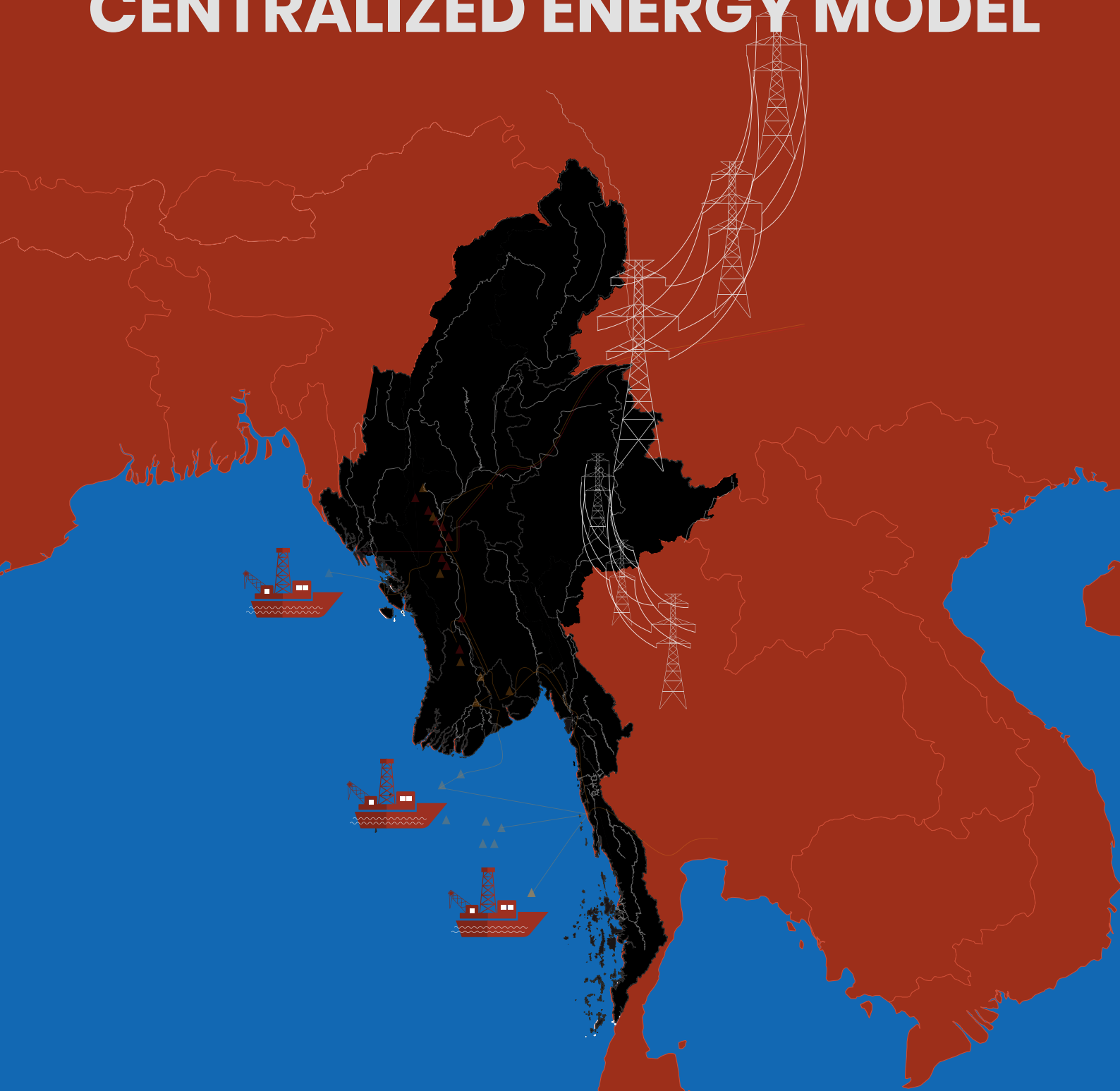




ETHNIC NATIONALITIES AFFAIRS CENTER

CHALLENGING MYANMAR'S CENTRALIZED ENERGY MODEL



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JULY 2020

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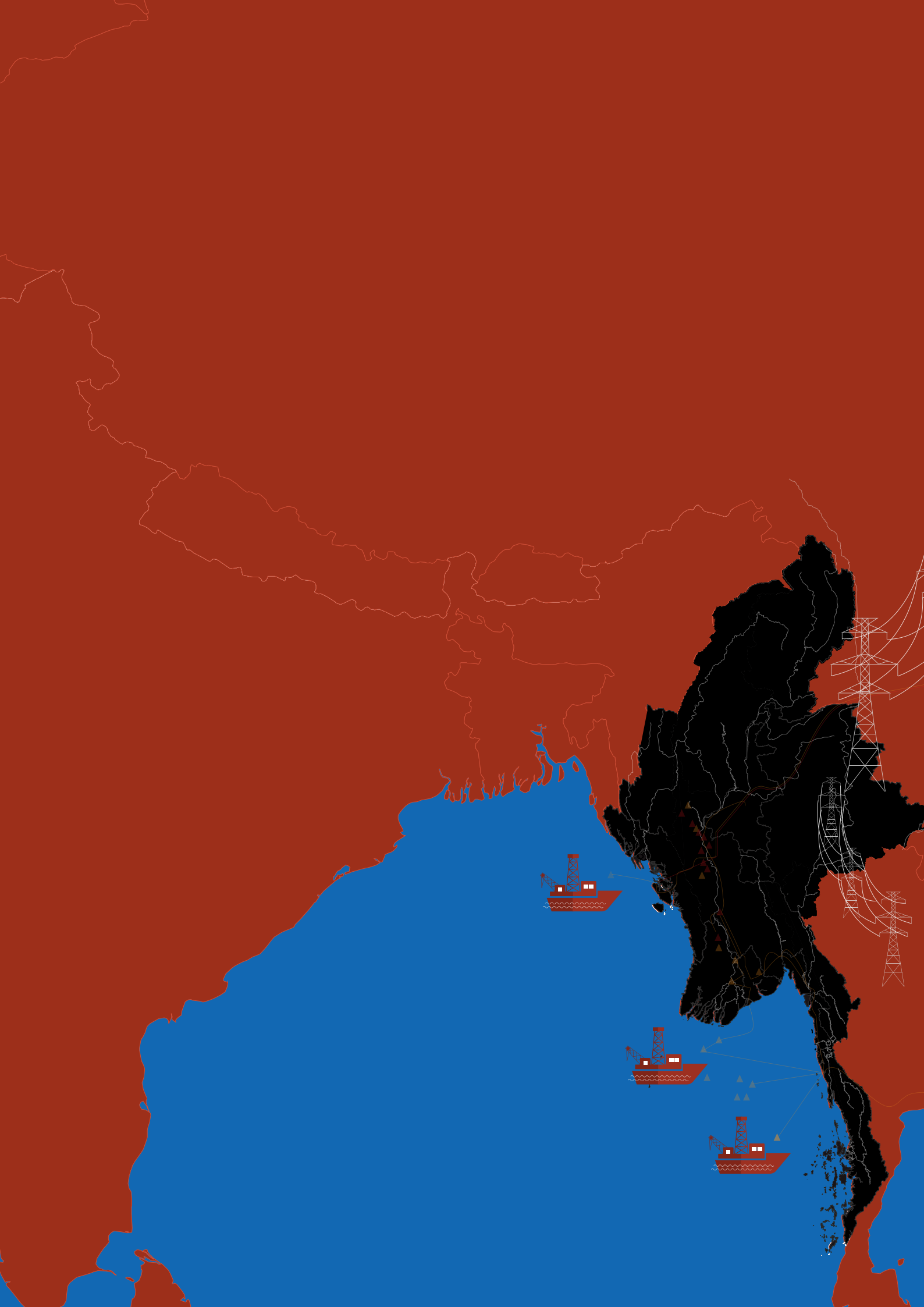
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Dr. Pon Nya Mon
Executive Director
Ethnic Nationalities Affairs Center (ENAC)

ACRONYMS

ADB	Asia Development Bank
AF	Asia Foundation
ASEAN	Association of Southeast Asian Nations
APU	APU-United Power of Asia Public Company Limited
APR	Alstom Power Rental Energy Holding Co., Ltd
Bcfd	Billion Cubic Feet Per Day
BOT	Build Own Transfer
CBO	Community Based Organization
CNPC	China National Petroleum Corporation
CNUOC	China National United Oil Corporation
CPP	Coal Power Plant
CSO	Civil Social Organization
CPI	China Power Investment
DEPP	Department of Power Planning
DHPI	Department of Hydropower Implementation
DICA	Department of Investment and Company Administration
DKBA	Democratic Karen Benevolent Army
DPTSC	Department of Electric Power Transmission and System Control
EAO	Ethnic Armed Organization
ECC	Environmental Compliance Certificate
EEDC	Electricity and Energy Development Committee
EGAT	Electricity Generating Authority of Thailand
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ECL	Environmental Conservation Law
EPGE	Electricity Power Generation Enterprise
ESE	Department of Electricity Supply and Enterprise
GAD	General Administrative Department
GAIL	Gas Authority of India Limited
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-region
GPP	Gas Power Plant
HPP	Hydropower Plant
IB	Infantry Battalion
IDPs	Internally Displaced Persons
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
JV	Joint Venture
KIA	Kachin Independence Army

KIC	Karenni Investment Committee
KIO	Kachin Independence Organization
Km	Kilometer
KNPP	Karenni National Progressive Party
KOGAS	Korean Gas Corporation
Kv	Kilovolt
Kwh	Kilowatt hour
LIB	Light Infantry Battalion
LPG	Liquefied Petroleum Gas
LNG	Liquefied Natural Gas
NA	Not Available
NEP	National Electrification Projects
MESC	Mandalay Electricity Supply Corporation
MMK	Myanmar Kyat
MIC	Myanmar Investment Commission
MIR	Myanmar Investment Law
MM	Myanmar
MOALI	Ministry of Agriculture, Livestock and Irrigation
MOA	Memorandum of Agreement
MOEP	Ministry of Electric Power
MONREC	Ministry of Natural Resources and Environmental Conservation
MOU	Memorandum of Understanding
MTOE	Million Tons of Oil Equivalents
MW	Megawatt
MOGE	Myanmar Oil and Gas Enterprise
MOEE	Ministry of Electricity and Energy
MMcfd	million cubic feet per day
MMcf	million cubic feet
MVA	Mega Volt Amp
NLD	National League for Democracy
NMSP	New Mon State Party
ONGC	Oil and Natural Gas Corporation
PRC	People's Republic of China
PTT	Petroleum Authority of Thailand
PTT E&P	Petroleum Authority of Thailand – Exploration & Production
SEZ	Special Economic Zone
SIA	Social Impact Assessment
SLORC	State Law and Order Restoration Council
SSA-N	Shan State Army-North
Tcf	trillion cubic feet
Tenasserim	Thaninthari
USD	US Dollar
YESC	Yangon Electricity Supply Corporation
Vpower-Sing	V Power Holding (Singapore) PTE Co., Ltd





EXECUTIVE SUMMARY

Three main features of Myanmar's energy and electricity sectors have led to crippling energy shortages and contributed to the country's long-standing civil war. First, energy resources are prioritized for export earnings to the central government rather than domestic consumption. Second, rigid centralized control of energy resources and electricity production, transmission, and revenue collection has disproportionately favored urban dwellers in central Myanmar at the expense of rural and ethnic state populations. Finally, the severe negative impacts from energy resource extraction and electricity production where resources are located have not been addressed.

