YANGON UNIVERSITY OF ECONOMICS
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A STUDY ON HOUSEHOLDS' ELECTRICITY CONSUMPTION AFTER INCREASED ELECTRICITY PRICES (CASE STUDY: THINGANGYUN TOWNSHIP)

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A STUDY ON HOUSEHOLDS' ELECTRICITY CONSUMPTION AFTER INCREASED ELECTRICITY PRICES

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Economics (MEcon (Economics))

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This is to certify that this thesis entitled "A Study on Households' Electricity Consumption After Increased Electricity Prices (Case Study on Thingangyun Township) submitted as a partial fulfillment towards the requirements for the degree of Master of Economics, has been accepted by the Board of Examiners.

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ABSTRACT

Electricity is a fundamental need and plays a vital role in modern society, that make electricity consumption is increasing rapidly. Consequently, there are many challenges in Myanmar power sector. Especially, the power supply–demand gap has widened and government face significant losses, then announced new electricity tariff from July 2019. This study is mainly focus on the impacts of increased electricity prices on households' consumption behavior in Thingangyun Township, Yangon. Descriptive method is used as the research methodology with both primary and secondary data. Until the recent tariff increase, households in Myanmar enjoyed the lowest electricity tariffs. In the analysis of after increase new electricity tariff that significantly reduce households' electricity consumption because charges are more than twice as much as before and express lower satisfaction on power outage situation. Thus, increasing electricity tariff could reduce a level of government's subsidizing for losing electricity, government should also take steps toward improving electricity availability for households and arrange public awareness campaigns to gain better public satisfaction, consumption and support.

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LIST OF ABBREVIATIONS

ESB	Electricity Supply Board
MOEE	Ministry of Electricity and Energy
CWS	Coal Water Slurry
WB	World Bank
GDP	Gross Domestic Product
EE	Energy Efficiency
EMI	Equated Monthly Installment
EPC	Electric Power Corporation
MEPE	Myanmar Electric Power Enterprise
MOEP	Ministry of Electric Power
ESE	Electric Supply Enterprise
MOGE	Myanmar Oil and Gas Enterprise
MPE	Myanmar Petrochemical Enterprise
MPPE	Myanmar Petroleum Production Enterprise
EPGE	Electric Power Generation Enterprise
YESC	Yangon Electricity Supply Corporation
YESB	Yangon Electricity Supply Board
MESC	Mandalay Electric supply Corporation
kWh	Kilo Watt Hour
MW	Mega Watt
GW	Giga Watt
NEP	National Electrification Plan
AMI	Advanced Metering Infrastructure
ERC	Electricity Regulatory Commission
LNG	Liquified Natural Gas
CSR	Corporate Social Responsibility
CERP	Covid-19 Economic Relief Plan

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Electrical energy originates from various source, including the conversion of other forms of energy. Commonly, it's generated through processes like burning fossil fuels (coal, oil, natural gas) to spin turbines that produce electricity. Renewable sources like wind, solar, hydro, and geothermal energy also contribute to generating electrical energy by harnessing natural phenomena. Electricity is basic needs for development of a country and promoting living standard. Myanmar is one developing country and also known to the citizens as the golden land, is blessed with abundant natural resources. Sunny dry zones in the central, long coastal lines and hilly regions in east and north provides many resources for this golden land to generate electricity. The use of electricity power had been started in Myanmar in 1908 when the British colonial authorities allowed private operator to supply electricity to urban areas. After Myanmar attained independence in 1948, then the government established "Electricity Supply Board (ESB)" was organized in 1951 and thus began the government monopoly on utilities [1].

Electricity is important because it is common form of energy that we consume and helps to make our daily lives easier and then almost everything is mainly powered by electricity in the world. So, it become necessary for development of a country, for promoting living standards and provides all the comforts of life. As a result, global electricity consumption and production has continued to go up rapidly at a faster rate since the twenty first century. Electricity consumption is an essential component of the modern life. It not only provides clean and safe light throughout the day, but also in many countries refreshes homes on hot summer days, and in others warms them in winter. So, the increasing energy consumption is one of the most relevant concerns that current societies are facing [1].

The use of electricity power had been started in Myanmar in 1908 when the British colonial authorities allowed private operator to supply electricity to urban areas. After Myanmar attained independence in 1948, then the government established "Electricity Supply Board (ESB)" was organized in 1951 and thus began the government monopoly on utilities [1]. But in Myanmar, a large portion of the population is not yet connected to the main grid. Reliable and sustainable access to electricity in Myanmar is a challenge. There are 10.88 million of total households in Myanmar. Currently only 43% of Myanmar households have access to grid electricity. The rest of households (57%) either has no access or must rely on unreliable or badly maintained diesel micro-grids and small solar systems. Most grid electricity is generated by hydropower and burning fossil fuels. And there are three functions of electric power sector. They are electricity generation, power transmission and power distribution. The power generation of Myanmar consists of four components. They are hydropower, natural gas, coal-fired power and diesel power generation [2].

Currently, hydroelectric sources are the main source in the entire electricity production sector of Myanmar. At present, Ministry of Electricity and Energy(MOEE) is mainly responsible for supplying with electricity. Only Yangon region uses half of the total production of electricity. The government supplied electricity to a public, at a loss of K507 billion in the 2017-18 fiscal year and losses rose to K630 billion in 2018-19 [1]. Because the consumption of electricity is also increasing at least 15% each year due to increase in living standard of people urbanization, increase in utilization of modern electronic things & population. So, there is an insufficient power generation to meet consumptions. Then the government has declared a significant increase in electricity prices from July1 2019 to control public electricity consumption. As electricity powers the economy, tariff rate increases would have an immediate and apparent impact country wide. Therefore, it is vital to manage the expectations of the public. In Myanmar, the public use of electricity is classified into four types such as (1) Industrial Use, (2) Domestic Use (Households), (3) Bulk Use (Institution, school and hospital) and (4) General Use (Street light, temporary light).

This research paper intends to focus on the impact of increased electricity prices on households' electricity consumption behavior. It is very important to understand consumers' behavioral aspects; habits of energy use thus allowing to examine various factors that affect electricity consumption The consumer behavior or buyer behavior is influenced by several factors or forces. They are personal factors,

social factors, cultural factors, economic factors and psychological factors. In personal factors include gender, age, education, occupation. And Economic situation and lifestyle involve in Economic factors. Social factors impact the demand behavior of consumer such as family size, home size, role and status.

Culture is also the most fundamental determinant of a person's want and behavior. Every individual has different sets of habits, beliefs and principles through his or her family status, society and background. Each culture consists of smaller sub-cultures (geographic regions). And psychological factors such as perception, motivation and attitude also impact on consumer behavior. Households, as well as the people living there are very different and one of the important factors is to assess a consumer's behavioral aspects. Therefore, households' electricity consumption behavior is worth to be studied for this study.

1.2 Objective of the Study

The objective is to study on households 'electricity consumption after increased electricity prices.

1.3 Method of Study

The research methodology used in this study is a descriptive method by using both primary and secondary data. Primary data were randomly collected from selected respondents by face-to-face interviewing with prepared questions. And secondary data is used from the previous studies such as research paper, statistical year books, Ministry of electricity and energy (MOEE), newspaper and other relevant sources. The proposed method for this thesis consists of collecting and analyzing monthly electricity consumption data sets in Thingangyun Township. During the survey, important quantitative and qualitative data from households participating identified by questionnaires: households' users personal, socio-economic, socio-demographic characteristics, and type of electrical appliances, as well as issues related to attitude, awareness, level of knowledge on appliance usage habits, behavior.

1.4 Scope and Limitations of the Study

The public use of electricity is classified into four types which are (1) Industrial Use, (2) Domestic Use (Households), (3) Bulk Use (Institution, schools & hospitals) and (4) General Use (Street light & temporary light). The study will mainly

focus on domestic use (households) who living in Thingangyun Township about electricity energy consumption and four wards out of 38 wards are selected as simple random sampling with 200 respondents.

1.5 Organization of the Study

This thesis consists of five chapters. Chapter (1) is the introduction chapter and it comprises the rationale of the study, objectives of the study, method of study, scope and limitations of the study. Chapter (2) deal with the Review on literatures. Chapter (3) included the historical background of Myanmar Electric Power Sector. Chapter (4) focus on the impact of increased electricity prices on household's consumption behavior. Chapter (5) is about conclusion which constitute findings and suggestions.

CHAPTER II
LITERATURE REVIEW

2.1 The Role of Electric Power for Economics Development

As a main infrastructure component, electricity is one of the most important blessings that science has given to mankind for social and economic development. Lights that is the most basic of luxury that electricity provides is our light at night, and even during the day. Today, it has also become a part of modern life and life without electricity is almost impossible because everything runs on electric in our daily environment. For instances, many modern things such as TV, air conditioning fans, heat, refrigerator and freezer and other electric appliances. All these things provide comfort to people. More than ever before, we need electricity for almost all our works. In factories, large machines are worked with the help of electricity. And essential items like food, cloth, paper and many other things are the product of electricity. The use of electricity is increasing day by day. So, it become necessary for development of a country, for promoting living standards and provides all the comforts of life.

Economies depended on energy from agricultural crops and wood as well as smaller amounts of wind and waterpower, all of which are directly dependent on the sun before the Industrial Revolution. There are still some of these cases in rural areas of developing countries. While plants only capture about 1% of the energy in sunlight, solar energy is inexhaustible and abundant and diffuse compared to fossil fuels. Then, the maximum energy supply in a biomass-dependent economy is low. Then, fossil fuels in the Industrial Revolution were so important in releasing constraints on energy supply and, therefore, on production and economic growth (Wrigley 2010). Electricity is more productive and flexible and a high-quality energy carrier than other energy, with less pollution at the end use point. Electricity is far more thermodynamically efficient than any alternative technology in applications. Several are particularly applicable to electricity: reallocation of household time, especially for women, away from energy provision towards improved education and income generation; enhanced productivity of education investment due to children being able to study at night; the

ability to use new technologies including communication technologies; and health benefits resulting from outcomes such as reduced indoor air pollution and the ability to refrigerate.

Economic theory suggests that electricity purchases will depend on the prices of its substitutes such as natural gas and distillate fuel oil. On the other hand, they also have a close relationship with each other. People demand for higher living standards and rapid population growth are among determinants in the increase of electricity consumption. And increases in income also result in increases in electricity demand since they will use more electrical appliances especially air conditioners, heaters, and refrigerators which consume more energy. A rapid growth in population is causing changes in electricity energy demand from time to time. High consumption of electricity has been attributed to many determinants. A rise in electricity prices ceteris paribus will lead to a fall in consumption. It suggests that if price increase, the consumption will decrease. They reveal a negative relationship between each other.

But the economic literature has yet to establish whether greater electricity consumption leads to economic growth, or where economic growth leads to more electricity consumption. Likewise, it is difficult to estimate the magnitude of the impact of greater access to electricity on poverty, since having electricity is not an end in itself. Electricity needs to work with other sectors to ensure that the poor benefit as much as possible from that improved access. It's also support of wide-ranging activities and services improves quality of life, increases labor productivity, and encourages entrepreneurial activity. Its stable supply of power allows households to improve living conditions, helping to meet heating, lighting, and cooking needs across income levels. And it is a key input in economic production, making goods and services across all economic sectors possible.

It is also vital to basic social services such as education, health care, clean water supply, and sanitation. Modern means of transportation and communication have been revolutionized by it. Modern equipment like computers and robots have also been developed because of electricity. As such, access to affordable electricity can help developing countries meet the United Nations Millennium Development Goals. Development provides market opportunities for employment and the means to avoid the negative effects of traditional fuels. Therefore, as incomes increase, households gradually consuming higher quality fuels such as electricity (Hosier, 2004), although this does not mean giving up traditional fuels altogether (van der

Kroon, Brouwer, and van Beukering, 2013) or that incomes are the only factor relevant for household energy transitions (Burke and Dundas, 2015).

Efficient allocation of resources in electricity infrastructure is a "very challenging task" (Joskow and Tirole, 2007, 83). Due to the complexity and costs of electricity sector management and investment, power supply is often less reliable in developing countries than in developed countries. Electricity theft is also more common (Khanna and Rao, 2009). Reliability issues provide an incentive for industry and other electricity consumers to rely on captive generation (i.e. self- generation) of electricity. We will investigate the importance of reliability for economic growth and development. Both in developed and developing countries, the availability of reliable electric power supplies is an essential precondition for the functioning of modem economies. For developing countries, electric power has been playing a more and more important role in national economy. The increasing energy consumption is one of the most relevant concerns that current societies are facing. With incessant population growth, technological booming, development of societies which strive for having more and the best quality of everything, energy problems are inevitable. Developing countries are rapidly increasing electricity energy consumption since they foster their economic growth currently. High technological electrical appliances in daily activities demand high consumption in the energy.

2.2 Energy Sources for Electricity Generation

Electricity is one of our most widely used forms of energy. A characteristic of electricity is that it is not freely available in nature in large amounts, so it must be produced that is, transforming other forms of energy to electricity. Electricity is generated from sources such as water, wind and the sun's ways. However, these are indirect sources. The direct sources of transforming energy into electricity are static energy, electromagnetic induction and chemical energy. It also includes the photoelectric process that is transforming light into electrical energy, direct conversion of temperature differences, nuclear energy, etc.

A major chunk of electricity generation is driven by heat energy. There are also the main techniques that are used for electricity generation. We get electricity which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Before electricity generation began slightly over 100 years ago,

houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves.

Nowadays, there is a range of total energy available to generate a large amount of electricity on a large scale in terawatt hours. These energy resources fall into two main categories, often called renewable and non-renewable energy resources. Each of these resources can be used as a source to generate power, which is a very useful way of transferring energy from one place to another such as to the home or to industry. All resources, both renewable and non-renewable are especially used by people and if one day they would miss our life probably would not be as comfortable as it can be while we use them. Hence the need for them not to be misused or wasted.

