in the 6.2 Productive gender needs.

6.2 Productive Gender Needs

Productive gender needs are distinguished by practical needs as it could increase women’s income-generating activities through access to reliable electricity (Clancy et al., 2003). During data collection in Than Pyar Chaung village, it was clear to investigate that women have expanded new income-generating activities after they have stable electricity from the mini-grid project: buying electric appliances for their business, finding a new income-generating activity, and working in the evening. Moser (1989) considered income can be part of practical women’s needs, but Clancy et al. (2003) developed productive gender needs should be separated from the practical gender needs especially in the energy intervention because access to electricity could promote women’s income-generating activities. This section elaborates more details on how practical gender needs have supported women’s productive gender needs in Than Pyar Chaung village.

6.2.1 Buying an Electric Appliance for the Business

Four out of sixteen interviewees were a tailor and they have been working even before the mini-grid project. Everyone answered that they bought an electric iron after they have used reliable electricity from the mini-grid project. All four tailor interviewees mentioned that they used to use a charcoal iron before, and it usually took an hour to heat charcoal and needed to wait until it had reached the proper temperature so they could put the charcoal inside of the iron. This process usually took a long hour and a very exhausting procedure for daily use.

“The biggest change in my life is that it (an electric iron) saves time and energy when from electric ironing” (I3)”.

Also, I8 stated that she had a really hard time using charcoal iron during the rainy season because it was extremely hard to make a fire due to humid rainy weather. Thus, she usually had to spend more time making a fire for the charcoal and exhausted herself during the rainy season. Myanmar has a heavy rainy season from May to September. All four women mentioned that they usually spent twice the time and energy to use a charcoal iron during the rainy season. However, all addressed that they can just use an electric iron easily and even enjoy watching television in their extra time because now they do not have to spend so much time in front of the fire for the charcoal iron. Also, they now can save time and energy, and it gives them to focus more time on making new clothes which have increased to take more orders. Using an electric iron has increased their productivity at work and they can make more income. Productive gender needs are developed by needs for work done for payment in cash or in-kind (Khamati-Njenga and Clancy, 2005). This can be understood especially in terms of energy intervention from access to reliable electricity tends to give the possibility of income-generating activity to women in the village (Raub, 2013; Haag 2017).

Another example of new income-generating activity was founded among women who own thanaka businesses in the village. Thanaka business is a common business in Myanmar. Cutting thanaka⁸ trees around five cm to ten cm long to sell it. Usually, two males have to use a big razor to cut a thanaka tree before the mini-grid project. However, I2 mentioned that she bought an electric chainsaw and it has saved significant time and energy than before. She used to hire men to run this thanaka business. “Two men had to use a really big razor to cut the thanaka wood. Using the electric woodcutter, saves a lot of time and energy and it does not cost much electricity bills, so it is more convenient” (I2). She mentioned that she has saved time and energy, but productivity has been increased due to an electric chainsaw and it has led to increased extra income from more selling thanaka. According to Clancy et al. (2002) productive gender needs can help women to

⁸ The stem bark powder of *Hesperethusa crenulata* or Thanaka has been used on the face by Myanmar women for more than a thousand years as a skincare regiment (Wangthong et al., 2010: 466)

bring extra income to their household and it could change women's status in the household in a long term.

Three of the sixteen interviewed are operating a grocery store in the village. Since the electricity access in the village, two of them have bought a refrigerator for the grocery store to sell more cold drinks during the summer. As refrigerators are not common in the village due to the high price, only two women have a refrigerator among the whole village.

“Two grocery shops recently bought a refrigerator. I think that mostly these grocery shops have got benefits from electricity access to sell cold drinks and water in the summer /.../ that it also benefits the whole village because now they can enjoy cold drinks as well” (I10).

“the grocery shops have benefited very gratefully having this access to electricity because they can buy a refrigerator and sell the cold drinks and that benefits them to make more income” (I14).

“I purchased a refrigerator, so I get to sell more cold drinks in summer” (I2)

Some interviewees mentioned that those grocery store owners got the most benefit from access to electricity because many people now want to consume cold drinks which were not possible before the electricity access and these owners of grocery shops have made more income selling these cold drinks. As stated above, I2, who owns a grocery shop answered that now she is making more income from selling cold drinks which have been possible because of the mini-grid project. Thus, above-interviewed women meet their productive gender needs because they are making extra cash into their household by using different electric appliances to promote their business (Clancy et al., 2003).

6.2.2 Making New Business Opportunities

The case study also found some evidence that women are looking for new business opportunities after reliable electricity access in the Than Pyar Chaung village. I1 bought an electric fuel dispenser for the petrol sale. She owns a grocery store at the center of the village, and she has made a small fuel station next to her store. She could buy this electric fuel dispenser under the microfinance

from Smart Power Myanmar⁹. She elaborated that she is already generating more income than before through the electric fuel dispenser.

Another new business opportunity was found in hand weaving businesses and it seems popular in the village. I4 stated that she bought two hand weaving machines after the mini-grid project to generate income from opening a new business.

“I can surely see that income has increased because by switching to the electric motor from diesel generators, it saves much more cost and energy. I can also operate much more time with these hand weaving machines” (I4).

Her family’s main business is running a mill for rice. They used a diesel generators motor for a rice mill which had to put effort into turning on the generator with her hands. But now they bought an electric motor for the grinding machine which can easily switch on and off. Now the family spends more time on a hand-weaving business to generate new income activities for the family. Now, it is also possible to work at night with stable lighting which wasn’t possible before with two hours limited electricity with dimmed lighting. She also stated that she was hiring three more women to run the hand-weaving business. She mentioned that she was thinking of buying more hand weaving machines in the future to make more income. Usually, women employees are preferred for those labor so there are quite many new jobs that can be found in the village after the mini-grid project from different new business opportunities. I6 has also operated a hand-weaving and incense making business after the electricity connection. Now nine women were hired for I6’s new businesses. I6 also mentioned that many of the men have already been working as a construction worker or carpenter, so they do not need extra job activities.

“I think that usually, the household which is keen about business gets the most benefits because, with access to electricity, it is possible to have new business opportunities” (I6).