In order to meet its energy needs, the people of Myanmar must first decide whether their priority is to produce energy for export or for domestic consumption. Myanmar's current energy policy prioritizes export of energy to neighbouring countries in exchange for cash payments to the central government. Little, if any, of these payments makes it back to the energy producing states.

Although only 40 percent of households in Myanmar had access to electricity in 2018—a percentage far lower than neighboring countries—the previous government sold 500 MW of power from hydroelectric projects in Kachin and Shan states to China for a minimum 10-year period and the current government exports roughly 80 percent of Myanmar's natural gas to Thailand and China. At the same time, the government must now buy more expensive electricity from Laos and Thailand to meet the energy demand on the eastern border of Myanmar. While the citizens of neighbouring countries enjoy Myanmar's gas as a fuel source for electricity, 60 percent of Myanmar's people are largely dependent on biomass and wood fuel for domestic energy, thereby further depleting local forests.

Myanmar's current energy export priority results in focusing on large-scale projects in border areas, such as the Irrawaddy and Salween mega hydro-power dams, which benefit nearby purchasing countries by minimizing electricity loss over long transmission lines, thus reducing distribution costs for the buyer. However, if Myanmar prioritized energy production for local consumption and development, then smaller energy production projects would logically replace these large mega-projects. These smaller plants, which would include those using new renewable energy, would provide cheaper, more efficient electricity and can be built faster and closer to the people they serve.

Myanmar's energy and power sectors remain extremely centralized despite minor changes put in place in 2012 by the Thein Sein-led government. The role of the Union remains paramount in terms of executive, legislative, judicial, and taxation authority. The state/regional governments were granted authority to manage “medium” power plants (maximum production of 30 MW), but capital investment cannot exceed US\$ 20 million and land use for non-agricultural investment projects cannot exceed 100 acres. State/regional energy production projects are not permitted to connect to the national grid. Moreover, state/regional ministries are required to work with union ministries in any rural

electrification project. Superficial legislative authority is constitutionally granted to the state/regional governments, but the right to exercise such authority is limited by the departments of the union ministries, which maintain control of the state/regional ministries.

The state/regional government cabinets also play a very limited role in the energy sector. All power plants that are connected to the national grid in the states/regions are under the union level ministry's control. This includes generation, production, and distribution. Even with the new authority to manage small scale generation projects, the departments and offices of the Union Ministry of Electricity and Energy (MOEE) are part of the state/regional government ministry and manage and control all energy and electricity matters in the states/regions, including collecting revenue, submitting the fiscal budget, electricity generation, and transmission and distribution of the electricity. Off-grid electrification projects, such as village preliminary electrification projects implemented by soft loans, are also directly managed by the union Ministry of Agriculture, Livestock and Irrigation. None of the state/regional cabinet members have a direct role in energy and power projects. Therefore, the state/regional governments have very limited capacity, space, and capital for electricity project development in their own administrative areas.

Finally, current energy and electricity production investments are fueling the civil war by creating negative social and economic impacts and an unequal development between the ethnic states and central Myanmar. The majority of existing and planned hydropower plants are in the resource-rich ethnic nationality areas. Due to weak governance, laws, and rules, previous power plants were built without proper impact assessments or environmental protection plans and many social impacts have occurred in the project site areas. Large-scale land confiscation and loss of livelihoods are very common phenomena. Hydropower security forces have killed local people and committed human rights abuses. Generally, the affected communities are not provided with proper compensation, mostly do not receive electricity, and despite the revenues generated by the power plants, continue to lack basic infrastructure.

Security of a Chinese-backed hydropower power plant re-ignited the conflict in Kachin State after a 17-year ceasefire, while numerous conflicts have erupted in connection to planned hydropower projects in Karenni, Shan and Karen states. Almost all of the hydropower plants currently underway or planned are in areas partially or fully controlled by ethnic armed organizations. Many more armed conflicts may occur if affected people and the the regional stakeholders are not involved in decision making, or if fiscal decentralization, legislature and executive authority devolution mechanisms of projects are not developed and managed well.

A significant case of negative impacts arising from the rigid central control of energy is the Lawpita hydropower plants in Karenni State. Since the first plant was built in 1960 until today, the project has supplied Yangon and central Myanmar with electricity and generated annual revenues of more than US\$ 440 million for the central government. However, for the people of Karenni State, the story has been quite different. In 2017, the chief minister of Karenni State had to distribute solar cells to residents of Lawpita village who were still without electricity 57 years after the first Lawpita hydropower plant was built. Other villagers, forcibly relocated due to flooding from the Moebyae Reservoir feeding the power plant in southern Shan State, have struggled to get electricity for their village and have only recently done so with their own

funds. Even if the 2020-21 national electrification targets are reached, 57 of Karenni State's 517 villages will remain in the dark. Similarly, the electrification rates in Arakan, Mon and Tenasserim, from where the central government generates US\$ 2-3 billion in revenues annually from nearby offshore gas sales, are among the lowest in the country.

It is clear that while the energy and electricity sectors in Myanmar are huge sources of revenue for the central government, they are not an engine for local development and job creation that can help the ethnic people stay on their own lands. With this type of energy policy, people living in the ethnic states often become social and economic migrant workers in Mandalay and Yangon, where most of the domestic electricity is transmitted. Such economic and social gaps only further entrench social conflict, making a sustainable peace in Myanmar elusive.

Myanmar's energy master plan has the stated goal of electrifying 100 percent of the country by 2030. Despite its already massive energy exports, the government is planning to increase electricity sales to neighbouring countries by increasing hydropower, coal, and gas power production. Although it has recently been trying to secure soft loans for rural electrification and opening more space for private investment in the energy sector, decisions and management remain highly centralized with a lack of public input. A continued failure to address the negative impacts and inequities of the sector reflect the lack of equality that lies at the heart of the ongoing armed conflict. All of these factors make reaching the 2030 goal unlikely.

In order to solve the chronic energy deficiencies in Myanmar many smaller power plants are needed closer to the people they serve. These are more efficient and lose less power over shorter transmission lines. Building many smaller energy production projects simultaneously across the country is beyond the capacity and knowledge of the central government to manage from far away. The people living outside central Myanmar cannot wait another 30 years to develop their states. Local power production and management is the only way to achieve equal energy access quickly across the country. Myanmar's energy priority must be domestic development and not export. New energy and electricity policies should prioritize domestic energy and electricity for self-sufficiency and security rather than exporting power, jobs, and development to other countries.

The devolution of energy governance, including related executive, legislative, judicial, and taxation authority, to the state/regional governments will help reach the goal of all people in Myanmar having access to electricity by 2030, as well as help promote economic growth in the all states/regions. At the same time, devolution of political power will allow affected peoples in local areas to approve and sanction energy projects according to their needs, increasing accountability. This is critical to ending the conflict and building an equal, federal, and democratic country.

CHAPTER 1: INTRODUCTION

Myanmar is rich in natural energy resources, such as rivers, natural gas, and coal. It is estimated that the two major rivers alone, the Irrawaddy and Salween, can produce more than 60,000 MW. In addition, over thirteen trillion cubic feet of gas deposits lie under the waters along the country's coastline, and a largely untapped coal belt passes through the central eastern and northern region. Myanmar has an estimated potential installed capacity of 100 GW from hydropower sources, yet the country's May 2019 installed capacity of 6,247.7 MW could provide electricity to just under 40 percent of households. This is due to the prioritization of export, rigid centralized governance of the energy and energy-related natural resources sector, human resource deficiency, and insufficient power production and funding for basic infrastructure.

Before the quasi-civilian government came to power in 2011, the country was ruled for decades in a centralized and authoritarian manner by a military junta. This included the energy and energy related natural resources sector and as a result, the country suffered chronic power shortages. Today, governance of the sector remains totally centralized, with the exception of some private and small-scale power production projects. The majority of the country's existing hydropower plants are in the state and regional ethnic areas, but the governing of hydropower resources, in the form of energy and electricity related departments and ministries, is firmly under the central government's management, and often headed by military and former military personnel. Nepotism and cronyism that has gone unchecked for decades and remains rife today has created massive deficiencies in the energy infrastructure of the country. At the same time, foreign investments in the energy and electricity sector, particularly in areas under the control of ethnic armed groups, is causing enormous human rights violations, and environmental, social, and armed conflicts, leaving thousands of IDPs and refugees in temporary shelters without proper support and protection.

Needless to say, all the revenues from the energy and electricity sectors that are generated in the states and regions are directly funneled to central government accounts. How and where these funds are spent remains opaque. Although revenues returning to the states and regions are wholly insufficient, the state/regional governments are extremely restricted by the 2008 constitution. For example, they are only allowed to levy taxes on very unimportant sectors; they can approve of only limited volumes of investment capital and land areas for business use; and they can operate only small-scale power plants with limited production and distribution. State and regional governments not only lack taxation authority, but also legislative authority over the energy and electricity sectors. The central government formulates every law, rule, and regulation for which the state/regional governments then have the obligation to implement.

This paper focuses on two areas: (1) the current roles of the state/regional governments in the energy and electricity sectors and how executive, legislative, and judicial authority in the sectors could and should be shared between the central and state/regional governments in the future and (2) the current energy policies and how priority should

be placed on domestic power sufficiency and consumption. It argues for 1) prioritizing domestic sufficiency above export of energy to neighboring countries and 2) decentralization of executive, legislature and judicial authority in the energy sector.

1.1 Structure of the paper

The main objective of this research paper is to examine the roles of the state/regional governments in the energy sector regarding ownership, generation, management, transmission, taxation, and revenue or benefit sharing under the 2008 constitution and current energy laws and regulations. It provides an overview of Myanmar's energy and energy related natural resources sectors, including existing energy and electricity projects and their social impacts. The paper provides recommendations for future federal energy policies, which will help Ethnic Armed Organizations (EOs), policy makers, political actors, Community Based Organizations (CBOs), and Civil Society Organizations (CSOs) in the negotiations at the 21st century Panglong conference, specifically talks on the economy and natural resources.

The paper contains five chapters:

- Chapter 1** describes the research methodology, gives an overview of Myanmar's energy and electricity sectors and ongoing energy and electricity development projects. It highlights the energy development projects in ethnic areas and how those projects are related to armed conflicts and human rights violations.
- Chapter 2** examines the divisions of fiscal decentralization, executive, legislative and judicial authority between the state/regional and union governments in the energy and energy related natural resources sectors.
- Chapter 3** provides a detailed case study of the Karenni state government's role in the energy sector, investigating the production, management, taxation, benefit sharing, and social impacts of the Lawpita power project.
- Chapter 4** discusses the decentralization of energy governance in Myanmar.
- Chapter 5** provides a conclusion and recommendations.