Renewable resources are those that are never depleted, since they can be restored through natural processes; at a faster rate than they are consumed. They are plentiful, sustainable and kind to the environment. It often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services. Benefits of renewable resources are clean, unlimited, operating cost are low and reliable. They are available in abundant quantities and also potentially harmless to the environment but something very important to take into account is that although they are renewed we cannot exceed in its use, we must handle them carefully so that we do not spend them at a faster rate than they are renewed and we must face scarcity of the same ones.

On the other hand, non-renewable energy comes from sources that have a limited supply. It includes fossil fuels such as oil, coal and natural gas. There will come a time when these resources will be completely exhausted after being used. These resources come directly from the earth. They are usually divided into two groups: fossil fuels and nuclear fuels. Most non-renewable energy sources are fossil-fuels which cause some environmental damages. And non-renewable resources, although known for their efficiency; since they are able to produce a large amount of energy in a short time, they can be more expensive in the long run.

2.2.1 Types of Renewable Resources

The types of renewable resources are solar energy, wind energy, water energy (hydroelectric power), biomass and biofuels and geothermal energy.

Solar Energy is radiant light and heat from the sun. It is an important source of renewable energy which is found in abundance and also important source of energy

for life forms. There are some basic equipment's of solar system. They are solar panels, batteries, charge controller and power inverter. Solar panels are the most significant of all the solar energy equipment. They are needed to harness the energy that is being generated by the sun to produce the power. Another piece of solar energy equipment is battery, which is designed to discharge and recharge energy countless times on a given day. So if the sun isn't shinning the battery storage will provide consistent power supply. In high sun exposure the voltage produced by the solar panels has the potential to damage the batteries. Solar energy equipment to prevent overcharging a charge controller is required to regulate the charge, ultimately increasing battery life and performance. A power inverter is also solar energy equipment needed unless on battery power exclusively. Nowadays, solar energy is used in number of ways such as, as heat for making hot water, heating buildings and cooking, to take the salt away from sea water, to use sun rays for drying for clothes and towels, to generate electricity with solar cells or heat engines.

Another way of producing electricity is using wind energy. It is created through the use of wind turbines; these turbines use air flow to mechanically peer generators for electricity. It is non-polluting and renewable. A wind turbine or alternatively referred to as a wind energy converter is, a device that converts the wind's kinetic energy into electrical energy. Wind power plants are becoming an increasingly important source of intermittent renewable energy and are used by many countries as part of a strategy to reduce their reliance on fossil fuels.

The cheapest source which is to generating power is water. Electricity is generated by using the kinetic energy of flowing water is called hydroelectricity. Thus, the electric power that is generated, is called hydro power. It is considered a source of renewable energy because it uses the earth's water cycle to generate electricity. In hydroelectric power plant, there must be continuous supply of water. Water reservoirs main functions are to store a net amount of water in it during rainy reason and supply it throughout the year but large space is needed for the reservoir. So, a high dam is constructed on one side of the reservoir to hold back water. It helps to increase the capacity of reservoir and to increase the working head of the power plant. Hydro power efforts produce a number of benefits, such as flood control, irrigation and water supply.

Biomass is also used for facility heating, electric power generation, and combined heat and power. The term biomass encompasses a large variety of

materials, including wood from various sources, agricultural residues, and animal and human waste, etc., are major examples of biomass. Biomass can be converted into electric power through several methods. The most common is direct combustion of biomass material, such as agricultural waste or woody materials in order to generate heat, which is further used to produce electrical energy. Some of the sources are also fermented to generate biogas, which can be readily burned and converted to electricity with the help of biogas power plants. Biomass is a very promising and important source of renewable energy, and its use for electricity generating purposes is steadily increasing.

Geothermal energy is the heat under the ground which generated and stored in the earth to heat water and make steam to turn generator turbine and make electricity. It is renewable energy because one water or steam is used, it can be pumped back into the ground and environmentally friendly, it does not affect the environment because these emissions are much lower per energy unit than those of fossil fuel but it is only suitable for a region which have hot rocks below the earth and can produce steam over a long period of time. The Earth's geothermal resources are theoretically more than adequate to supply humanity's energy needs, but only a very small fraction may be profitably exploited. Drilling and exploration for deep resources is very expensive. Forecasts for the future of geothermal power depend on assumptions about technology, energy prices, subsidies, plate boundary movement and interest rates.

2.2.2 Types of Non-Renewable Resources

There are four main types of non-renewable energy such as coal, oil, natural gas and nuclear power.

Coal is a black rock that can be burned to produce energy and plays a vital role in electricity generation worldwide. There are four types of coal. They are lignite coal, sub bituminous coal, Bituminous coal and anthracite coal. The function of grounding the coal blocks evenly to fine fragments and placing them in a furnace that is attached to a water boiler. After undergoing heating and combustion, the water bois, and the resultant steam is used to drive the turbines to generate electricity. An alternative method is by using coal water slurry(CWS) fuel, which helps improve the efficiency of power generation. Out of the total electricity generated on our planet, around 40%is derived by heating coal. Coal-fueled power plants currently fuel 38% of global electricity and in some country, coal fuels a higher percentage of electricity.

Coal is produced in over 50 countries and used in over 70 countries. And worldwide, the largest reserves are found in the US, Russia, China and India. Because coal is still plentiful and easy to obtain, it is less expensive than oil and gas. The top exporter is Australia about 55% of world exports. However, it releases carbon dioxide, other environmentally harmful gases into the atmosphere and the main greenhouse gas that has the largest impact on global warming. All of these pollute the air and water.

Crude oil is also a nonrenewable fossil fuel. This means that one day we will probably run out of crude oil. Heating from crude oil and other petroleum products can warm homes in colder weather, making modern living possible even in colder climates. Though most oil is used for transportation or home heating purposes, a small percentage is still used as a fuel for electricity generating plants. Oil reserves can be found all over the world, including the North Sea, Saudi Arabia, Russia, the United States, Iran, Iraq and China. Producing electricity from crude oil is expensive compared to other fossil fuels such as coal and gas. There are three technologies are used to convert oil into electricity:(1) Conventional steam, (2) Combustion turbine and (3) Combined-cycle technology. But burning oil to generate electricity and the operation of oil-fired power plants can cause significant air pollution and also impacts on land use and solid waste disposal. And this is a greenhouse gas that contributes towards climate change.

Natural gas is a fossil energy source that formed deep beneath the earth's surface. It is formed from dead plants and animals being pressured undergrounds for millions of years. Natural gas is non-renewable resources with finite use and availability and a clean-burning fuel. It is very easy to transport using pipelines. When it is burned in a boiler to heat steam, the steam then turns a turbine to generate electricity. It is the most effective hydrocarbon fuel and produce 30% less CO2 than petroleum and 45% less than coal although environment is polluted and affect the lungs of humans and creating a problem in breathing. When fossil fuels (coal, oil) are burned, they can release different elements, compounds, and solid particles. When they are burned, they release high amounts of harmful emissions, including nitrogen oxides, sulfur dioxide, and particles that drift into the atmosphere and contribute to air pollution. In contrast, the methane in natural gas has a simple molecular make-up: CH4. When it is burned, it emits only carbon dioxide and water vapor. The most common places to use natural gas are the USA and Russia and the least are Sweden, Portugal, and some other countries in Asia and Africa.

Nuclear power is a clean and efficient way of boiling water to make steam, which turns turbines to produce electricity. It comes from radioactive elements, mainly uranium, which is extracted from mined ore and then refined into fuel. It generates power through fission, which is the process of splitting uranium atoms to produce energy. The heat released by fission is used to create steam that spins a turbine to generate electricity. Nuclear is the United Stated largest sources of clean energy. All fuel resources have some environmental effects, but nuclear has much smaller effect than fossil fuels. Nuclear power plants generate electricity without producing air pollution and the amount of energy produced far exceeds what is produced using fossil fuels. But they are very expensive to build and maintain. Because electricity is used as inputs to produce most of the goods and services, a higher electricity price can affect the prices of other sectors of an economy both directly and indirectly.

2.3 Economics of Electric Tariff

Electricity is often considered to be a public good for households. Pricing this product has thus been influenced by both politics and economics. For most households, these prices appear as tari-rates from regional retailers. The amount of money frame by the supplier for the supply of electrical energy to various types of consumers in known as an electricity tariff. In other words, the tariff is the methods of charging a consumer for consuming electric power. The tariff covers the total cost of producing and supplying electric energy plus a reasonable cost. The actual tariffs that the customer pay depends on the consumption of the electricity. The consumer bill varies according to their requirements. The industrial consumers pay more tariffs because they use more power for long times than the domestic consumers.

The goal of tariff design from an economic perspective is to create the right price and cost signals and economic incentives such that producers and consumers would make the appropriate investment and consumption decisions that would make the economy run more optimally (Passey, Haghdadi, Bruce, & MacGill, 2017; Picciariello, Reneses, Frias, & Söder, 2015; Zaheeruddin & Manas, 2015). True to the economic efficiency principle discussed before, a regulator would prefer a tariff design that is economically productive, where goods and services are produced at lowest possible cost, and economically allocative, where resource is allocated to whoever who utilizes or values it best [3].

The traditional approach to power sector investment planning starts with a forecast of demand and a search for least-cost solutions (Turvey & Anderson, 1977). The tariff pricing structure could then be derived. Tariff should be designed to differentiate among the different types of consumption and production cases so as to properly allocate costs and also create the right incentives to promote ideal behaviors in players in the system, normally through price signals (Qi, Zhang, Wei, & Que, 2008). But there are direct and indirect costs to producing and delivering electricity to consumers (Kirschen & Strbac, 2004). Direct costs include cost of generating the energy – fuel, operation, and maintenance – and cost of transmitting and distributing the power – grid operation and maintenance and commercial activities such as billing. Indirect costs include management and financing costs. These costs can be simply classed into cost of producing the energy and the cost of delivering the energy to consumers. In practice, the cost of delivering electricity is a function of the geographical location of customers and the capacity and timing of their demand [3].

The cost of producing energy is nowadays reflected in power purchase agreements with independent power producers or through competition on a wholesale electricity market (Economic Consulting Associates, 2016) [3]. For example, electricity generation prices, particularly in liberalized wholesale markets, often change dramatically from hour to hour. Due to this mismatch between costs and prices, some subscribers (person who receive a publication regularly by paying in advance) may pay less than their fair share for electricity while others pay more. As retailers are often regulated to meet specific financial criteria, such cost transfers are imposed as cross-subsidies on the consumer population. This fairness issue is a common theme of debate in distribution grid pricing. Second, this economic efficient cost is deliberately adjusted to achieve some country- specific equity objectives. Previous attempts to incorporate income re-distributional concern into electricity pricing relied heavily on simplified economic theory of supply and demand curves.

In the case of developing countries which are more prone to macroeconomic instabilities such as depreciating currencies, considerations have to be given to managing fiscal risks as power purchase prices are normally denominated in U.S. dollars (The World Bank, 2018) [3]. And governments in most developing countries are under pressure from lending institutions and the business community to review their role in the provision of infrastructure services and to promote private sector participation. Naturally, private investors would desire a removal of subsidies.

However, to protect consumers from large price shocks, subsidy removal might be a gradual process and not a one-step radical operation. While subsidies remain, it is necessary that they be used cautiously in order not to erode the financial viability of the power industry. So adequate pricing of electricity to allow for cost recovery is also important to minimize the power sector's negative macroeconomic, fiscal, environmental, and social impacts.

And the physics of alternating current electricity flows mandate that a higher peak demand of energy would require thicker transmission wires and additional capacitors to deliver the greater capacity. The further the distance required to transport this energy, the greater the investment required. This means more investment, more depreciation, and more operational costs to the network operator. Therefore, for this example, a cost reflective tariff design would mean that higher peak demand customers should be allocated the extra cost required to serve them. Financial viability of the power sector is a prerequisite for attracting the investment needed for universal access to affordable, reliable, and sustainable electricity and the transaction toward clean energy.

However, investment size in power infrastructure is typically very large and highly significant in the context of a developing country. The assets invested cannot be easily moved or adapted, and have decades long useful lifespans. Therefore, the cost structure of electricity can be highly rigid if there is a lack long-term planning ultimately delivering least-cost solutions. The size of investment combined with negative net cash operations could lead to circular debt problem. This lack of planning or inability to execute a well-designed plan is a hallmark of the power sector in most low-income countries (Erdogdu, 2010).

Long term oriented coordinated planning is required for least cost power generation and optimally performing network. For example, investments in power generation and power transmission could be coordinated to reduce the required investment size in each component respectively. A coordinated investment plan between power generators and network operators would generate higher returns or cost savings than an uncoordinated one. Well-planned network investments such as an optimally located transmission line or electrical equipment in well-selected substations could meet increased electricity demand without any extra power generation investment required (Aung, 2015).

So, tariff policy also plays an important role in providing "right" price signals for consumers, which is a necessary condition to improve the demand side energy efficiency (EE) in terms of the environmental, social and economic benefits. Improving EE is the most effective way to address challenges of energy security, import dependency and climate change. In spite of these benefits EE still remains underutilized in Georgia. Regulators can partly address this issue by creating "right" consumer incentives through adequate electricity tariffs. In other words, the price should reflect the costs considering all its components, and guarantee that the cost of the companies involved in electricity chain are covered. Electricity tariffs can stimulate energy efficiency, however, if other barriers remain unaddressed, raising utility tariffs alone will not lead to the desired effect. Another important factor affecting consumers' incentives is the transparency of the tariff. Consumers should be able to understand the electricity price and consumption so the tariff can motivate decisions toward both behavior changes and investments in energy efficient technologies [4].

