YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF APPLIED ECONOMICS
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(NAY PYI TAW CAMPUS)

A STUDY ON PRIVATE SECTOR PARTICIPATION IN ELECTRICITY GENERATION IN MYANMAR

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EMPA – 2 (18th BATCH)

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A thesis submitted as a partial fulfillment of the requirements for the degree of Master of Public Administration Program (MPA)

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This is to certify that this thesis entitled **"A Study on Private Sector Participation in Electricity Generation in Myanmar"**, submitted in partial fulfilment towards the requirements for the degree of Executive Master of Public Administration (EMPA) has been accepted by the Board of Examiners.

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ABSTRACT

The electricity is that the essential role for the event the country and electricity generation is one amongst the vital roles to shape the country development. The objectives of the study are to examine at the benefits and also the challenges of private sector participation within the electricity generation projects and currently being implemented within the electricity generation sector. The study used descriptive method supported primary and secondary data. Key informant interview was conducted with total 25 of government officials and private investors. The study found that the private sector participation within the electricity generation sector plays a vital role within the development of the country. Additionally, the private sector participation within the electricity generation projects has both benefits and challenges; therefore the government has to provide good management. The government should provide incentives to encourage more private sector participation within the electricity generation sector.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
BOO	Build Own Operate
BOT	Build Operate Transfer
BTL	Build Transfer Lease
BTO	Build Transfer Operate
CAGR	Compound Annual Growth Rate
CBA	Cost Benefit Analysis
CLP	China Light and Power
CSR	Corporate Social Responsibility
DEPP	Department Of Electric Power Planning
DHPI	Department Of Hydro Power Implementation
DICA	Directorate of Investment and Company Administration
DPTSC	Department of Power Transmission and System Control
EIA	Environmental Impact Assessment
EPC	Electric Power Corporation
EPGE	Electric Power Generation Enterprise
ERIA	Economic Research Institute for ASEAN and East Asia
ESB	Electricity Supply Board
ESE	Electricity Supply Enterprise
EU	European Union
FDI	Foreign Direct Investment
FE	Foreign Exchange
FY	Fiscal Year
GDP	Gross Domestic Product
GW	Giga Watts
GWH	GigaWatt-Hours
HM Treasury	Her Majesty’s Treasury
IAP	Investment Action Plan
IFC	International Finance Corporation

IGA	Implementing Government Agency
IMF	International Monetary Fund
IPP	Independent Power Producers
JICA	Japan International Corporation Agency
JV	Joint Venture
JVA	Joint Venture Agreement
KV	Kilovolt
KWH	KiloWatt-Hours
LNG	Liquefied Natural Gas
MEPE	Myanmar Electric Power Enterprise
MESC	Mandalay Electricity Supply Corporation
MIC	Myanmar Investment Commission
MNPED	Ministry of National Planning and Economic Development
MOA	Memorandum of Agreement
MOEP	Ministry Of Electric Power
MOPF	Ministry Of Planning and Finance
MOU	Memorandum of Understanding
MSDP	Myanmar Sustainable Development Plan
MUSD	Million United State Dollar
MVA	Megavolt-Amperes
MW	Megawatt
MWH	Megawatt-Hours
NECC	National Economic Coordination Committee
NEMC	National Energy Management Committee
OEM	Original Equipment Manufacture
O&M	Operation and Management
ODA	Official Development Assistance
PFI	Private Finance Initiative
PFP	Privately-Financed Projects
PHP	Philippine peso
PPA	Power Purchase Agreement
PPI	Private Participation in Infrastructure

PPIAF	Public–Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PPPLRC	Public Private Partnership Legal Resource Center
PRC	People's Republic of China
PSC	Production Sharing Contract
PSP	Private-Sector Participation
SHPC	Shweli (1)Hydro Power Co., Ltd.
SIA	Social Impact Assessment
SOE	State Owned Enterprise
SPP	Small Power Producers
SPV	Special Purpose Vehicles
TWH	Trillion -Watt Hours
US	United States
VFM	Value For Money
YESB	Yangon Electricity Supply Board
YESC	Yangon Electricity Supply Corporation
YNIC	Yunnan International Co.,Ltd.
YUPD	Yunnan United Power Development Co.,Ltd.

CHAPTER I
INTRODUCTION

1.1 Rationale of the Study

Electricity generation plays a crucial role within the development of the country. In Myanmar, electricity consumption is increasing year by year in line with the rapid growing population and expansion of urban cities. To come up with this increasing demand, power plants have to be built. The budget is in stringent to complete the power plant projects being built by the government. Because of the limited government budget, private sector investment is required to extend domestic and foreign investment within the electricity generation; the government laid down the Electricity Law, and invited local and foreign investors to boost the generation of electricity. Electricity is that the most vital energy source in Myanmar. Myanmar has abundant energy resources particularly hydropower and natural fossil fuel. The hydropower potential is estimated to be more than 10,000 megawatts (MW) in terms of installed capacity. Electricity is additionally a necessity for socioeconomic development to satisfy basic human needs and support industrial development.

Despite having abundant electricity-generating resources, Myanmar has some of the world's lowest electrification and electricity usage rates. However, the power sector in Myanmar is underdeveloped because it lacks financial and technical capacity and investments. Inadequate electricity supply has emerged as one of the most serious infrastructure constraints on the country's sustainable economic growth. Compared with the dimension of its population and economy, Myanmar's consumption level of modern energy resources is low. The low use of, limited availability of, and poor access to electric power are obstacles to improving living standards and expanding industrial activities. So, the Ministry of Electric Power invited the Independent Power Producer to get the electric power. Independent power producers invested in Myanmar for last ten year ago.

According to ADB report (2018), Myanmar has one of the lowest per capita electricity consumption rates in the world—263 kilowatt-hours (kWh) per person in 2016, one-tenth of the world average of 3,000 kWh. The country's electrification rate was 35% in 2016. In Myanmar, Electric Power Sector plays a vital role for the development of the government. Although Myanmar faced with power shortage in current situation, it'll make ensure that electric power sector of Myanmar won't be binding constraint for economic process by timely transforming the power sector. Since Myanmar has adequate energy resources and a lot of opportunities for investment, and there are welcoming the local and foreign investors to speculate in Myanmar Power Sector.

Electricity is generated by alternative ways such as Hydro, Gas, LNG, Coal, Solar, Wind and Biomass, etc. In 2022, the electrification rate is 62% of total households. All urban areas have been electrified, but rural areas haven't yet been. The goal of the Ministry of Electric Power is to have nationwide access to electricity by 2030, so the private sector is important in meeting the demand for electricity. There are 25 Private Power Plant Projects, the installed capacity is 3,778 MW and it is 55% of total installed capacity.

Total generation is 23,407 GWh and private sector's generation is 16,347 GWh. Thus, it is about 70 percent of total generation. The whole country's electricity consumption is 22,509 GWh. Yangon's electricity consumption is nearly 50% of the entire country. The remaining Region and State is about 50%.According to the official statistics book (EPGE), the type of energy mix within the national grid in 2020-2021 consisted of 46.86 % Hydro Power, 50.82 % natural gas, 1.74% coal power and o.58 % solar power. The type of ownership in the power sector in 2020-2021consisted of 45 % state owned, 14 % JV, 37 % BOT and 4 % BOO.

To meet the fast-growing future demand, the government will expand the generating system to succeed in about 23,600 MW in 2030. This plan faces obstacles, including the environmental impact, and large up-front cost of large hydropower developments and the limited domestic availability of natural gas and the proper quality of coal. Policies for Power Sector are to utilize the available energy resources in power generation, to fulfill our demand to come up with power using Renewable Energy (solar, wind) for ensuring the steadiness and reliability of facility and lowering the price of generation, to encourage Private-participation in electricity generation and distribution.

To increase the nation’s electricity access and support the broader economic development, Myanmar will have to follow through planned supply and demand–side solutions for the facility sector yet as national grid extension and utilization of distributed energy strategies. The private sector will play a central role in these efforts and Myanmar’s policymakers must create an enabling environment for future business, addressing issues like market-distorting subsidies and inadequate banking services. The Private Sector has been able to partially meet the demand for electricity and can reduce investment in electricity generation and increase production. This study attempts to examine the benefits and the challenges of private sector participation in the electricity generation projects to meet Myanmar's electricity demand.

1.2 Objectives of the Study

The objectives of this study are to examine the benefits and also the challenges of private sector participation within the electricity generation projects and currently being implemented within the electricity generation sector.

1.3 Method of Study

The descriptive method used, and it bases on primary and secondary data. Primary data is collected to get vital information; key informant interview was conducted with total 25 of stakeholders, government officials, current operators from electricity sectors and private investors. Secondary data is collected relevant information from Ministry of Electric Power and its departments, research papers, libraries and internet website.

1.4 Scope and Limitation of the Study

The study is especially focused on the private sector participation within the electricity generation projects generally and particular in Hydro and Thermal power Projects. It doesn't include the other means of generating electricity.

1.5 Organization of the Study

This study is organized into five chapters. Chapter I describe the introduction including the rationale, objectives, and method of study, scope and limitations of the study and organization of the study by 5 subchapters. Chapter II studies literature review on related study areas. Chapter III describes about overview of the electricity generation in Myanmar. Chapter IV is that the study analysis. Chapter V is conclusions supported the findings and suggestions.

CHAPTER II
LITERATURE REVIEW

Electricity is an indispensable infrastructure for the development of Myanmar. Electricity is critical to Myanmar's economic development, including in the areas of education and health. Electricity is a public good that is crucial to everyone and non - excludable. Government spending on electricity has increased, but the government's budget is limited, so the private sector has been forced to participate. As the government budget remains limited, the private sector has become important for the development of electricity generation. In building the national government's infrastructure, the private sector has entered into the role of developing the country's economy. The private sector is playing a key role in inviting local and foreign investment to ensure adequate electricity supply throughout the country. Various forms of private investment have entered the electricity generation projects. These include Joint Venture (JV), Build Operate Transfer (BOT), and Build Own Operate (BOO). The role of the private sector participation in electricity generation, a holistic review of previous and present literature on the research area has been undertaken. Peer-reviewed articles and published books have been referred to this section.

2.1 Motivation for Engaging in PPPs and Definitions of Public-Private Partnerships

According to ADB (2008), the three main needs that motivate governments to enter into PPPs for infrastructure are:(i) To attract private capital investment (often to either supplement public resources or release them for other public needs);(ii) To increase efficiency and use available resources more effectively; and(iii) To reform sectors through a reallocation of roles, incentives, and accountability.

The definition varies on a country-by-country, sector-by-sector and project-by-project basis. The term“public private partnership” has originated within the U.S., initially regarding joint- and private-sector funding for educational programs, and

public–private joint ventures for reclamation in 1960. The assorted definitions of the term "public-private partnership (PPPs)"are as follows; (Sie Sein 2020)

(i) World Bank (2007) defines public-private partnerships broadly as " an agreement between government and a personal firm under which the private firm delivers an asset, a service, or both, reciprocally for payments contingent to some extent on the long-term quality or other characteristics of outputs delivered".

(ii) World Bank (2014) defined as: "A long-term contract between a public party and a non-public party for the event and/or management of a public asset or service, during which the private agent bears significant risk and management responsibility through the lifetime of the contract, and remuneration is significantly linked to performance, and/or the demand or use of the asset or service".

(iii) Public-Private Partnerships (PPPs) means an investment mechanism supported a contractual agreement between an implementing administrative body and a non-public party for providing a public asset or infrastructure or service that features but isn't limited to financing, designing, implementing, managing, and/ or operating infrastructure facilities and services traditionally provided by the general public sector in a trial to cut back the Government's capital and operating expenditures while improving the standard of assets and services. (Sie Sein 2020)

2.2 Types of Public-Private Partnerships (PPPs)

The contracts public-private partnerships are different from country by country. Within the Union of Myanmar, kinds of public-private partnerships include but shall not be limited to the following: (Sie Sein 2020)

(i) Availability payment means a payment mechanism to the private sector for a sort of PPP Project whereby the general public sector pays the private partner a pre-established, maximum period payment to style, build, finance, operate and/or manage Project facilities; the scope of services for the private sector wouldn't include numbers of customers/ users and demand risks, fare collection; the private partner is compensated for both capital and operating costs; the private partner is evaluated each period on the supply of facilities and services and performance; each periodic payment is adjusted to reflect deductions for non-compliance with pre-established service levels and credits for enhanced performance.

(ii) Build-Own-Operate (BOO) means a Build-Own-Operate contract to create, operate, and maintain a facility; after the completion of the ability, the investor shall own and has the proper to commercially operate such facility in perpetuity unless by mutual agreement the govt. decides to buy the asset at the top of a specified period of your time.

(iii) Build-Operate-Transfer (BOT) means a Build-Operate-Transfer contract to create a facility; after the completion of the constructed facility, the investor shall have the correct to commercially operate such facility for a set term; at the top of such term, the investor (s) shall transfer the power to the government

(iv) Build-Transfer-Lease (BTL) means a Build-Transfer-Lease contract to create a facility, transfer its ownership to the government after the facility's construction, and after the private investor having executed its right to work the ability for a specified period of your time, leases the power to the Implementing office from whom lease payments are made to the investor for a period of your time laid out in the BTL contract.

(v) Build-Transfer-Operate (BTO) means a Build-Transfer-Operate contract to create a facility; after the completion of the constructed facility, the investor shall transfer such facility to the Implementing federal agency and shall have the correct to commercially operate such facility for a set term.

(vi) Operation and Management (O&M) means an Operate-Manage contract to commercially operate a part of a facility or the whole facility for a set term, where the private sector operator wouldn't have any investment responsibility.

(vii) Other kinds of PPP means styles of PPPs aside from the above and will also include but not be limited to Design-Build-Operate and Design-Build-Finance-Operate-Transfer contracts. Sie Sein(2020)

2.3 Investment in Infrastructure Projects by Public-Private Partnerships

The following sectors are permitted to take a position by public-private partnership.