1.2 Research Methods

This research paper is mostly based on in-depth interviews, site visits, and secondary data collection. The secondary data is from official government data, presentations, and reports, industry and civil society reports, news articles, and academic studies. The research team also visited the following power projects firsthand: the Lawpita hydropower stations in Loikaw, Karenni State (the country's oldest and biggest), the Moebye hydropower reservoir in Shan State, and the Myanmar Lighting (Ngan Tae) privately-run gas power station and the Mawlamyaing Cement Factory coal power plant in Mawlamyaing, Mon State. The key informants for this research were engineers from the Lawpita power plants (1, 2, and 3), the permanent secretary of the Ministry of Roads, Transport and Electricity in Karenni State, and the ministers of electricity and energy and of natural resources and environmental conservation in Mon State. The engineer from the Ngan Tae gas power plant run by a private company, and a foreign engineer from the coal power plant at the Mawlamyaing cement factory in Mon State were also interviewed. The research team also met local environmental organizations, the Karenni National Progressive Party, the Karenni Nationalities People's Liberation Front, and the Kayan New Land Party in Karenni State, as well as some local activists concerned about the coal power plant in Mon State. The fieldwork data collection for this paper was undertaken during the whole month of August 2018.

The research team was not able to access the union ministry of energy and electricity due to time limitations and other reasons.

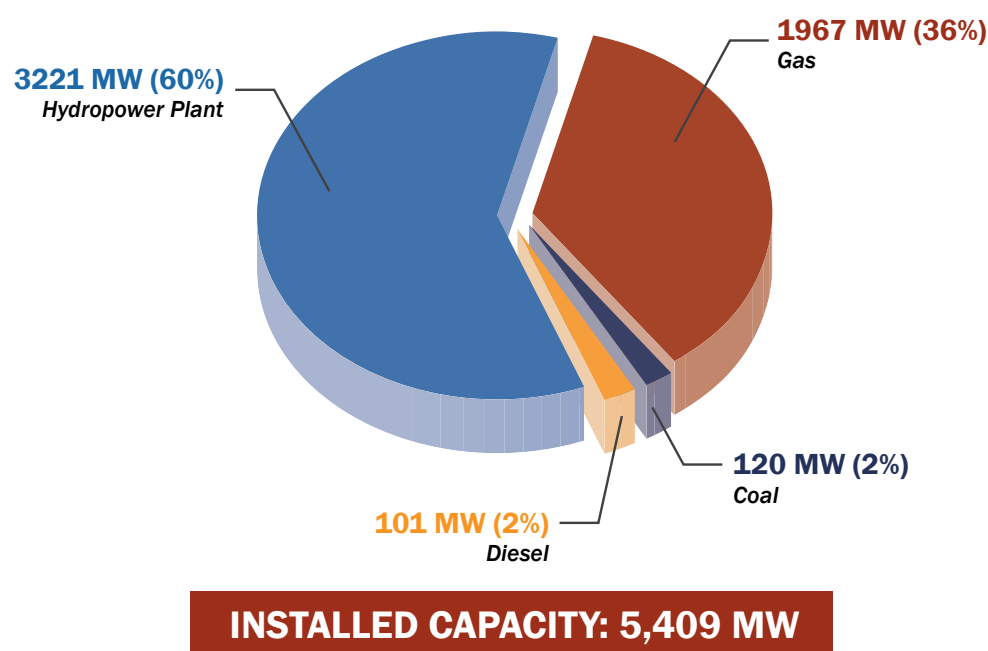
1.3 Myanmar Energy and Electricity Overview

Myanmar is rich in natural energy resources, including rivers, natural gas, and coal. Its many rivers, from the mighty Irrawaddy, Salween, Sittaung, and Chindwin to the hundreds of smaller rivers, such as the Mali, N mai, Mu, Pawn, Shweli, Lemro, Kaladan, Thanintharyi, Bago, Balu, Paunglaung, Manipur, and Tiau, have enormous hydropower potential. The waters off its long coastline of 2,228 km, from the Myanmar and Bangladesh border to Kawthawng along the Martaban Gulf in the Andaman Sea, have an abundance of natural gas and oil deposits. If used wisely, these natural resources can secure the energy needs of today and the country's energy future.

Myanmar's energy needs are currently met mainly by hydropower, coal, petroleum and natural gas. According to the Ministry of Electricity and Energy (MOEE), during 2017-18 Myanmar had a total installed capacity of 5,409 MW, 60 percent from the hydropower, 36 percent from the natural gas facilities, 2 percent from coal and 2 percent from diesel plants¹ (see Figure 1). In July 2018, the MOEE announced that Myanmar had a total installed capacity of 5,458 MW² and by May 2019 that had risen to 6,247.7 MW. This capacity comes from hydropower, gas, and coal power plants operated by the government, private companies, and the Kachin Independence Organization (KIO). Excluding fuel type generation, (see Appendix 2), of the 6,247.7 MW of power generated in the country, 500 MW is exported to China. The retail export price per unit is unknown text.

As of September 2017, only 39 percent of 10.89 million households had access to electricity with the remainder depending on biomass energy (firewood, candles, waste, and others). The electricity consumption rate is steadily increasing, at an average rate of 15 percent annually. Forecasts predict that energy demand will reach between 9,100 to 12,542 MW by 2030 (see Chart 1). The total peak load on May 21, 2018 was 3,241.9 MW (with Yangon at 1,531 MW, Mandalay at 561 MW, and 1,167 MW in the rest of the states/regions).

Figure 1: Power production by energy source

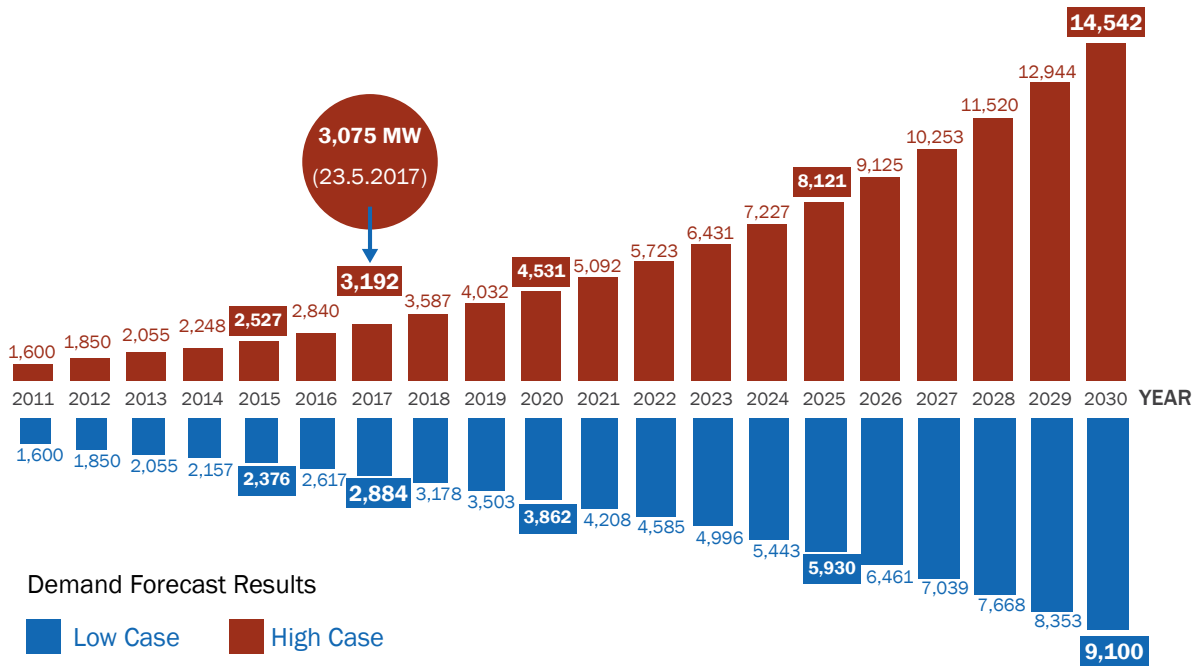


Source: Ministry of Electricity and Energy

1 <http://www.moee.gov.mm/en/ignite/contentView/405>

2 <http://www.moee.gov.mm/en/ignite/contentView/645>

Chart (1) Demand forecast for 20-year period (2011-2030)



Source: MOEE

1.3.1 Crude Oil

Myanmar has a history of crude oil production since the 18th century; hand-dug crude oil wells have been drilled in the central Myanmar basin since before British colonization. When some early British soldier diplomats visited central Myanmar, they found such wells in the vicinity of Yenanchawng. In 1889, the British colonial Yangon Oil Company, which later became the Barmah Oil Company registered in Scotland, began digging the first cable tool wells, which resulted in the discovery of the Yenanchawng Oil Field. The company traded crude oil from the Yenanchawng field, which alone had over 4,000 wells, on the international oil market (Scott 2015). The Burmah Oil Company enjoyed a monopoly on the oil market until the Ne Win regime nationalized the oil industry in 1963. After nationalization, the Ne Win government formed the Myanmar Oil and Gas Enterprise (MOGE), which controls and operates most of major oil and gas businesses still today.³

During the 1960s and 70s, Myanmar oil production remained modest, increasing from 3.8 million barrels in 1965 to 9.8 million barrels in 1978 (ADB 2012). However, due to technical limitations, reluctance to collaborate with foreign companies, and the depletion of reserves, Myanmar oil production fell to 0.2 million barrels (see Table 1) in 2014 (ADB 2015). Although Myanmar extracts billions of barrels of oil annually, because it only has three refineries, namely Thanbayakan and Chauk in Magwe Region, and Thanlyin in Yangon (see Table 2), it must import oil to meet domestic consumption needs.

In 2011, the MOEE opened the development of 18 onshore oil blocks to bidding; eight blocks were awarded to six foreign companies. In January 2013, MOEE again opened 18 onshore oil blocks up for tender, and another 30 offshore blocks in April. As of 2014, 16 foreign companies were developing 17 onshore blocks. Currently, crude oil production is about 19,400 barrels per day (bpd), of which 12,000 bpd is from offshore deposits and 7,400 bpd from onshore deposits, mainly from the Salin sub-basin (NEMC 2014).