Especially, electricity tariffs in many developing countries are heavily subsidized below the opportunity costs by the government for a number of sociopolitical or equity reasons which may include: a) the need to make electricity affordable to very poor consumers; b) the desire to achieve an optimal mix in consumption pattern of available energy resources; and c) the need to stem rural-urban migration and thereby sustain rural agriculture [5]. But it also suffers heavy distortions because of undue government influence. However, in view of increasing financing constraints in recent times and the need for increased energy efficiency, private sector participation in the electric utility industry in these countries is crucial for the future success of the industry. Consequently, to encourage private sectors efforts, electricity tariffs must be adjusted to acceptable economic levels [5].

2.4 Consumer Behavior Model

Consumer behavior encompasses every though, feeling or actions of individuals (consumers) directly involved in obtaining, using, and disposing of economic goods and services, including the decision processes that precede and determine these acts. It is the study of how individuals, groups and organizations select, decide and use to spend their income based on their individual preferences and dispose of goods, services, ideas, and experiences to satisfy their needs and wants. In

fact, everybody in this world is a consumer. However, we all have different characteristics and adopt different behavior patterns while making purchase decisions. Each consumer is unique and this uniqueness is reflected in the consumption behavior, pattern and process of purchase. The study of consumer behavior provides us with reasons why consumers differ from one another in buying and using products and services.

Consumer behavior, also called Human Behavior is the process and act of decision-making of people involved in buying and use products. Kotler observed that human behavior is largely the result of a learning process and as such individuals grow up learning a set of values, perceptions, preferences and behavior patterns as the result of socialization both within the family and a series of other key institutions. Consumer buying behavior refers to the selection, purchase and consumption of goods and services for the satisfaction of their wants. Meanwhile, **N Ramya and Dr. SA Mohamed Ali** propose that there are various other factors influencing the purchases of consumer such as social, cultural, economic, personal and psychological.

(i) Social characteristics play an important role in consumer behavior. Its factors are family, Roles and status and Reference Groups influencing consumer behavior. For instances, if the family size is large and group decision-making gets more preference than individual and greater consumption than the smaller family. And role specialization is critical in family decision making. And in most households, it is the housewives who have to manage family members' income. She plays a greater role to make decision about expenditure in this household. And role specialization is critical in family decision making. A reference group is a group of people with whom an individual associate. It is a group of people who strongly influence a person's attitudes values and behavior directly or indirectly. For e.g. friends, family members, neighbors, religious groups, professional groups etc.,

(ii) Cultural factors have a strongly effect on an individual's consuming decision. It consists of culture, sub culture and social class. Culture is the most fundamental determinant of a person's want and behavior. Every individual has different sets of habits, beliefs and principles through his or her family status, society and background. Culture influences considerably the pattern of consumption according his habits and the pattern of decision-making. Sub-culture refers to a set of beliefs shared by a subgroup of the main culture, which include nationalities, religion, age, geographical location, gender etc. And consumer behavior is determined by the social class to

which they belong. There are three different social classes in our society. They are upper class, middle class and lower class. These three social classes differ in their buying behavior. Upper class consumers want high-class goods (luxurious items) to maintain their status in the society. Middle class consumers purchase carefully and collect information to compare different producers in the same line and lower class consumers buy on impulse. Social class is not determined by a single factor, such as income but it is measured as a combination of various factors, such as income, occupation, education, authority, power, property, ownership, life styles, consumption, pattern etc.

(iii) Another important factor is personal factors which influence consumer behavior, are age, occupation, income and life style. Age of a person is one of the important personal factors influencing buyer behavior. People buy different products at their different stages of cycle. Their taste, preference, etc. also change with change in life cycle. An individual's nature of job or occupation has a direct influence on his/her consuming behavior. The life styles and buying considerations and decisions differ widely according to the nature of the occupation. Income level of people is another factor which can exert influence in shaping the consumption pattern. Income is an important source of purchasing power. So, buying pattern of people differs with different levels of income and life style to a person's pattern or way of living as expressed in his activity, interests and opinions.

(iv) Consumer behavior is also influenced largely by economic factors. The following are the main economic factors that greatly influence the consumer buying behavior: personal income, family income, savings, income expectations, consumer credit and liquid assets. The personal income of an individual influences his buying behavior as it determines the level to which the amount is spent on the purchase of goods and services. The family income refers to the aggregate of the sum of the income of all the family members. The total family income also influences the buying behaviors of its members. The income remaining after meeting all the basic necessities of life can be used for the purchase of shopping goods, luxury items, durable goods, etc. The amount of savings out of the personal income also influences the consumer buying behavior. Such as, if the customer decides to save more for a particular period, then his expenditure on the other items will be less and in case the savings are less the expenditure on other items increases.

An Individual's expectation with respect to his income level in the future influences his buying behavior today. Such as, if a person expects his income to increase in the future, then he will spend more money on the purchase of the luxury goods, durables and shopping goods. And on the contrary, if he expects his income to fall in the future his expenditure on such items also reduces. The credit facility available to the consumer also influences his buying behavior. If the credit terms are liberal, and EMI scheme is also available, then the customers are likely to spend more on the luxury items, durable goods, and shopping goods. This credit is offered by the seller either directly or indirectly through the banks and other financial institutions. And The liquid assets with the consumer also influences his buying behavior. The liquid assets are the assets that are readily convertible into the cash. If the customer has more liquid assets, then he is likely to spend more on the luxury items and the shopping goods. On the other hand, if the liquid assets are few then the expenditure on luxury items also reduces.

(v) Various psychological factors influencing individual behavior. This is considered to be the most important factor that affects consumer behavior. Traits like satisfaction, perception, motivation, personality, beliefs and attitude are important to decide why a consumer would purchase a product. Satisfaction plays a significant role in consumption behavior and can influence how individuals, households, and consumers make choices regarding the goods and services they purchase and consume. Perception is the process of knowing or understanding. A given situation is perceived differently by different people. If the perception of a person is correct, he/his organization stands to benefit. If it turns out to be incorrect, he/his organization loses. Consumer attitude basically comprises of beliefs towards, feelings towards and behavioral intentions towards some objects. Belief plays a vital role for consumers because, it can be either positive or negative towards an object. And motivation is sufficiently pressing and the driving force behind purchasing decisions as consumers are actively seeking to satisfy their needs.

2.5 Review on Previous Studies

Phone Myint (2012) studied the Electricity distribution development (from 1988-1989 to 2010-2011) in Myanmar and he also focus on the reasons for unit losses of electricity based on secondary data by using qualitative approach. According to his study, the electricity distribution development plays an important role to meet

people's basic need for reducing poverty and achieving the Millennium Development Goals and Conventional Generation System should be paid more attention.

Matam Manjunath & Prashant Singh (2013) studied Consumer Behavior towards Electricity. In this study mainly focused on Generating Capacities, Transmission and Distribution. But consumer and his demand for power source are crucial for Electrical system and its sustenance. In fact, there is less or no study to predict consumer demand. Their behavior is hardly understood through load forecasting. A Distribution feeder connects all consumers -poor to rich, rural to suburban then to urban, low demand agriculture to high demand industries etc. According his paper is intended to study domestic consumer covering all socioeconomic geographical sections. This study has revealed and created inputs to Electrical Load Online Census, load dynamics like fields.

Liga Poznaka, Ilze Laicane & Dagnija Blumberga (2014) studied about Analysis of electricity user behavior. Their research was carried out by analyzing 1) what kind of behavioral and motivation factors influenced changes in electricity consumption; and 2) to what extent changes in electricity consumption were affected by smart meters. The results show that changes in electricity consumption are not influenced only by technical aspects, but also by users' psychological aspects, such as subconscious and belonging to the social group. And N Ramya and Dr. SA Mohamed Ali (2016) studied Factors affecting consumer Consumption Behavior. They explored that an individual and a consumer is led by his culture, his subculture, his social class, his membership groups, his family, his personality, his psychological factors, etc. and is influenced by cultural trends as well as his social and societal environment.

Soe Naing (2018) also examined the willingness to pay for the use of electricity in Yangon by using descriptive method based on both primary and secondary data. According to his analysis, he explored that Ministry of Electricity and Energy lost because electricity production actual costs was more than government average selling prices. So he studied people's willingness to pay for improved electricity and he also found that the reasons for willingness to pay are positive impact on their life to be secure as well as to social wellbeing according the analysis on the industrial owners in Myanmar.

In 2018, Aung Kaung Set studied on electricity generation development in Myanmar. In his analysis, power pricing system in Myanmar is still weak to encourage for industrial sector development because of high price for industrial and

commercial use. Zeya Aung (2019) also studied Myanmar Electricity Tariff Reform for his master degree at Tsinghua University. In his finding, showed four distinct attitudes towards reform which provide understanding into the dynamics between consensus and neutral opinions and disagreements

CHAPTER III
OVERVIEW OF ELECTRIC POWER SECTOR IN MYANMAR

3.1 Myanmar's Electrification and Historical Background

Myanmar is geologically very rich with a population size of approximately 54 million and is strategically located between the two most populous countries in the World – China and India. Myanmar is blessed with significant natural resource endowments including oil and gas, minerals, gemstones, and potential hydropower. In Myanmar, the electric power sector plays an important role for infrastructure development. The usage of electricity in Myanmar started in 1908. Myanmar's electricity sector consists of private and state-owned energy generators that sell electricity directly to government. In the period approached to independence of Myanmar, the national leaders set strategies and plans for the development of the country: to promote and expand the agricultural sector with advanced technologies; to exploit the natural resources effectively by cooperating with local industries. The leaders also realized that electricity played a vital role to implement above strategies.

Therefore, in June 1947, they decided to implement the hydropower projects which were enormous resources in Myanmar and could be implemented by suitable budgets as a first priority. They put those plans in two years plan for Economic Development of the Union of Myanmar (1947). In early post-independence time, Electricity Supply Board (ESB) was organized under the Ministry of Industry on 1st October 1951 complied with the Electricity Act of 1948. On 16th March 1972, it was changed as Electric Power Corporation (EPC). On 1st April 1975, the Ministry of Industry was divided into the Ministry of Industry (1) and the Ministry of Industry (2) and hence the Electric Power Corporation (EPC) was composed under the Ministry of Industry (2). On 12th April 1985, the Ministry of Industry (2) was expanded with the Ministry of Energy and the EPC was composed under the Ministry of Energy.

On 1st April 1989, the EPC was changed into the Myanmar Electric Power Enterprise (MEPE). On 15th November 1997, the Ministry of Electrical Power was organized, and there were three departments under it: The Department of Electrical Power, the Myanmar Electric Power Enterprise and the Department of Hydropower. On 15th May 2006, the ministry was divided into No 1 and No 2, and on 5th September 2012, they were composed again into one Ministry as the Ministry of Electrical Power (MOEP) under which there were three departments, two enterprises and two corporations. On 1st April 2016, the MOEP was composed with the Ministry of Energy to form the Ministry of electricity and energy (MOEE) under which there were four departments, five enterprises and two corporations.

They are;(a) Department of Electricity power and planning (DEPP), (b) Department of Hydropower Implementation (DHPI), (c) Oil and Gas Planning Department(OGPD), (d) Department of Electric Power Transmission and System Control (DPTSC), (e) Electric Supply Enterprise(ESE), (f) Electric Power Generation Enterprise (EPGE), (g) Myanmar Oil and Gas Enterprise (MOGE), (h)Myanmar Petrochemical Enterprise(MPE), (i) Myanmar Petroleum Production Enterprise (MPPE), (j) Yangon Electricity Supply Corporation(YESC) and (k) Mandalay Electricity Supply Corporation (MESC).

Economic development is accordingly a priority for Myanmar. As part of its development, efforts are needed to upgrade the country's basic infrastructure, including roads, bridges, communication systems, and the electrical grid. Boosting electrification is a key driver for the economic development and industrialization of Myanmar. Many in the international community see Myanmar as a new economic frontier as the country has opened to the outside world and started to implement political and economic reforms. But in the power sector, Myanmar has one of the lowest electrification rates in Asia and rural communities face significant energy poverty. Furthermore, Myanmar is an agricultural-based economy with around two-thirds of the population living in rural areas with no access to electricity. Lacking electricity, most rural households burn firewood and animal dung for lighting and cooking, causing widespread acute respiratory problems.

Low electrification also hampers development of industry and even small businesses. Electrification varies widely between urban and rural areas. Electrification rate is around 40%, meaning 60% of the population has no access to electricity from the power gird. To achieve energy sustainability, the government

aims to increase electricity generation from renewable energy resources. It sees these as vital to electrifying rural areas and therefore promotes (i) capacity building of those involved in renewable energy generation activities, (ii) awareness of alternative renewable energy sources, (iii) public–private partnerships and foreign investment for implementing renewable energy-related business, (iv) research and development of renewable energy, and (v) energy efficiency.

In 2013, Myanmar began to reform the power sector first by attempting to unbundle power generation, transmission, and distribution. In power generation, independent power producers were invited to invest in electricity generation. The government also recognizes that foreign direct investment through the private sector will be one of the main vehicles to develop the power sector. In the absence of a comprehensive and transparent framework for increased private sector participation in the sector, the government has taken initial steps to strengthen legislation to facilitate the financing of power investments through various private sector participation schemes with the provisions in the new Electricity Law. In power distribution, retail franchisee contracts were given to private companies. These contracts allow for electricity distribution in individual townships to be operated by the franchisees.

However, Myanmar's electric power regulatory framework includes new laws, and policies at high levels, but detailed implementing guidelines and standards are still under development, over the years, some companies have returned their licenses and some townships were confiscated by the state-owned distribution company. But at the end of 2015, the financial sector and telecommunications industries are experiencing major shifts that will increased energy demand and open new opportunities for rural customers to access markets and services.

On the other hand, Myanmar's government also implementing the National Electrification Plan (NEP). The Myanmar National Electrification Plan (NEP) aims to electrify 100% of Myanmar's households by 2030. But there is one of the most pressing challenging to achieving full electrification when the grid is available. That is every communities and every household often do not have the money necessary to connect. Individual households are presently responsible for paying their own connection costs in Myanmar. These costs are in the range of 400,000K to 500,000K per household and many poorer cannot afford it. Currently, there are inadequate financial scheme to support poorer households to pay for their connections. This situation has left too many households in the frustrating position of being literally

next to new electricity poles but unable to connect to them. However, due to the implementation of the government's NEP, access to electricity in the States and regions has increased significantly. The following table is the list of electrified villages and townships, number of households being electrified in each state and region as of September 2020.