This case also presents how I4 and I6 met productive gender needs by increasing income from access to reliable electricity, and their businesses spread new income-generating opportunities to

⁹ NGO was established in 2018 to accelerate the development of decentralized renewable energy solutions in Myanmar and transform the long-term economic potential by micro-financing.
(<https://www.smartpowermyanmar.org/>)

other women in the village by giving them a chance to work as a part-time job for running weaving machines and making incense sticks. However, this case does not challenge the gender division of labor since working with these jobs are normally considered as traditional women's work (Moser, 1993).

6.2.3 Working at Night: Generating Extra Income

Tailors interviewed mentioned that sometimes customers ask for an emergency order. However, it wasn't impossible before making clothes within a short period due to a lack of electricity at night. They could work only before the sunset. However, now they can work more and even at night with electric bulbs and it is now possible to make clothes in such a short time which allows them to make more income from some extra orders.

“I did not have opportunities before due to two hours of limited electricity. So, I used to have a hard time in the dark with sewing these clothes with very dimmed lights. However, now with stable electricity and I can work in the well-lighted environment and the same is true for many women in the village” (I3).

The incense stick business seems quite common in the village. It was possible to see this business everywhere in the village. Burning incense sticks at the temple is part of their religious practice every day since 88 percent of the population believes in Buddhism in Myanmar (Department of Population, 2015). Making an incense stick is easy and simple so anyone can make it without any special skills. People also used to make incense stick at home before electricity access, but it did not give them much extra income because usually women are busy during the day with household chores and other tasks. However, women now make incense sticks at night when they have free time. Some people answered that they are making incense sticks while they are entertaining such as watching TV or listening to the radio at night. Moreover, it helps these women to get extra income as well by selling incense sticks at the market. four out of sixteen interviewees were the housewife and three of them mentioned that they are making incense sticks at home while they have time as a part-time job. These housewives can generate extra income from making incense sticks. I13 said that “Women usually like to work and generate more income whenever there is a carnival or festival near the village, they can buy more stuff that they want to with this extra income that they have got from making incense sticks. So, I think that with the electric lights on at night,

this contributes to having more income for them (I3)”. In this case study, women are happy that they can buy something for themselves with extra income from making incense sticks. However, working at night has been one of the critiques some critique that new income generating activities often increase women’s workload without promoting decision making power or control of resources (Oxaal and Baden 1997).

6.3 Strategic Gender Needs

Moser defined strategic gender needs which challenge existing gender roles and required to overcome the current subordinate position of women to men in the society which can promote women’s empowerment (1993). Street lighting, entertainment and village electrification committee can be recognized as strategic gender needs in this case study. Also, generating income generation not only meets practical gender needs but also strategic gender needs because it has promoted women’s empowerment by increasing their voice at the household level which can bring gender equality in the long term.

6.3.1 Income Generating Activity

Clancy et al. (2003) demonstrated that income-generating activity can be identified both productive gender needs and strategic gender needs because when women generate income and bring this to their household this process will change women’s status and promote gender relations in the society which will match with strategic gender needs. However, meeting strategic gender needs can only occur when women promote their decision-making power or their voice in the intra-household which women challenge existing gender norms.

“I think that I have a strong voice with my income generation activities. I say something to the family whenever I want to do a new thing or have to decide something. I can make my own decision. So, I think that my income generation activity makes me more successful and makes my voice stronger in the family” (I3).

Only four women out of sixteen interviewees stated that they have increased decision making power in the family by generating income activities. I5 said “I have a stronger voice because of my economic activity. I am generating income, so I usually say whatever I want”. The common ground of these women was having their own business and the one who mentioned that they’ve

got great benefits from access to electricity by themselves. I3 and I5 are working as a tailor who bought an electric iron and making extra income from getting more orders. I7 owned slipper making business and now thinking to move their factory to the village since they can use stable electricity to run a slipper making machine. I15 thinks that she has a strong decision-making power because she is generating income and also, she is working as a registered nurse who has medical knowledge. I2 stated that “I also think that with electricity women get an even stronger voice because it makes life much easier, it saves them a lot of time and energy so that they can have less time doing the household work and focus on some other stuff they can participate in a lot of meeting, community works, and social welfare and those kinds of things”. These women’s case showed that meeting strategic gender needs by promoting their voice and control over resources within their household (Khamati-Njenga and Clancy, 2005)

6.3.2 Security

The streetlights are free of charge as a public good from the NEP and many interviewees mentioned streetlight as one of the great improvements in the village after the mini-grid project which makes people feel safe at night. (Department of Rural Development, 2019). Before the project, people would not come outside of the house frequently due to the perception of insecurity. However, streetlights have given the community the ability to see the surroundings at night and many women insisted that they feel safe even at late night. Thus, now the village is very lively at night which could not happen before the project.

I15, a nurse, stated that she can go anywhere anytime without worrying about her security at night. Whereby, before, she could not go alone even for an emergency at night because she felt insecure. The lit streets at night also enable more income to be generated in female-owned grocery stores. Before the mini-grid project, the streetlights didn’t exist in the village, so people stayed at home after sunset or went outside when there was some emergency with their hand lamp. Now, customers can go to the grocery shop even late at night to buy some snacks and it has helped to gain extra income in many grocery stores as well.

“The biggest change in the whole village is that it lights at night which makes transportation here to another place easier because of the streetlights. Because before the

mini-grid arrival they used to stay in the dark and they are really happy that they got these streetlights at night and it makes a huge difference” (I4).

According to Clancy et al. (2003), street lightning for safety can be identified as strategic gender needs since it makes women to enable to participate evening study class, community meeting and power for women’s enterprise development. In Than Pyar Chaung village, it wasn’t possible to find the evidence of improving women’s education opportunity due to street lightning. However, it clearly showed that benefits toward women’s enterprise development by giving extra income to the grocery shop owners.