(i) Agriculture;

(ii) Generation, transmission and distribution of electrical and thermal power;

(iii) Processing, storage, transportation, transmission and distribution of oil and natural gas;

(iv) Automobile, railway, water, air, urban transport;

(v) Roads and railway (including bridges and tunnels);

(vi) Public utilities and public services;

(vii) Medical, medico-preventive and other healthcare services;

(viii) Education, upbringing, culture and social services;

(ix) Mobile and stationary telecom services,

(x) Tourism, recreation and sports;

(xi) Water resources and waste water;

(xii) Solid waste management;

(xiii) Mining and other sorts of mineral processing (upon approval from the Pyidaungsu Hluttaw);

(xiv) Survey, implementation and monitoring of hydropower projects work like civil and mechanical work, power supply, power stations, and electricity supply enterprises;

(xv) Other sectors, involving the availability of services to a large range of consumers.

In addition, Production Sharing Contracts (PSCs) and Joint Venture agreements between usually the ministries concerned and private companies can be considered PPPs as they use project financing financial structure and special purpose vehicles (SPVs) to implement investment projects. Sie Sein (2020).

2.4 ASEAN Principle for Public-Private Partnerships (PPP) Framework

According to ERIA (2014), Public-Private Partnerships (PPPs) play an important role in meeting the infrastructure challenge and have been an established part of many countries' development paths. Private participation in infrastructure provision can enhance existing public capacity in providing economic infrastructure (e.g. transport, telecommunication, power, water and sanitation) and social infrastructure (e.g. health and education).

The Principles are subdivided into four headings. First, the Principles address the requirement to establish a strong policy and organizational framework within government and a sound enabling environment for private sector participation. Second, the Principles deal with the PPP process – selection, development and implementation – followed by a third set of Principles to ensure affordability and budget transparency. The fourth and final heading addresses the issue of transnational PPPs for infrastructure connectivity. ERIA (2014)

Policy and organizational framework for private participation: ASEAN governments attempting to mobilize private sector participation in infrastructure would benefit from policies establishing a transparent and predictable legal and regulatory investment framework, implemented by sufficiently resourced and appropriately mandated authorities, and complemented by a competitive business environment.

Project selection, development and implementation: Project selection should be prioritized through a whole-of-government approach. The choice of procurement methodology and management of the PPP process should be based on principles of highest value for money and most efficient allocation of risks. Dispute resolution mechanisms should be in place to address disputes in a timely and impartial manner

Affordability and budget transparency: The government must ensure that investment projects and the overall investment envelope are affordable. All projects are treated transparently in the budget documentation which should disclose all costs and contingent liabilities of PPP projects.

Transnational infrastructure connectivity: Transnational infrastructure development is an integral part of regional integration in ASEAN, and multi-jurisdictional projects present one option for achieving this.

2.5 Legal Framework for Public-Private Partnerships in Myanmar

The public-private partnerships projects are welcomed by the Union of Myanmar Government to reduce the Union of Myanmar Government's financial burden and the tax burden. Until 2018, the Union of Myanmar Government governed the PPPs project through the Foreign Investment Law, 2012 and Myanmar Citizens Investment Law, 2013.On 2 November 2012, Myanmar's new Foreign Investment Law was enacted by replacing the previous Union of Myanmar Foreign Investment Law of 1988. According to this Law, the investment may be carried out in any of the following forms: (i) one hundred per cent foreign capital on the business permitted by the Commission; (ii) a joint venture between a foreigner and a citizen or the relevant Government department and organization; and (iii) the contract which approved by both parties.

The Union Government guarantees: (i) No nationalization within the term of the contract or the extended term if such term is extended. (ii)No suspension any investment business before the expiry of the permitted term without any sufficient

cause. (iii)Disbursement his rights in the category of foreign currency in which such investment was made.

According to the Myanmar Citizens Investment Law, 2013, any type of economic activities may be applied for investment, except other restricted or prohibited businesses under this law, or any existing Law. The types of investment are: (i) one hundred percent investment by a citizen (ii) a joint venture between a citizen and relevant government department, government organization (iii) contracts (iv) contract between a Citizen and Union, carrying out mutual agreement system including BOT, BOO .

In 2016, the Union of the Government of Myanmar enacted a new Myanmar Investment Law. The Myanmar Investment Law came into effect on 18 October 2016 and replaced the previous Foreign Investment Law 2012 and the Citizens Investment Law 2013. The Myanmar Investment Rules 2017 came into force on 30 March 2017.

Although there is no law of public-private partnerships, some of the laws relating to PPPs projects are the Company Law, Investment Law, Contract Act, Land Acquisition Law, Arbitration Law, the rules and regulations of the related Ministries. The main government agencies relating to PPPs project are the Ministry of National Planning and Economic Development (MNPED), the Myanmar Investment Commission (MIC), the Directorate of Investment and Company Administration (DICA), which issue permits for the investment approval.

In 2018, the significant change for the public-private partnerships system is the introduction of the Notification of Project Bank, 2018. According to the Project Bank Notification, 2018, Project Bank means an interactive, web-based, publicly accessible database or project information bank that includes Projects that Implementing Governing Agencies perform to develop to implement the MSDP and its Strategic Action Plans.

The main target groups are Ministry of Planning and Finance and its PPP Center which are mainly responsible for PPPs. PPP Center means a specialized unit formed within the Ministry of the Planning and Finance. To be the responsible investments, environmental and social impact studies and aspects for proposed Projects including PPP Projects shall comply with regulations set out by the Ministry of Natural Resources and Environmental Conservation.

A PPP contract may be included: amount of investment, conditions precedent,

responsibilities and liabilities, rights and obligations of the Union or State or Region Governments, rights and obligations of the private partner, risk allocation, incentives, dispute resolution, effectiveness and key performance indicators, financing, insurance, term, minimal performance standards, performance monitoring, termination, early termination and extension, amendments, force majeure, tax and duties, auditing, change in law, effective date, contract term, guarantee and representation and renegotiation. Sie Sein (2020)

2.6 Potential Benefits and Risks of Public Private Partnerships

According to World Bank, PPLRC (2022), the fiscal extremity of 2008 onwards brought about renewed interest in PPP in both developed and developing countries. Facing constraints on public coffers and financial space, while feting the significance of investment in structure to help their husbandry grow, governments are decreasingly turning to the private sector as an indispensable fresh source of backing to meet the backing gap. While recent attention has been concentrated on financial threat, governments look to the private sector for other reasons:

(i) Exploring PPPs as a way of introducing private sector technology and invention in furnishing better public services through bettered functional effectiveness

(ii) Incentivizing the private sector to deliver systems on time and within budget

(iii) Assessing popular certainty by setting present and the future costs of structure systems over time

(iv) Exercising PPPs as a way of developing original private sector capabilities through common gambles with large transnational enterprises, as well as sub-contracting openings for original enterprises in areas similar as civil workshop, electrical workshop, installations operation, security services, drawing services, conservation services

(v) Using PPPs as a way of gradationally exposing state possessed enterprises and government to adding situations of private sector participation (especially foreign) and structuring PPPs in a way so as to insure transfer of chops leading to public titleholders that can run their own operations professionally and ultimately export their capabilities by bidding for systems common gambles

(vi) Creating persification in the frugality by making the country more competitive in terms of its easing structure base as well as giving a boost to its business and assiduity associated with structure development (similar as construction, outfit, support services)

(vii) Supplementing limited public sector capacities to meet the growing demand for structure development

(viii) Rooting long- term value- for- plutocrat through applicable threat transfer to the private sector over the life of the design – from design/ construction to operations/ conservation. (Sie Sein 2020)

There are a number of implicit pitfalls associated with Public Private Partnership.

(i) Development, bidding and ongoing costs in PPP systems are likely to be lesser than for traditional government procurement processes:

(ii) The government should thus determine whether the lesser costs involved are justified. A number of the PPP and perpetration units around the world have developed styles for assaying these costs and looking at Value for Money

(iii) There's a cost attached to debt – While private sector can make it easier to get finance, finance will only be available where the operating cash-overflows of the design company are anticipated to give a return on investment (i.e., the cost has to be borne either by the guests or the government through subventions, etc.)

(iv) Some systems may be easier to finance than others (if there's proven technology involved and/ or the extent of the private sectors scores and liability is easily identifiable), some systems will induce profit in original currency only (eg, water systems) while others (eg, anchorages and airfields) will give currency in bone or other transnational currency and so constraints of original finance requests may have lower impact

(v) Some systems may be more politically or socially challenging to introduce and apply than others- particularly if there's an being public sector pool that fears being transferred to the private sector, if significant tariff increases are needed to make the design feasible, if there are significant land or resettlement issues, etc

(vi) There's no unlimited threat bearing – private enterprises (and their lenders) will be conservative about accepting major pitfalls beyond their control, similar as exchange rate pitfalls threat of being means. If they bear these pitfalls also their price for the service will reflect this. Private enterprises will also want to know that the rules of the game are to be admired by government as respects undertakings to increase tariffs fair regulation, etc.

(vii) Private sector will also anticipate a significant position of control over operations if it's to accept significant pitfalls Private sector will do what it's paid to do and no further than that – thus impulses and performance conditions need to be easily set out in the contract. Focus should be on performance conditions that are out- put grounded and fairly easy to cover,

(viii) Government responsibility continues – citizens will continue to hold government responsible for quality of mileage services. Government will also need to retain sufficient moxie, whether the enforcing agency and/ or via a nonsupervisory body, to be suitable to understand the PPP arrangements, to carry out its own scores under the PPP agreement and to cover performance of the private sector and apply its scores,

(ix) The private sector is likely to have further moxie and after a short time have an advantage in the data relating to the design. It's important to insure that there are clear and detailed reporting conditions assessed on the private driver to reduce this implicit imbalance

(x) A clear legal and nonsupervisory frame is pivotal to achieving a sustainable result (for further, go to legislation and Regulation)

(xi) Given the long- term nature of these systems and the complexity associated, it's delicate to identify all possible contingencies during design development and events and issues may arise that weren't anticipated in the documents or by the parties at the time of the contract. It's more likely than not that the parties will need to talk the contract to accommodate these contingencies. It's also possible that some of the systems may fail or may be terminated previous to the projected term of the design, for a number of reasons including changes in government policy, failure by the private driver or the government to perform their

scores or indeed due to external circumstances similar as force majeure. While some of these issues will be suitable to be addressed in the PPP agreement, it's likely that some of them will need to be managed during the course of the design.

2.7 Experiences of PPPs in Infrastructure of Selected ASEAN Countries

According to ADB Economics Working Paper Series (2018), among the ASEAN countries, the gests of Indonesia, the Philippines, and Thailand, which have developed PPP, will be presented. Structure is abecedarian to support profitable growth and mortal well- being. It provides goods and services for direct use as well as supports other socioeconomic conditioning. May be the most grueling issue in structure development is the backing of construction or funding the operation and conservation. Since numerous structure systems are distributed as commercial, it becomes the responsibility of the public sector.

Since public finances are limited, structure development competes with other spending precedences, hence, deficit of its force. Government mates with the private sector to fill this gap. The public – private cooperation (PPP) allows the private sector to use its capability and innovative coffers; and, at the same time, to gain fair benefits from it. druggies admit advanced benefits and better quality services performing from private sectors ' professionalism and effectiveness. The challenges to apply PPP in a large scale is that it's a complex system; requires specific and sufficient knowledge of backing structure, pitfalls allocation, contract operation, and controversies resolution; and the sale process generally takes a long time to conclude.

Hence, the capacity of the public sector is pivotal and it still needs coffers and finances from the public side. The geography of structure development in maturity of the Association of Southeast Asian Nations(ASEAN) member states with emphasis on backing medium, in which PPP is promoted as strong complement of limited public finances. It also discusses the "structure ecosystem," and the eventuality to use PPP in social structure and pro-poor development planning. PPPs are handled in colorful ways in Southeast Asia. Some countries define PPP terms, and set up devoted units to deal with its perpetration. Others launch PPP as part of a larger investment or public institution.

(i) Indonesia

Indonesia has further than one institution responsible for its PPP programs, conforming of the National Development Planning Agency (Badan Perencanaan Pembangunan Nasional- BAPPENAS), the Ministry of Finance, and line ministries. They're coordinated by the Coordinating Minister for Economic Affairs. To speed up the perpetration of prioritized structure systems, President Joko Widodo established the Policy Committee for the Acceleration of structure Provision (Komite Kebijakan Percepatan Penyediaan Infrastruktur - KPPIP) in 2014 to set the public precedence design list and coordinate its perpetration. Indonesia has been reforming its PPP- related legal aspects to speed up the process.

During the last 5 times, there have been revised regulations on the compass of PPP, land accession, and government support (i.e., guarantee and vacuity payment). Some advancements were made, including the progress of three systems that reached fiscal ending in late 2016, and another four systems (all risk roads) that are presently on the stages of bidding and concession. still, the progress of perpetration is slow, generally because of inconsistent conduct by public agencies. Since the Asian fiscal extremity in 1997, Indonesia's spending on structure has been lower than its pre-crisis spending, leading to stagnant and dwindling stock per GDP.

A small structure budget means insignificant spending for erecting new systems, and indeed lower allocation for maintaining the being structure. This situation, combined with ineffective prioritization policy, has hampered Indonesia's growth occasion. For a decade, Indonesia's structure force had been short of its demand, performing in road locks in civic areas, high logistic costs, nearly no new structure erected outside Java Island, electricity knockout, and numerous further. President Joko Widodo, who took the position in October 2014, has a different profitable policy from his precursor. He believes that structure plays a significant part in profitable development and he has committed to develop outside Java.

During his first times of administration, he lifted energy subvention but allocated significant finances for universal health care, education, and structure. BAPPENAS estimated three scripts for structure development and anticipated that roughly 60 of the finances come from SOEs and PPPs. As structure development was an important part of President Widodo's crusade, he instructed the acceleration of structure systems. While PPP requires longer time due to its complications, several systems that were originally declared as PPPs were assigned to SOEs lately, several abandoned backbone systems have been completed or nearly completed in the islets of

Kalimantan, Sulawesi, Sumatra, and Papua. There's fresh fund in the form of special transfer to subnational governments to support original structure development. On the other hand, autonomous debt increased, but it's still manageable at below 27 of GDP. ADB (2018).