Table (3.1) List of Electrified Villages and Townships, Number of Households Being Electrified in Each State and Region

S/N	state / Division	Status of Electrification (Towns)				Status of Electrification (Villages)					Status of Electrification		
		No. of Existing Town	No. of Electrified Town (National Grid)	No. of Electrified Town (Off Grid)	Total No. of Electrified Town	No. of Existing Villages	No. of Electrified Villages (National Grid)	No. of Electrified Villages (Off Grid)	Total No. of Electrified Villages	Remaining Villages to Electricity	Total No. of household	No. of Household being electrified	Percentage of households being electrified (%)
1	Kachin	32	16	16	32	2547	566	778	1344	1203	269365	192823	71.58
2	Kayah	10	10	-	10	517	404	77	481	36	64809	64753	99.914
3	Kayin	18	11	7	18	2097	565	594	1159	938	308041	159595	51.81
4	Chin	19	7	12	19	1343	55	933	988	355	91121	29739	32.64
5	Sagaing	50	35	15	50	5989	2936	2389	5325	664	1096857	599942	54.7
6	Tanintharyi	18	-	18	18	1237	-	748	748	489	283099	69810	24.66
7	Bago (East)	29	29	-	29	2878	1203	287	1490	1388	636214	357101	56.13
8	Bago (West)	23	23	-	23	3609	1384	188	1572	2037	506760	240117	47.38
9	Magway	32	32	-	32	4788	1594	1646	3240	1548	919777	384560	41.81
10	Mon	17	14	3	17	1143	596	269	865	278	422612	317650	75.16
11	Rakhine	26	22	4	26	3741	595	1499	2094	1647	459772	158055	34.38
12	Shan (South)	36	34	2	36	4784	1397	476	1873	2911	514639	320899	62.35
13	Shan (North)	29	17	12	29	5241	617	1253	1870	3371	445983	186774	41.88
14	Shan (East)	21	2	19	21	3748	35	853	888	2860	208947	35774	17.12
15	Ayeyarwaddy	45	43	2	45	11864	1605	5376	6981	4883	1488983	335952	22.56
16	Nay Pyi Taw	8	8	-	8	796	561	59	620	176	262253	211627	80.7
	ESE (Total)	413	303	110	413	56322	14113	17425	31538	24784	7979232	3665171	45.93
17	YESC	21	20	1	21	2143	1407	215	1622	1582944	1582944	1483986	93.75
18	MESC	30	30	-	30	4799	3617	470	4087	1323191	1323191	963105	72.79
	Total	464	353	464	464	63264	19137	18110	37247	10885367	1085367	6112262	56.15

Source: MOEE,2019

Average per user consumption is also increasing, adding to the challenges of meeting the ambitious target of 100% electrification by 2030. So, the World Bank approved a $400 million loan to support the Myanmar Government's National Electrification Plan (NEP). And other international donors such as Asian Development Bank, UN agencies and development entities from Germany, Japan, Italy, Norway and other countries are making significant investments in this arena. As the country's economy has been undergoing a process of economic reform, the outlook and prospects for economic growth in the near term future are optimistic.

Key to economic growth in the country will be a continuous supply of energy to enable the country to prosper. The ongoing enhancement and expansion of Myanmar's electricity industry is thus an important part of enabling economic growth to occur. Myanmar also has one of the lowest electrification rates in the region. Enhancing access to electricity is therefore a major concern.

3.2 Organizational Structure, Functions and Objectives of YESC

3.2.1 Organizational Structure of YESC

Yangon is commercial city of Myanmar, and all of the industrial zones, households and businesses are mainly relying on the Electricity Supply System of Yangon City Electricity Supply Corporation(YESC). Yangon City Electricity Supply Board (YESB) is responsible for the supply of electricity to consumers in Yangon City. On 1 April 2015, however, the YESB has been corporatized into state-owned Yangon City Electricity Supply Corporation, financially independent from MOEP. Yangon District Electric Head Office which was managed by Myanmar Electric Power Enterprise under Ministry of Electric Power was established as new board namely "Yangon City Electricity Supply Board" on 1st April 2006. Ministry of Electric Power (MOEP) reorganized as two Ministries viz Ministry of Electric Power No.1(MOEP-1) and Ministry of Electric Power No.2 (MOEP-2) on 15 May 2006. MOEP-2 constituted with one Department, two Enterprises and one Board. The two Ministries: Ministry of Electric Power No.1 and Ministry of Electric Power No.2 has been merged into the Ministry of Electric Power again by forming with three Departments, three Enterprises and, one Board named YESB on 5th September 2012.

Corporatization of YESB into YESC has been appointed to start on 1st April 2015 in accordance with the order no. 58/2/7/ president office dated on 29th January 2015. MOEP has given permission for corporatization of YESC in accordance with the assigned authority of 2014 Union Act no. 44, Electricity Law, Article 8, Section (c) and Article 72, section (b) and with the permission of president office reference no. 58(2)/7/president office and Cabinet Meeting/Union Government meeting no. (16/2015) has been held on 13th August 2015. To stand with owned budget separate from State's budget, YESC has formed on 1st July 2015 in accordance with the office of the union minister order no. (126/2015) of Ministry of Electric Power. The

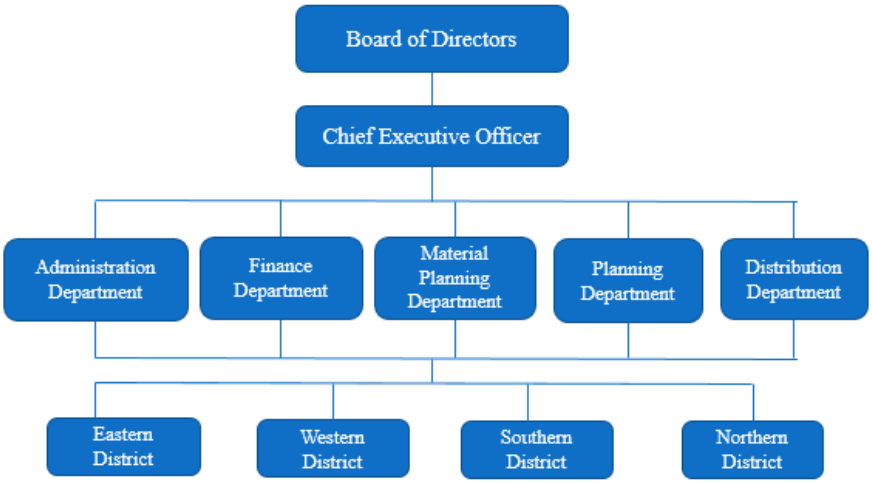
following figure is the Organization of Yangon Electricity Supply Corporation (YESC).

Figure (3.1) Organization of Yangon Electricity Supply Corporation (YESC)

Ministry of Electricity and Energy

Yangon Electricity Supply Corporation

Organization Chart



Source: MOEE,2019

3.2.2 Operating Functions

YESC distribute the required electric power to the domestic and commercial consumers by connecting with 66 kV, 33 kV, 11 kV, 6.6 kV and 0.4 kV low voltage distribution lines received from the National Grid transmitted via 230 kV High Voltage transmission line from Northern part of Myanmar. YESC intends to fulfill the annual load increased in the area of Yangon Region. The following tasks are carrying out to fulfill the annual increasing demand-

a. Monitoring and planning the system development plan for 66 kV, 33 kV, 11 kV, 6.6 kV and 0.4 kV lines and substations in the distribution system.
b. Monitoring and Planning the System Improvement Plan Carrying out the replacement of high capacity cables and lines, insulators and low voltage transformers in needed places in order to distribute steadily at the low voltage distribution lines of the system.
c. Operation and Maintenance tasks for low voltage lines and substations running in distribution system.

Carrying out to fulfill and achieve the reliable and efficient power to the consumers steadily, planning to provide sufficient power and to achieve electricity fully by users. Implementing the projects with adopting the short-term and long-term project plans. Overseeing the electricity losses reduction programs. Overseeing the collection of electricity bills in order to receive accurately and fully. Complying with the provision of Electricity Law and rules and regulations. Carrying out measures for the development of private sector investment in electricity generation and distribution. Nowadays, (12) no. of Franchise Companies has held in (19) townships meanwhile YESC has running the left (39) townships in Yangon Region.

3.2.3 Objectives

There are six objectives of Yangon Electricity Supply Corporation (YESC). They are ;(1) to oversee the whole functions relevant with electricity in accordance with the Government policies, (2) to accomplish to distribute effective and reliable power to the consumers and to get and supply adequate electric power entirely, (3) to carry out for more investment of electricity infrastructures, (4) to manage the emergence of corporation as prosperous business, (5) to carry out measures the emerge from Government owned organization to Public Owned Corporation successfully within 5 years and (6) to accomplish the Corporation's tasks as sophisticate/commercial business in line with market economic system.

3.3 Myanmar's Power Policies and Relevant laws

A number of groups are advising the Myanmar government in updating national energy related policies and laws. Myanmar faces many obstacles as it works to develop comprehensive energy policies that will guide the sustainable use of natural resources, and will stimulate infrastructure investment quickly enough to secure an adequate energy supply to meet the rapidly growing demand. It is critically important to develop a strategy for the utilization of Myanmar's domestic resources (including natural gas, oil, coal, and renewables) to enable the country to plan energy infrastructure investment. National Electric power policy are controlled by the Union government decision making. In real time, these regulations are affecting low various players can participate in Myanmar's energy sector. At present, Ministry of Electricity and Energy (MOEE) enact the following power sector policies;

i. To employ, the available energy resources in power generation for the sufficient supply of electricity.
ii. To promote the effective and efficient use of electricity for future energy sufficiency, reserves and sustainability in our nation.
iii. To conduct the reliable power quality to be supplied safely.
iv. To enhance the electricity distribution system to be developed in accordance with the advance technologies.
v. To adopt the environment-friendly ways in electricity generation, transmission and distribution.
vi. To restructure the power sector with the cooperation of boards, private companies, and regional organizations toward more participation of local and foreign investments and formation of competitive power utilities;
vii. To encourage the expansion of power transmission and distribution throughout the country and the Public-private participation in each sector.
viii. To define the energy pricing by observing the ASEAN and international energy pricing policy.
ix. To reach millennium development goals in areas covering construction of thermal power plants and more hydropower plants.

Electricity Laws were enacted in1948 and amended in 1967. In 1984, government sets Myanmar electricity laws which the requirements for the electricity authority, the duties and responsibilities of electricity inspectors, and the punishments and fines for various offences, and empowers the government to grant rights to specified organizations, including foreigners to participate within the sector (Webb 2013). Laws of 1984 were added with electricity rules in 1985. In 2014, government canceled that of 1984 and establishes the Electricity Regulatory Commission (ERC) and grants some regulatory responsibilities to the ERC; and authorizes the Ministry of Electric Power (MOEP), region and state governments, and leading bodies of self-administrated zones and self-administrated divisions the power to grant permits to entities to engage in electricity-related works such as generation, transmission, and distribution, thereby encouraging foreign and domestic investments in power projects.

But the electricity law does not yet include implementing rules or detailed guidelines. In 2014, the government passed a new electricity laws which aims to improve electric power development and management for meeting the nation's electricity demand. However, because these policies and laws are high level and lack

detailed implementation plans or guidelines, the energy regulatory environment remains ambiguous and challenging to navigate, particularly for off-grid service providers. So, there are also Tentative National Energy policy of Myanmar.

- To minimize the environmental impact, to include natural resources utilization plan for future generation, to invite the local and foreign investments and to continuously carry out Corporate Social Responsibility(CSR) activities in extraction and utilization of natural resources in order fulfill the nation's energy needs.
- To adopt prioritized plans on Energy Efficiency and Conservation.
- In defining the energy pricing in accordance with the market oriented economy, the necessary laws and regulations shall be promulgated by observing the ASEAN and international energy pricing policy in order to maintain the stability of energy price for the people and to set up an energy fund.
- To follow energy standards and specifications which are appropriate for the nation and which are also in compliance with ASEAN and international practices.
- To promote private sector participation or privatization according to the State's economic policy for realizing the success of State's Own Enterprises.
- To lay down the short term and long term plans not for not only renewable energy and hydropower projects but also feasible utilization of Liquefied(LNG) in thermal power plants to generate more electricity in order to meet the increased demand which will accompany with the nation's GDP growth.
- To participate in regional energy trading (such as electric power, crude oil and natural gas) by expanding the power grid and pipeline network to neighboring countries including ASEAN nations.
- To implement the following short term and long term plans in order to get power generation stability by conserving the water catchment areas of hydropower dams and the reservoirs, rehabilitating the aged plants and constructing the news ones in the grid system and replacing the ineffective transmission lines, constructing newlines, expanding the network system and building substations in the national grid system.

- To prioritize the use of solar, wind, hydro, biomass and other renewable energy resources in fulfilling the electricity demand of off-grid system.
- To establish Energy Database System and to draw and implement energy supply plans by surveying the nation's energy demand annually.
- To formulate a plan on civilian use of unclear energy.
- To setup the energy stockpiling plan for future energy security.

3.4 Prices and Consumption of Electricity in Myanmar

Myanmar's electricity sector has witnessed substantial growth in demand in recent times, exerting pressure on aging and insufficient infrastructure. Electricity consumption in Myanmar commenced as early as 1908. After independence in 1948, then the government took a significant step by establishing the 'Electricity Supply Board (ESB)' in 1951, marking the initiation of government monopoly over utilities. Since Myanmar embarked on economic reform and opening its market in 2012, it has witnessed rapid economic growth averaging almost 7 percent in the past seven years along with a sharp increase in electricity consumption. But Myanmar has the lowest access to electricity in ASEAN and has enormous unmet demand for domestic electricity. Total electricity consumption was 3,268 GWh in 2000. Of this total consumption, the industrial sector accounted for 40%, while the residential sector constituted 42%. The services sector claimed a share of 16%, and the remaining 3% was attributed to other sectors.