6.3.3 Entertainment

Many interviewees mentioned listening to music and watching television entertained people and contribute to gathering more women’s social welfare in the village. During the day, the community had music or Buddhist scripture playing in the various speakers around the village. Concerning entertaining benefits, people answered that they are enjoying the music and listening to Buddhist scripture and it had made the village livelier during the day. Women usually stay at home during the daytime and many of them mentioned they can spend their time entertained with these sounds. Also, many interviewees mentioned that they are now enjoying watching TV every day without having concerns about the limited electricity supply. Various studies found that access to media can be a vehicle for women’s empowerment because they allow them to be more aware of their rights and were less likely to hold views that promote the subordination of women by meeting strategic gender needs in the long term (Haves, 2012). However, such results were not found in Than Pyar Chaung village, but it might be expected in the future. Also, some women groups did not have enough meetings at night before electricity access due to lack of safety. Conversely, now they can perform these events whenever they want to, and people are really satisfied with social events with stable electricity now. These social events seem to have promoted women’s solidarity which can help to support each other in the future. Allowing participation of women’s group meeting has been identified one of the strategic needs which makes women to link with others and to reduce women’s isolation (Clancy et al., 2003).

6.3.4 Village Electrification Committee (VEC)

According to Khamati and Clancy (2005) stated that “women’s strategic gender needs are generally to do with addressing issues related to laws; “a strategic need is to improve the status of women, for example through laws which give women and men equal rights” (14). To be the mini-grid project site, a village needs to organize Village Electrification Committee (VEC) to make decisions about energy-related topics such as procurement, tariffs, or payment options with a mini-grid developer who is in charge of their village’s mini-grid project implementation (Numata et al., 2018). When GoM planned to start the NEP, the gender-related mandatory rule was applied in the terms of condition: “for a 30% quota for women’s participation in the village electrification committee (VEC)” (World Bank, 2017c). This case study found that Than Pyar Chaung village’s VEC consists of nine members and three of them are women. Williams (1994) stated that strategic gender needs are provided for as a result of involvement in the planning of the project. 30 percent of women’s quota can be addressed by Williams’ statement. The GoM recognized the importance of gender equality in the NEP. Since NEP is a long-term project until 2030, 30 percent of mandatory women’s quota would improve the status of women by NEP’s strong rule. Women are hard to be involved in energy nexus, but they must be involved in VEC to follow GoM’s NEP’s rule. It was hard to find evidence in a short run of how this improved women’s empowerment because those VEC women members were a more supportive role in the village rather than expressing their voice. However, during the data collection period, it was hard to find actual evidence of women’s empowerment from being VEC members.

7. Conclusion

Electricity is one of the most life-changing innovations made by humanity. It is hard to think to survive without electricity in our modern life. Previous research has found that access to reliable electricity mainly affects women more than men from reducing women’s household chores to improving women’s empowerment in the long term (UNDP, 2007; Köhlin et al., 2011; ADB,2012; Winther et al., 2017).

Myanmar has the lowest electrification rate in the world even though it has great potential for renewable energy projects (ADB, 2017). Moreover, access to reliable electricity is extremely limited in most rural areas in Myanmar because it’s low population density and remote location

seems impossible to connect to the national grid by high cost and difficult to implement the connection (World Bank, 2018). The NEP's off-grid component could be the key to rural electrification in Myanmar which would provide stable electricity through mini-grids run by solar, hydro, wind, and biomass (ADB et al., 2016).

Yet, it is crucial to consider the integration of gender aspects within rural electrification projects to identify the different gender needs and impacts on access to electricity by both men and women (Cecelski, 2004; Clancy et al., 2003; Haag, 2017; Raub, 2013). Thus, this case study has identified different gender needs of energy in the rural Than Pyar Chaung village in Myanmar and looked at how the various gender needs have been affected in terms of ensuring women's empowerment through their attainment of practical, productive and strategic gender needs.

RQ 1 analyzed how access to stable electricity met practical gender needs by improving women's life by reducing women's household chores. The case study found that using household electrical appliances have reduced many women's significant amount of time in household drudgeries in Than Pyar Chaung village. Women in the village bought many different electric appliances to reduce their household chores such as a rice cooker, an electric cooking pot, a kettle, an electric iron, among others. Especially, the rice cooker has been considered one of the biggest changes among women in the village. Many women mentioned that using an electric rice cooker has reduced their energy and time from exhausting traditional cooking practice. Moser (1993) stated that practical needs are usually a response to an immediate perceived necessity which is identified by women within their context (40). Therefore, a rice cooker in Than Pyar Chaung village can be identified as a women's practical needs of energy. It has been insisted that women's practical needs can be a key contributor to bringing women's productive and strategic gender needs that time saving by reducing household chores usually enables women to find new income-generating activities which can increase their participation in the decision-making process in their household and the society in a long term (UNDP, 2007; Raub, 2013; ENERGIA, 2019).

The findings from RQ2 showed that women have found new income-generating activities after electricity access from the mini-grid project. The result indicate that access to reliable electricity meets productive women's needs in the Than Pyar Chaung village. It was clear that women's

economic opportunity has been extended: buying electric appliances finding, new opportunities, and increasing productivity by working at night.

Clancy et al (2003) recognized that productive gender needs can support women to bring extra cash into their household. This case study showed three major pieces of evidence of how access to electricity meets productive gender needs in the village.

First, women started to buy an electric appliance that could support their business in the village. All the tailors interviewed stated that they had bought an electric iron after they received reliable electricity to save their time and energy from the traditional ways of charcoal ironing. Moreover, grocery shops bought a refrigerator and thanaka businessowners bought an electric chainsaw to extend extra income from selling cold drinks in the village and cutting more thanaka tree. Second, many women started to open new businesses to make income generation after the mini-grid project in the village. Handweaving and incense stick production became popular businesses among women in the village. It is not just to increase the extra income of women, who operate the business, but also other women who are hiring from the operator as part-time workers.

Lastly, the mini-grid projects allowed earning extra income by working at night showed productive gender needs in Than Pyar Chaung village. Before the mini-grid project, people used dimmed lights from the community-owned diesel generator, which ran for two hours at night. However, now everyone works in a well-lighted environment. Many interviewees mentioned that incense sticks had expanded in the village, from individual part-time work to a big business owned by women. It has expanded because incense sticks are easy to make, and women had extra time by reducing their household drudgery. Some women stated that they contributed the extra income to their family which gave them a stronger voice in the family. These findings show that productive gender needs are deeply related to strategic gender needs as well.