(ii) Philippines

The Philippines PPP Center has been more progressive. It has awarded 16 PPP contracts worth roughly $6.4 billion since 2010. Completed systems include the Ninoy Aquino International Airport Expressway and, 202 classrooms in six regions, while the Mactan – Cebu International Airport New Passenger Outstation structure and the Bulacan Bulk Water Supply Project are both under construction. The Philippines has several strong points in its PPP programs, especially in leadership of PPP; clear guidelines on cost- benefit analysis (CBA), threat assessment, and relative modality; and clear references to structure the schemes.

Progressive PPP development in the Philippines can not be detached from the strong commitment and massive PPP education of applicable officers (especially original governments) and the public in general. Familiarity to the conception is important to gain public support, exclude gratuitous public controversies, and promote translucency. The Philippines set up the PPP Center that acts as a one- stop service to handle PPP processes. Under President Rodrigo Duterte's administration, the Philippines launched a 10- Point Socioeconomic docket that includes accelerated structure spending, of which PPP plays a crucial part.

The focus of the programs is on transportation, new master plans of metropolises, and digital structure (internet speed and content). Among the crucial programs are (i) Increased public structure to 7 of GDP (ii) Ease in blessings of design proffers the current administration focuses on erecting architectures at a massive rate, creating millions of jobs, and lowering prices of goods. The National Economic and Development Agency, the Department of Transportation, the Department of Public Works and Highways, and the Bases Conversion and Development Authority are responsible for enforcing the Duterte structure Plan. The Philippines expects an increase of structure spending during 2017(Investor Relations Office 2017). ADB (2018)

(iii) Thailand

In Thailand, there are 44 PPP systems run by 16 agencies grounded on the State Enterprise Policy Office report. They cover transportation and logistics, serviceability, telecommunication, and property development. The State Enterprise Policy Office also released the PPP Master Plan 2015 – 2019 to determine the direction for sectors and types of marketable and social investments with private participation. Thailand, in the early 1990s, originally used a PPP approach to exclude corruption practices in design procurement and cover public interests. In 2013, it legislated the Private Investment in State Undertaking Act, with fresh vittles to promote PPP investment.

The norms have been set through institutionalizing the PPP Master Plan, PPP Committee, and PPP Unit; and through a set of guidelines for VFM, small systems, and the PPP database. It also facilitates streamlined procedure and determined timeline, and provides design development finances. Thailand set up the PPP Unit. Thailand blazoned its Transport structure Development Master Plan 2015 – 2022 in 2015 with a total investment of B,913 billion. The objects of the master plan are to strengthen social and profitable security, increase transport safety, ameliorate the quality of life, and enhance competitiveness and gain implicit benefits from the ASEAN Economic Community (Nitithanprapas 2016).

The plan includes several big systems, videlicet (i) upgrading rail and its installations, and erecting a double- track road network and its extension to the border; (ii) constructing four- lane road networks connecting growth centers with border areas; iii) extending the metro rail conveyance, earning new motorcars, and perfecting quality of roads and islands in Bangkok; (iv) developing a multimodal transport system andcross-border logistics center; (v) developing seaports on Thai gulf and Andaman Sea; and (vi) adding field capacity and perfecting field- related services. Piecemeal from the master plan, Thailand has an periodic investment action plan (IAP) which started in 2015. IAP 2015 comprises 59 systems with an investment cost of B848 billion. Of this, B56 billion is anticipated to be expended in 2015 and the rest would be carried over during the coming 7- time period from 2016 to 2022. IAP 2016 was planned with 20 systems worth B1.8 trillion. By the end of 2016, the Ministry of Transport blazoned that seven systems with a total investment of B874 billion were laid over. ADB (2018). Summary of PPP Framework/ Experience in the ASEAN Member Countries such as Indonesia, Philippine, Thailand and Myanmar is described in Appendix (B).

2.8 Reviews on Previous Studies

As per previous studies, scholars conduct the research on study of project management of Hlawga gas-fired power plant project by Aung Thu Htoon (2015) and a study of electricity distribution of Yangon electricity supply board (YESB) by Tun Tun Swe (2015), a study of hydro power generation and gas-fired power generation in Myanmar by Ko Ko Soe (2019), a study on electricity distribution system in Nay Pyi Taw council by War War Bo Myint (2020).

Aung Thu Htoon (2015) studied of 'project management of Hlawga gas-fired power plant project' by descriptive research method and based on primary and secondary data. He highlighted the project management and analysis on time, cost and earned values. This study covered the project planning, implementation, project management, evaluation practices for whole project except technology details and legal factors.

Tun Tun Swe (2015) studied of 'electricity distribution of Yangon electricity supply board (YESB)' by descriptive method based on secondary data of Yangon electricity supply board (YESB) between 2011 and 2015. He found that non-technical losses was the major problem facing, was about 18% of losses each year. YESB changed the name to YESC. He analyzed the generation and distribution of Electricity in Yangon region and studied the current consumption of electric power in Yangon Region by using both primary and secondary data. He stated that reducing of electricity losses increased the supply of electric power. (Tun, 2015)

Ko Ko Soe (2019) studied of 'hydro power generation and gas-fired power generation in Myanmar' by descriptive method based on secondary data from Ministry of Electricity and Energy. The objectives of the study are to examine the current status of hydropower generation and gas-fired power generation in Myanmar, to examine the difficulties and challenges of power generation management and to identify on transmission and distribution losses. He found that the Ministry of Electricity and Energy needs to increase more power generations, electric power security. In addition, it has to renovate or replace the old infrastructures and manage on non-technical transmission and distribution losses to get the affordable price for consumers.

War War Bo Myint (2020) studied of 'electricity distribution system in Nay Pyi Taw council' by descriptive method based on secondary data from Ministry of Electricity and Energy. This study focuses on the Distribution of Electricity in Nay Pyi Taw (2016-2017 to 2019-2020). The aim of the study is to expose the distribution of

electric power sector in Nay Pyi Taw Council and evaluate the condition of consumption and power supply services to Nay Pyi Taw Council (2016-2017 to 2019-2020). She found that ESE is facing the major problem such as shortage of power supply and losses of electricity, and is trying to reduce these barriers during this period. (War, 2020)

CHAPTER III

OVERVIEW OF ELECTRICITY GENERATION IN MYANMAR

3.1 Historical Background of Power Sector

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. The power supply group was reorganized into Electric Power Corporation (EPC) on 16th March 1972.

The Ministry of Industry was reorganized into the Ministry of Industry No. 1 and the Ministry of Industry No. 2 on 1stApril 1975. Electric Power Corporation was incorporated under the Ministry of Industry No. 2. The Electricity Act was enacted by the Pyithu Hluttaw Law No. 7(1984) on 22nd October 1984.The Ministry of Industry No. 2 expanded the Ministry of Energy on 12nd April 1985. The Electricity Corporation was incorporated under the Ministry of Energy.

The Electricity Corporation was reorganized as Myanmar Electric Power Enterprise (MEPE) on1stApril 1989. The Ministry of Energy expanded the Ministry of Electric Power on 15th November 1997. Department of Electric Power under the Ministry of Electric Power; Myanmar Electric Power Enterprise and Hydropower Department were formed with three departments.

The Ministry of Electric Power was reorganized into two ministries, the Ministry of Electric Power No. 1 and the Ministry of Electric Power No. 2 on 15th May 2006. The two ministries were merged to form the Ministry of Electric Power on 5th

September 2012. It was reorganized into two businesses and two corporations. The new Electricity law, which was enacted on 27th October 2014 according to the Pyidaungsu Hluttaw Law No.44, 2014. The Ministry of Electric Power and the Ministry of Energy merged to form the Ministry of Electricity and Energy on 1st April 2016. It was reorganized into 5 businesses and 2 corporations. Before 1984 October, the rules, regulations, by-laws, orders, directives and procedures issued by the Board of Yangon City Electric Power Supply Law and the Electricity Act (The Phyithu Hluttaw Law No. 7, 1984) may be applied in so far as they are not contrary to the new Electricity law (2014). The Ministry of Electricity and Energy was reorganized into two ministries, the Ministry of Electric Power and the Ministry of Energy on 2nd May 2022.

3.2 Overview on the Power Sector Under Different Period

3.2.1 Status of Electricity Generation up to 1988

Before independence, in 1936, Myanmar's first hydropower plant was Mogok with an installed capacity of 0.45 MW. During the 1960s, the power generation and distribution of the people's power were able to overcome the power needs of the people with the power from the Baluchaung No. 2 (Lawpita) hydropower plant. In the 1970s, large public factories in the country increased, and as large planned factories were expanded and built, when power demand increased, if large hydropower plants were built, the construction period will be long, so in order to fully meet the current demand, natural gas power plants have been built and power generation and distribution have been done. In 1974, the first natural gas-fired power plant was built in the Kyunchaung, and it started generating electricity with three turbines with an installed capacity of 18 MW. Later, to speed up Mann, ShweTaung, Thaton and Yangon, natural gas power plants were built and implemented as a short-term project. The North and South power grids were built as a power grid network. For off-grid areas, small hydropower plants and diesel generators provide power distribution. A detailed list of installed capacity, power generation and construction of power plants up to 1988 is given below –

Table (3.1) Installed Capacity and Electricity Generation Status up to 1988

Types of Power	Installed Capacity (MW)			Unit Generation (GWh)
	Grid	Off-Grid	Total	
Hydro	224.000	4.232	228.232 (35%)	934.89 (41.99%)
Gas/Steam	340.000		340 (52.17%)	1,267.86 (56.95%)
Diesel	-	83.500	83.50 (12.81%)	23.70 (1.06%)
Total	**564.000**	**87.732**	**651.732**	**2,226.45**

Source: MOEP

Above the table (3.1) describes that as of 1988, the installed capacity is 651.732 MW and there are 2226.45 GWh unit generated. Hydropower has an installed capacity of 228 MW, gas steam has an installed capacity of 340 MW and diesel has an installed capacity of 88 MW. During this period, the total installed capacity in the national grid was 546 MW and there was 88 MW installed off-grid.

Below the Table 3.3 describes that the hydropower plants that have been built up to 1988. After the independence period, Kayah Baluchaung (2) hydropower plant was constructed in 1964. There are 3 installed capacity of 28 MW and a total of 84MW. Another 3 plants with installed capacity of 28 MW each were completed in 1974. In 1985, the construction of 3 plants with installed power of 28 MW each was constructed in Kinda, Mandalay Region.

Table (3.2) Detailed List of Hydropower Plants Constructed up to 1988

Sr. No.	Name of Power Station	Location	Installed Capacity (MW)	Year of Completion
1.	Baluchaung (2) Lawpita	Kayah State	28 x 3 = 84 28 x 3 = 84	1960 1974
2.	Kinda	Mandalay Region	28 x 2 = 56	1985
	Total		**224**	

Source: MOEP

Table (3.3) below shows that 7 thermal power plants have been constructed in Yangon, Bago, Ayeyarwady, Magway Region and Mon State with an installed capacity of 340 MW.

Table (3.3) Detailed List of Thermal Power Plants Constructed up to 1988

Sr. No.	Name of Power Station	Location	Installed Capacity (MW)	Year of Completion
1.	Kyunchaung	Magway Region	18.1 x 3 = 54.3	1974
2.	Myanaung	Ayeyarwady Region	16.25 x 3 = 48.75 18.45 x 1 =18.45	1975 1984
3.	Ywama - Gas - Steam	Yangon Region	18.45 x 2 =36.9 10.0 x 3 = 30	1980 1957
4.	Mann	Magway Region	18.45 x 2 = 36.9	1980
5.	Kyeiklatt	Ayeyarwady Region	2.18 x 5 = 10.9	1983
6.	Shwetaung	Bago Region	18.45 x 3 = 55.35	1984
7.	Thaton-Gas -Steam	Mon State	18.45 x 1= 18.45 6 x 3 = 18	1985 1987
8.	Mawlamyaing	Mon State	6 x 2 = 12	1980
	Total		**340**	

Source: MOEP

3.2.2 Status of Electricity Generation up to 2011

Under the National Peace and Development Council, the expansion of factories, the construction of high-end housing, the implementation of many electricity projects for agriculture, the improvement of people's living standards, and the use of modern technology and equipment in various sectors such as health and education has led to an increase in electricity consumption.

After 1988, in order to meet the increasing demand for electricity consumed in the country every year, natural gas-fired power plants continuously generate power from waste heat power plants, and hydro power plants and coal-fired power plants are being expanded and built to produce and distribute power. In 2005, a coal-fired power plant was built in Tigypit, with an installed capacity of 120 MW. In 2009, the Shweli 1 hydropower plant was built in a joint venture with China, with an installed capacity of

600 MW and in 2011, the Dapein 1 hydropower plant was built in a joint venture with China, with an installed capacity of 240 MW.

The table (3.4) describes that the total installed capacity is 3413MW and total unit generation is 8625 GWh until 2011. From 1989 to 2011, (13) state-owned hydropower plants were built, and (2) joint venture hydropower plants were completed which is shown in Table 3.6. In addition, the construction of (6) thermal power plants has been completed, as shown in Table (3.4).

Table (3.4) Status of Installed Capacity and Electricity Generation up to 2011

Types of Power	**Installed Capacity (MW)**			**Unit Generation (GWh)**
	Grid	**Off-Grid**	**Total**	
Hydro	2,488	34	2522 (74%)	6188.95 (71.76%)
Gas	550	-	550 (16.11%)	1,763.46 (20.44%)
Steam	285	-	285 (8.35%)	640.14 (7.42%)
Diesel	-	56	56 (1.64%)	32.66 (0.38%)
Total	**3,323**	**90**	**3413**	**8,625.11**

Source: MOEP

According to Table (3.5) below, the Yeywa hydropower plant, which was completed in 2010, has an installed capacity of 790 MW and is the first largest hydropower plant in Myanmar. The second largest hydropower plant is the Paunglaung hydropower plant, which has an installed capacity of 280 MW and was completed in 2005. These hydropower plants are very helpful for the central regions of Myanmar to get electricity.

In 2009, Shwe Li (1), the first joint venture hydropower plant in the power generation sector, was completed. The Shweli (1) hydropower plant has built 6 units with installed capacity of 100 MW each. The power of 4 units is purchased from the Myanmar side and the power of 2 units is sent to China.Then, in 2011, the construction of the second joint venture plant, Dapein (1) hydropower plant was completed. 8% of the free power generated by the Dapein (1) hydropower plant is being sent to BanMaw and the remaining

power is being sent and sold to China. 4 units with an installed capacity of 60 MW each have been built and plans are being made to purchase 2 units from Myanmar.