By 2016, the total electricity consumption in Myanmar surged to 15,365 GWh, reflecting an average annual growth rate of 10.2%. Industry sector consumption increased at a slower rate of 8.3% per year compared with that of the residential sector at 11.3% per year. Total household's electricity consumption rate is 10.877 million in 2019, some 4.289 million (38.4 per cent) can get access to electricity and leaving 6.588 million households still lacking a reliable electricity supply. Current electrification rates stand at approximately 40%, indicating that 60% of households remain unconnected to the national grid. Instead, these households rely on alternative solutions such as diesel generators, and, increasingly, solar home systems. Out of 482 towns, some 350 towns can get access to electricity and the remaining 132 towns are in need of electricity supply. Out of 63,737 villages, some 32,228 villages can get access to electricity and the remaining 31,509 villages are still in need of electricity supply.

According to the Ministry of Energy and Electricity (MOEE), Myanmar has experienced a consistent annual increase in electricity consumption, ranging between 15-19 percent in recent years. Notably, the Yangon region leads in consumption, utilizing 1,286 megawatts daily, representing over 40 percent of the total production. Following closely is the Mandalay Region, which consumes 485 megawatts, constituting over 15 percent of the total. Nay Pyi Taw's electricity consumption stands at 130 megawatts, approximately 4 percent of the total, while other states and regions collectively account for an expenditure of over 1,372 megawatts, surpassing 42 percent of the entire production. Among the 1.58 million households in Yangon, approximately 1.3 million households currently have access to electricity supply, while the remaining 0.28 million households are still in need of electricity supply. Out of 2,126 villages, some 1,304 villages can get access to electricity supply and the other 822 villages are still in need of electricity supply. The present rate of electricity consumption in Yangon stands at 1,351 megawatts, with 50% attributed to household use and an additional 16% dedicated to street lampposts.

In Mandalay, where there are 1.32 million households, 0.7 million households currently have access to electricity, leaving 0.62 million households still in need of reliable power. Out of the 4,807 villages in Mandalay, 3,724 villages have electricity, while the remaining 1,083 villages are still in need of electricity. Out of 4,807 villages in Mandalay, 3,724 villages can get electricity, and the remaining 1,083 villages are still in need of it. lines the current rate of electricity consumption is 551 megawatts, which includes 48 per cent for household use, 42 percent for industry plus factory, and 10 per cent for lampposts. Apart from Yangon and Mandalay, the total consumption of electricity power is 1,193 megawatts and the annual consumption is about 15 per cent. There are 269 towns which rely on electricity, and 130 towns which still use diesel and hydro power. Out of 56,804 villages, some 27,200 villages can consume electricity, and some 29,604 villages lack electricity. As for power consumption, household use is 63 per cent and 16 per cent is lampposts and other.

Myanmar's electricity supply-demand imbalance is intricately linked to market distortions caused by electricity subsidies. The country's electricity tariff is notably one of the lowest in Southeast Asia. To address this imbalance, the government has undertaken tariff adjustments multiple times, with the most recent change taking effect on April 1, 2014. Off-grid consumers bear tariffs that fluctuate based on the generation cost by the type of power plant, spanning from Mk100 to Mk300 per kWh.

Annually, the government allocates approximately Mk185 billion to cover both generation and distribution expenses. Factoring in transmission costs, the estimated cost per kilowatt should be at least Mk125/kWh. These subsidies intended to sustain the ongoing operations of power plants not only strain fiscal capacity but also deter private power producers from making investments and expanding their operations, knowing that the present tariff structure will not generate enough profit.

Throughout the stay-at-home period, there has been a notable increase in power consumption due to the higher number of people staying at home. So, government have been installed around 30 additional 200KV transformers at the ward base electricity distribution centers in Yangon' most populous townships. This initiative aims to stabilize residential power consumption during this period. The cost is about K20million for one 200KV transformer and the upgrade cost government is more than K600 million. Due to the impact of COVID-19, several factories and workshops ceased operations, resulting in a reduction of over 300MW in Yangon's power consumption during the first wave of the pandemic. But in the second wave of the pandemic, household electricity usage in Yangon surged by more than 50MV because people are using much more power than before as they stay at home and factories and businesses are operating again. Currently, the maximum power consumption of Yangon city is up to 1500MW, including household usage of about 1200MW according to the YESC.

On the other hand, affordable tariff rates, however, do not necessarily ease access to electric power. Private households applying for electricity connection not only face long waiting times but must also shoulder the initial connection fee of MMK100,000 excluding the expenses associated with internal wiring, materials, and service charges. This is considered high for most people outside urban areas. On average, electricity is sold to end-users at a price lower than the cost Myanmar Electric Power Enterprises (MEPE) pays producers. Lack of tariff adjustments, especially because the infrastructure network needs refurbishment and upgrading to cater to growing needs, also threatens service efficiency. And the implicit subsidy is a fiscal burden for already stretched government.

As a result, the government loses money with every kilowatt-hour (kWh) sold. The government has raised tariffs several times over the years, most recently with effect on 1 April 2014. In 2014, the government approved a new blocked economy tariff scheme, resulting in raised prices for both households and the industrial sector.

Under that tariff structure, large commercial and industrial users cross-subsidize residential, small-medium commercial, and public-sector customers, whose tariff remain below the average cost of supply. During the 2017-18 fiscal year, the government supplied electricity to the public at a loss of K507 billion and losses rose to K630 billion in 2018-19, according to the data from the Ministry of Planning and Finance. But the government implemented its first electricity tariff increase in June 2019, marking the end of a five-year period without adjustments, after years of subsidies at heavy losses. The government has declared a significant increase in electricity prices from July1 but will retain some subsidies to protect low-income households. The following table is the comparison of electricity rate of Myanmar.

Figure (3.3) Myanmar's Electricity Prices Rates

COMPARASION OF ELECTRICITY RATES

Types of Consumers		New rates		Old rates	
		Units	kyat/ unit	Units	kyat/ unit
Domestic Consumption	. Residential homes . Religious buildings	1 to 30	35	1 to 100	35
		31-50	50		
		51-75	70		
		76-100	90		
		101-150	110	100 to 200	40
		151-200	120		
		>201	125	>200	50
Non Domestic Consumption	. Companies . Industries . Embassies . International organisations	1 to 500	125	1 to 500	75
		501 to 5000	135	500 to 10,000	100
		5001 to 10,000	145		
		10,001 to 20,000	155	10,000 to 50,000	125
		20,001 to 50,000	165		
		50,001 to 100,000	175	50,000 to 200,000	150
		>100,001	180		

Source: MOEE,2019

The new staggered system will see households, as well as buildings used by religious institutions, charged from K35 a unit (kilowatt hour) to K125 depending on how much they consume. Households that consume 100 units a month currently billed K3,500 but have been paid K6,050 since July 1. Those using 200 units that pay K7,500 at present will see their bill jump to K17,550. But households that use large amounts of electricity will be most affected. Those consuming 500 units a month, for example, pay K22,500 at present but will from July 1 pay K55,050 a month. The new system retains K35 as the lowest band for households, but it applies only to the first 30 units. Users will pay K50 per unit from 31 to 50 units, K70 per unit from 51 to 75 units, K90 per unit from 76 to 100 units, K110 per unit from 101 to 150 units, K120 per unit from 151 to 200 units and K125 per unit for all consumption above 200 units. Industry, businesses, government offices, embassies and international organizations will be charged substantially more. They will have to pay K125 per unit up to 500 units and higher amounts for usage beyond this, with the upper band being K180 per unit beyond 100,000 units. The following table is the comparison of electricity rate of Myanmar.

But this government has been subsiding household's consumption of electricity, From April to July where households were expected from paying for the first 150 units of free power per month and will continue to do so at least for the rest of the year as part of the COVID-19 Economic Relief Plan (CERP). For the month of May, religious organizations, domestic civil society organizations and residential will not have to pay for the first 150 units of electricity consumed, according to the energy ministry. However, the exemption does not apply to foreign embassies, UN agencies and international organizations. In April, it forked out a total of K 35.5 billion to subsidies the first 150 units of electricity consumed at some 4.5 million households in the country but the ministry faced backlash from the public, which claimed that power bills were raised over the past month. In response to public criticism, Energy department explained during a press conference that due to lack of staff members to read the electricity meters, the authorities had resorted to using estimates to calculate the total amount of electricity consumed. But this problem still exists, consumption trends have changed during this period.

3.5 Monthly Electricity Consumption of households When Increased Electricity Prices in Thingangyun Township

Thingangyun Township locate in the eastern part of Yangon, Myanmar. The township comprises 38 wards, and shares borders with South Okkalapa township in the north, North Dagon Township in the east and, Yankin township and Tarmwe township in the west, and Taketa township in the south. In 2014, total population was 209,486 and the total number of households was 43320 in Thingangyun Township. According to the 2014 census, the majority of the households are living in wooden houses (36.7%) followed by households in apartment/condominium (35.9%) and there are 4.6 persons living in each household. This is slightly higher than the Union average. And 97.3 percent of households use electricity for lighting. This proportion is higher than the electricity usage compared to other townships in Yangon region. The percentage of households that use electricity in Yangon region is 69.3%. Table (3.5.1) is the monthly electricity Consumption of households and government revenue before increased Electricity Prices (April 2018-March 2019) in Thingangyun Township.

Table (3.2) Monthly Electricity Consumption of households and government revenue Before Increased Electricity Prices (July 2018 - Jan 2019) in Thingangyun Township

Year	Month	Total Units	No. of Households	Total Revenue of government
2018	July	20262488	60237	1220115901
2018	Aug	20228627	60427	1223097005
2018	September	21454323	60677	1302785800
2018	October	22339515	61026	1341038175
2018	November	22369440	61153	1354750524
2018	December	21084956	61217	1264228888
2019	January	19444469	61428	1178363520
2019	February	19926134	61697	1197287726
2019	March	23583324	61786	1432436500
2019	April	35966521	61898	1529118135
2019	May	25160629	61993	1491114850
2019	Jun	22016135	61983	1300678260

Source: Thingangyun Township EPC, 2020

In 2019, the total population of Thingangyun Township increased to 214379 and total number of households increased to 48687 according to the data of Myanmar's Department of Population. Now the total numbers of households have been increasing to over 6000 in 2020. Thus, electricity consumption is also increasing while population is growing. On 01 July 2019, the government declared a significant increase in electricity. On the other way, they reduce electricity bills as a subsidy to public from April 2019 to July 2019. So, government revenue was declining from April although household electricity usage was also increasing that how in Table (3.3) which is the monthly electricity consumption of households who live in Thingangyun Township when government increased electricity prices during July2019 - Dec 2020.

Table (3.3) Monthly Electricity Consumption of Households Who Live in Thingangyun Township When Government Increased Electricity Prices (July2019 - Dec 2020)

Year	Month	Total Units Usage	No. of Households	Total Revenue of government
2019	July	19744967	61986	2262934690
2019	August	23185131	62048	2267176442
2019	September	20588319	62230	2374102790
2019	October	22890355	62331	2664238995
2019	November	20951463	62451	2417980280
2019	December	17357540	62495	1950725500
2020	January	18009828	62620	2044482055
2020	February	18305285	62786	2077604916
2020	March	21636578	62798	2493252805
2020	April	24390938	63133	2292743995
2020	May	26299035	63466	2531720453
2020	Jun	20779076	63821	1844018100

Source: Thingangyun Township EPC, 2020

CHAPTER IV
SURVEY ANALYSIS

4.1 Survey Profile

Yangon is the largest and most populated city of Myanmar. It also known as a major commercial city, all of the industrial zones, households and businesses are mainly relying on the Yangon City Electricity Supply Board (YESB) which is taken the responsibility of electricity distribution in Yangon region. So, it consumes the amount of over half of the electricity being generated across Myanmar. Contrastingly, Myanmar was one of the lowest electricity tariffs in Southeast Asia. After that, the government has raised tariffs several times over the years, with the most recent adjustment taking effect on 1 April 2014. But the government annually allocates approximately Mk185 billion to offset both generation and distribution costs. after has raised tariff. Notably, in the fiscal year 2018-19, the government incurred losses amounting to K630 billion. Because they fixed tariffs below production cost and the number of people using electricity is also increasing.

Then the government declared a significant electricity tariff for the first time in five years in June 2019, after year of subsidies at heavy losses. Then the electricity bills have doubled or almost tripled. So, this survey is to study the impacts of increased electricity prices on households' consumption behavior. The study focuses on the total 200 numbers of respondents who are living in Thingangyun Township. Thingangyun Township is one of the cities of Yangon and located in the eastern part of Yangon district. The township comprises 38 wards and total population is 214379 according to the Myanmar department population. All the people in the township in urban area. There are 4.6 persons living in each household in Thingangyun Township according to the 2014 census. This is slightly higher than the Union average.

4.2 Survey Design

This survey is to explore the impact of increased electricity prices on households' consumption behavior. For this study, descriptive survey method was utilized. A descriptive study is carefully designed to ensure complete description of situation, making sure that there is minimum bias in the collection of data and to reduce in interpreting the data collected. The purpose of descriptive study is to provide a picture of situations, people or events or show how things are related to each other and as it naturally occurs [6].

Primary data are collected by face-to-face interviewing. For secondary data (conditions of household's electricity consumption before and after increased electricity prices in Thingangyun township during 2018-2020) is used from the data of YESC Thingangyun Township Yangon. There are 200 respondents from 38wards by selecting a sample and collecting data. The survey is carried out in February and March of the year of 2021. There are three main parts for survey questionnaires; part (I) socio demographic characteristics of the respondents (Households), part (II) The status of household's electricity usage after increased electricity prices and part (III) general knowledge, perception and satisfaction of respondents.