RQ 3 analyzed how women's reliable electricity access met strategic gender needs by promoting women's decision-making power and their voice in intra-household. The income-generating activity can be considered to meet both productive needs and strategic needs. Moser (1989) stated that strategic gender needs challenge existing gender roles and are required to overcome the women's subordination position which can promote women's empowerment. Unlike practical needs, strategic needs are hard to identify or are less obvious and are often challenged by existing

gender relations in the society (Moser, 1993). Thus, to meet strategic needs, women have to challenge the existing gender norm. As identified in productive needs, many women stressed that they have more income-generating opportunities through access to electricity. However, only four women out of sixteen interviewees mentioned that they felt they had a strong voice and have decision making power in their family because of their income-generating activities. Thus, for these four women access to electricity seemed to have allowed them to fulfill their strategic gender needs. Moreover, streetlights and social welfare gains could be also be viewed as allowing women's strategic needs to be met, namely by, enabling women to participate in a wider range of activities (Khamati and Clancy, 2005).

Finally, strategic needs can be improved by the enforcement of laws to give equal rights to women and men (Khamati and Clancy, 2005). In Than Pyar Chaung village, nine people are working for VEC and three of them are women. This case study's findings showed that electricity meets strategic gender needs in Than Pyar Chaung village by gaining division making power from earned income, benefits from the streetlight, and participating in social welfare. However, this case study could not evidence on how the NEP's mandatory 30% female quota in the VEC promoted women's empowerment in the village.

To conclude, the overall finding showed that there are clear practical and productive gender needs in the village and little evidence for the strategic gender needs. However, as mentioned above, strategic gender needs are hard to define since they are related to changing women's position in society (Williams, 1994). Also, this case study showed a typical bottom-up process where women tried to find their gender needs to support them in better situations. UNDP (2004) defined empowerment as "aiming to transform women's lives by promoting greater self-reliance based on increased skills, income, social status, and decision-making power and enabling women to take control of their transformation process" (32)." This case study confirms findings that women in Than Pyar Chang villages have tried to change their lives for the better by meeting their practical, productive, and strategic gender needs on energy and it has promoted women's empowerment toward some of them. However, this case study's mini-grid project has been providing reliable electricity for less than two years, thereby it is not enough time to investigate the long-term impact of access to electricity to women's empowerment from strategic gender needs in the village. The questions raised by this study is on how the NEP mini-grid project would promote rural women's

empowerment in Myanmar in the long term since the NEP's project will end by 2030. This case study was one of the first implemented mini-grid project sites under the NEP. So, further studies could assess the long-term positive effects of electricity toward rural women in Myanmar.

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Appendices

Appendix I: List of Interviewees

Gender	Interviewees' number	Age	Job	Marital Status	Family Size	Date
Female	1	42	Grocery Store and Small Petrol shop	married	3	2020.01.07
	2	42	Grocery Store and Thanaka Business	married	4	2020.01.07
	3	26	Tailor	single	4	2020.01.07
	4	41	Hand weaving and Incense Making Business	single	7	2020.01.07
	5	30	Tailor	married	6	2020.01.07
	6	40	Hand weaving and Incense Making Business	single	6	2020.01.07
	7	47	Slipper Making Business	married	5	2020.01.07
	8	24	Tailor	single	6	2020.01.07
	9	50	Tailor	married	7	2020.01.07
	10	30	House Wife	married	3	2020.01.08
	11	38	House Wife	married	4	2020.01.08
	12	58	Grocery Store	married	3	2020.01.08
	13	59	House Wife	married	2	2020.01.08
	14	26	House Wife	married	4	2020.01.08
	15	39	Nurse	married	3	2020.01.08
	16	44	Elementary school teacher	married	4	2020.01.08

Appendix II: Interview Guide

Data-Collection Interview Guide

Personal Details

- Name and Age
- Marital Status
- Current Job and Role in the household

Access to Electricity (Project)

- 1) What is the average monthly electricity bill in your household?
- 2) What has been the biggest change in the village after the mini-grids project?
- 3) Did you buy any electricity appliance after the project? What did you buy and why?

Economic situation (Economic)

- 4) What are the main sources of income in your household?
- 5) Do you currently perform any income generation activity?
 - Was it same one years ago?
 - If no, when did you start this income activity and why?
 - Are you making more money than before?

Empowerment

- 6) How has your economic activity changed your ability to have strong voice in the family and village?
- 7) Have you participated the community meeting regarding electricity issue, Why or Why not?
- 8) Do you think access to stable electricity change your life and what is the biggest change in your life?
- 9) Do you think who get most benefit from the access to stable electricity?
- 10) Have access to electricity changed your living and What is the most valuable change you have seen because of access to stable electricity? (ex. Cooking, water and children caring)

Appendix III: Informed Consent Form

Informed Consent

Consent to take part in Gender Impact research in Than Pyar Chaung village in Myanmar

- I _____ Voluntarily agree to participate in this research study
- I understand that even If I agree to participate now, I can withdraw at any time or refuse to answer without any consequence of any kind.
- I have agreed to have our discussions recorded for the purposes of record keeping and analysis
- I understand that I will not benefit directly from participating in this research
- I understand that all information I provide for this study will be treated confidentially.
- I have agreed to have the opportunity to ask any question related to this research.

Signature of research participant

Name of participant

Date

Researcher

Soonyeob Lee

Master's student, International Development and Management (LUMID), Lund University

Appendix IV: Survey Form (English)

Demand Survey Form

Date: _____

Community/village: _____

Description of house type: (_____) (eg., concrete, brick, mud or metal etc.)