Table (3.6) Detailed List of Hydro Power Plants Constructed from 1989 to 2011

Sr. No.	Name of Power Station	Location	Installed Capacity (MW)	Year of Completion
(A)	**State owned**			
1.	Sedawgyi	Mandalay Region	12.5 x 2 = 25	1989
2.	Baluchaung (1)	Kayah State	14 x 2 = 28	1992
3.	Zawgyi (1)	Shan State	6 x 3 = 18	1995
4.	Zawgyi (2)	Shan State	6 x 2 = 12	2000
5.	Zaungtu	Bago Region	10 x 2 = 20	2000
6.	Thaphanzeik	Sagaing Region	10 x 3 = 30	2002
7.	Mone	Magway Region	25 x 3= 75	2004
8.	PaungLaung	NayPyiTaw Council	70 x 4 = 280	2005
9.	Yenwe	Bago Region	12.5 x 2 = 25	2007
10.	Kabaung	Bago Region	15 x 2 = 30	2008
11.	KyaingTaung	Shan State	18 x 3= 54	2009
12.	Yeywa	Mandalay Region	197.5 x4 = 790	2010
13.	Shwegyin	Bago Region	18.75 x 4 = 75	2011
	State Owned Total		**1462**	
(B)	**Joint Venture**			
1.	Shweli (1)	Shan State	100 x 6 = 600	2009
2.	Dapein (1)	Kachin State	60 x 4 = 240	2011
	Joint Venture Total		**840**	
	Grand Total (A+B)		**2302**	

Source: MOEP

According to Table (3.6) below, between 1989 and 2011, 6 state-owned thermal power plants were built, including 1 coal-fired power plant. The Tigypit Power Plant has been generating electricity using coal produced from the Eden Coal Mine. Aiming to generate more electricity for the Tigypit Power Plant, a tender was called on 8-5-

2015 and a contract was signed on 10-2-2016 with the successful company. At present, power generation is being done in the form of public-private partnership.

Table (3.6) Detailed List of Thermal Power Plants Constructed from 1989 to 2011

SR NO.	Name of power station	Location	Installed Capacity (MW)	Year of Completion
	State owned			
1.	Thaketa- Gas -Steam	Yangon Region	19 x 3 = 57 35 x 1 = 35	1990 1997
2.	Ahlone -Gas -Steam	Yangon Region	33.3 x 3 = 99.9 54.3 x 1 = 54.3	1995 1999
3.	Hlawga -Gas -Steam	Yangon Region	33.3 x 3 = 99.9 54.3 x 1 = 54.3	1996 1999
4.	Thahton- Gas	Mon State	16.25 x 2 = 32.5	2001
5.	Ywama(Nedo)- Gas - Steam	Yangon Region	24 x 1= 24 9.4 x 1= 9.4	2004 2004
6.	Tigypit	Shan Stste	60 x 2= 120	2005
	Total		**586.3**	

Source: MOEP

3.2.3 Status of electricity generation during the democratic government from 2012 to 2021

During the period of the new government, according to the modernized social environment, but also according to the developed industrial and economic activities, the consumption of electricity increased rapidly. Electricity consumption is increasing year by year and electricity is being generated in various ways. Up to 2021, Myanmar's total installed capacity was 7,052 MW, including 3,225 MW from hydropower, 3,498 MW from gas and steam, 120 MW from coal, and 40 MW from solar energy sources of the national grid and 116 MW from diesel are shown in the table 3.8 below.

Table 3.8 Status of installed capacity and electricity generation up to 2021

Types of Power	Installed Capacity (MW)			Unit Generation (GWh)
	Grid	Off-Grid	Total	
Hydro	3,225	37	3262 (46.26%)	8,370 (35.40%)
Gas	3,213	16	3,229 (45.79%)	13,394 (56.65%)
Steam	285	-	285 (4.04%)	1149 (4.86%)
Coal	120	-	120 (1.70%)	531 (2.25%)
Diesel	-	116	116 (1.64%)	120 (0.51%)
Solar	40	-	40 (0.57%)	79 (0.33%)
Total	**6,823**	**169**	**7,052**	**23643**

Source:MOEP

Table 3.9 Detailed list of hydro power plants and solar power plant constructed from 2012 to 2021

SR NO.	Name of power station	Location	Installed Capacity(MW)	Year of Completion
(A)	**State owned(Hydro)**			
1.	Kyeeohnkyeewa	Magway Region	37 x 2 = 74	2012
2.	Kunchaung	Bago Region	20x 3 = 60	2012
3.	Nancho	Shan State	20 x 2 = 40	2014
4.	Phyuchaung	Bago Region	20 x 2 = 40	2014
5.	Upper Paunglaung	Shan State	70 x 2 = 140	2015
6.	Myogyi	Shan State	15 x 2 = 30	2016
7.	Myittha	Magway Region	20 x 2 = 40	2017
8.	Yazagyo	Sagaing Region	4 x 1 = 4	2018
	State Owned Total		**428**	
(B)	**BOT(Hydro)**			
1.	Thaukyekhat(2)	Bago region	40 x 3 =120	2014

2.	Baluchaung(3)	Kayah State	26 x 2 = 52	2015
	BOT Total		**172**	
(C)	**Joint Venture(Hydro)**			
1.	Chiphwenge	Kachin State	33 x 3 = 99	2013
(D)	**BOT(Solar)**			
1.	Minbu (Solar)	Magway Region	40 x 1= 40	2019
	GrandTotal(A+B+C+D)		**739**	

Source:MOEP

According to the above table 3.9, (8) more state-owned hydropower plants have been constructed, and (4) private JV, BOT hydropower and solar power plants have constructed. Table 3.10 been described that (3) state-owned thermal power plants have been constructed and (11) private JV, BOT and BOO thermal power plants have been constructed. In 2013, the construction of five (5) IPP plants has been completed, and power generation and distribution is underway through the BOT system. As of 2021, there are 25 power plants that have been completed with private investment and JV/BOT, BOO system, including 5 hydropower plants, 19 thermal power plants, and 1 solar power plant.

Table 3.10 Detailed list of thermal power plants constructed from 2012 to 2021

SR NO.	Name of power station	Location	Installed Capacity(MW)	Year of Completion
(A)	**State owned**			
1.	Ywama(EGAT)	Yangon Region	120 x 2 = 240	2014
2.	Thilawa	Yangon Region	25 x 2 = 50	2014
3.	Thahton(WB)-Gas -Steam	Mon State	46 x 2 =92 44 x 1 =44	2019 2019
	State Owned Total		**426**	
(B)	**JV/BOT**			
1.	Ahlone(ToyoThai) -Gas -Steam	Yangon Region	41.5 x 2 = 83 38 x 1 =38	2013 2015
2.	Hlawga(Zeya)	Yangon Region	1.03 x 26 = 26.78 9.34 x 3 =28.02	2013 2013
3.	Ywama (UPP)	Yangon Region	4 x 13 =52	2013
4.	Thaketa(Max Power)	Yangon Region	3.35 x 16 =53.6	2013
5.	Mawlamyaing(MyanmarLighting)-Gas -Steam	Mon State	43.5 x3 = 130.5 21.5 x1= 21.5	2014 2015

6.	Tigypit(Wuxi;)	Shan State	60 x 2=120	2017
7.	Sembcorp(Myingyan)-Gas -Steam	Mandalay Region	72.83 x2=145.66 85.05 x 1= 85.05	2018 2018
8.	UREC(Thaketa) (JV)-Gas -Steam	Yangon Region	80.3 x1= 80.3 39.43 x1 =39.43	2018 2018
9.	MCM(ShweTaung)	Magway Region	9.87 X 4=39.48	2020
	BOT Total		**943.32**	
(C)	**BOO**			
1.	Kyaukphyu(V Power)	Rakhine State	1.56 x 66=102.96 2.026 x30=60.78	2015 2016
2.	Myingyan(VPower)	Mandalay Region	1.56 x 48=74.88	2015
3.	Magway(VPower)	Magway Region	1.56 x 48=74.88	2019
4.	Kyaukse(Powergen)	Mandalay Region	18.47 x8=147.76	2019
SR NO.	**Name of power station**	**Location**	**Installed Capacity(MW)**	**Year of Completion**
5.	Myingyan(VPower)	Mandalay Region	1.56 x 70=109.2	2019
6.	Vpower (Thaketa)LNG	Yangon Region	1.78 x 181=322.18 18,47 x 8=147.76	2020
7.	Vpower (Thilawa)LNG	Yangon Region	1.995 x 138=275.31 18.47 x 8=147.76	2020
8.	Vpower (Kyunchaung)	Magway Region	1.58 x 13=20.54	2020
9.	CEEC (Ahlone)-Gas -Steam	Yangon Region	123 60	2021
10.	Petrol&Trans(Pahtoolone)	Magway Region	2 x 7=14	2021
	BOO Total		**1681.01**	
	GrandTotal(A+B+C)		**3050.33**	

Source: MOEP

3.3 Policies and strategies for power sector in Myanmar

3.3.1 National Energy policy in Myanmar

To ensure development of the energy and electricity sectors, the NEMC prepared the National Energy Policy which was approved by the President in January 2014. The national energy sector policies are as follows;

(i) To implement short-term and long-term comprehensive energy development plans based on systematically investigated data on the potential energy resources that are feasible and can be practically exploited, considering minimum impact on natural environment and social environment.

(ii) To institute laws and rules and regulations to promote private sector participation and privatize state energy organizations in line with State Economic Reform Policy.

(iii) To compile systematic statistics on domestic demand and supply of various different kinds of energy resources of Myanmar.

(iv) To implement programs through which local population could proportionally enjoy the benefit of energy reserve discovered in the areas.

(v) To implement programs on a wider scale, utilizing renewable energy resources such as wind, solar, hydropower, geothermal, and bioenergy for the sustainable energy development in Myanmar.

(vi) To promote energy efficiency and energy conservation.

(vii) To establish a research, development, design, and dissemination institution to keep abreast with international practices in energy resources exploration and development works, and to produce international quality products and conduct energy resources exploration works in accordance with international standards.

(viii) To promote international collaboration in energy matters.

(ix) To formulate appropriate policy for energy product pricing, meeting economic security of energy producers and energy consumers.

Government plans as set out in the National Energy Policy paper include sector restructuring, investment planning, pricing and fuel subsidy review, renewable energy and energy efficiency development, promotion of private sector, increased international trade, and a national electrification program to achieve 100% electrification by 2030.

3.3.2 Policy and Objectives of the Ministry of Electric Power

As the Ministry of Electric Power, with the goal of being able to adequately distribute the nation's electricity needs, all available water power, wind power solar

energy generates electricity using thermal energy and other energy sources; transmission of electricity; Efforts are being made to implement distribution.

Policy : (i) Improving power generation;(ii) Achieving a stable power system in terms of power transmission and distribution; (iii) more international cooperation; (iv) Further development of human resources.

Objective: (i) To improve power production, power plants must be expanded and built.(ii)To improve the power system, substations and power lines must be expanded.(iii) Build a cross-border power grid with neighboring countries and purchase and supply the necessary power.(iv) Courses must be opened and taught for the further development of human resources.

Vision: (i) To achieve full power supply nationwide by the year 2030;(ii) To improve the proportion of renewable energy in power generation.

Mission:(i) Development of electricity production, transmission and distribution activities necessary for the people to have continuous power supply; (ii) Improvement of meter reading systems and electricity payment systems to provide good service to the people who use electricity. (iii) Educating the public on electrical safety.

3.3.3 Ongoing projects and Future Plan

(1) Ongoing projects

Hydropower projects: As for the ongoing hydropower projects, 166 MW in the middle of Paunglaung, 280 MW in Upper Yeywa, 51 MW in the upper Kyaing Taung, 111 MW in Thahtay, 6 MW in Nampanga, 20 MW in Nampaw, and 30.40 MW in Upper Baluchaung, a total of 664.4 MW are being implemented .

Natural gas projects: As for the ongoing natural gas projects, Myanaung 23 MW, Kyauk Phyu 135 MW, Myingyan Gas Engine + Solar Hybrid 120 MW, and Magway Gas Engine + Solar Hybrid 120 MW, a total of 398 MW are being implemented.

Solar power plant projects: There are 15 solar power plant projects under construction. The total installed capacity is 740 MW. Ongoing projects are listed in Table 3.11.

Power line and substation projects:There are 3 lines of 500 KV power lines , length 310.45 miles and 4 substations of 500KV,capacity 4000MVA,8 lines of 230 KV power lines, length 137.33 miles and 6 substations of 230 KV, capacity 8716.5 MVA,18

lines of 66 KV power lines, length 426.1 miles and 3 substations of 66 KV, capacity 6558.05 MVA,33 KV power lines, length 198.12 miles and capacity 9863.349 MVA.

The ongoing projects include 664 MW of hydro power, 398 MW of thermal energy and Solar Hybrid , and 240 MW of solar energy, with a total installed capacity of 1,802 MW, as can be seen in Table 3.11.

Table 3.11 Ongoing projects of hydropower, thermal power and solar power

Sr. No.	Project Name	Location	Installed Capacity (MW)
(A)	**Hydropower**		
1.	Middle Paunglaung	Naypyitaw Council	166
2.	UpperYeywa	Mandalay Region	280
3.	Upper Kyaing Taung	Shan State	51
4.	Thahtay	Rakhine State	111
5.	Nampanga	Shan State	6
6.	Nampaw	Shan State	20
7.	Upper Baluchaung	Kayah State	30.4
	Total(A)		**664.4**
Sr. No.	**Project Name**	**Location**	**Installed Capacity (MW)**
(B)	**Thermal power+ Solar Hybrid**		
1.	Myanaung	Ayeyarwady	23
2.	KyaukPhyu	Rakhine State	135
3.	Myingyan GasEngine+ SolarHybrid	Mandalay Region	120
4.	Magway GasEngine +SolarHybrid	Magway Region	120
	Total(B)		**398**
(C)	**Solar**		
1.	15 projects		740
	Total(A+B+C)		**1802.4**

Source:MOEP

(2) Future plan

The Ministry's future plan is as follows:

(i) **Cross-Border Power Purchases**: In order to be able to meet the power needs that are growing every year in a timely manner, in order to be able to buy and distribute electricity from neighboring countries, plans are being made to purchase (500) MW

from India, (400) MW from the People's Republic of China, (600) MW from Laos and (200) MW from Thailand for a total of (1,600) MW.