³ <https://www.irrawaddy.com/news/burma/investigation-missing-magwe-public-funds-continues.html>

**Table (1) Myanmar oil production and refinery intake
2000-01 to 2013-14 (Physical)**

YEARLY PRODUCTION FROM 2000-2014															
	YEAR	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14
	Total production (Unit: '000 ton)	571	571	550	925	992	1,183	1,314	1,117	532	443	556	733	790	565
	Underground	21	15	19	17	13	39	41	43	54	41	59	72	42	
	Surface	606	532	938	1,071	1,37	1,381	964	489	389	514	674	719	523	
	Statistical Difference	-56	-3	-31	-96	-32	-106	-113							
	Imports	47	8												
	Exports	402	531	440	737	800	623	515	229	43	30	25	34	53	
	Domestic Supply	169	40	110	188	192	559	798	889	489	413	556	708	757	512
	Statistical Difference	37	-62	-10	-20										
	Total Final Consumption	133	102	120	188	192	559	798	889	489	433	556	708	757	512
	Transformation	89	340	507	473	244	207	290	338	303	131				
	Electricity	89	340	507	473	244	207	290	338	303	131				
	Total Final Consumption	133	102	120	188	103	219	291	416	245	226	266	370	454	380
	Industry sector	128	99	114	183	101	188	206	266	196	175	170	307	292	288
	Cement	65	65	76	134	51	137	141	202	177	128	166	238	219	199
	Steel	21	8	9	11	24	20	26	15	19	27	3			
	Briquetting	43	27	29	38	26	30	40	48	20					
	Fe/Ni Factory	69	73	89											
	Other Sector	4	2	6	5	2	31	85	150	50	51	96	63	162	92
	Commercial & public														

Source: Myanmar Energy Master Plan

Table (2) The Capacity of the Oil and Gas Refineries

Refinery	Year Commissioned	Design capacity (bbl/d) ⁴	Actual Output (2013) (bbl/d)	Main Products
Thanbayakan	1982	25,000	8,600	Naptha, gasoline, diesel, petroleum, coke
Thanlyin	1963-extended in 1980	20,000	11,400	Naptha, LPG
Chauk	1,954	6,000	2,000	Naptha, wax
	Total	51,000	22,000	

Sources: MOGE, ADB

1.3.2 Natural Gas and Power Plant Development

Apart from crude oil, Myanmar is rich in both onshore and offshore natural gas. The majority of onshore gas deposits are located along the Salin basin in the central dry zone area, in northern Shan State, and in the current conflict zone of northwestern Kachin State, where two natural gas blocks in the Danai/Uru River area were awarded to Russia's Nobel Oil by the former military regime.⁵ As of 2015, seventeen geological sedimentary basins had been identified in the central basin and the Pyay embayment (MEMP 2015). Potential onshore natural gas reserves of 5.6 trillion cubic feet (tcf) are in the Salin basin in central Myanmar, and it is reported that Myanmar produces 50.8 million cubic feet per day (MMcfd).

Offshore natural gas potential reserves of 13.5 trillion cubic feet (tcf) are located in six existing exploration sites off the Arakan coast, in the Irrawaddy delta offshore basin, in the Andaman Gulf, and in Tenasserim (Thanintharyi). Myanmar's average offshore production is 1,980 MMcfd, of which 1,430 mmcfd from Yadana, Yetagun, and Zawtika is exported to Thailand and 450 MMcfd from Shwe gas field to China⁶ (see Map 9 and Chart 3).⁷ In total, only 380 MMcfd (19.19 percent of total production) from four major offshore gas fields and 50.8 MMcfd from onshore sites are used for domestic consumption.

The winners of the gas projects

During the Thein Sein government (2011-2016), 35 onshore blocks were awarded to foreign and domestic companies. According to energy reports, Kachin, Mon, Arakan, and Bago each have onshore gas blocks; the rest are located along the central dry zone and delta region (see Appendix 3) (MEMP 2015). Of the 35 blocks, 19 are currently producing. In 2008, block PSC-A, which is located in the conflict zone near Danai in Kachin State, was awarded to JSC Nobel Oil from Russia for exploration, but there have been no project activities to date.⁸ In addition, in March 2007, MOGE and two Russian companies (Silver Wave Sputnik Petroleum Pte. Ltd. and Silver Wave Energy Pte. Ltd.) signed contracts and operational drilling is ongoing at the Zeebyutaung test well-1 of the inland block B-2 in Pinlebu Township of northwestern Sagaing division.

More than 24 offshore blocks have been awarded to foreign and domestic companies. Among these, Yadana, Zawtika, Yetagun, and Shwe are the most prominent and generate huge foreign revenues (see Table 3).

4 The refinery is that factory that refine crude oil to be the usable one. Design capacity means that power or capacity of the refinery that can refine the crude oil per day.

5 <https://www.irrawaddy.com/news/burma/burmas-frontier-appeal-lures-shadowy-oil-firms.html>

6 <https://gettingthedealthrough.com/area/15/jurisdiction/132/gas-regulation-myanmar/>

7 The large offshore gas deposits were discovered in the early 1990s at the Andaman Sea and started production in 1998 from Yadana gas field followed by Yetagun gas field in 2000, Shwe gas field from Arakan in 2013, and Zawtika gas field in mid-2014.

8 https://www.banktrack.org/download/the_shwe_gas_bulletin/shwe_gas_bulletin_jan_2009.pdf

The amount of natural reserves in the Yadana block was confirmed in 1993 and gas sale negotiations were initiated with the Petroleum Authority of Thailand (PTT). Four investors hold shares in a conventional production-sharing contract (PSC): Total (31.2 percent), Unocal Corporation, a subsidiary of Chevron (28.3 percent), PTT E&P (Petroleum Authority of Thailand – Exploration & Production: 25.5 percent), and MOGE (15 percent).⁹

After discovery of reserves in 1992, Yetagun was initially developed by a joint venture of Texaco (50 percent), Premier Oil (30 percent), and Nippon Oil (20 percent). Amid allegations of human rights abuses related to the building of a pipeline from Yetagun to Thailand, Texaco withdrew from the venture in 1997 and Premier Oil in 2002. Production began in 1998 under new investors Petronas, in partnership with MOGE, Nippon Oil, and PTTEP (see Chart 3).

A consortium of six companies from South Korea, India, China and Myanmar is developing the Shwe gas project in Arakan State (see Chart 3). POSCO, a subsidiary Daewoo International, is the operator of the project. The average production rate of the Shwe field is 500mmcf/d, of which approximately 450mmcf/d is exported to China; the remainder is for domestic consumption.¹⁰ The majority of the gas will be sold to the China National United Oil Corporation (CNUOC) for the next 25 to 30 years.

Zawtika is owned by PTTEP International, which is the operator of the project and 80 percent shareholder in the PSC. The Myanmar Oil and Gas Enterprise (MOGE) holds the remaining 20 percent share. The US\$ 2 billion project initially began delivering natural gas for domestic use in March 2014 at a rate of approximately 60 million standard cubic feet per day (MMscf/d). In August 2014, it started exporting natural gas to Thailand at a rate of 240MMscf/d. Today, nearly 80 percent of the gas from the Zawtika field is being sent to Thailand.

Revenue from exports

Myanmar earns approx. US\$ 170 million per month from the sale of 1.6 Billion cubic feet per day (Bcfd) of natural gas exports to Thailand and China. This includes revenues from taxes and other charges from the gas-related sector.¹¹ According to officials from the commerce ministry, revenues from gas amounted to US\$ 3 billion in the fiscal year of April 2017- March 2018.¹² Myanmar earned US\$ 15.4 billion in revenues from the gas sale for 5 years¹³ (see below).

Year	Export/Tons of Gas	Revenue in USD Billion
2017-18	-	2.738
2014-15	59,516	3.52555
2012-13	114,287	3.666
2010-11	410,370	2.522
2009-10	489,442	2.926
Total	>1,073,615	15.37755

The MOU for the Shwe gas project in Arakan State was signed between China's Vice President Xijiangping and Myanmar's Vice-General Maung Aye on June 6, 2009. It stipulated the sale of gas to China for 30 years and the payment of a pipeline usage fee of US\$ 1 per metric ton of crude oil, a crude oil traffic fee of US\$ 31.6 per metric ton, and a Right of Way fee of US\$ 6.905 million annually¹⁴ (SGM 2009). The dual pipelines to China have a design capacity of transporting 12 billion cubic meters of gas per year and 22 million tons of crude oil per year. As of January 2015, 2.92 billion cubic meters of gas had been exported to China, with a mere 147 million cubic meters gas offloaded in Myanmar. On April 10, 2017, the first 130,000

9 <https://www.offshore-technology.com/projects/yadana-field/>

10 <https://gettingthedealthrough.com/area/15/jurisdiction/132/gas-regulation-myanmar/>

11 <https://www.mmtimes.com/business/15034-govt-earns-us-170-million-monthly-from-gas-exports.html>

12 <https://www.mmtimes.com/news/natural-gas-export-brings-3b-fiscal-year.html>

13 <https://www.mmtimes.com/news/natural-gas-export-brings-3b-fiscal-year.html>

14 <http://www.moi.gov.mm/moi:eng/?q=news/13/04/2017/id-10450>

metric tons of crude oil from Maday Island in Kyaukphyu were pumped through the pipeline across Myanmar to China¹⁵. Myanmar will earn US\$ 180.629 billion from the Shwe gas revenue for 30 years contract (see below) (AOW 2012).

30 years contract revenue from Shwe Gas	USD Billion
Total sales revenue of available gas: US\$ 37.53 billion (1.25 billion/year)	37.53
10% Royalties	3.75
56% Myanmar Government share of Profit Gas	16.27
44% Consortium share of Profit Gas	12.28
Consortium share-discount	12.03
MOGE take as consortium member	1.8
Amount of Profit Gas to non-MOGE Consortium	10.23
Taxes to Myanmar Government on non-MOGE Consortium Profit Gas	2.76
Myanmar Government revenues (w/out signing bonus) -(970 million/year)	29.09
Cash profit for Myanmar Government (728 million/year)	21.83
Profit Gas	28.55
Pipeline Transit fee	4.5
Production bonuses	0.006
Fees for training and technology	0.003
Total	180.629

Domestic Gas Consumption

Myanmar has a huge potential gas consumption market. However, due to the export of 75 to 80 percent of the country's gas to Thailand and China and inadequate refinery facilities, despite the massive reserves off Mon and Arakan shores, only urban residents from central Myanmar and major industries can access the gas. Although 55-60 percent of gas from onshore blocks is used to generate power, it is mainly for state-owned industrial consumption; twenty percent is sent directly to government-owned factories, nearly 8 percent to fertilizer plants, and the remainder is used in a compressed natural gas facility (7.2 percent) and for LPG production (0.9 percent). Household usage is very limited and very few refueling stations (49) are available only in urban areas. As of February 2017, the Myanmar Petroleum Enterprise under the MOEE had handed out 68 separate D licenses and 435 E licenses¹⁶ for the storage and retail of natural gas in all of the states and regions, except in Karenni, Chin, Rakhine and Kachin states.¹⁷

The current refinery facilities can produce only 800 metric tons of LPG per day, which can meet only 19 percent of demand. Annual production of 50-60,000 metric tons of LPG is needed to meet the country's demand. In 2017, the local company Yadanar Su received approval to operate a liquefied petroleum gas power plant in Nyaung Don, Ayeyarwady region with initial investment of US\$ 2.2 million and in collaboration with state-owned Myanma Petrochemical Enterprise (MPE).¹⁸

Gas Power Plants

According to an energy-related workshop held in Naypyidaw by the Ministry of Electricity and Energy (MOEE) in October 2016, Myanmar has 27 existing gas power plants (GPPs). MOEE invests in eleven of these; five are owned by the government; six are operated by public-

15 <http://www.globalnewlightofmyanmar.com/trial-pumping-of-imported-crude-oil-to-china-via-south-east-asia-pipeline/>

16 A and B class licenses are issued to firms that import LPG and own storage facilities. C licenses are for wholesale distributors to retail outlets, while D licenses are for retail operations and E licenses are for storage and distribution on a local level.