- 1) Name: Age:
- 2) Male Female
- 3) Number of Occupants: _____
- 4) Number of Rooms in house:
- 5) What is your main source of income
 Agriculture/Farming Trading Others (specify)
- 6) Please check approximately what your household income was last month?
 200,000 kyat – 400,000 kyat 400,000 kyat – 600,000 kyat
 600,000 kyat – 800,000 kyat 800,000 kyat – 1,000,000 kyat Above
 1,000,000 kyat
- 7) How many people in your family has an income?
- 8) Are there any member of the family working outside of the village and how many?
- 9) What was the main source used for light before the mini-grids project?
 generator SHS battery candle/kerosence
How many hours of the day are the lights usually turn on?
 hours
- 10) What is the main source used for Cooking before the mini-grids project?
 firewood coal kerosene others

11) What was the main source used for Rice cooking now?
 Electricity firewood coal kerosene others

12) What was the main source used for general cooking now?
 Electricity firewood coal kerosene others

13)

	Tick if you are using below item with electricity	Rank the most used appliance for you in order from 1 to 3.
Lighting		
Water Pump		
Mobile tel.Charger		
Rick Cooker		
Refrigerator		
Radio		
Television		
Fan		
Electric Iron		

14) How much do you spend on electricity for every month?
 Less than 5,000 kyat 5,000 -8,000 kyat 8,000 kyat – 10,000 kyat 10,000 kyat – 15,000 kyat 15,000 kyat – 20,000 kyat More than 20,000kyat

15) Our household is happy with the electricity system that we have in our home.
 Strongly Agree Agree Neutral Disagree Strongly Disagree

16) Today, the quality of life of my household is better than it was a year ago.
 Strongly Agree Agree Neutral Disagree Strongly Disagree

17) The monthly electric bill is a financial burden for my family
 Strongly Agree Agree Neutral Disagree Strongly Disagree

18) Men and women use energy and its devices differently
 Yes No

Appendix IV: Survey Form (Burmese)

လျှပ်စစ်ဝယ်လိုအား ဆန်းစစ်ချက်

ရက်စွဲ: _____ ကျေးရွာအမည်: _____

Description of house type: ()

- ၁. အမည်: [] အသက်: []
- ၂. ကျား မ
- ၃. မိသားစုဦးရေ: []
- ၄. အိမ်ရှိအခန်းပေါင်း: []
- ၅. အဓိကဝင်ငွေ ကိုအောက်တွင်ရွေးပါ။
 စိုက်ပျိုးရေး၊ မွေးမြူရေး အရောင်းအဝယ် အခြား(ဖော်ပြပါ) []
- ၆. သင့်အိမ်၏ ယခင်လဝင်ငွေ ခန့်မှန်းခြေကို အောက်တွင် ရွေးချယ်ပေးပါ။?
 ၂၀၀,၀၀၀ ကျပ် - ၄၀၀,၀၀၀ ကျပ် ၄၀၀,၀၀၀ ကျပ် - ၆၀၀,၀၀၀ ကျပ်
 ၆၀၀,၀၀၀ ကျပ် - ၈၀၀,၀၀၀ ကျပ် ၈၀၀,၀၀၀ ကျပ် - ၁,၀၀၀,၀၀၀ ကျပ်
 ၁,၀၀၀,၀၀၀ ကျပ် အထက်
- ၇. သင့်အိမ်တွင် မိသားစုဝင် ဘယ်နှဦးတွင် အလုပ်လုပ်၍ ဝင်ငွေရရှိလျက်ရှိပါသနည်း။
 []
- ၈. သင့်မိသားစုတွင် အခြားအရပ်တွင် အလုပ်လုပ်ကိုင်၍ ဝင်ငွေထောက်ပံ့လျက်ရှိသော သူများရှိပါသလား။ ဘယ်နှစ်ယောက်ရှိပါသနည်း။? []
- ၉. လျှပ်စစ်မီးမရခင်က မည်သည့်နည်းလမ်းများဖြင့် အလင်းရောင်ရယူပါသနည်း။
 မီးစက် အိမ်သုံးဆိုလာ ဘက်ထရီ ဖယောင်းတိုင်၊ ရေနံဆီ
 အထက်ပါအရာများကို တရက်လျှင် နာရီမည်မျှသုံးလေ့ရှိသနည်း။?
 [] နာရီ
- ၁၀. လျှပ်စစ်မီးမရခင်က ချက်ပြုတ်ရန် မည်သည့်လောင်စာကို သုံးသနည်း။
 ထင်းမီး မီးသွေး ရေနံဆီ အခြား
- ၁၁. လျှပ်စစ်မီးရပြီးနောက် ထမင်းချက်ရန် မည်သည့်လောင်စာကို သုံးသနည်း။?
 လျှပ်စစ်မီး ထင်းမီး မီးသွေး ရေနံဆီ အခြား
- ၁၂. လျှပ်စစ်မီးရပြီးနောက် ဟင်းချက်ရန် မည်သည့်လောင်စာကို သုံးသနည်း။
 လျှပ်စစ်မီး ထင်းမီး မီးသွေး ရေနံဆီ အခြား

၁၃.

	အောက်ပါပစ္စည်းများကို လက်ရှိသုံးနေပါက အမှန်ဖြစ်ပါ။	သင့်အတွက်အသုံးများဆုံးပစ္စည်းကို နံပါတ်စဉ်အလိုက်စီပေးပါ(၁ မှ ၃ စသဖြင့်).
မီးသီး၊မီးချောင်း		
ရေမော်တာ		
ဖုန်းအားသွင်းကြိုး		
လျှပ်စစ်ထမင်းအိုး		
ရေခဲသေတ္တာ		
တီဗီ		
ရေဒီယို		
ပန်ကာ		
မီးပူ		

၁၄. လစဉ်လျှပ်စစ်ဓာတ်အား မည်မျှပေးဆောင်ပါသနည်း။?