(ii) **Hydropower projects**. A total of 2111.1 MW of 18 hydropower projects are being planned.

(iii) **Wind power projects**: Ann,Gwa,Thandwe in Rakhine State , three wind power projects, a total of 360 megawatts have been submitted to the State Administration Council office to request comments for the signing of the MOA. It has been submitted to the State Administration Council Office for the signing of a Memorandum of Understanding (MOU) for the installation of three projects in Yangon Region, Irrawaddy Region and Rakhine State with a total installed capacity of 358 MW.

(iv) **LNG and natural gas power plant projects**: Plans are underway for the implementation of 4 LNG and natural gas power plant projects with a total capacity of 2547 MW.

(v) **Solar power projects**: 24 solar power projects with a total capacity of 900 MW have already been tendered.

(vi) **Coal-fired power projects**: The implementation of a coal-fired power plant with a total capacity of 300 MW is underway.

3.4 Current situation in private sector participation in electricity generation projects

Myanmar's first Joint Venture Hydro power project is the Shweli (1) Hydropower Plant, which was operational from the fiscal year 2008-2009. The information of the Shweli (1) hydropower plant, which signed the first JV Agreement in Myanmar, is shown in Appendix (B). In 2013, we have been inviting private power producers (Independent Power Producers) to meet the demand for electricity in Myanmar and to be involved in the electricity generation sector. At the time, the form of private participation was Build Operate Transfer (BOT) with a term of 25 years. Five private owned power plants have been built to meet Yangon's electricity needs. The Ministry supplies natural gas to private power plants, and they generate electricity and sell it to the Electric Power Generation Enterprise to meet the needs of the people.

In the short term, the government has been unable to invest in the construction of gas-fired power plants and has invited private investors. In the 2015-2016 financial years, MOEP leased natural gas engines that could be completed in a short-term period to meet the growing demand for electricity. The short-term lease of gas-powered

engines is the Build Own Operate (BOO) model, with a validity period of two to five years.

The following table 3.12 and 3.13 describe that there are 25 private power plants with a total installed capacity of 3,778 megawatts till 2021 and a total generation capacity 16,347 million kilowatt-hour (GWh) in the fiscal year 2020-2021.Until 2021, the installed capacity of private owned hydropower and solar power plants and the state of electricity generation in 2021 are shown in Table 3.12.

Table 3.12 Private owned hydropower and solar power plants up to 2021

SR NO.		Name of Power Station	Installed Capacity (MW)	Unit Generation (GWh)	Concession Right(Year)	Unit selling price
A.		**Hydro Power (JV)**				
	1	ShweLi(1)	600	2,273	40	RMB 0.2253
	2	Dapein - 1	240	87		RMB 0.375
	3	Chipwenge	99	287	45	RMB 0.375
		Hydro Power (BOT)				
	4	Thaukyekhat(2)	120	297	65	70 Kyat
	5	Baluchaung(3)	52	155	65	64.50 Kyat
B.		**Solar Power (BOT)**				
	6	Minbu	40	79	29	US Cent 12.75
		Grand Total	**1151**	**3178**		

Sources:EPGE

According to the table 3.12 above, there are (3) joint-venture hydropower plants and (1) BOT solar plant. 15 percent of free power royalty from Shweli (1) hydro power plant and 8 percent of free power royalty from Dapein (1) hydro power plant has been received for the government and is being paid as tax revenue. Since 2011, 20 percent of the dividends from Shweli (1) hydropower plant has been distributed. The electricity price of Shweli (1) hydropower plant is the cheapest and the government gets Free Power Royalty 15% and Free Share 20%, so it is the most cost-effective JV project.

According to Table 3.13 below, thermal power plants use natural gas to operate the plant, so the cost is high. There are two (2) LNG-powered plants, and the electricity price is the highest. Now, the world's LNG price is high and the crisis has caused the LNG power plants to be stopped without operating. Sembcorp Myingyan Thermal power plant was built by BOT system and invested by a Singapore-based company. It was found that the companies that invest the most in the electricity generation sector are from Singapore, Hong Kong, China and Thailand. In addition, Myanmar companies are also included.

Table 3.13 Private owned thermal power plants up to 2021

SR NO.	Name of Power Station	Installed Capacity (MW)	Unit Generation (GWh)	Concession Right(Year)	Investment country
	Thermal Power				
	Coal(Contract)	120	531	22	
1	Tigypit	120	531	22	China
	Natural Gas (JV/BOT)				
	JV BOT	**119**	**853**		
2	UREC(Tharketa)	119	853	30	HongKong
	BOT	**783**	**5,473**		
3	MCP(Hlawga)	55	389	30	Myanmar
4	UPP(Ywama)	52	378	30	Singapore
5	TTCL(Ahlone)	121	912	30	Thai
6	Max Power(Tharketa)	55	329	22	Singapore

7	MyanmarLighting (Mawlamyaing)	230	1,338	30	Myanmar
8	Sembcorp (Myingyan)	231	1,871	22	Singapore
9	MCM (ShweTaung)	39	256	24	Myanmar
	BOO	**1,604**	**6,312**		
10	CEEC (Ahlone)	183	1,048	5	China
11	Vpower (Kyunchaung)	22	133	5	HongKong
12	Vpower (Thaketa)LNG	461	1,243	5	HongKong
13	Vpower (Thilawa)LNG	433	1,097	5	HongKong
14	Powergen(Kyaukse)	148	1,090	5	Myanmar
15	Vpower(Myingyan)	94	647	5	HongKong
16	Petrol&Trans (Pahtoolone)	14	6	5	Myanmar
17	Vpower(Kyaukphyu)	100	446	5	HongKong
18	Vpower (Myingyan)	75	281	5	HongKong
19	Vpower(Magway)	75	321	5	HongKong
	Grand Total	**2,627**	**13,169**		

Sources:EPGE

The role of private power producers is crucial to meeting Myanmar's electricity needs. It is a challenge for the country to fully generate the electricity that is growing every year. It is found that the hydropower plants under construction with the state budget are not completed on time due to budget constraints. Therefore, the Ministry is making efforts to meet the country's electricity demand by building thermal power plants that can be completed in a short period of time. The Electricity Law provides for the participation of local and foreign investors in conducting electricity business.

By looking at the table 3.14,it will be found that private sector participation in hydropower generation is 13.24%, thermal power (Gas+Coal) generation is 56.26 %, and solarpower generation is about 0.34%. With Myanmar’s economic and political transformation, the country’s annual electricity generation rose 23,407 GWh in 2021. In the 2020-2021 financial year, types of energy mixed are 8,328 GWh of hydropower, 14,469 GWh of natural gas, 79 GWh of solar power and 531 GWh of coal-fired power generation, respectively. Types of ownership are 7,060 GWh of public and 16,347GWh of private generation. The status of private sector participation until 2021 is shown in Table 3.14 below. The total installed capacity of the private sector is 3,778

MW with 16,347 million generating units(GWh). In terms of percentage, it is about 55 percent in installed capacity and almost 70 percent in manufacturing units.

Table 3.14 Installed capacity and unit generation up to 2021

Types of Power	Installed Capacity (MW)			Unit Generation (GWh)		
	State owned	Private(JV, BOT,BOO)	Total	State owned	Private(JV, BOT, BOO)	Total
Hydro	2,114	1,111	3225	5,229 (22.34 %)	3,099 (13.24%)	8,328 (35.58%)
Gas	992	2,507	3499	1,831 (7.82 %)	12,638 (53.99%)	14,469 (61.81%)
Coal	-	120	120	-	531 (2.27%)	531 (2.27%)
Solar	-	40	40	-	79 (0.34 %)	79 (0.34%)
Total	**3,106 (45.12%)**	**3,778 (54.88%)**	**6884**	**7,060 (30.16%)**	**16,347 (69.84 %)**	**23407**

Sources: EPGE

The following table 3.15 describes that the installed capacity and generating units of the state-owned hydropower plants. According to the table, it can be seen that the Yeywa HydroPower Plant has the largest installed capacity and the largest generating unit. And then,Yazagyo hydropower plant has the smallest installed capacity and the smallest generating unit. These state-owned hydropower plants can operate at full capacity during the rainy season, but cannot operate at full capacity during the summer. It relies on private thermal power plants for continuous power generation in the summer,

Table 3.15 State owned hydropower plants up to 2021(National Grid only)

Sr.No	Power Station	Installed Capacity(MW)	Unit Generation(GWh)	Remark
1	2	3	4	5
	State Owned			
1	Beluchaung - 1	28	84	
2	Beluchaung - 2	168	558	
3	Kinda	56	17	

4	Sedawgyi	25	106	
5	Zaung Tu	20	40	
6	Zaw Gyi - 1	18	55	
7	Zaw Gyi - 2	12	27	
8	Thaphanzeik	30	63	
9	Paung Laung	280	393	
10	Mone	75	217	
11	Yenwe	25	53	
12	Kabaung	30	41	
13	Kyaing Taung	54	298	
14	Yeywa	790	2237	
15	Shwe Gyin	75	204	
16	Kun	60	62	
17	Kyeeohnkyeewa	74	209	
18	Nancho	40	67	
19	Phyu Chaung	40	102	
20	Upper PaungLaung	140	241	
21	Myogyi	30	53	
22	Myittha	40	91	
23	Yazagyo	4	11	
	Total	**2114**	**5229**	

Sources:EPGE

The following table 3.16 describes that the installed capacity and generating units of the state-owned thermal power plants. According to the table, it can be seen that the Thaton thermal power Plant has the largest installed capacity and the largest generating unit. And then, Myanaung thermal power plant has the smallest installed capacity and no generating unit.State-owned thermal power plants such asAhlone, Thaketa, Kyungchaung, ShweTaung, and Thilawa have a low generation unit, because the capacity of these plants is declining and the government budget is insufficient for maintenance.

Table 3.16 State owned thermal power plants up to 2021 (National Grid only)

Sr.No.	Power Station	InstalledCapacity (MW)	Unit Generation (GWh)	Remark
1	2	3	4	5

	State owned			
1	Ahlone	100	79	
2	Tharketa	82	88	
3	Thaton	187	572	
4	Kyunchaung	54	0	
5	Shwetaung	55	6	
6	Myanaung	18	5	
7	Thilawa	64	0	
8	Hlawga	154	303	
9	Ywama	277	778	
	Total	**992**	**1831**	

Sources:EPGE

Myanmar's electricity consumption remains one of the lowest in the regions. According to 2020-21, Myanmar's per capita consumption of electricity is 356 kilowatt-hours. The rate of per capita electricity consumption from 2015-2016 to 2020-2021 is described in the table 3.17 below;

Table 3.17 Per capita electricity consumption

Fiscal Year	Electricity Consumption (per capita kWh)
2015-16	263
2016-17	301
2017-18	335
2018 Mini	372
2018-19	378
2019-20	389
2020-21	356

Source:DEPP

Today, Myanmar has one of the lowest electrification rate in Asia and rural communities face significant energy poverty. The national electrification ratio is 56 percent in 2020-21 and in rural areas only a fraction of the population has access to the grid. The following table 3.18 describes that the percentage of electrification ratio that has increased annually. As of May 2022, the ratio of electrification is about 62 percent, which includes the connection to the national grid as well as other ways.

Table 3.18 Electrification Ratio up to 2021

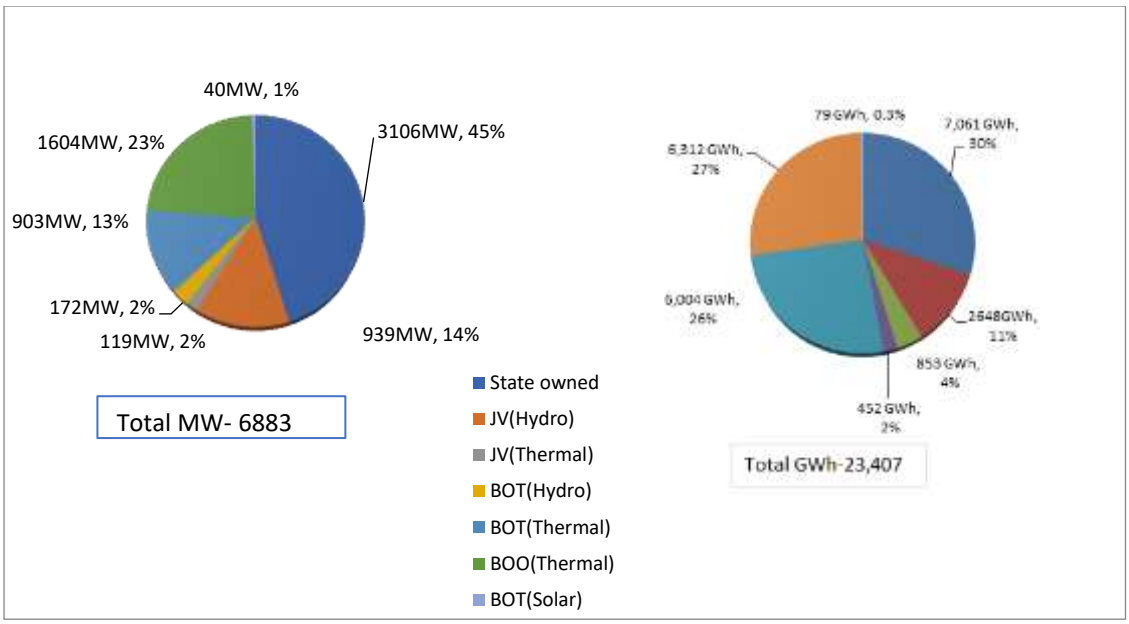
Fiscal Year	Electrification Ratio
2015-16	33
2016-17	38
2017-18	40
2018 Mini	42
2018-19	47
2019-2020	56
2020-21	56

Source:DEPP

The following figure.3 describes that the installed capacity and unit generation by type of ownership up to 2021. The figure shows that 45 percent of the installed capacity is state-owned and 55 percent is private and, unit generation has 30 percent state ownership and 70 percent private ownership.