17 <https://energy.frontiermyanmar.com/sites/all/libraries/ckfinder/userfiles/files/MEB%2023%20February%20%202017.pdf>

18 <https://www.dealstreetasia.com/stories/myanmar-yadanar-su-1ng-plant-nayung-don-85228/>

private partnerships, and five by independent electricity producers from the private sector. In total they had a capacity of 1,967 MW in July 2018, or 36 percent of the total electricity produced (see Figure 1). During 2015-16, the eleven GPPs required 863.23 MMcfd to operate at full capacity, but they received only 271.85 MMcfd. Continued insufficient supplies of gas will be an obstacle to successfully achieving the 2030 energy master plan, which aims to produce 4,758 MW from natural gas by 2030. In addition to the 25 existing GPPs, 13 new GPPs are planned or under construction across the country (see Appendix 2). At present, Yangon has more than ten GPPs; the states/regions that have GPPs are Tenasserim, Mon, Bago, Irrawaddy, Arakan, Magway, Mandalay and Sagai.

The government is planning to build four new LNG power facilities, even though the existing ones do not have enough gas. The four facilities, with the total installed capacity of 3,111 MW, are scheduled to go online during the 2019-20 fiscal year, before the next election. The combined capacity of the existing and upcoming four plants would exceed the target production for 2030. It is clear that the NLD government is prioritizing gas power plants to solve the high energy demand, despite exporting 70-80 percent of the gas extracted from the country's four major gas fields to Thailand and China. The four planned LNG power plants, with a total investment capital of US\$ 5 billion, will generate power with imported LNG. The tremendous costs of the upfront investment and importing the LNG will create huge revenue deficits for MOEE, which will need to purchase LNG at a high price per unit, but sell it to the public at a lower price. The government will therefore be injecting millions of dollars of subsidies into the energy and electricity sector.

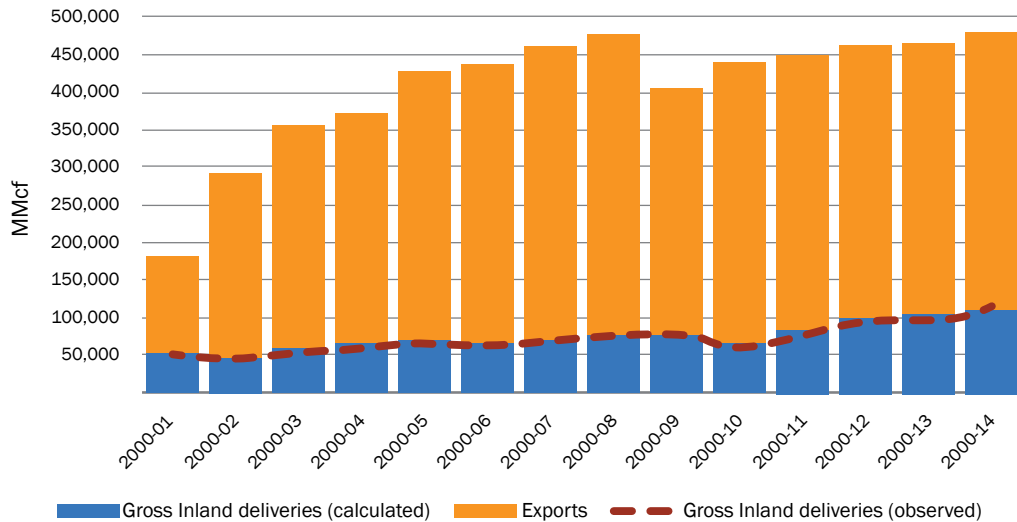
As the most populated city, Yangon, with its 7.3 million inhabitants, 21 industrial zones, and a special economic zone, consumes the most electricity in the country. Yangon itself has an installed capacity of 1,661.1 MW, but actual production is below 1,000 MW, lower than the city's average of 1,300 MW daily. This consumption rate for the city far exceeds that of each of the seven states and six regions, which have an average usage of 530 MW daily. Yangon will need more energy in the future, as it is a hub of the commerce, education, finance, and service sectors.

Table (3) Onshore/Offshore natural gas production 2011-14

Period	Gas field	Production	Sale			Own use	Vent/Flare	Line pack	Unpack
			Export	Domestic	Total				
		MMcf	MMcf	MMcf	MMcf	MMcf	MMcf	MMcf	MMcf
2011-12	Onshore	23948		21,058	21,058	2,840	53	1,344	
	Yadana	287,385	218,336	66,460	284,796	2,190	458	306	368
	Yetagun	153,602	146,649		146,649	2,616	109	4,227	
	Total	464,935	364,985	87,518	452,503	7,646	620	5,878	368
2012-13	Onshore	22,635		13,833	13,833	391	16	92	29
	Yadana	288,931	217,333	67,728	285,060	2,897	485	3,382	
	Yetagun	155,439	144,283		144,283	4,397	1,940	4,278	
	Total	467,005	362,156	81,561	443,717	7,686	2,442	7,752	29
2013-14	Onshore	21,819		12,370	12,370	350	39	124	8
	Yadana	270,579	197,826	69,411	267,237	2,851	451		
	Yetagun	146,814	137,823		137,823	4,530	421	4,041	
	Shwe	42,079	37,041	531	37,571	1,249	3,045		
	Zawtika	986		618	618	45	11		
	Total	482,276	372,690	82,929	455,619	9,025	3,967	4,165	8
Grand Total		1,414,216	1,099,831	252,008	1,351,839	24,357	7,029	17,795	405

Source: Myanmar Energy Master Plan (2015)

Chart (2) Offshore gas production and export (MMcf) by year

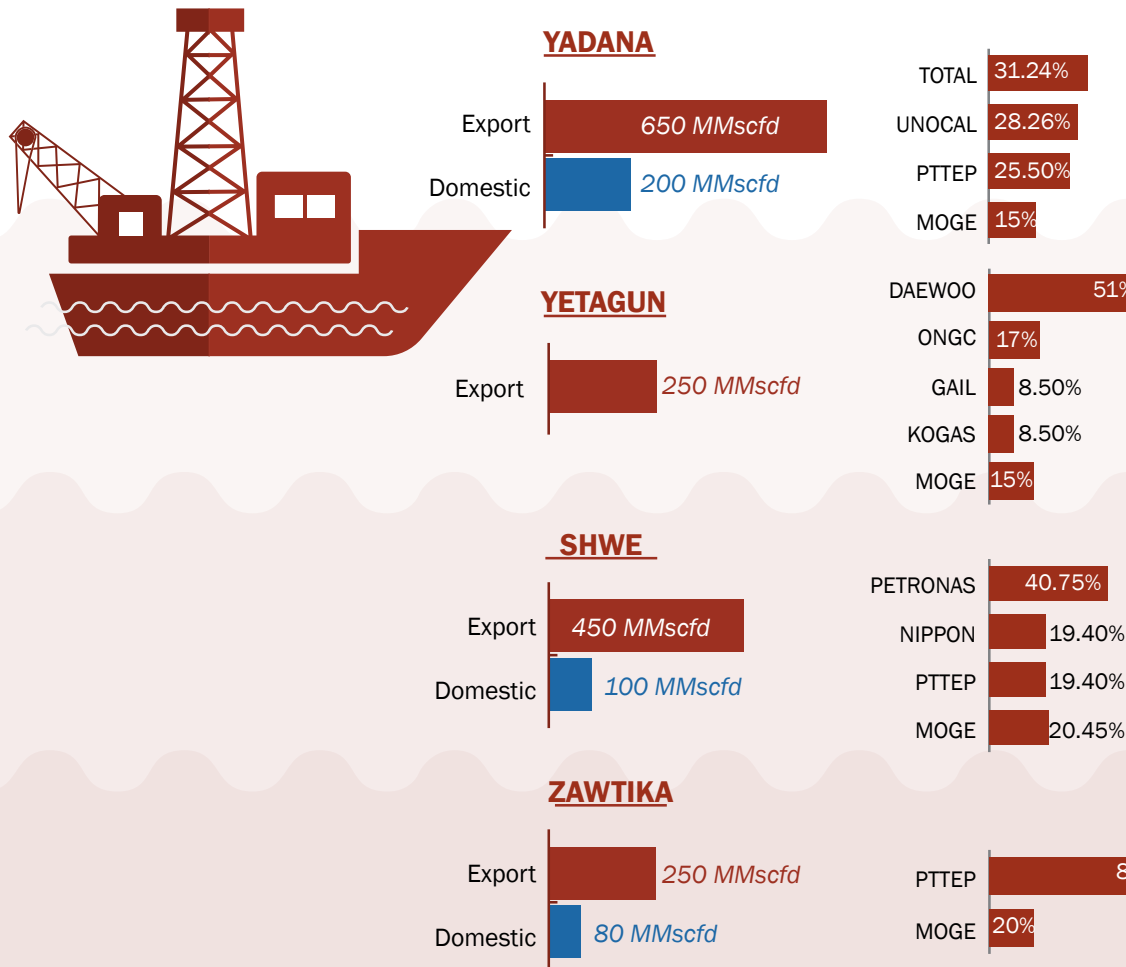


Source: Myanmar Energy Master Plan

Chart (3) Stakeholders of offshore natural gas blocks

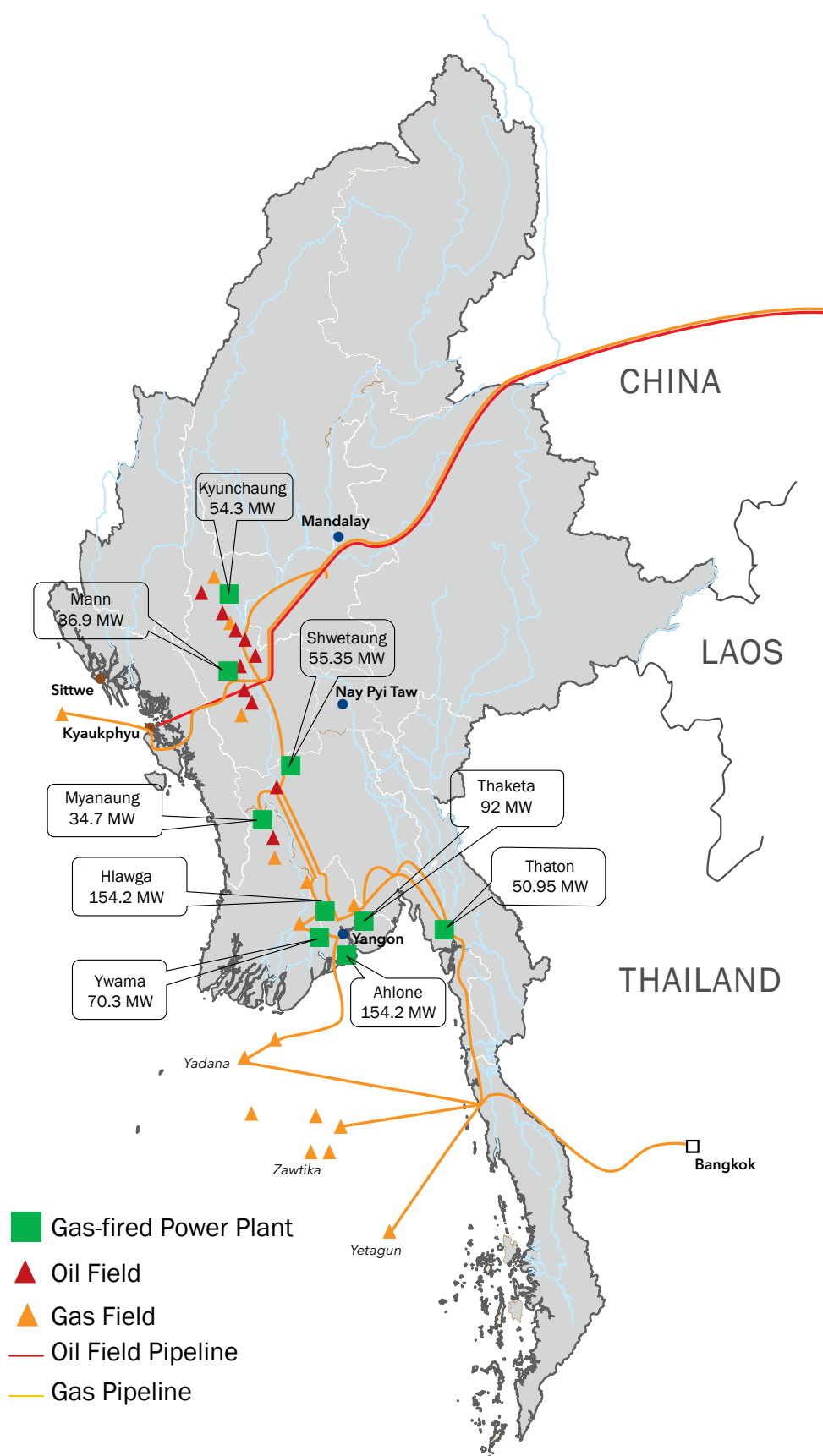
NATURAL GAS	Onshore	Offshore
	5.6 TCF (Proven)	11 TCF (Proven)