- ၅,၀၀၀ ကျပ်အောက် ၅,၀၀၀ - ၈,၀၀၀ ကျပ် ၈,၀၀၀ ကျပ် - ၁၀,၀၀၀ ကျပ်
 ၁၀,၀၀၀ - ၁၅,၀၀၀ ကျပ် ၁၅,၀၀၀- ၂၀,၀၀၀ ကျပ် ၂၀,၀၀၀ကျပ် အထက်

၁၅. မိမိတို့အိမ်သည် mini-grid လျှပ်စစ်မီးရရှိမှုကို ဝမ်းသာပါသည်။

- လေးနက်စွာသဘောတူပါသည် သဘောတူပါသည် သာမန်ဖြစ်သည်
 သဘောမတူပါ လုံးဝသဘောမတူပါ

၁၆. လွန်ခဲ့သော တနှစ်နှင့်စာလျှင် လျှပ်စစ်မီးရရှိသဖြင့် လူနေမှုဘဝတိုးတက်လာပါသည်။

- လေးနက်စွာသဘောတူပါသည် သဘောတူပါသည် သာမန်ဖြစ်သည်
 သဘောမတူပါ လုံးဝသဘောမတူပါ

၁၇. လစဉ်ပေးဆောင်ရသော လျှပ်စစ်ဓာတ်အားသည် ဝန်ထုပ်ဝန်ပိုးဖြစ်စေပါသည်။

- လေးနက်စွာသဘောတူပါသည် သဘောတူပါသည် သာမန်ဖြစ်သည်
 သဘောမတူပါ လုံးဝသဘောမတူပါ

၁၈. အမျိုးသားနှင့် အမျိုးသမီးတို့သုံးစွဲသော လျှပ်စစ်ပစ္စည်းများမတူညီပါ။

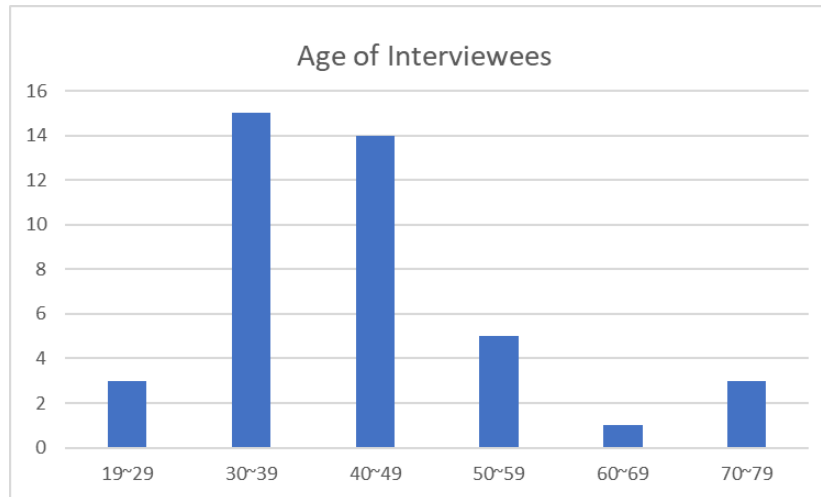
- လေးနက်စွာသဘောတူပါသည် သဘောတူပါသည် သာမန်ဖြစ်သည်
 သဘောမတူပါ လုံးဝသဘောမတူပါ

Appendix V: NVivo Nodes

Nodes			
Name	Files	References	
Changes		1	26
Community meeting		1	19
cooking paractice		1	6
electric appliances		1	24
Entertainment		1	11
Gender Impact & Empowerment		1	21
Main source of Income		1	16
New Income generating activities		1	68
Price		1	31
Reducing women's drudgery		1	31
school		1	2
Security		1	20
Social Welfare		1	12
SPM		1	5
The situation before the Project		1	12

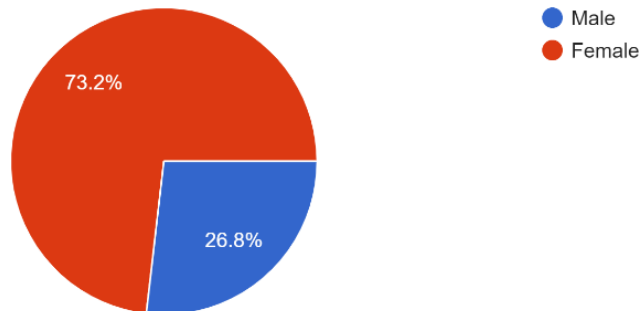
Appendix VI: Paper Surveys Result

Target Group	A random people in Than Pyar Chaung Village
Results	41 Paper Surveys
Survey Date	January 7 ~ 8, 2020