FIGURE-3 Type of Ownership (Partnership) up to 2021

(Installed Capacity and Unit Generation for National Grid only)



Source:EPGE

The following table 3.19 is existing generation mix in Myanmar. There is grand total 7,052 MW (98% of national grid 6,883 MW and 2% of off-grid 170 MW) at existing generation mix. Hydropower provides 3,262 MW and ongoing constructions' capacity is 1355.4 MW in various areas in Myanmar. On the existing generation mix, hydropower account for (3,225 MW), natural gas-fired power account for (3,498 MW)

and coal-fired power generation account for (120 MW) are under national grid and small hydropower (37 MW), gas-fired power (16 MW), and Diesel power (117 MW) are under off-grid system. Currently, there are 61 Numbers of hydropower generation projects, 1 Number of coal-fired power plant and 28 Numbers of gas-fired power generation projects operating in Myanmar.

Table 3.19 Existing Generation Mix up to 2021

Types of Power Plants	No. of Stations	Installed Capacity (MW)
On-Grid		**6883**
Hydropower Plants	28	3225
Gas-fired Power Plant	27	3498
Coal-fired Thermal Plant	1	120
Solar power plant	1	40
Off- Grid		**169**
Small Hydropower plants	33	37
Gas-fired Power Plants	1	16
Diesel		116
Grand Total	**91**	**7052**

Source: DEPP

The following table 3.20 describes that power installation by types. Hydropower is always more than thermal power from the fiscal year 2005-2006 to 2018-2019. However, since the fiscal year 2019-2020, the installed capacity of thermal power has increased more than hydropower. More and more thermal power plants are being built due to government hydropower projects not being completed on time. In 2020-2021, the installed capacity has decreased by about 1 percent. The reason is that the 2 privately-owned power plants that were leased for a short period of time and Build Own Operate (BOO) model are no longer in operation after their 5 year term have expired.

Table 3.20 Electricity installation by type

Year	Hydro power (MW)	Thermal Power (MW)	Diesel (MW)	Solar (MW)	Total (MW)	Yearly Increased %

2005-06	746	876	68	-	1690	-
2010-11	2522	835	56	-	3413	102%
2015-16	3215	1815	95	-	5125	50%
2016-17	3255	2041	94	-	5390	5%
2017-18	3255	2295	92	-	5642	5%
2018 mini	3259	2276	116	-	5651	0.2%
2018-19	3262	2420	116	40	5838	3%
2019-20	3262	3711	116	40	7129	22%
2020-21	3262	3634	116	40	7052	-1%

Source: DEPP

The following table 3.21 states that power generation increased yearly. But in 2020-2021, the electricity generation has decreased by about 1 percent. The reason is that the 2 private-owned power plants that were leased for a short period of time and Build Own Operate (BOO) model are no longer in operation after their 5-year term have expired.

Table 3.21 Electricity Generation by type (GWh)

Year	Hydro power	Thermal Power	Diesel	Solar	Total	Yearly Increased (%)
2005-06	3001	3030	33	-	6064	
2010-11	6189	2403	33	-	8625	42%
2015-16	9399	6511	55	-	15965	85%
2016-17	9744	8062	61	-	17867	12%
2017-18	11191	8796	69	-	20055	12%
2018 mini	6575	4514	40	-	11129	-
2018-19	11228	11537	104	14	22883	-
2019-20	9369	14142	186	81	23778	4%
2020-21	8370	15074	120	79	23643	-1%

Source: DEPP

To meet the fast-growing future demand, the government will expand the generating system to reach about 23,600 MW in 2030. The 2030s generation mix will consist of 66% hydropower, 17% natural gas, 10% coal, and 7% renewable energies such as solar and wind. This plan faces obstacles, including the environmental impact

and large up-front cost of large hydropower developments and the limited domestic availability of natural gas and the proper quality of coal.

The country's transmission system comprises a network of 66 kilovolt (KV), 132 KV, and 230 KV transmission lines totaling 15,838 kilometers (km). It includes (i) 230 KV lines totaling 5406 km, (ii) 132 KV lines covering 2,320 km, (iii) 66 KV lines totaling 8132 km. Most of these lines run from the north, where most of the country's hydropower plants are located, to the Yangon area. New 500 KV transmission lines are being developed to create a transmission backbone connecting the northern generation centers to the major load centers in the South.

The distribution system comprises a network of 33 KV, 11 KV, and 6.6 KV lines and substations. Most of the distribution facilities are outdated and inadequate for current loads. Many conductors are not insulated and vulnerable to external accidents that can cause power outages that last from a few minutes to a few hours. The system lacks automation and communications equipment, and mostly is operated manually. To improve efficiency and reduce losses, the government is phasing out 6.6 KV networks, upgrading them to 11 KV networks, and expanding the 33 KV networks.

In order to meet the growing demand for electricity, the government has encouraged private investment, increasing the installed capacity to 7,052 MW and generating 23,643 million units (GWh). Since private investments are invested in foreign currency, they want to get their unit selling prices in foreign currency. Some companies that have a lot of foreign investment get their power sales in foreign currency, while some companies get it in equivalent kyats.

In order to be able to pay the electricity bill in foreign currency, payment FE is applied to the Ministry of Planning and Finance, and if the permit is obtained, the payment will be transferred to foreign banks through the Myanmar Foreign Trade Bank. When paying electricity bills to companies that receive electricity bills in kyats equivalent to foreign currency, they must be paid at the daily exchange rate of the Central Bank of Myanmar on the day of payment. In the current situation, due to the high foreign exchange rate, the budget deficit is increasing.

The unit selling prices of private owned thermal power plants currently being purchased by the Electric Power Generation Enterprise (EPGE) are as follows:

Table 3.22 Unit selling prices of private owned thermal power plants

SR NO.	Name of Power Station	Name of Organization	Unit selling price (US cent)
	Coal(Contract)		
1.	Tigypit(120MW)	Wuxi Hua Gaung Co;Ltd.	3.5
	Natural Gas (JV/BOT)		
	JVBOT		
2.	Thaketa(119MW)	U Energy Thaketa Power Co.,Ltd(UREC)	3.39
	BOT		
3.	Hlawga(55MW)	Myanmar Central Power Co.,Ltd(MCP)	3.4
4.	Ywama(52MW)	UPP Power Myanmar Ltd.	
5.	Ahlone(121MW)	Toyo Thai Power Myanmar Ltd. (TTCL)	4.6
6.	Tharketa(55MW)	Myanmar Power Pte.Ltd.(Max Myanmar)	3.4
7.	Mawlamyaing(230MW)	Myanmar Lighting Pte.Ltd.	3.4
8.	Myingyan(231MW)	Sembcorp Myingyan Power Co.,Ltd	3.13
9.	ShweTaung(39MW)	MCM Power Co.,Ltd.	3.19
	BOO		
10.	Ahlone (151.54 MW)	Myanmar Ahlone Power Pte.Ltd. (CEEC)	2.53
11.	Kyunchaung(20.54 MW)	V Power KC1 Co.,Ltd	
12.	Thaketa(461MW)LNG	CNTIC Vpower YG1 Ltd.	12.2
13.	Thilawa(433 MW)LNG	CNTIC Vpower YG2 Ltd .	12.2
14.	Kyaukse(147.76 MW)	Powergen (Kyaukse) Co.,Ltd.	3.25
15.	Myingyan(90MW)	V Power Group Holdings Limited	2.57
16.	Pahtoolone(14MW)	Petrol & Trans Co;Ltd.	2.45
17.	Kyaukphyu(100MW)	V Power Group Holdings Limited	2.87
18.	Myingyan(66MW)	V Power Group Holdings Limited	2.8
19.	Magway(67MW)	V Power Group Holdings Limited	2.8

Source:EPGE

According to the table 3.22 above, the selling price per unit of the two thermal power plants, Thaketa and Thilawa generated by LNG is US Cent 12.2, which is the highest. A coal-fired power plant'selling price per unit excluding coal cost is US Cent 3.5, the coal cost is paid by the department. The rest of the power plants are sold per unit price without the gas cost, and the gas cost is paid by the department. The gas price

is 7.5 US dollars per 1MMBTU for Yadana and Zawtika and 9.9 US dollars per 1MMBTU for Shwe Gas . Taking gas costs into account, the selling price per unit can range from a high of 12 US cents to a low of 10 US cents. This is higher than the selling price of hydropower plants.

The above table 3.22 shows the unit sales prices of private JVBOT, BOT, BOO power plants. In order to purchase the electricity produced by these power plants, power purchase contracts must be signed. In the contract, the selling price per unit is expressed in US cents, and payment must be made in kyat equivalent according to the daily exchange rate of the Central Bank of Myanmar. Due to the rising exchange rate, the cost of power purchase is high and the government is burdened, and the load shedding is a challenge due to private participation.

There are seven (7) contracts signed with foreign direct investment companies, and even the power purchased from them is paid in foreign currency. In order to pay in foreign currency, an application for permission to use foreign currency has been submitted to MOPF, and if the permit is obtained, the payment must be transferred to the relevant banks abroad through Myanmar Foreign Bank.

CHAPTER IV
ANALYSIS ON BENEFITS AND CHALLENGES OF PRIVATE SECTOR PARTICIPATION

4.1 Brief on overview of Electric Power Generation Sector

The Ministry of Electric Power is responsible for managing and operating the power sector development. Under the Ministry, there are one Union Minister's Office, three Departments, two state-owned enterprises and two corporations. They are Department of Electric Power Planning (DEPP), Department of Hydropower Implementation (DHPI), Department of Power Transmission and System Control (DPTSC), Electric Power Generation Enterprise (EPGE), Electricity Supply Enterprise (ESE), Yangon Electricity Supply Corporation (YESC) and Mandalay Electricity Supply Corporation (MESC). DEPP has been leading and handling the new projects of the entire ministry, loan acquisition issues, MOU, MOA, and Notice to precede issues. DHPI is responsible for the construction of state-owned hydropower projects, and DPTSC is responsible for the construction of transmission lines and substations for power transmission. EPGE is responsible for the operation of state owned power plants and it is a single buyer from private power producers. ESE, YESC and MESC are responsible for the power distribution to consumers.

Electric Power Generation Enterprise **(**EPGE) is responsible for the operation of state owned power plants, and it is a single buyer from private power producers and then sells electricity to the distribution enterprises such as Electricity Supply Enterprise, Yangon Electricity Supply Corporation and Mandalay Electricity Supply Corporation. There are 25 state-owned hydropower plants and 10 thermal power plants under the Electric Power Generation Enterprise (EPGE). There are (25) projects signed with EPGE in the form of JV, BOT, BOO. Tables 3.12 and 3.13 have already been described. Since EPGE is the focal department that mainly communicates with private investors, it also has more responsibility and accountability. Since the generation of state-owned power plants is not enough to generate electricity, the steps in the process of inviting the private sector are as follows:

(i) Call for tenders through national newspapers and the Ministry's website

(ii) Notifying successful companies after tender verification

(iii) Negotiating and preparing to sign a Power Purchase Agreement (Contract)

(iv) Negotiating and preparing to sign a land lease Agreement (Contract)

(v) Requesting comments to the five major departments on the draft contract

(vi) Submitting the draft contract prepared in accordance with the opinion of the five major departments to the Economic Committee and the Government Cabinet

(vii) Signing a contract if approved by the Government Cabinet.

4.2 KII Design

In this thesis, the method of study is descriptive and based on secondary data which collected from ministry and its departments from MOEP, joint study reports, related articles, documents, international organizations and websites. Key Informant Interviews with 25 persons from electricity sectors and private investors.

4.2.1 Sampling Design

For this thesis, in-depth interview and telephoning interviews with total (25) officials of electric power industries were conducted and private sector. All these people have experienced in electricity generation, management, planning and operations.

Table 4.1 Informant Interview List

Participants	Number
Stakeholders	6
Heads of the Company	6
Departments Heads	7
Project Directors	6
Total	**25**

Vital information, key informant interview and discussion surveys with six stakeholders, six of the heads of company, seven Departments Heads and six project directors altogether twenty-five.

4.2.2 Questionnaire Design

The research used qualitative data analysis and data was collected through a structured questionnaire as a main tool for the study. The key informant interview questionnaire contained twenty-four questions related to private sector participation in

electricity generation. These questions will be divided into four(4) categories and Question No.(1) to (6) to be asked stakeholders , Question No.(7) to (12) to be asked heads of the company, Question No.(13) to (19) to be asked department heads and Question No.(20) to (24) to be asked project directors. The interview questions are listed in Appendix (B).

4.3 Identify the benefits and challenges from KII

1. Are existing electricity generations meeting the country's needs?

Regarding this question, six informants gave suggestions. Fundamental needs of the country are to achieve sustainable and reliable electricity. It is not only having enough mix power generations but also require reliable infrastructure from power plant to end-users. The existing power generations in Myanmar are not meet country's needs. To attain sustainable and dependable electricity is to fulfill a fundamental need for the nation. In addition to having a sufficient variety of power sources, it also calls for a stable infrastructure from the power plant to the final consumers. Myanmar's current electricity generating capacity does not satisfy the needs of the nation.

2. How important is the private sector participation in the electricity generation projects?

Regarding this question, six informants gave suggestions. The fulfillment of power demand in time is the most important thing of the private sector participation. It is extremely important that heavy private sector participation, especially foreign direct investment (FDI) in the power generation sector will grow rapidly to achieve the aim of having 23,600 MW by 2030. The growth of the nation's economy depends heavily on private sector involvement in the production of power. More reliability, affordability, and access to electricity must be attained. Not only private sector, but also Government sector, these sectors choose to operate through specific sets of goals and approaches to execute in the electricity generation. The higher power consumption which is the economic driver and support country economy development, Myanmar is far behind our neighboring countries. Currently, Myanmar has only 3800MW generating capacity compared to Bangladesh now has more than 25,000MW as 2021 and keep growing. It is important to growth plans to fulfill as contract guarantee production MW and government payment schedule.