Existing Offshore Projects in Myanmar



Source: Myanmar Energy Master Plan

Map (1) Location of gas and oil fields, gas pipelines, and gas power plants



Source: Ministry of Electricity and Energy

1.3.3 Coal Deposits and Power Plant Development

As Myanmar is rich in coal deposits, coal power is considered a solution to meet increasing energy demands. Myanmar has at least 19 coal deposits, with an estimated total reserve of 405.89 million tons. There are six deposits in Sagai, eight in Shan State, one in Kachin State, two in Magwe, and two in Tenasserim (see Appendix 4). Out of the 19 deposits, Tigyit, Namma, Sam Luang, and Kehsi Mahsam in Shan State, Pinlebu and Kalewa in Sagai, and Maw Taung in Tenasserim have been mined by joint ventures with foreign companies, especially from China and Thailand. Tigyit is Myanmar's biggest open pit coal mine, producing nearly 2,000 tons of coal daily, which is used mainly for the nearby coal-fired power plant that opened in 2002 and is operated by the China National Heavy Machinery Corporation (CHMC) and the Burmese companies Eden Group and Shan Yoma Nagar (PYO 2011).

The Thai company Saraburi Coal Co., Ltd. is licensed to excavate the Maw Taung coal mine in Tenasserim Region and export the extracted coal to Thailand. Coal from the Mai Khot (Mong Kok) mine in eastern Shan State is also slated to be exported to Thailand (PYO 2011). The Pinlebu mine, operated by a retired general's company, Tun Chyoi Paw Company, was suspended a few years ago due to poor management and failing to follow the mining laws. After paying a fine of 1,000 million Kyat to the NLD government, it got permission to restart mining at the site.¹⁹

Coal Power Plants (CPPs)

Coal-fired power plants have become a means to tackle insufficient power supplies and growing energy demands in Myanmar. Myanmar plans to increase the number of coal power plants (CPPs) to meet the power demand. According to the Myanmar Energy Master Plan, power production from coal will increase from 120 MW (or 3 percent of the total) in 2015-16, to 7,940 MW (or 33 percent of the total) in 2030-31.

Although coal power plants can be constructed within a short time to provide stable and cheap electricity, their socioeconomic and environmental costs are expensive. For example, the country's very first coal power plant at Tigyit in Shan State was shut down in 2014 due to the strong public outcry over the many negative consequences of the plant, including damaging the locals' livelihoods and health, 100-150 tons of toxic fly ash released into the air every day, confiscation of more than 500 acres of farmland, and forced eviction. The power plant was also controversial because while critical health and other public facilities received no regular power supply from the plant, a foreign joint venture (the Pinpet steel plant) received 24-hour electricity supply (PYO 2011). After being shut down from its original 120 MW production, it is currently operating again at a reduced capacity of 20 MW.

Another problematic coal power plant is that of the Mawlamyaing Cement Factory, which has an installed capacity of 49 MW for commercial use and is facing public pressure to shut down. The coal power plant in Ain Din village in Ye township of Mon State was also cancelled due to local opposition to the project. Due to their negative impacts, coal power plants are not popular in Myanmar and so far only two coal power plants are operating in the country. Therefore, the government's plan for more coal power plants by 2030 is not likely to run smoothly.

Coal power plants are planned mainly in the ethnic areas, such as Tenasserim, Mon, Karen, Arakan, Irrawaddy, and Sagai (See Appendix 2). The planned coal power plant in Kalaywa, Sagaing, is also located in a place where the majority of the residents are Chin ethnic people.

¹⁹ <https://streamer1.rfaweb.org/stream/BUR/BUR-2018-0221-1330.mp3>

1.3.4 Solar and Wind Power Plant Development

Nuclear, hydropower, coal, and gas power plants are very capital intensive to build and costly for the ecological and social environment. As such, solar and wind power are an attractive solution. A nuclear power plant is the most expensive and technologically complex type to build. The management of the nuclear waste, long-term costs, and risk of disaster are prohibitive even for well-developed countries. However, once the power plant installation is complete, it can provide stable and cheap electricity. Hydropower plants are known for providing stable power supply. However, they are capital intensive to construct, cause environmental damage, are vulnerable to earthquakes, extreme weather, and dam collapses, cause relocation and community destruction, and destroy riverine life. There are many examples of the negative impacts to communities from the mega hydropower dams. On July 24, 2018, due to a continuous rainstorm, a hydropower dam collapsed in Laos, submerging six villages and killing at least 20 people; more than 100 remain missing.²⁰ In central Myanmar, due to insufficient water supply during the summer, six hydropower plants stopped operation and were not able to supply any power.²¹ Coal power facilities can provide stable and cheap electricity, but they emit enormous amounts of poisonous carbon dioxide that are extremely harmful to health and the environment. Therefore, ecofriendly solar and wind power facilities are gaining more attention around the world as power from the sun and the wind is infinitely renewable and has negligible negative impacts.

Many countries are innovating new sustainable energy technology to cut down on carbon emissions, prevent global warming, and avoid unnecessary fuel politics. While the benefits of solar and wind facilities are clear, harnessing new technology and upfront costs are challenges.

The UK, the US, and China are heavily investing in offshore and onshore wind power plants. The UK plans to generate 30 percent of its energy supply from offshore wind power facilities by 2030.²² Nevertheless, wind facilities require heavy capital investment. For example, a 1 MW offshore facility requires 500 tons of steel, 1,000 tons of concrete,²³ and other necessary materials. China will need to spend US\$ 11.4 billion on 13 offshore facilities to reach its target of generating 10 GW from offshore wind facilities by 2030. Although such facilities require more capital investment than other basic electricity infrastructure, the wind has zero cost as a “fuel” for the power plant.

The US and China are also developing solar power plants, even reaching beyond earth-based facilities. Both countries are injecting billions of dollars into developing and innovating solar power projects in space.²⁴ The advanced technologies required for such facilities are costly and need highly skilled human resources; political and economic stability is also needed to develop such ambitious ideas. Yet to install a basic solar farm also comes with some challenges: the facility needs sunlight, a large and contiguous land area, batteries to store the power to supply during rainy and cloudy days, and maintenance. For example, the Minbu solar power plant, with the installed capacity of 220 MW, needs more than 835 acres of land, and costs US\$ 1.285 million per MW for installation. Its 700,000 solar panels electrify more than 200,000 households.²⁵ In addition to that, the government has agreed to buy electricity at a price of US\$12.75 (190 kyat) per unit, which is more than triple the price of 50 kyat per unit for household consumption today.²⁶ Moreover, the management and disposal of unusable massive solar panels remains in question. Despite these challenges, solar power generation has enormous benefits. These include zero costs for fuel, no carbon emissions, a renewable and sustainable power supply, no harm to the environment, and the flexibility to install them

20 <https://www.bbc.com/news/world-asia-44935495>

21 <http://burmese.dvb.no/archives/329373>

22 <https://www.forbes.com/sites/arielcohen/2019/03/26/as-global-energy-demands-grows-so-does-appetite-for-offshore-wind/#16b3a64e65e7>. Access on 27 May 27, 2019.

23 <https://www.forbes.com/sites/arielcohen/2019/03/26/as-global-energy-demands-grows-so-does-appetite-for-offshore-wind/#16b3a64e65e7>

24 <https://www.forbes.com/sites/scottsnowden/2019/03/12/solar-power-stations-in-space-could-supply-the-world-with-limitless-energy/#254de984386b>. Access on 27 May 27, 2019.

25 <http://metacorporation.co.th/works/minbu-project-01/>

26 <http://www.globalnewlightofmyanmar.com/minbu-solar-plant-to-supply-40mw-power-to-national-grid/>

at varying scales, thus radically reducing power transmission costs. Floating solar facilities can save land space, are 16 percent more efficient than land-based ones, are easier to connect to the grid than remote wind farms, and prevent water evaporation.²⁷ Such a facility can be an environmentally friendly solution to local energy needs.

To date, two solar power plants are operating in Mandalay and Magway region as part of the NEP. In June 2019, a 0.0561MW solar power facility next to Deedoke village is providing power to Deedoke village in Meiktila, Mandalay region as part of an off-grid scheme of the NEP.²⁸ Another 20 MW solar facility entered its first phase of a 170MW project connected to the national grid on June 2019.²⁹ The project is located 16 miles from Minbu town in Magway region. Several solar facilities are also planned in the dry zone area of Myanmar (see Table 4).

As a solar facility needs sunlight and space, the dry zones of Magway, Mandalay, and some parts of Bago and Sagaing are perfect places for solar farms. Those regions have high temperatures and large swathes of barren land. Instead of buying back electricity from China, Laos, and Thailand, the government could transform these regions into a hub of solar power supply with the potential to be the biggest solar farm in ASEAN.

To meet its 2030 energy policy, Myanmar should emphasize investment in solar power plant projects and opening more space for private developers. Solar facilities are easily manageable, transmit directly to the targeted area, and can be built in a short time regardless of the installed capacity. The closeness to the targeted area and lower installation costs of solar facilities enable them to rapidly electrify rural areas. Mostly importantly, the central government should hand over the electricity management authority to those regions to be able to implement the project quickly rather than waiting for the long process from the central government. If regional governments can generate surplus electricity, they can earn surplus revenue to spend in other development sectors in their areas.