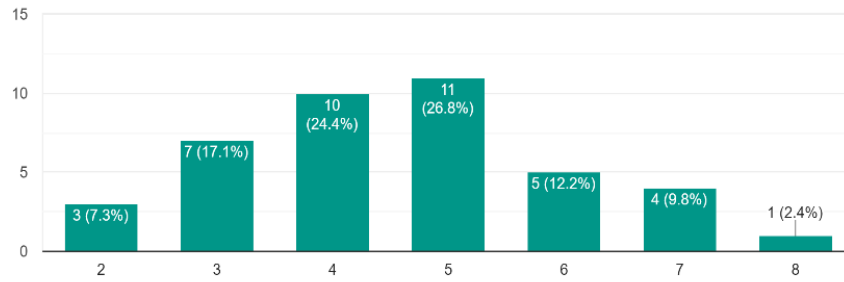
What is your gender

41 responses



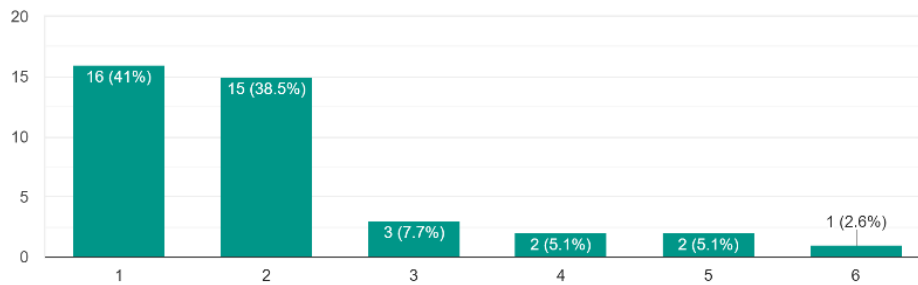
Number of occupants

41 responses



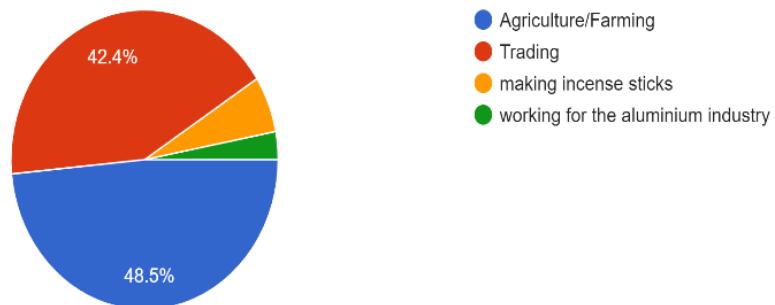
Number of Rooms in your house

39 responses



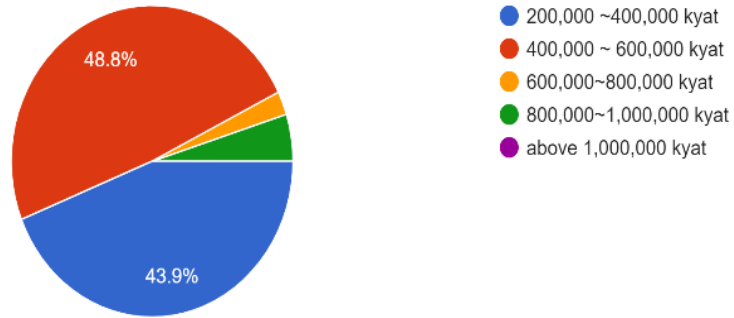
What is your main source of income

33 responses



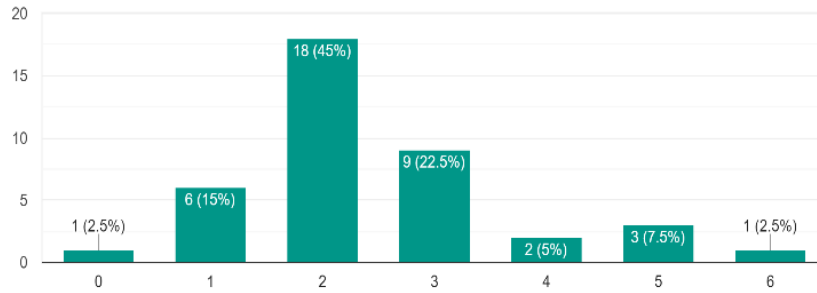
Please check approximately what your household income was last month?

41 responses



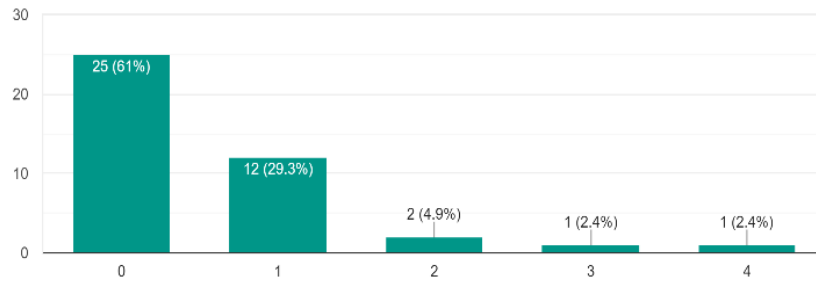
How many people in your family have an income

40 responses



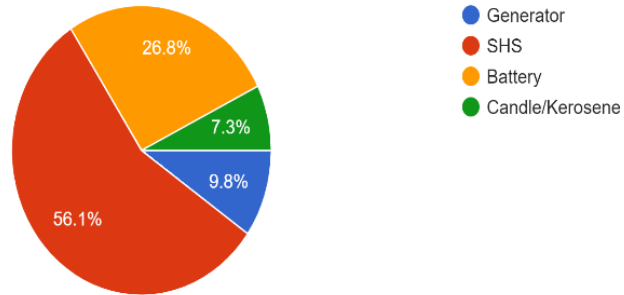
Are there any members of the family working outside of the village and how many?

41 responses



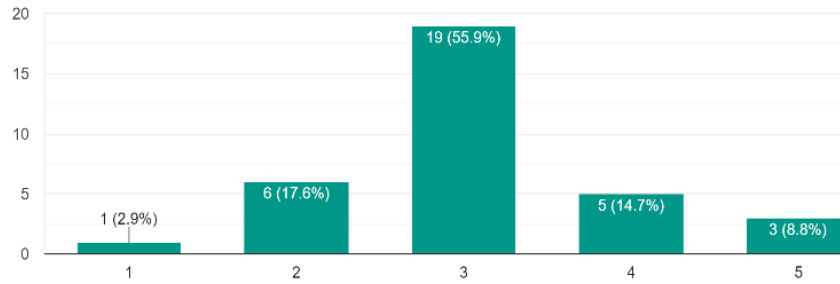
What was the main source used for light before the mini-grids project?

41 responses



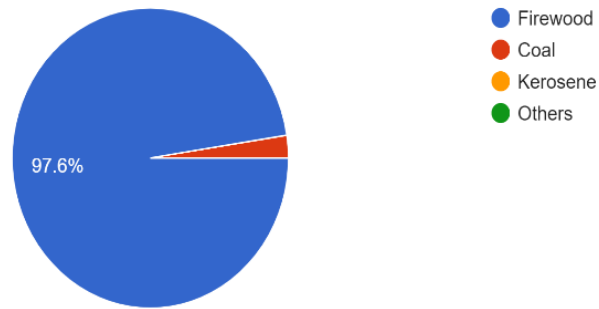
How many hours of the day are the light before the mini-grids project?

34 responses



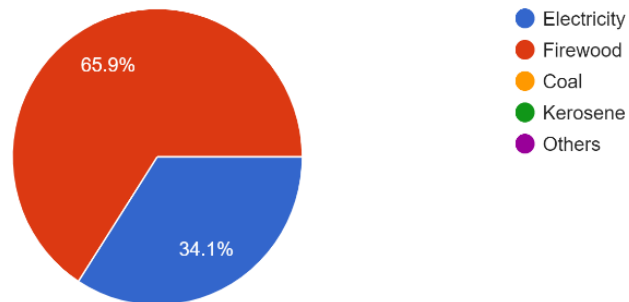
What was the main source used for cooking before the mini-grids project?