3. **What is your expectation on PPP projects? Do you think that private sector participation is the only way to fulfill the deficits of infrastructure improvement in power sector or do you have any suggestions for other kinds of financing?**

Regarding this question, six informants gave suggestions. It is necessary to develop in PPP projects. The private sector participation is the major role of to fulfill the deficits of infrastructure improvement in power sector. But it is also necessary to develop the government owned power projects for the energy security of the country. If government cannot arrange the budgets in time, it should be looking for the official development assistance (ODA) loan from the multilateral agencies such as World Bank, JICA, ADB, etc., for the lower interest rate and long repayment period. The private sector participation is the only way to fulfill the major infrastructure development in power sector, including generation, transmission and distribution. The Government can only be made itself as a regulator and guiding the private sector heavy participation with self-sufficient funding within the power industry. Self-sustaining is the key. All projects must have successful project financing system to be implemented.

4. **Does the Government incentive in order to improve the participation of private sector?**

Regarding this question, six informants gave suggestions. In order to encourage private sector participation, the government has established income tax exemption periods .According to Myanmar Investment Law, Section 74 state that The Commission shall, for the purpose of supporting the development of the Union by allowing investment in sectors which need to be developed, and for the proportionate development of Regions and States, scrutinize and may grant one or more tax exemptions or reliefs if the investor applies for such exemptions or reliefs. According to Myanmar Investment Law, Section 75 state that (a) With respect to the income tax exemption , designated the less developed regions as Zone (1) , the moderate developed regions as Zone(2),and the adequate developed regions as Zone (3), the Commission shall, with the approval of the Government , issue a notification and may grant income tax exemptions to investment businesses in Zone(1) for a period of 7 consecutive years including the year of commencement of commercial operation, investment businesses in Zone (2) for a period of 5 consecutive years including the year of commencement of commercial operation ,and investment businesses in Zone(3) for a period of 3

consecutive years including the year of commencement of commercial operation. (b) With the approval of the Government, the Commission may change the designation of the zones from time to time depending on the development of the respective regions. (c) Income tax exemptions shall be granted only for the sectors specified by the Commission in the notification as the sectors to promote the investments.The government is also supporting the acquisition of land for solar power plant projects tendered by the Ministry of Electric Power.

5. **How to make the improvement of private sector participation in electricity generation projects?**

Regarding this question, six informants gave suggestions. The attractive, fair and relevant policy, rules and regulations, less country risk and easy doing business procedures make the improvement of private sector participation in electricity generation. Providing the reasonable incentives to the developer, arranging the stable and good regulation and providing reasonable guarantees such as government guarantee are necessary. Government should provide project location land because foreign investment company cannot manage or owned the land as per FDI law. Government must have standardized requirement such as equipment manufacturer, materials and guarantee period for tariff structure.

6. **What do you think about the private sector participation in electricity generation projects?**

Regarding this question, five informants gave suggestions. The consumption of electricity is also increasing in line with the growing population of Myanmar and the limited budget for electricity generation by the government department alone, so the fact that the government has invited domestic and foreign investors. In building a modern developed country, electricity supply is an essential basic infrastructure, and foreign investment has flowed in, so the private sector has participated. State-owned thermal power plants require a lot of capital to build, and if regular annual maintenance is not carried out, efficiency and generation will decrease. Therefore, building private power plants and generating electricity is more beneficial than state-owned thermal power plants.

To be summarized of the questions from Question No. (1) to No. (6) that were asked to the stakeholders, the current electricity production has not yet met the country's

electricity demand, the participation of the private sector is important to meet the electricity demand, the necessary financing for the construction of power plants should be obtained from ODA Loans, and fair legal procedures need to be established for the participation of the private sector.

7. What is the reason for getting involved in the country's electricity generation projects?

Regarding this question, five informants gave suggestions. Electricity Sector is one of the vital sectors to shape the country development. The electricity of the essential role for the development the country is the reason for getting involved in the country's electricity generation sector. The increasing demand for electricity and the government's ambitious growth plans to fulfill 100 percent of the country's electricity needed. Myanmar has the lowest electricity consumption among Southeast Asian countries, as well as being a country with slow development, participated in the power generation sector with the aim of further improving the electricity sector. As for the private sector, there is a desire to develop the nation's power generation sector in a win-win situation that benefits both parties.

8. Competing through a tender system? (Or) Competing through a limited tender system? How did you get in?

Regarding this question, five informants gave suggestions. Working in both tender system (open or limited tender) some of the power project entered the competition based on the tender information advertised in the state-owned newspapers, and some entered the work through the limited tender system. Each tender there purchased, firstly there always review the criteria & requirement of tender and then there closely gathering information from all stakeholders not limited buyer, suppliers, subcontractor to be the competitive & best proposal in line with buyer requirements.

9. As a private investor, what challenges did you face in entering the electricity generation projects?

Regarding this question, six informants gave suggestions. The main challenges are country stability, currency exchange risk, change of regulations, difficult to get the international currency in Myanmar to purchase fuel and maintenance equipment.

Private investors believe entering new business always create opportunities and need to solve challenges what not familiar before. A private investor must be interact with many challenges such as appointing the right Experts and workforce to drive operation excellence, Bank financing, Balance in power purchasing agreement and Regulatory Compliance. As a private investor, it is facing challenges in entering the power generation due to shortage of fuel, source of energy; EIA & SIA impact issues, insufficient financial support for getting project loan, differential tariff structure. There are many enormous challenges faced by being a foreign own private sector investor.

10. What is the first priority objective for private power producers?

Regarding this question, six informants gave suggestions. The project must be commercially feasible. The possible financial support from one of the international banks, strong PPA terms & conditions favorable for investor friendly terms, long term rather than short terms and stable cash flow is the first priority objective for private power producers. In addition, to generate guarantee electricity and to produce reliable electricity are the first priority objectives.

11. What are the obstacles to the timely completion of the nation's power plant projects?

Regarding this question, six informants gave suggestions. In building a modern and developed nation, basic infrastructure such as education, health, transportation, clean water, and electricity are crucial. As Myanmar is a developing country, budget availability to provide infrastructure at the same time is limited. Myanmar's main income is derived from the export and sale of natural gas. The financing supports, complicated rules and regulations, and unstable country situation are the obstacles to the timely completion of the nation's power plant projects. The main obstacles to the timely completion of the nation's power plant projects are political Issue, unfamiliar new technology, not enough budget allocation, lack of commitment supplier delivery, unexpected weather condition, insufficient resources,not clear job scope.

12. Are there any regulations on PPA contracts?

Regarding this question, six informants gave suggestions. There are standard PPAs in place drafted by the assistance of ADB and IFC. Based on the advice of ADB and IFC, the PPAs are drafted depending on situation and type of the power projects.

Bankability of PPAs and regulations of government are needed to be compromised each other. According to their rules and standards, various Ministries and Departments regulate PPAs. PPAs are regulated by related Ministries and Department upon their regulations and standards.

From question (7) to (12), to summarize the questions asked to the company heads, the private sector has participated because the electricity sector plays an important role in the development of the country, and it has also participated in the tender system, the unstable political situation, insufficient fuel to run the factory; insufficient funds; insufficient budget to complete the power plant construction on time; There are also challenges such as lack of adaptability to new technologies.

13. Is there any monitoring and evaluation assessment on existing PPP projects, investor's interest and the government sector itself either?

Regarding this question, seven informants gave suggestions. Currently, constructed private power plants can be known by looking at the monthly power generation status without having to conduct separate monitoring and evaluation by the department. A power purchase agreement has been signed between the department and the private sector for monthly power purchases, monthly power production is monitored and penalties are paid to the department if the power is not produced as per the contracted target. Regarding Corporate Social Responsibility (CSR) activities, there is a monitoring and evaluation to see if private companies are performing the activities that are to be performed.

14. What are the benefits of private sector involvement in electricity generation projects?

Regarding this question, five informants gave suggestions. The benefits of private sector involvement in power generation are no capital expenditure for government and more feasible of the projects. As the state-owned power plants were not able to be expanded and built, the participation of the private sector enabled more electricity production and distribution to the people. The Ministry's statistical information has already testified to the annual increase in electricity generation. The benefits of private sector involvement in power generation are the shorter duration of

generation power plant construction, the quick fulfillment of power demand. Most of Private Company and Corporation had the concept and flexible ways how to maximize the benefits from the power generation rather than state-owned organizations always acting under the government policies. So by the involvement of private sector in power generation, more productivity and operation efficiency shall be increased. Instead of constantly working in accordance with government rules, state-owned organizations with private ownership had the concept and flexible means to optimize the gains from electricity generating. Therefore, higher productivity and operational efficiency will result from the private sector's involvement in the production of electricity.

15. What are the challenges to private sector participation in electricity generation projects?

Regarding this question, seven informants gave suggestions. Due to the increasing participation of the private sector in the electricity generation sector, difficulties in controlling the power system have been encountered. In the event of a power blackout, according to the department's power requirements, the power system is to be restored within one hour, but private power plants are unable to access the power system in time, and have experienced difficulties in regulating the power system. Due to thermal power plants have high speed; it is difficult for the power system to control if there is a fault. The challenges are difficult generation control, less energy security, following of the changes of governmental policy in private sector participation in power generation. Implication of the private participation in electricity generation projects; development lead times longer, access to financing for private investment higher than government financing, governments provide an enabling environment to attract equity investors and debt providers, complex contractual arrangements underpinned by Power Purchase Agreements with government guarantees, high selling prices, regulatory conformity, regulatory compliance.

16. What are the environmental and social impacts of thermal power generation sites?

Regarding this question, seven informants gave suggestions. It is depending on the type of fuel. For coal fire power plants, more carbon emission and pollution of water may affect. Thermal Power Plant will have some noise pollution if it is in the city area rather than outskirt of the city. The most advance thermal power plant do not have

environmental impact or social impact. Noise and traffic congestion on the way to the site are two effects of thermal power generation project construction on the environment and society. **For EIA issue:** Changes in land use associated with exploration and plant construction, noise and sight pollution, the discharge of water and gases, soil subsidence, pants also consume a large amount of water and change climate. **For SIA issue:** Affect to human health, access to education, socioeconomic status,gender equality, global partnerships, and culture. Some populations are more vulnerable to impacts of traditional culture and sexual influence.

17. Do you have short-term and long-term plans in place to provide electricity to the growing number of consumers?

Regarding this question, seven informants gave suggestions. The officials of the ministry are working on establishing short-term and long-term plans to ensure full power supply. Due to the limited availability of natural gas in the country, plans were made to import LNG from abroad and generate electricity, but due to unforeseen circumstances, it was not possible to continue working. As a short-term plan, the ministry has called for tenders for solar power plants that can be built in a short period of time and is currently being implemented. As a long-term plan, six (6) hydropower projects have been tendered and will continue to be implemented. In addition, long-term projects such as Cross-Border Power Purchases, Wind power projects, LNG and natural gas power plant projects, and Coal-fired power projects will be implemented. The Government's long-term objective is universal electricity access by 2030 with secure reliable, affordable, and environmentally and socially sustainable energy supply to all consumers.

18. What are the strength and weakness of private companies operating in the electricity generation projects?

Regarding this question, seven informants gave suggestions. From the perspective of the private sector, high demand of electricity is strength as well as source of fuel and strong commitment of government, stable income. Weakness is incomplete infrastructure such as transmission line, gas pipeline, and land issue during construction period and long and complicated approval procedure, frequent change in policy. There are no human resources for doing maintenance as well as work shop to do maintenance in Myanmar. Strengths are quick adoption of new technology, easy to increase investment, get financial resource from the investor and implement the project &

generate electricity within short duration, can provide the stable power generation, strong commitment of government, stable income. Weakness are employee attain, share authority and corporate decision- making, long and complicated approval procedure, frequent change in policy.

19. Can the government meet the annual budget funding requirement for electricity projects?

Regarding this question, seven informants gave suggestions. The government cannot arrange the annual budget in time for the electricity projects. Due to the government's limited budget availability, it will be seen that the power generation projects cannot be implemented. Even if they take foreign loans, they cannot build projects because it is not easy to get concessional loans. If the electricity tariff are set correctly covering the three major components (Generation, Transmission and Distribution Cost) + Administrative + Tax (VAT or CT) then the state annual budget can meet the electricity projects. If the government is still subsidizing the tariff, the funding may not be met.

To be summarized of the questions from Question No. (13) to No. (19) that were asked to the department heads, it is found that the monitoring and evaluation of the projects are being carried out under the PPA contract, and there are benefits and challenges brought about by the participation of the private sector. It has been found that in a short period of time, the ability to build power plants and generate electricity, and the government no longer has to bear the cost of investment, is paid as a current expenditures. The difficulty of controlling private generators during grid outages is challenge . As department heads, we are working to develop short-term and long-term plans to ensure continuous electricity generation. the high demand for electricity and stable revenue are strength and incomplete infrastructure is a weakness.

20. What are the three major operations in Electric Power sector?

Regarding this question, seven informants gave suggestions. There are three major operations such as generation, transmission and distribution in electric power sector. Electricity generation is carried out by the state-owned sector as well as the private sector. The transmission of electricity throughout the country is carried out by the government department. Electricity distribution is handled by 3 state-owned enterprises.

21. How is the nation's electricity demand being met?

Regarding this question, six informants gave suggestions. Originally, the government department was responsible for meeting the nation's electricity needs, but in 2006, the first joint venture hydropower plant was built and implemented. Myanmar's electricity was originally considered to be based on hydropower, but hydropower projects to be built by the state could not be completed on time due to budget constraints and began to experience power outages. So, in the 2012-13 financial year, local and foreign private investments were invited, and electricity production was put into operation. Since hydropower projects take at least 4 to 5 years to build and cannot generate power in a short period of time, natural gas-powered engines were rented, and power generation activities were carried out through BOT and BOO systems. After that, the government allowed the construction of solar power plants, and the Minbu solar power plant was operated through the BOT system. Along with the growing population, the number of electricity consumers is also increasing, and there are plans to provide electricity to the entire country, even to rural areas. In the year 2030, the nation-wide electrification plan is being implemented, and as of May 2022, electrification ratio has reached 62 percent.