4.3 Survey Result

There are five influencing factors on household's consumption behavior such as social factor, economic factor, personal factor, cultural factor and psychological factor. According this study, a total of 200 households' electricity consumption behavior is studied as follow when electricity tariff is significantly increased.

4.3.1 Socio Demographic Characteristics of the Respondents

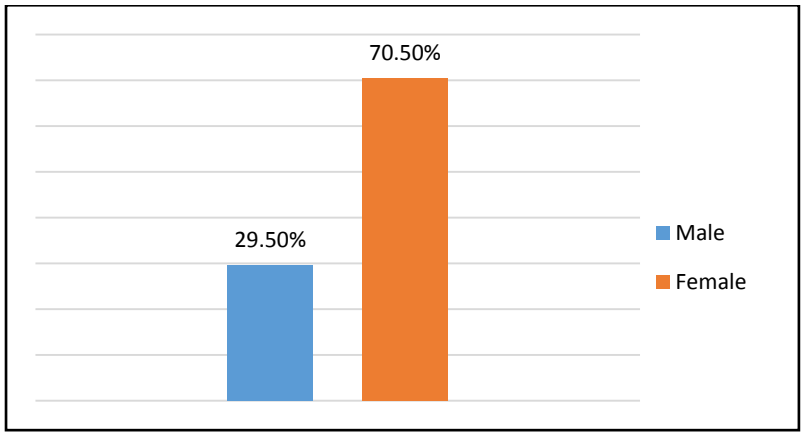
The purpose of this part was to gain a better understanding of the diverse factors that influence their behaviors, preferences, and opinions. This study presents a selected socio demographic characteristic of residents who live and consume the electricity when government increased the electricity prices in Thingangyun, Yangon Township. Eleven specific characteristics were analyzed: gender, age, education level, material status, occupation, dwelling types, rent or own, family sizes, family working members and monthly family's income.

Table (4.1) Socio Demographic Characteristics of the Respondents

Sr. (1)	**Gender**	**No. of Respondents**	**Percentage**
	Male	59	29.5 %
	Female	141	70.5 %
Sr. (2)	**Age**	**No. of Respondents**	**Percentage**
	18-25	8	4.5%
	26-35	48	24%
	36-45	38	18.5%
	Above 45 years	106	53%
Sr. (3)	**Education**	**No. of Respondents**	**Percentage**
	3Rs	2	1%
	Primary	20	10%
	Middle School	54	27%
	High School	78	39%
	Bachelor	44	22%
	Master	1	0.5%
	Other	1	0.5%
Sr. (4)	**Material Status**	**No. of Respondents**	**Percentage**
	Single	35	17.5%
	Married	165	82.5%
Sr. (5)	**Occupation**	**No. of Respondents**	**Percentage**
	Own Business	20	10%
	Housewife	138	69%
	Student	2	1%
	Government Staff	11	5.5%
	Company Staff	26	13%
	Unemployment	1	0.5%
	Retire	2	10%
	Other	0	0%

Sr. (6)	**Dwelling types of households**	**No. of Respondents**	**Percentage**
	Detached house	21	10.50%
	Wooden house	61	30.50%
	Apartment	106	53%
	Hostel	1	0.50%
	Other	11	5.50%
Sr. (7)	**Rent or own the place**	**No. of Respondents**	**Percentage**
	Rent	134	67%
	Own	66	33%
Sr. (8)	**Head of household**	**No. of Respondents**	**Percentage**
	Male	152	75.5%
	Female	48	24.5%
Sr. (9)	**Family members**	**No. of Respondents**	**Percentage**
	Only One	2	1%
	Two	20	10%
	Three	62	31%
	Four	98	49%
	Above Four	18	**9%**
Sr. (10)	**Working Family members**	**No. of Respondents**	**Percentage**
	Only One	68	34%
	Two	79	39.5%
	Three	38	19%
	Four	13	6.5%
	Above Four	2	1%
Sr. (11)	**Household's Monthly Income**	**No. of Respondents**	**Percentage**
	Under kyat 100,000	9	4.5%
	Kyat 100,001 to 300,000	80	40%
	Kyat 300,001 to 500,000	61	30.5%
	Above 500,000	50	25%

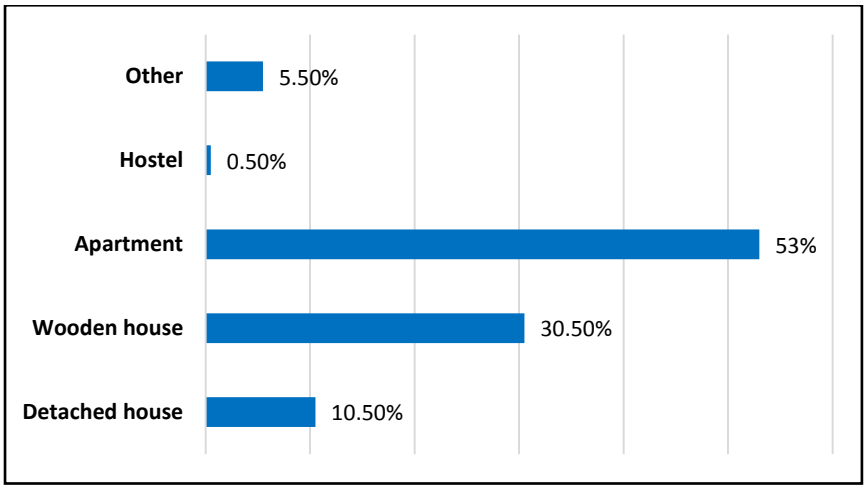
Figure (4.1) Gender Distribution of households



Source: Survey Data, 2021

According to the figure (4.1), out of 200 respondents surveyed 59 were males and 141 were females. In terms of age, the majority 53 percent is over 45 years old. Around 24 percent are between the ages of 26 and 35, while 18.5 percent are between 36 and 45. Among the respondents surveyed, many households are married. And the education of most respondent's 39 percent is high school level, the second largest groups 27 percent are middle school level, 22 percent are bachelor's degree holders, 10 percent are primary school level and 1 percent is basic3Rs. There is only one master degree holder and only one uneducated. According to their marital status, 17.5 percent are single, and the remaining individuals are married. In term of occupation, most of respondents are housewives while other are company staff, own business, retiree, government staff, and there is only one unemployment. Figure (4.2) shows the dwelling type of respondents.

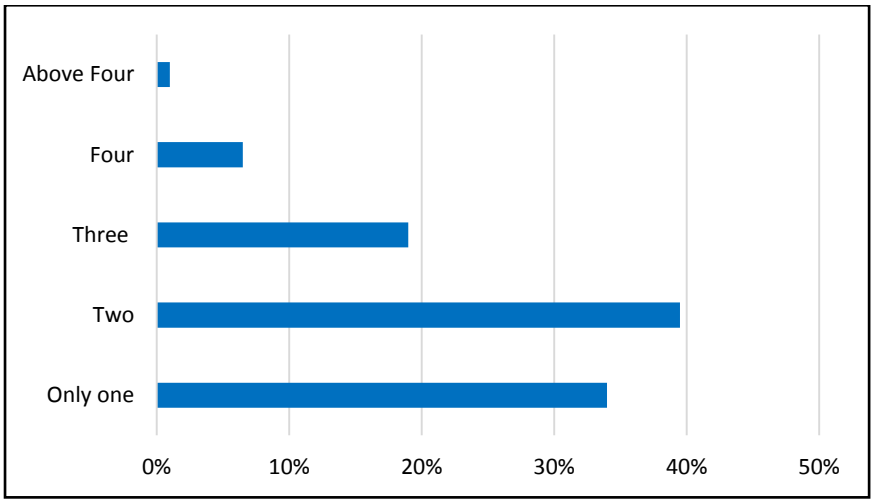
Figure (4.2) Dwelling types of households



Source: Survey Data, 2021

In the analysis of the respondent's dwelling type such as detached house is 10.5 percent, wooden type is 30.5 percent, apartment type is 53 percent, hostel and other type are 0.5 percent and 5.5 percent. A significant 67 percent of respondents are currently renting their homes while a comparatively smaller portion, 33 percent, are homeowners. 75.5 percent of households are headed by male, and 24.5 percent are female. Regarding the respondents' working family member frequency, there was 34 percent for only one, 39.5 percent for two working family members,19 percent for three, 6.5 percent and 1 percent are respondents who have above four working family members. These data are shown in Figure (4.3).

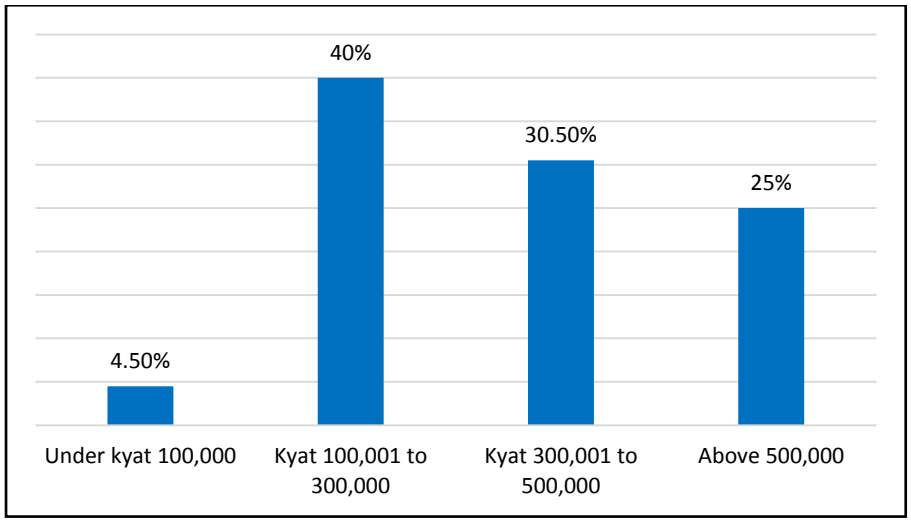
Figure (4.3) Working family members of households



Source: Survey Data, 2021

Total electricity use differs between households due to differences in the level of income and expenditure. From the point of family income, it is also a large influence on electricity consumption. In the analysis of monthly family income, their income level has been divided into four groups: under MMK 100,000, MMK 100,000 to 300,000, MMK 300,000 to 5 00,000 and above MMK 500,000. Out of 200 respondents, 40 percent of respondents earned between MMK 1 lakh to 3 lakh, 30.5 percent of respondents earned between MMK 3 lakh to 5 lakh, 25 percent that earned above MMK 5 lakh and there was only 4.5 percent earned under MMK 1 lakh. These data are shown in figure (4.4).

Figure (4.4) The households' monthly income



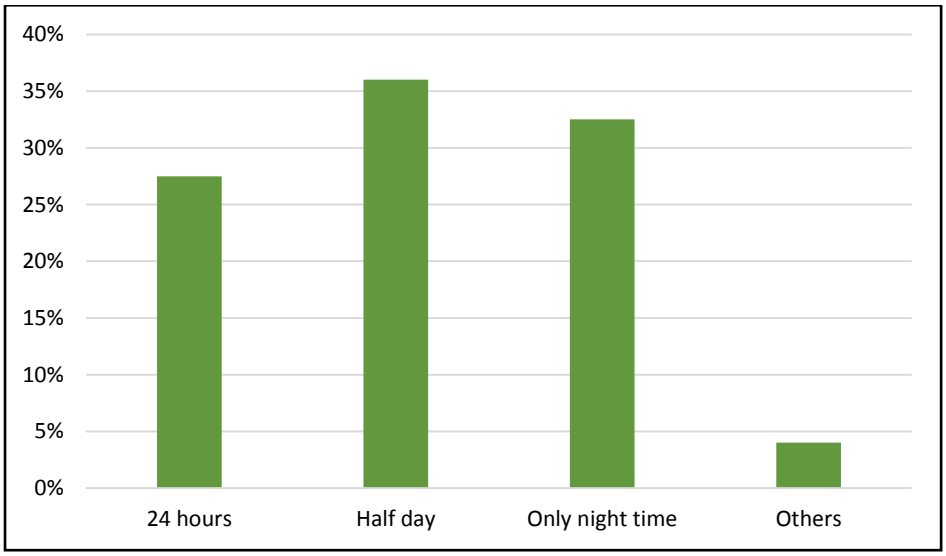
Source: Survey Data, 2021

4.3.2 The Status of Household's Electricity Consumption

This section is related to the status of household's electricity consumption who live in Thingangyun Township, Yangon. Household consumption increased year by year before the rise in electricity prices. Thus it is need to explore the household consumption behavior after increased electricity prices. In this analysis, most of households or 187 out of 200 know about Myanmar government increased electricity prices from July 2019. But 23 out of 200 respondents only know why government enact newly electricity charges. And most of respondents get this information about new electricity tariff announced by the Ministry of Electricity from social media and their neighbor.

The status of household electricity usage is examined by the terms of their electricity requirement in a monthly spending on electricity bill, types of electricity appliances that they use, average frequency of electricity goes out and ways of their payment for electricity consumption. Every household accept electricity is necessary for their family's daily routine. Figure (4.5) show the requirement of household's electricity consumptions.