41 responses



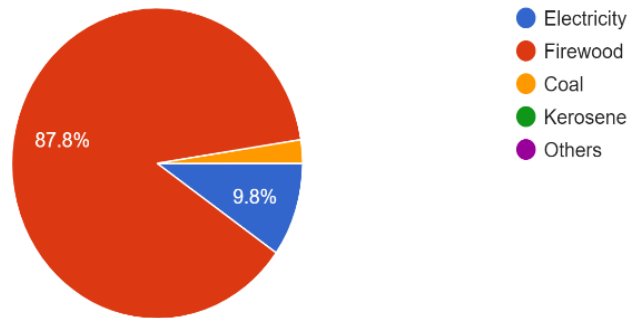
What is the main source used for rice cooking now?

41 responses



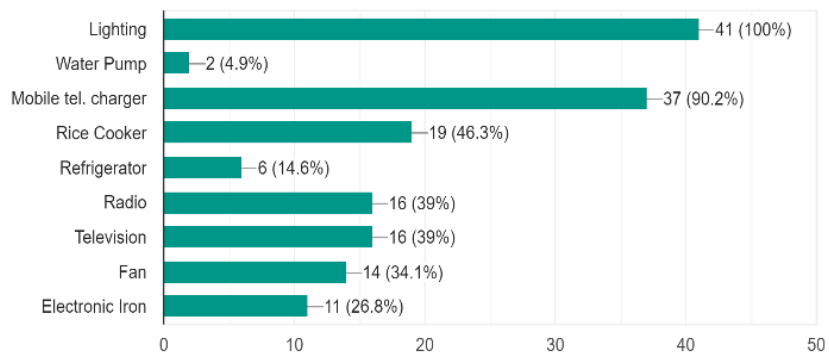
What is the main source used for general cooking now?

41 responses



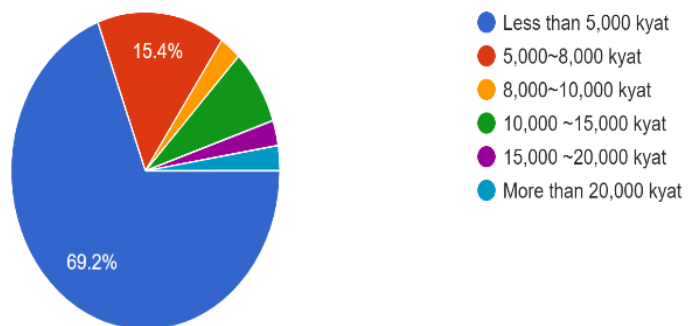
Tick if you are using below item with electricity

41 responses



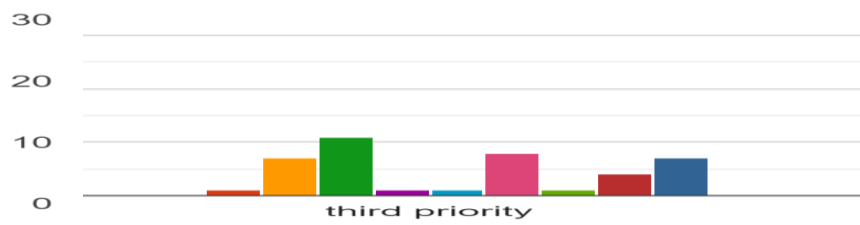
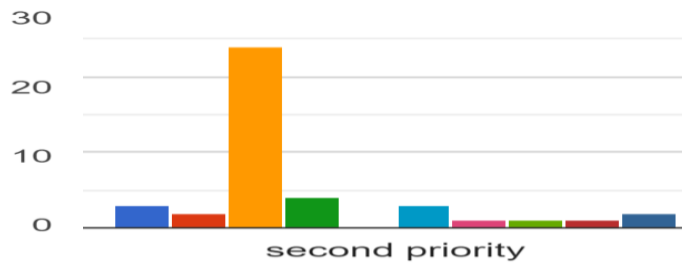
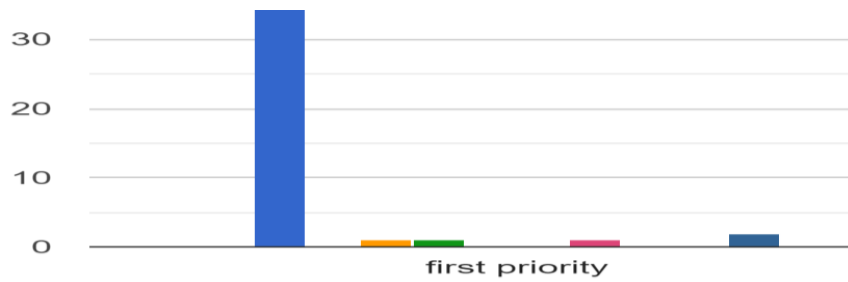
How much do you spend on electricity for every month?

39 responses



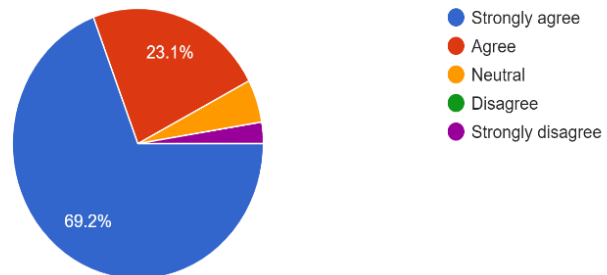
Rank the most used appliance for you from 1 to 3

■ Lighting
 ■ Water Pump
 ■ Mobile tel. Charger
 ■ Rice Cooker
 ■ Refrigerator
 ■ Fan
 ■ Electric Iron
 ■ Didn't answer

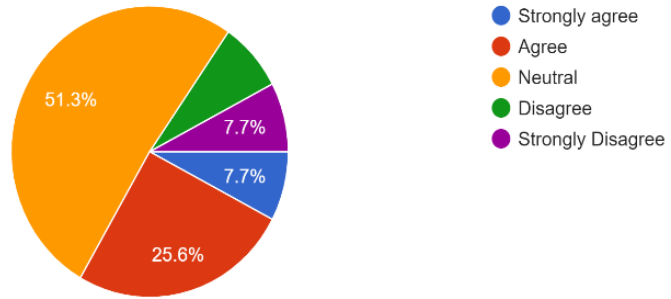


Today, the quality of life of my household is better than it was a year ago.

39 responses



The monthly electricity bill is a financial burden for my family
39 responses



Men and women use energy and its devices differently
39 responses