22. Why do you think power outages are happening in Myanmar?

Regarding this question, eight informants gave suggestions. Especially, supply and demand are unbalance. Hydropower plants operate mechanically depending on rainfall conditions and water inflow conditions. Some hydropower plants constructed and handed over by the Irrigation Department are only operated when water is needed for agriculture. Due to global climate change, rainfall is decreasing, and hydropower plants are running less. At present, almost all the cities have electricity, and the people living in the rural areas are also getting electricity and using it more and more. Because of these factors, the power outage is caused by insufficient electricity. Because out of dated infrastructure and insufficient power generation. Accumulated delays in investments in power infrastructure, degraded generation plants, fuel shortages, over-reliance on seasonal hydropower production, unstable current circumstance and together with a rapid increase in electricity demand, have resulted in large electricity shortages. Electricity shortages and supply disruptions are widespread. Accumulated delays in investments in power infrastructure, degraded generation plants, fuel

shortages, over-reliance on seasonal hydropower production, unstable current circumstance and together with a rapid increase in electricity demand, have resulted in large electricity shortages, which peaked at about 30 percent of power demand in 2020–2021.

23. Do you think that private sector investment will meet the government budget needs?

Regarding this question, six informants gave suggestions. The government does not need to make the investment to build power plants, but on the other hand, it has to bear the current expenses due to the need to pay the cost of purchasing power from the private sector. For example, electricity generation is carried out by the private sector and the government department purchases the power they produce. Although this situation is a private-government win-win situation, in practice, the government is subsidizing the cost of power purchase.

24. What is the price of PPA of thermal power generation?

Regarding this question, six informants gave suggestions. It is depended on the type, size and fuel consumption of power plants. The price of PPA of thermal power generation base on contract period (short term or long term), government mainly focuses in low tariff structure than quality of installed equipment. Thermal power generation cost is basically gas (fuel) pass through and only plant capacity cost and O & M cost. Depending on the size and capacity of the plant, generally the $0.9 million to $1.4 million per MW contracted capacity. The price of PPA, which always depends on the project's capacity, terms, technology, accessible lanes with fuel resources & load area, and government incentives, determines the price of PPA for thermal power generation.

To be summarized of the questions from Question No. (20) to No. (24) that were asked to the project directors, there are three major operations such as generation, transmission and distribution in the electric power sector. In order to meet the demand for electricity, there have been building power plants and generate electricity through JV, BOT, BOO systems with private participation. Power outages are caused by outdated infrastructure and insufficient power generation. Electricity prices are based on the type of machine, fuel consumption rate and term of the concession right.

CHAPTER V
CONCLUSION

This thesis briefly describes the current situations of electricity generation sector in Myanmar based on the up-to-date data sources. And then the private sector participation in electricity generation projects in Myanmar has been described by facts and data. Regarding public private partnership, it has been found that Myanmar has not yet formulated specific laws and regulations. A PPP center has been established under the Ministry of Planning and Finance, and the department has been responding to requests for comments regarding private sector participation.

5.1 Findings

In Myanmar's electricity generation sector, after starting with hydropower, it was found that thermal energy (gas) power plants were built and produced electricity. It has been found that the private sector has become involved in the development of the electricity generation sector, which is essential for the development of the country. It was also found that since 2009, a joint-venture hydropower plant with China's investment has been built and produced electricity. In 2013, 4 privately owned thermal power plants in Yangon Region and 1 privately owned hydropower plant in Bago Region in 2014 were built and produced electricity through the BOT system.

In 2019, a privately-owned solar power plant was built in Minbu, Magway Region using the BOT system, and has been generating electricity. As of 2021, 26 privately owned power plants have been built to produce electricity, and the number of electricity consumers has increased. In order to complete the construction of state-owned hydropower plants on time, it is necessary to obtain government budget or concessional loans. Because the government cannot build power plants, when the private sector participates, the costs are high and the unit selling price is high. It has been found that the private sector's participation in the electricity generation sector plays an important role in the development of the country.

In the electricity generation sector, in addition to the state-owned power plants, there are also privately owned plants provided by the private sector in the form of joint ventures (JV), build-operate-transfer(BOT), and build-own-operate(BOO). Although the PPP Center has been established in Myanmar, laws, rules and regulations for public-private partnership have not yet been published. The government was unable to complete the construction on time due to budget funding difficulties in building state-owned hydropower plants, so it had to invite private investors to do so.

Since the construction of hydropower plants cannot be completed in a short time, the private sector is participating in the construction of natural gas power plants that can meet the country's electricity needs in a short time. In the past, hydropower was used as the base load, but due to climate change, environmental damage, and the long construction period, it has been found that thermal power has changed to the base load in the current situation.

Looking at electricity generation by energy mix type up to 2021, it is found that the percentage of electricity generation using thermal power is the highest and the

private sector's participation in electricity generation projects is also about 70 percent. It was found that the country's electrification ratio is about 56 percent till the fiscal year 2020-2021.This Electrification ratio is that connected by the national grid system. If there take into account the ratio of electrification obtained by other means, it is about 62 percent. The installed capacity and unit generation have been increased, and the public have used more electricity.

The main disadvantage of private sector participation is that it is difficult to control the stability of the national power system in the event of grid failure. It has been found that the unit selling price is high, and production costs have been high and deficits budgets have occurred. The government needs to undertake the type of power generation that has a lower unit selling price in the long run. Although the private sector has benefited from the participation of the private sector in the power generation sector, it has also been found that the cost of purchasing power is high due to the large private investment. In the current situation, it is found that there are many challenges that the private sector is facing, and the main one is exchange rate risk.

Due to the participation of the private sector, the power generation sector has seen many improvements and also faced many challenges. Aiming to provide electricity in the short term, private thermal power plants were built to produce electricity, but on the other hand, the department suffered from high costs and the high price of electricity purchased.

The benefits and challenges of private sector participation in electricity generation projects are presented. The benefits are: being able to build power plants in a short-term period, increase in installed capacity, increase in annual power generation, increase in electrification ratio, increase in electricity consumers, reducing the investment needed to build power plants from the government, allocate to long term investment stakeholders, improving the lives of rural people and expansion and establishment of industrial zones.

The challenges are: difficult to control the national power system in order to achieve stability in the event of a power outage, take time to negotiate power purchase agreements, difficulty in accessing financing for private investment, complex contractual arrangements underpinned by Power Purchase Agreements with government guarantees, the high price of electricity purchased from the private sector, weak compliance with regulations, due to the unstable political situation, the exchange

rate is unstable and affects the investment, and difficulty in obtaining land and other infrastructure due to policy changes.

5.2 Suggestions

First, there is a need to issue specific laws, rules, regulations, and instructions for private sector participation. According to the current generation mix of Myanmar's electricity generation, hydropower, thermal power, solar power, etc. are generated, and hydropower and solar power should be used to increase the electricity generation.

Instead of high unit cost thermal power plants, electricity generation should be done by hydropower, which has a low unit cost. The cost of producing electricity from hydro is lower than the cost of producing electricity from thermal energy, and since the price of electricity is lower, hydropower projects should be managed to be completed on time.

Under the current situation, the power purchased from private power plants with full foreign investment is not affected by paying in foreign currency. When purchasing power from private power plants that are fully invested by citizens, purchasing power with the Kyat equivalent has been affected by a large exchange rate, affecting both the government and the private sector.

Due to the high price of natural gas, which is the main raw material of thermal power plants, it is necessary to reexamine and reduce the high production costs and the high electricity prices. Since the selling price per unit is allowed to be in Kyat equivalent in foreign currency, it is affected by the change in exchange rate, so in the future, contracts should only be signed in Kyat. As a future plan, cross-border power purchase issues will also be handled, so it is necessary to make effective management to achieve the success of the project.

The private sector participation in the electricity generation projects has both advantages and challenges, so the government needs to provide good management. Currently, as people are suffering from power outages, short-term and long-term projects should be accurately established to ensure sufficient electricity generation. Due to the declining capacity of state-owned thermal power plants, cooperation with the private sector is needed to ensure full power generation. In order to obtain reliable and affordable electricity, the government needs to establish good governance. In order to promote cooperation between the government and the private sector, it is necessary to look forward to mutual benefits and be careful not to oppress one side.

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Appendix -A

Summary of PPP Framework/ Experience in the ASEAN Member Countries

	Policy Framework	Legal Framework	PPP Government Agency	Guidelines	Government Financial Support	Land Acquisition	Implemented Projects	Pipeline New Projects
Indonesia	Set out in Economic Master Plan and PPP Book	Several specific PPP laws and regulations	Bappenas and some other bodies play each role	PPP Investor's Guide and PPP Book (published annually)	Guarantees (through IIGF) and VGF	A various forms of Land Funds or related laws place	Several water and power projects currently in procurement	27 projects set out in 2013 PPP Book, mainly in the transport, water, waste and power sectors
Philippines	Philippines Development Plan by National Economic and Development Authority	Republic Acts developed from BOT framework and their Implementing Rules and Regulations	PPP Center	PPP manual and Sector Guidelines published by the PPP Center	Project Development and Monitoring Facility, PPP Strategic Fund	Strategic Fund was established to support Right-of-Way (ROW) acquisition	Airport, expressway, school infrastructure	37 projects of Airport, railway, or social infrastructure projects are ongoing (As of 10 July 2014)
Thailand	General policies to increase spending on infrastructure and develop PPP regime	PPP law - Private Investment in State Undertaking Act 2013	PPP Committee is the key agency for PPP, supported by State Enterprise Policy Office	No published PPP guidelines	No developed regime	Government has the responsibility for land acquisition	Some transport projects structured as BOT concessions	Being developed, but likely to focus on transport (esp. road and rail)
Myanmar	Limited PPP specific policies. Some infrastructure policies in National Comprehensive Development Plan	No specific PPP laws (new Foreign Investment Law provides a basic framework)	No specific PPP agency	No published PPP guidelines	No developed regime	Limited government support	Several airport or power projects in procurement	Limited (several airport PPPs are in procurement (Hanthawaddy, Mandalay, Yangon)

Source: ERIA(2014)

Appendix –B

QUESTIONNAIRES FOR KEY INFORMANT INTERVIEWS (KII)

1. Are existing electricity generations meeting the country's needs?
2. How important is the private sector participation in the electricity generation projects?
3. What is your expectation on PPP projects? Do you think that private sector participation is the only way to fulfill the deficits of infrastructure improvement in power sector or do you have any suggestions for other kinds of financing?
4. Does the Government incentive in order to improve the participation of private sector?
5. How to make the improvement of private sector participation in electricity generation projects?
6. What do you think about the private sector participation in electricity generation projects?
7. What is the reason for getting involved in the country's electricity generation projects?
8. Competing through a tender system? (Or) Competing through a limited tender system? How did you get in?
9. As a private investor, what challenges did you face in entering the electricity generation projects?
10. What is the first priority objective for private power producers?
11. What are the obstacles to the timely completion of the nation's power plant projects?
12. Are there any regulations on PPA contracts?
13. Is there any monitoring and evaluation assessment on existing PPP projects, investor's interest and the government sector itself either?
14. What are the benefits of private sector participation in electricity generation projects?
15. What are the challenges to private sector participation in electricity generation projects?

16. What are the environmental and social impacts of thermal electricity generation sites?
17. Do you have short-term and long-term plans in place to provide electricity to the growing number of consumers?
18. What are the strength and weakness of private companies operating in the electricity generation projects?
19. Can the government meet the annual budget funding requirement for electricity generation projects?
20. What are the three major operations in Electric Power sector?
21. How is the nation's electricity demand being met?
22. Why do you think power outages are happening in Myanmar?
23. Do you think that private sector investment will meet the government budget needs?
24. What is the price of PPA of thermal electricity generation?

Appendix-C

The first Joint Venture(JV) Investment of electricity generation

To meet the growing demand for electricity, private investors have been invested to participate in the power generation sector.The Ministry of Electric Power's first joint venture hydropower project is the Shweli 1 Hydropower Plant, with an installed capacity of 600 megawatts. The following information about the project is as follows:

1.	Name of Parties	-	(A) Department of Hydropower Implementation, Ministry of Electric Power, The republic of the Union of Myanmar (B) Yunnan United Power Development Co.,Ltd, The republic of the Union of China
2.	Company Registration Date	-	18 .10. 2006
3.	JVA Agreement Signing Date	-	30 .12. 2006
4.	Name of Plant	-	Shweli (1) Hydropower Plant
5.	Location	-	Nam Kam town, Northern Shan State,The Republic of the Union of Myanmar
6.	Installed Capacity	-	600 MW (100 MW x 6)
7.	Project Period	-	(35 + 5) years
8.	Shareholding and Voting Ratio	-	(a) **DHPI = 20%** - Royalty 10 % - Contribution 10 % (b) **YUPD = 80%**
9.	Project Cost (as per JV Agreement)	-	281.222 MUSD
10.	Project Cost (Actual)	-	475.000 MUSD
11.	Project Cost Financing (as per JV Agreement)	-	Shareholder's Contribution = 50% Loan Financing = 50%
12.	Ownership of Parties	-	**(A)Contribution = 140.611 MUSD**

			DHPI = 14.0611 MUSD YUPD = 126.5499 MUSD
			(B)Loan = 334.389 MUSD
			DHPI = 14.0611 MUSD YUPD = 320.3279 MUSD
13.	DHPI's Right	-	Royalty Power - 15 %(Free Power) Dividend - 20 %(Free Share) Interest on Loan
14.	Operation &Maintenance Contractor	-	YUPD
15.	Commercial Operation Date	-	5 .9. 2008
16.	Depreciation Rate	-	5%
17.	Taxes from JV Company	-	(a) 8% Commercial Tax (on local and foreign sale of Electricity) (b) 2% Income Tax (on local and foreign sale of Electricity) (c) 10% Income Tax (on salary of JV Staff) (d) 15% Withholding Tax (on the payment of Interest) (e) 3.5% Withholding Tax (on O & M Cost) (f) 3.5% Withholding Tax (on system stability fee paid to YNIC)
18.	Off-takers of Electricity with PPA	-	(1) YNIC(Yunnan International Co.,Ltd) (2)TakaungTaungNickelProject (3) Electric Power Generation Enterprise (EPGE) (Former MEPE)
19.	SHPC's Contracts	-	(1) JV Agreement (2) Supplementary Aggrement (3) Loan Agreement (4) Operation and Maintenance Contract (5) PPA Contracts