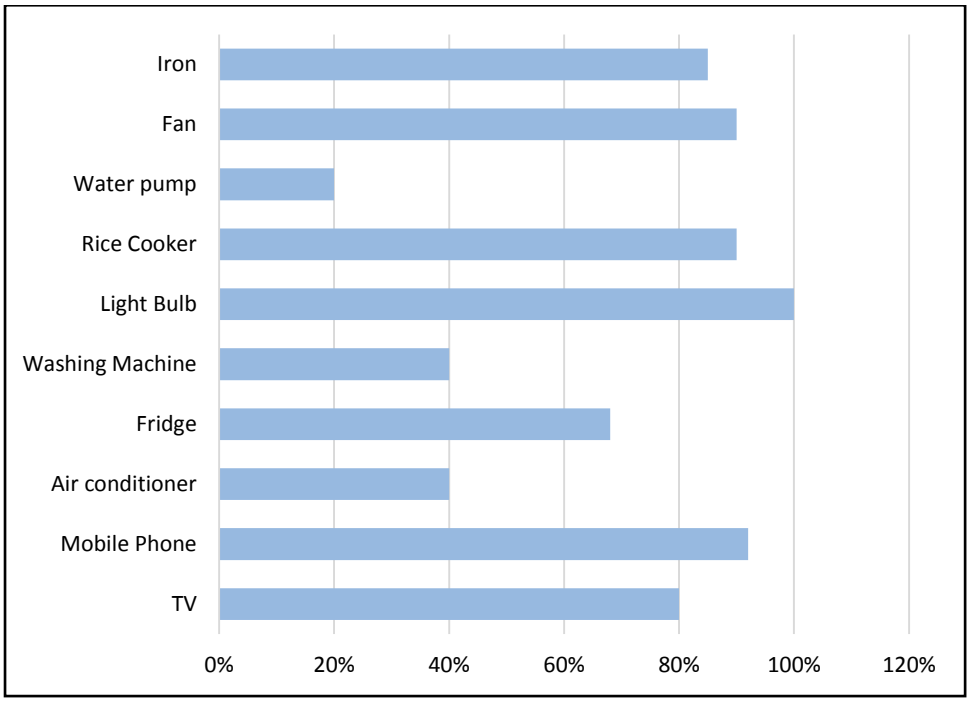
Figure (4.5) Electricity requirements per day



Source: Survey Data, 2021

According to the results of households' electricity requirement per day, Figure (4.5) present the number of households who require 24 hours is 27.5 percent, half day is 36 percent, only nighttime is 32.5 percent and others are 4 percent. From the analysis, the number of households who require electricity for half day is the highest. The ownership rates of main household appliances that are used in Thingangyun Township are listed in figure (4.6).

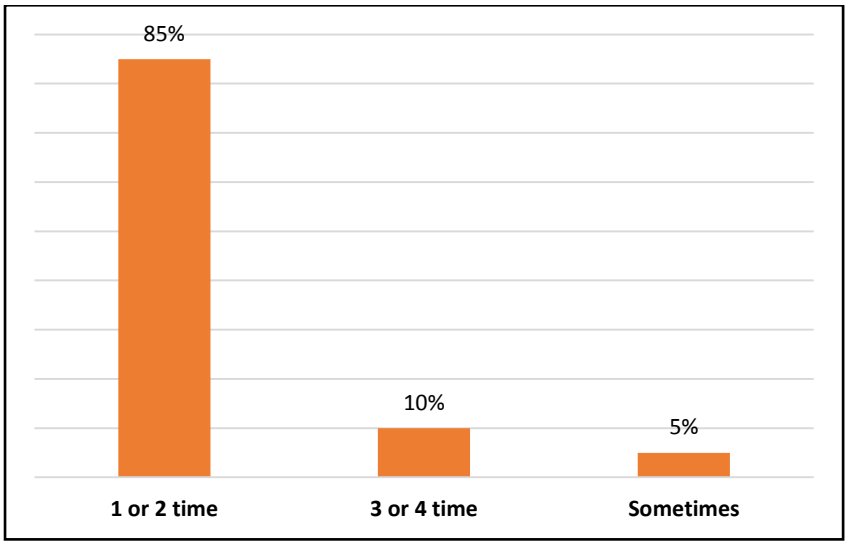
Figure (4.6) Appliance ownership and usage behavior



Source: Survey Data, 2021

The result of these data, figure (4.6) present that most households have television, a rice cooker, light bulb, fan, fridge, mobile phone and iron. Less than 50 percent of households possess equipment such as air conditioner, washing machine and water pump. Most households responded air conditioner consume the most electricity appliance above the list. In the analysis of households acknowledge of their usage unit, most households 95 percent didn't know the amount of electricity that they use each month while only 5 percent know the amount of their usage unit. From early 2019, Myanmar started face power shortage. Electricity generation has been declining, resulting in a widening power supply–demand gap. Thus, the electricity outage has also become a major factor in households' electricity consumption. Figure (4.7) present the household who live in Thingangyun Township face the frequency of power outage per day.

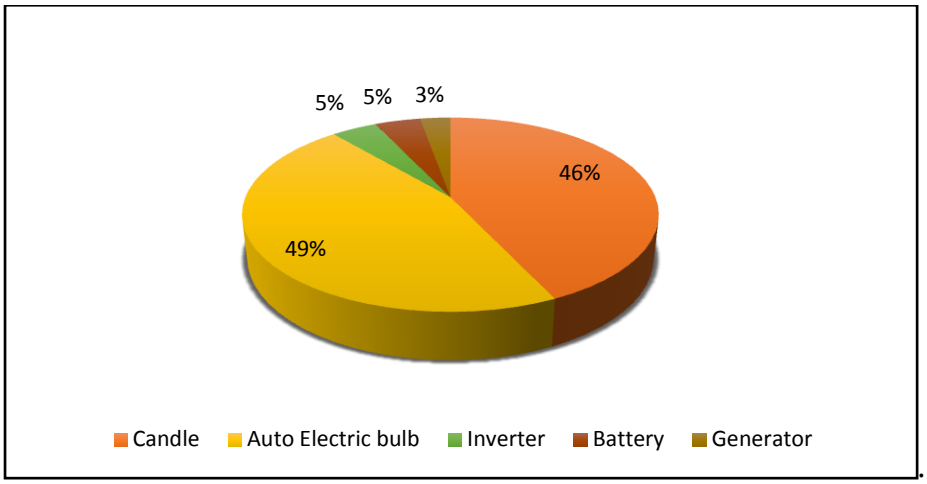
Figure (4.7) Frequency of power outage per day



Source: Survey Data, 2021

In the analysis of power outage, most of households who live in Thingangyun Township present that there is often power outage at their home occurred. It shows that 85 percent or 170 out of 200 respondents indicated that power outage happens 1-2 times every day while 10 percent indicated that it happened 3-4 time per day. However, 5 percent of respondents stated that power outage happened sometime in their area. In effect, 95 percent of those surveyed in Thingangyun Township are facing power outage situation. In term of this situation, household use different kinds of appliances such as candle, auto electric bulb, battery, generator and invertor. In figure (4.8) shows that the appliances of households when electricity outage.

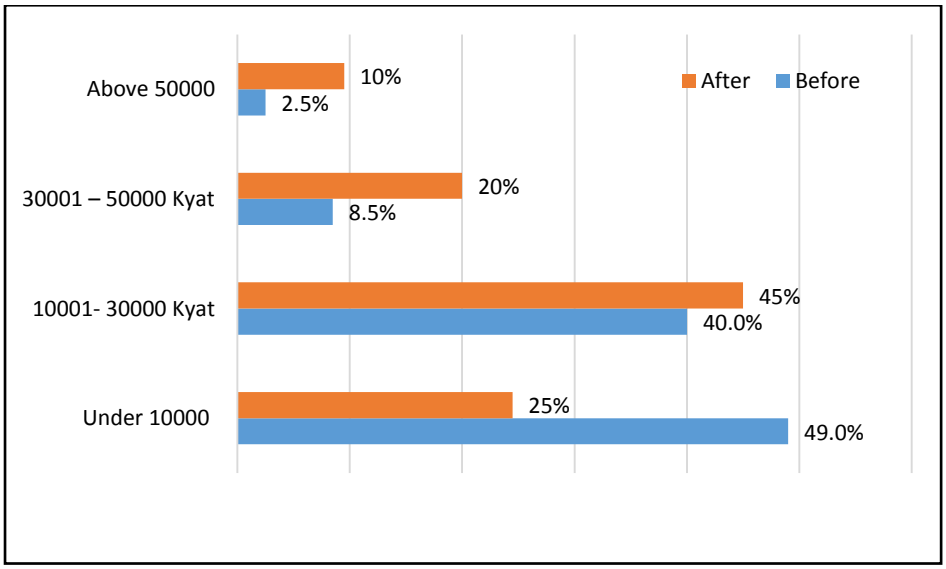
Figure (4.8) Appliances usage when electricity outage



Source: Survey Data, 2021

In the analysis of households' appliances usage with electricity outage, figure (4.8) shows that the most 49 percent of total respondents use auto electric bulb while 46 percent use candle and the other households use 5 percent for battery, 5 percent for inventor and 3 percent for generator. Until the recent tariff increase, households in Myanmar enjoyed the lowest electricity tariffs in the region. In a bid to stem unsustainable losses, the government took the difficult decision to raise electricity tariffs in July 2019, marking the first hike in five years. In figure (4.9) present the households' expenditure situation before and after increased electricity prices.

Figure (4.9) Households' expenditure before and after increased electricity prices

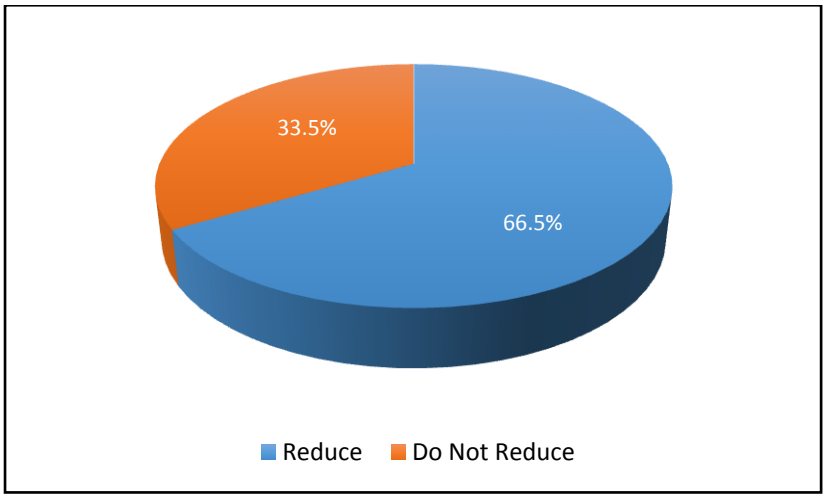


Source: Survey Data, 2021

As the study progressed, households' electricity expenditure has been divided into group four: under MMK 10,000, MMK 10,001 to 30,000 MMK 30,001 to 50,000 and above MMK 50,000. Before electricity prices increase, figure (4.9) show that most of household expenditure or 49 percent is under MMK 10,000, 40 percent of respondents are between MMK 10,001 to 30,000, 8.5 percent is between MMK 30,001 to 50,000 and only few households or 2.5 percent paid above MMK 50,000. Under the new pricing scheme, households who pay less than MMK 10,000 are too reduced and other three groups are increased. In figure (4.9) indicate only 25 percent is under MMK 10,000 after entitled new charges, 45 percent is between MMK 10,001 to 30,000, 20 percent is between MMK 30,001 to 50,000 and 10 percent paid above MMK 50,000.

After increasing households' electricity expenditure, most of household have a good habit that is they turn off the lights when they do not use them. And 133 out of 200 respondents or 66.5 percent who live in Thingangyun Township tried to reduce their electricity consumption while 67 of respondents or 33.5 percent didn't try to reduce their consumption. In Figure (4.10) show that the households' consumption situation after increased electricity prices.

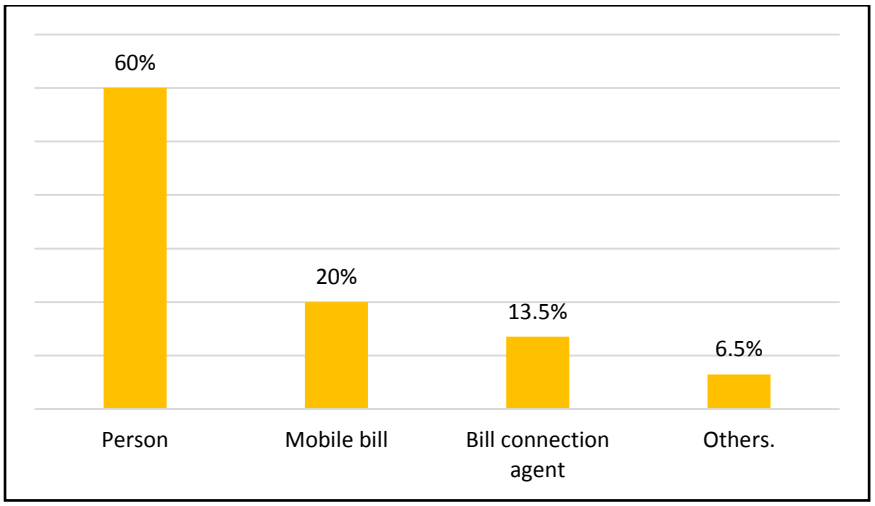
Figure (4.10) Consumption Situation After Increased Electricity Prices



Source: Survey Data, 2021

For Electricity bill payment, households normally receive invoices around the 11th to 15th day of each month, and pay it by 19th day of the month. If the payment is delinquent, then YESB has the authority to stop sending electricity to the user. If, after 4 months, the user still has not made the required payment, then YESB will physically remove the electricity meter from the said user's premises. There are many ways to bill electricity bill such as in person, mobile bill, bill connection agents and etc. The results of the analysis of households' payment ways for electricity bill, figure (4.11) show that most of households or 60 percent continue to pay their electricity bills at their township office, 20 percent of respondents pay from mobile bill, 13.5 percent pay with bill connection agent and 6.5 percent use other services for payment.

Figure (4.11) Payment ways of electricity bill



Source: Survey Data, 2021

4.3.3 Satisfaction of Households on Electricity Access and Prices

The main reason for this part, households' satisfaction with electricity access and prices is a direct reflection of consumption behavior. Electricity is a necessity for modern life, impacting everything from lighting and heating to the ability to cook and communicate. A lack of satisfaction in these areas can significantly affect people's quality of life. The sample used in the survey contained questionnaire responses from 200 respondents who live in Thingangyun Township that show in Table (4.1) as follows. There are satisfaction situations of households on their electricity availability, prices before electricity charges increase, prices after electricity charges increase, power outage after increase electricity charges and meter reading system with options ranging from very unsatisfied to very satisfied.