Wind power plants, which are more costly and require more technology, are also in Myanmar's energy plan. In February 2018, the government signed a technological cooperation agreement with Denmark and memoranda with four companies to develop wind power projects that are expected to produce more than 6,478 MW. The chosen areas for these projects are Magway, Chin, Mon, Shan, Karenni, Karen, Arakan, Irrawaddy, Yangon, and Tenasserim (see Appendix 2). In Magway, Infra Capital Myanmar-Rex, a private renewable energy firm, will build a 200 MW wind power facility and expects to begin construction in 2019.³⁰

27 <https://www.weforum.org/agenda/2019/03/japan-is-the-world-leader-in-floating-solar-power>

28 https://www.facebook.com/MOEEMyanmar/posts/690190261402553?__tn__=K-R

29 <http://www.mizzimaburmese.com/article/57013>

30 <https://www.mmtimes.com/news/countrys-first-solar-power-plant-start-operations-magwe.html>

Table (4) Solar power plants in Myanmar

No.	Name	Type	Installed MW	Actual MW	Commission Year	Place	Developer
1	Sappya	Solar	0.561		June 2019 ³¹	Sappya, Myiktila	Mdy Yoma
2	Minbu	Solar	20		June 2019	Minbu, Magway	Green Earth Power (Myanmar) Co.Ltd.,
3	Wundwin	Solar	150		2018 ³²	Wundwin, Thar Se township in Myeiktila district	New York-based ACO's Convalt Energy
4	Nabuaing	Solar	150		2018	Nabuaing township in Myin Chan district	New York-based ACO's Convalt Energy
Total			320.561				
3	Minbu	Solar	220	170	2018-19	Minbu, Magway	Thai Green Earth Power Company[1]
4	Solar	Solar	80	NA	On process	Sagai region	Andaman Capital Partners
5	Shwe Myo	Solar	10	NA	Planned	Naypyidaw	NA
6	Thapyaysan	Solar	100	NA	Planned	Naypyidaw	NA
7	Kun Chaung	Floating solar	30	NA	pilot project (Survey March 2017)	Kunchaung dam, Bago	NA
8	Zaung Tu	Floating solar	30	NA	Planned	Zungtu dam, Bago	NA
9	Shwe Gyin	Floating solar	30	NA	Planned	Shwegyin dam, Bago	NA
10	Sagai, Mandalay		880	NA	Planned	Sagai/Mandalay	NA
Total			1,380				

Sources: News, Ministry of Electricity and Energy

1.3.5 Hydropower Development

Hydropower is the backbone of Myanmar's current energy supply. However, it remains controversial due to the well-documented negative impacts, particularly of large dams, to people, water resources, and environmental ecosystems.³³ The Asian Development Bank estimates that Myanmar has the hydropower potential of more than 100 GW (ADB 2015, pp.25). According to the MOEE, the installed capacity of hydropower was 3,221 MW (60 of total power produced) in 2017-18 (see Figure 1). In May 2017, the International Finance Corporation (IFC) of the World Bank Group recorded 30 existing hydropower plants of 10 MW or more, with a total installed capacity of 3,317.5 MW (including hydropower plants built by the KIO) and 57 planned projects with the capacity of 49,178 MW. All the power plants were implemented either by the union-level MOEE or the Ministry of Agriculture, Livestock and Irrigation (MOALI), and were Build, Own and Transfer (BOT) or Joint Venture (JV) types (see Table 5). Of the planned 49,178 MW of hydropower, 20,935 MW will be generated in Kachin State (where one industrial zone that was approved in December 2017), and 19,649 MW will be generated in Shan State.

31 https://www.facebook.com/MOEEMyanmar/posts/690190261402553?__tn__=K-R

32 <http://www.mandalaysolar.com/>

33 Dams and Development: A New Framework for Decision-Making, the World Commission on Dams, 2000.

The existing hydropower plants and production rates vary from one state/region to another. Kachin State has a total installed capacity of 387.2 MW, 300 MW of which is sold to China. The Tapein I hydropower plant, which was one of the trigger points that brought an end to the 17 year-ceasefire agreement between the KIO and the government in 2011, exports 221 MW of electricity out of the 300 MW it produces. In Shan State, the 970 MW Shwe Li II hydropower plant exports 200 MW to China. At the same time, the Myanmar government is buying 4-5 MW of electricity from neighboring Laos and 1,000 MW from Yunnan province, China³⁴ to meet the electricity demands in Shan State and plans to buy 100-200 MW more in the near future.³⁵ The Myawaddy trading zone in Karen State is currently buying electricity from Thailand at 2.6 Baht³⁶ per unit for household use and 6 Baht per unit for industrial use.³⁷ These are very good examples of how the government sells the country's resources to the neighbouring countries at low prices while buying back electricity at high prices.

Table (5) Hydropower projects with greater than 10MW of installed capacity

Project status	Developers					Total installed capacity (MW)
	Domestic				Foreign	
	MOEE	MOEE/ MOALI	MOALI	BOT	JVA/BOT	
Existing	12 (1,474.05 MW)	7 (492MW)	2 (104MW)	3 (183MW)	3 (939MW)	3,317.05
Construction	3 (442MW)	0	3 (232MW)	2 (96MW)	1 (1,050MW)	1,820
Covenant	0	0	0	20	0	20
Govt. Plan	0	0	1 (64MW)	1 (20MW)	0	64
JVA	0	0	0	0	6 (13,160MW)	13,160
MoA	0	0	0	0	13 (16,174MW)	16,174
MoU Local	0	0	0	4 (576MW)	0	576
MoU	0	0	0	0	22 (11,024MW)	11,024
No Agreement	0	0	0	0	3 (6,340MW)	6,340
Total	1,916	492	400	875	48,687	52,370.05

Source: IFC (2017)

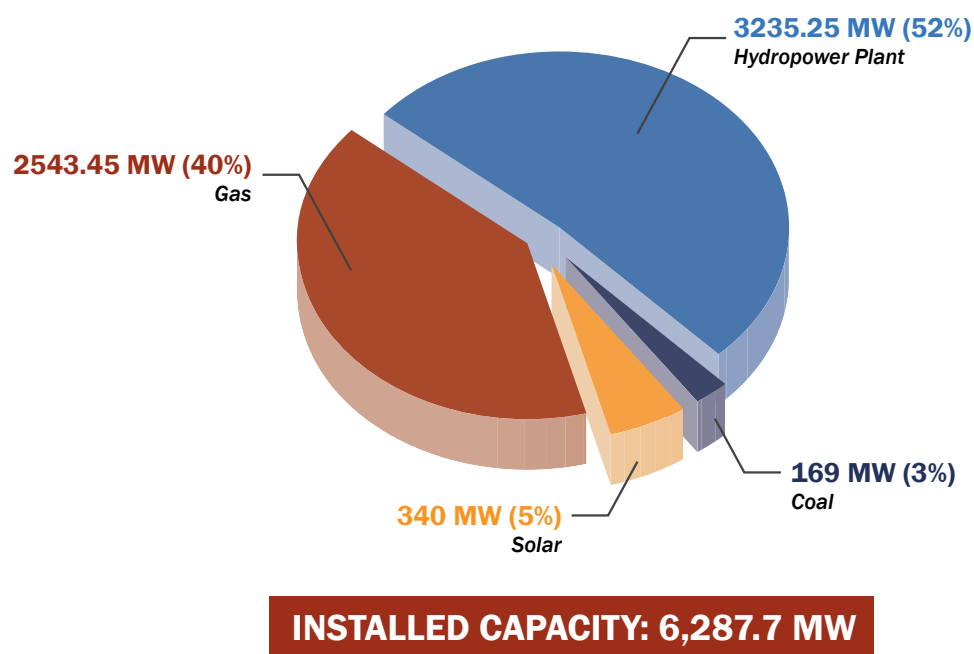
34 <https://www.irrawaddy.com/news/burma/govt-buy-electricity-china-cover-shortfall.html>

35 http://www.xinhuanet.com/english/2018-01/16/c_136899158.htm

36 With the exchange rate of 40 kyat=1bath, 2.6 bath=104 Kyat for the household users and 6 Bath=240 Kyat per unit for the industrial users.

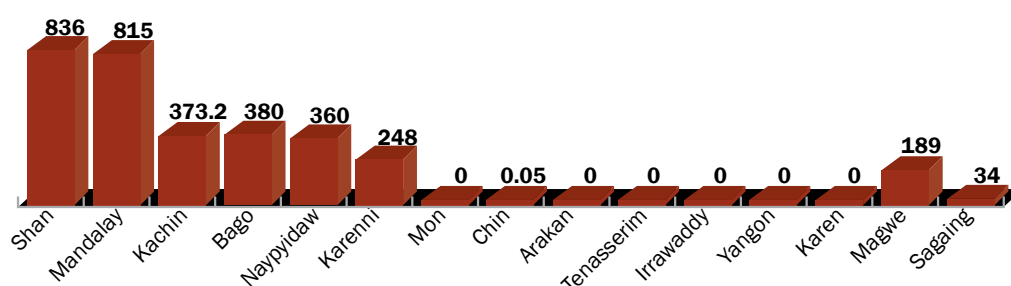
37 <http://www.myanmarinsider.com/the-great-expectations-of-local-residents-of-myawaddy/>

Chart (4) 2019 Energy Matrix and Total Installed Capacity



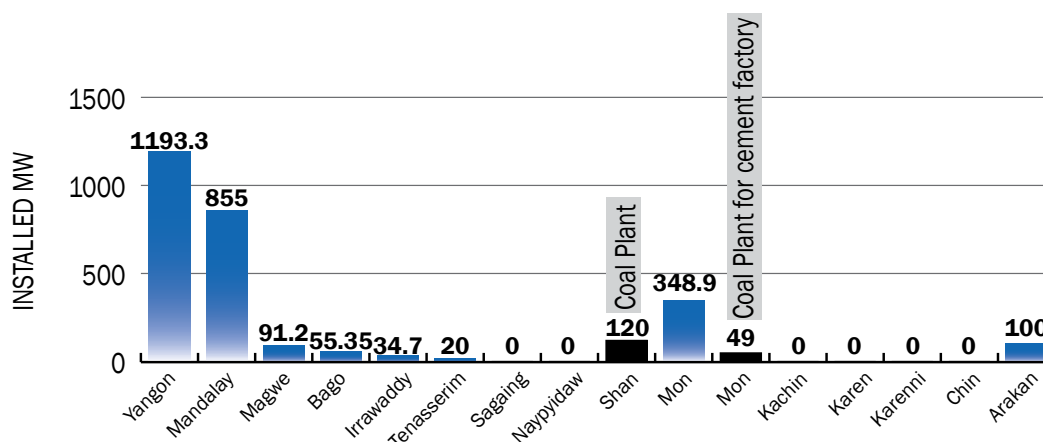
Source: The information for this chart is abstracted from various sources, especially from MOEE and IFC.