Table (4.2) Satisfactions of Households Before and After Increased Electricity Prices

Statements	Percentage				
	Very unsatisfied	**Unsatisfied**	**Neutral**	**Satisfied**	**Very satisfied**
Electricity Availability	0%	71%	24.5%	4.5%	0%
Prices before electricity charges increase	1%	5.5%	40%	31%	22.5%
Prices after electricity charges increase	7%	37%	29.5%	20%	6.5%
Power outage after increase electricity charges	3.5%	44.5%	42%	8%	2%
Meter reading system	5%	43%	48.5%	2.5%	1%

Source: Survey Data, 2021

According to the analysis of households' satisfaction on electricity availability that is show in Table (4.2), most of respondents or 71 percent unsatisfied with their electricity availability, 24.5 percent was neutral and satisfied respondents on electricity availability is 4.5 percent. Before the electricity price rise was analyzed, 40 percent of households expressed a neutral opinion, 31 percent was satisfied, 22.5 percent was very satisfied regarding the price before rise while there were only few percent on unsatisfied and very unsatisfied situations. After the increase in electricity prices, the satisfaction of households has changed significantly. Table (4.2) show that 29.5 percent of household was neutral opinion on new electricity charges, 20 percent and 6.5 percent were satisfied and very satisfied. However, over 37 percent of the households were unsatisfied with new electricity tariff.

The outages have also become a major burden on households' consumption. This part of survey aimed to capture the sentiments of households towards power outages in the aftermath of the electricity price hike. Table (4.2) show that many households or 44.5% expressed dissatisfaction and 3.5 percent was very unsatisfied with the power outage situation after increase electricity while neutral was 42 percent, satisfied and very satisfied were 8 percent and 2 percent. To know the power units used by the electricity consumers in a timely manner, the Ministry of Electric

Power has been implementing the AMI system, which combines with the meter equipment which can read the meter bill with the online system and information management systems. In the analysis of the satisfaction of households with the electricity meter reading system, 43 percent of households was dissatisfactions. However, a significant percentage of households or 48.5 percent were neutral, and 2.5 percent was satisfied with the meter reading system.

CHAPTER V
CONCLUSION

5.1 Findings

Today, life without electricity is almost impossible because everything runs on electric in our daily environment. Moreover, the ongoing digital transformation of industries and businesses worldwide requires substantial energy resources to power data centers, communication networks, and information technology infrastructure. As societies become interconnected and reliant on electronic devices, appliances, and energy intensive industries, the need for electrical power continue to grow unabated. Among of them, one significant contributor to rising electricity usage is the proliferation of electronic gadget and appliances. With the advent of smartphones, laptops, and ever-expanding array of smart home devices, individuals and households are consuming more electricity than ever before.

Consumer behavior is the actions and decisions that people or households make when they choose, buy, use, and dispose of a product or service. Consumer behavior is influenced by many factors such as personal factors like age, gender, education. These life stages often come with different consumption patterns. For example, young adults may prioritize spending on education, housing, and technology, while families with children may focus on child-related expenses. Empty nesters and retirees might have lower consumption overall as they downsize and have different needs. In most households, traditional gender roles influence electricity consumption. Most of female might be responsible for household chores such as cooking and cleaning, which can involve the use of energy-intensive appliances.

Households with higher levels of education are often more aware of the importance of energy conservation and may be more likely to adopt energy-saving technologies and practices. Home size and family size that are include in social factor that can significantly influence electricity consumption behavior in households. Larger homes often have more extensive heating and cooling systems, which can lead

to higher electricity usage, especially in regions with extreme temperatures and the number of people living in a household affects electricity consumption. More family members generally result in higher electricity use due to increased lighting, appliance use, and heating or cooling demands.

Furthermore, Income and expenditure are also a central component of the socio-economic characterization of households and determinant of their energy consumption in economic factor. In low income level, energy poverty may be defined by the minimum energy consumption needed to sustain lives while higher-income households tend to use more electricity. Thus, income has been recognized as a key driver of energy consumption as well as a limit for households to achieve a certain level of energy services in the home. After rising electricity prices, it creates a sense of urgency and financial motivation for households to adopt energy-saving habits. Household habits play a crucial role in electricity consumption behavior as a cultural factor. These habits, which encompass daily routines, behaviors, and choices related to energy use, can significantly impact a household's electricity consumption patterns and overall energy efficiency.

Moreover, households' satisfaction is closely related to their electricity consumption behavior. The level of satisfaction with various aspects of electricity service and usage can influence how individuals and households consume electricity, make energy-related decisions, and engage in energy-saving behaviors. Overall satisfaction with electricity availability can contribute to a higher households' quality of life and enhanced comfort. However, Households that experience frequent power outages or voltage fluctuations may express lower satisfaction with the reliability of their electricity service. Low satisfaction with service reliability lead to increased use of backup generators, and other appliances such as candle, auto bulb, battery that decrease the households' standard of living.

Higher electricity tariff lead to dissatisfaction among most of households, particularly if they perceive electricity bills as burdensome. But as a behavioral response, Dissatisfaction with costs may encourage energy-saving behaviors, such as turning off lights and appliances when not in use, adjusting thermostat settings, and seeking energy-efficient alternatives. Nowadays, adoption of smart meters and home energy management systems can improve satisfaction by providing real-time information on electricity consumption. If households' higher satisfaction with smart

grid technologies, it can lead to more informed consumption decisions, but most of households still using payment ways with in person.

A mobile payment educational campaign need to older individuals and women who are engaged in daily household work requires a thoughtful and inclusive approach because there are also environmental advantages of reducing paper bills and encouraging digital transactions. In summary, if households are well-informed about electricity mobile payment methods and understand how to read the meter reading system, they are likely to trust and rely on the meter reading system in the future. This trust is built on transparency, accuracy, and empowerment, which can lead to more efficient energy use, cost savings, and greater customer satisfaction.

On the other side, Myanmar's power sector has been spiraling downward with prolonged electricity blackouts throughout the country. Electricity generation has been declining, resulting in a widening power supply–demand gap. The repercussions of damaged power infrastructure due to conflict have impacted the stability of the whole transmission system. Major cities, including Yangon, Mandalay, and Nay Pyi Taw, are facing power outages while industrial zones across the country are bracing for crippling power cuts and surging fuel prices. Thus, increasing the power supply–demand gap is the major challenge to securing reliable electricity services in the country. Myanmar already faced power shortages in 2019, of up to approximately 300 megawatts (MW).

The power supply–demand gap has widened since 2021. Generation capacity available for dispatch has been reduced by more than 2.5 gigawatts (GW), due to various factors, including the suspended operation of two large liquified natural gas (LNG)-to-power plants in Yangon, low precipitation and low water levels in hydropower reservoirs, and a supply shortage of domestic natural gas New hydropower and solar photovoltaic (PV) development continues but with slow progress. Domestic gas fields are projected for production decline and depletion over the coming years, and major multinational companies that were developing new offshore gas fields have left the country.

To achieve Myanmar's electrification goals, serious investment in infrastructure development and power generation is needed. According to the MOEP and MOE, the ministry will need $5.8 billion to construct medium and low voltage lines and transformer/substations under the NEP plan. However, the energy sector poses some significant challenges for foreign investors, including unsettled political

and economic policies, unclear rules and guidelines, and a shortage of skilled labor. As Myanmar's national grid system is weak and not accessible to most villages in rural areas, renewable mini-grids can be an affordable option for rural communities. In addition, corruption, lack of transparency in the tender and procurement process, and banking issues are additional barriers. Furthermore, rising electricity demand of households and business will make renewable energy resources, including solar, wind, biomass, and geothermal, critical in the future.

5.2 Suggestions

One study, in which the impact of increased electricity prices household's electricity consumption, was analyzed and found that it related with each factors of consumption behavior. Tariff increases are a step in the right direction, as they are a crucial short-term measure to set the power sector on the path of financial viability. In parallel to such reforms, the government will need to take measures to reduce costs and remove the many inefficiencies in the power production and distribution network. For instance, an efficient, real-time data-collection system to monitor the financial and operational performance of the sector would be beneficial. In addition, a new methodology for setting tariffs may need to be implemented to allow for more regular tariff adjustments. To diversify power sources and take advantage of Myanmar's solar potential, smart systems could allow households and businesses to feed excess power into the grid in return for tariff offsets.

However, the new tariff does not entirely cover the costs of production and distribution, but the government hopes it will stem the escalating subsidy bill and free up funds to invest in building capacity. Thus, there will still be a power outage and it ultimately hamper economic growth unless the government attracts new investment in gas-fired plants, hydropower stations, renewable energy and distribution networks.

According to Myanmar's The National Electrification Plan (NEP), which aims to achieve universal electrification by 2030, forms the basis of the government's efforts to reform the segment and increase generation capacity. The plan is being supported by the World Bank, which has extended a $400m credit facility to the government to help meet its targets. The NEP has laid out specific milestones, seeking to reach 50% electrification by 2020 and 75% by 2025, before achieving 100% electrification by 2030. While in the long term electricity will come through the main grid, short- and medium-term demand will require off-grid solutions. Home solar photovoltaic

systems, which are becoming increasingly popular in Myanmar, are likely to become even more common in the years to come.

In summary, while adjusting electricity tariffs is an important step in addressing power outages and improving electricity availability, it is just one part of a broader strategy. Achieving a stable and reliable power supply for business and households in Myanmar requires a comprehensive approach that encompasses infrastructure investments, regulatory reforms, demand management, and efforts to reduce energy losses and theft. Additionally, public awareness and engagement are crucial for building a culture of energy conservation and responsible energy use.

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A Study on Household's Electricity Consumption After Increased Electricity Prices

(Case Study on Thingangyun Township)

Questionnaires

Name : Su Myat Noe Aung

Roll : MEcon(Eco)-7

Part A: Socio Demographic Characteristics of the Respondents (Households)

1. Gender : ☐Male ☐Female

2. Age : ☐18-25 ☐26-35
☐ 36-45 ☐above 45 years

3. Education ☐Basic 3Rs ☐Primary
☐Middle School ☐ High School
☐Bachelor ☐Master
☐Other

4. Material status: ☐ Single ☐ Married

5. Occupation: ☐Own Business ☐Housewife
☐Student ☐Civil servant
☐Company Staff ☐Unemployment
☐Retiree ☐Other

6. What is your dwelling type?
☐Detached house ☐Wooden house
☐Apartment ☐Other

7. Do you rent or own the place where you live?
☐Rent ☐Own

8. Who is the head of your household?
☐ Male ☐Female

9. How many numbers are there in your family?
☐Only one ☐Two ☐Three
☐Four ☐Five ☐Other

10. How many of them are currently working?
☐Only one ☐Two
☐ Three to Four ☐Above four

11. What is your approximate total households' monthly income?

☐Under kyat 100,000

☐kyat 100,001 to 300,000

☐Kyat 300,001 to 500,000

☐Above 500,000

Part B: The Status of Household's Electricity Usage

12. Do you know, Myanmar government increased electricity prices from July 2019?

☐Yes ☐No

13. Do you know why government enact newly electricity charges?

☐ Yes ☐No

14. Where do you get the information about electricity announced by the Ministry of Electricity?

☐ Social media ☐ TV

☐ News ☐ Neighbor

☐ Family members ☐Others

15. Do you accept electricity is necessary for your family?

☐Yes ☐No

16. How much electricity requirement in your households a day?

☐24 hours ☐Half day

☐only night time ☐other

17. What are the application of electricity in your households?

TV		Light Bulb	
Washing Machine		Rice Cooker	
Mobile Phone		Water pump	
Air conditioner		Fan	
Refrigerator		Electric Iron	

18. Which appliances do you think consume the most electricity? (according No.14)

_____.

19. Do you know how many your households use electricity units per month?

☐Yes ☐No

20. If yes, how many average electricity units are required in your households in a month?

☐ less than 100 units ☐ 101 to 300

☐301 to 500 ☐501 to 1000

☐1001 to 2500 ☐ over 2500

21. Is there often electricity goes out in your area?

☐Yes ☐No

22. If yes, How many time per month?

☐once or twice ☐third or fourth

☐sometimes ☐often

☐other

23. If yes, how many average electricity units are required in your households in a month?

☐ less than 100 units ☐ 101 to 300

☐301 to 500 ☐501 to 1000

☐1001 to 2500 ☐ over 2500

24. How much is your monthly electricity expenses before increase electricity prices?

☐Under 10000 ☐10001- 30000

☐30001 – 50000 ☐Above 50000

25. How much is your monthly electricity expenses after increase electricity prices?

☐Under 10000 ☐10001- 30000

☐30001 – 50000 ☐Above 50000

26. Do you turn off the lights when you do not use them?

☐Yes ☐No

27. Do you try to reduce your electricity consumption when increased electricity prices?

☐Yes ☐No

28. How do you pay for electricity charges?

☐Personal contact to the station ☐Mobile bill

☐Bill connection agent ☐Others.

Part C. Satisfaction Status of Households on Electricity Access and Prices

29. Do you feel satisfied electricity availability from electric power plant?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Unsatisfied
- ☐ Very Unsatisfied

30. Do you feel satisfied prices before increase electricity charges?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Unsatisfied
- ☐ Very Unsatisfied

31. Do you feel satisfied prices after increase electricity charges?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Unsatisfied
- ☐ Very Unsatisfied

32. Do you feel satisfied on power outage after increase electricity prices?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Unsatisfied
- ☐ Very Unsatisfied

33. Do you feel satisfied the electricity meter reading system?

- ☐ Very satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Unsatisfied
- ☐ Very Unsatisfied