Chart (5) Hydropower Production in each state/region in January 2019 (MW)



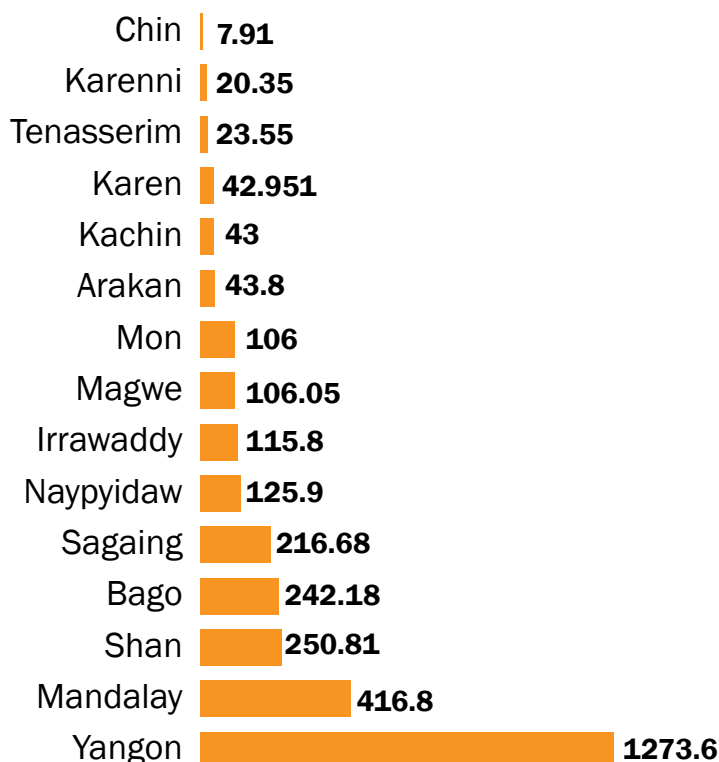
Source: The information for this chart is abstracted from various sources, especially from MOEE and IFC.

Chart (6) Power Production from Gas/Coal Plants in each state and region as of December 2018 (MW)



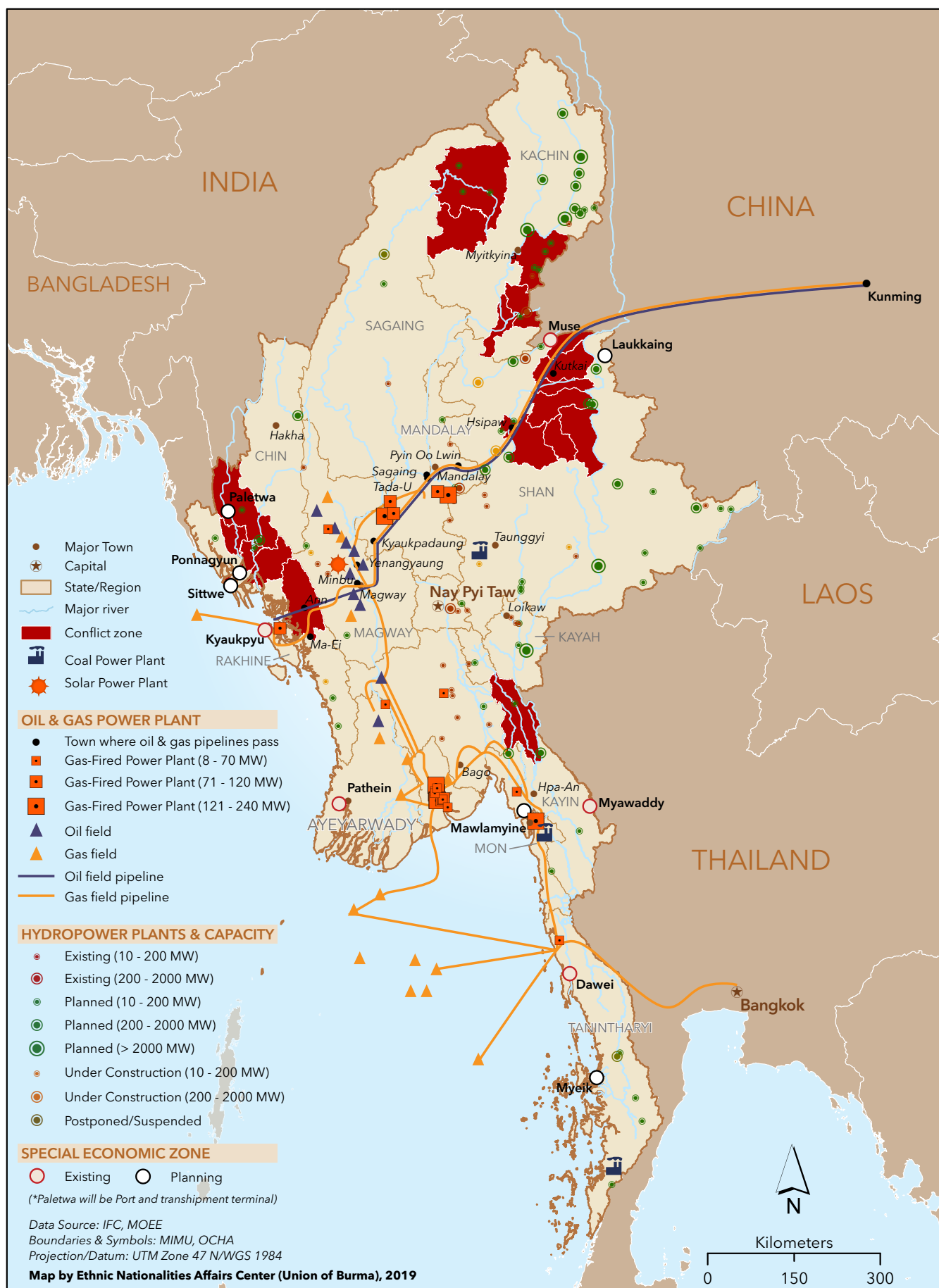
Source: The information for this chart is abstracted from various sources, mainly from MOEE.

Chart (7) Power Consumption in each state/region as of December 2018 (MW)



Source: The information for this chart is abstracted, mainly from MOEE.

Map (2) Energy Development Projects and Armed Conflict



Existing and planned hydropower plants are located on the Irrawaddy, Salween, Chindwin, Mekong, Sittaung, Arakan, Tenasserim, Bago, Manipur rivers, and tributaries of major rivers. Most are in contested ethnic areas, mainly in Kachin and Shan states, where armed conflicts have been increasingly tense since 2011 (see Map 2). The hydropower plants in the regions are located near the border with the states, where the majority of local residents are ethnic people as well. Due to the armed conflict and for the sake of hydropower plant and dam security, many civilians are being affected seriously while the energy produced is transmitted away from local areas through the national grid line. Major electricity consumers are urban dwellers where there is no armed conflict. Revenues from the sale of electricity from hydropower are not returning to the state/regional government accounts and the local people are not benefitting: the electrification rates in the power production areas are lower than places with no mega hydropower plants.

1.3.6 Overview of the National Electrification Plan (NEP)

The government's National Electrification Plan (NEP) was drafted with the aim of achieving universal access to electricity for 10.89 million households from all states/regions by 2030. The plan was initiated by and implementation began under the Thein Sein government. International financial institutions such as the World Bank have financed it. As of April 2018, 4.3 of 10.89 million households (40 percent) have been electrified. The NEP plans to electrify a further 1.7 million households by 2020. In other words, by the end of 2019, 5.95 million households will be electrified if the NEP plan achieves its targets.

The NEP is composed of off-grid, grid rollout, and capacity building components to be implemented in three phases. Phase I is to take place during 2016-2020. The International Development Assistance (IDA) branch of the World Bank has funded US\$ 400 million for the first phase (US\$ 300 million for grid rollout, US\$ 80 million for off grid, and US\$ 20 million for capacity building). The Ministry of Agriculture, Livestock and Irrigation (MOALI) is responsible for off grid, the MOEE for grid rollout, and the MOEE and the Department of Rural Development (DRD) of MOALI for the capacity-building program. Activities for each component are being implementing in targeted project areas around the country.

The off-grid program will provide electricity to households that are beyond the reach of the national grid. The off-grid electrification program will support installation of solar photovoltaic (PV), mini-hydropower, wind, biomass, and hybrid (for example diesel-solar) projects, including the development of public institutions, solar power systems, and mini-grids. These off-grid communities are expected to connect to the national grid after the first phase of the NEP (2015-2020).

The grid rollout program is being implementing by the MOEE and private sector entities. The project includes the procurement of materials for grid extension and installation. This includes the extension of distribution networks, the expansion of the existing medium voltage (MV) substations, construction of new MV stations and voltage lines, and the provision of electricity for 11,600 communities, and 132,000 public lights (in public schools, clinics, and so on). It will connect the 700,000 households nearest the existing national grid.

The capacity building program aims to strengthen institutional capacity to implement the NEP.³⁸

³⁸ The capacity building program will include capacity building and training of the National Electrification Executive Committee and its Secretariat, capacity building at the Union, State/Region, district, township and village levels and for the private sector, improving the policy and regulatory framework related to electrification, development of an integrated, geographic information system (GIS)-based framework for electrification planning, results-based monitoring and impact evaluation of the project, building on the existing GIS platform for the geospatial least-cost electrification planning, securing technical advice and consulting services on standards, technology assessment and technical design, economic and financial analysis, environmental and social impact management, procurement and financial management and project management.

NEP's Key Stakeholders

Among the twelve departments of the MOEE, the Department of Electricity Supply and Enterprise (ESE), the Yangon Electricity Supply Corporation (YESC), the Mandalay Electricity Supply Corporation (MESC), and the Department of Rural Development (DRD) of MOALI are the major domestic actors implementing the NEP, along with the IDA of the World Bank Group and other partners. To manage, control, and implement the NEP, the former Thein Sein government formed the National Electrification Executive Committee (NEEC) with the objectives of overseeing NEP Project Management Offices (PMOs), which are responsible for the technical activities carried out by the ESE, YESC, MESC, and DRD. However, the NLD government abolished the committee, instead using the MOAL (Technical Assistant or TA) as an executing agency and the DRD as the implementing agency for the off-grid program. The YESC, MESC, and ESE of the MOEE are responsible for procuring materials for the grid rollout. The DRD township engineers will provide guidance to village communities and townships in selecting and developing appropriate off-grid electrification solutions at the township level. If special assistance is needed to communicate or work with the local communities, Local Technical Advisors can be engaged. The LTAs can be local NGO/CSOs and consultants collaborating with local governments (especially, but not exclusively, DRD staff).

A Technical Support Unit (TSU) at the Union level with international and national expertise will provide technical backstopping to the local technical advisors, as well as support policy and regulatory development (See Figure (2)). The TSU will also assist the financial sector to adopt/adapt mechanisms for consumer and supplier financing and provide trainings to improve their capacity to assess the creditworthiness of off-grid electrification projects. For state DRD offices, the TSU will develop and disseminate streamlined contracting and procurement processes, support DRD in consumer information campaigns, monitoring and evaluation, and assist in program management. The TSU will assist private sector equipment suppliers and installation companies through capacity building and training on technical as well as business development topics (Myanmar National Electrification Project ESMF 2015). The role of the state/regional governments in the NEP is practically non-existent, as MOEE and MOALI are in charge of all projects (see Figure 2). According to the MOEE's presentation on the NEP with union parliament members in early 2018, the role of the state government, state parliament members, and state ministries is just to cooperate in verifying household, village, and other data. The planning, management, and implementation of the projects are done solely by union ministries.

Distribution Sector

According to the NEP, the MOEE will prioritize electrification of the regions over the states. Villages within two miles of the existing 33kv sub-stations and grid lines are targeted for electrification in the first phase of the project. This amounts to a total of 626,758 households. Of these, only 62,707, or 10 percent, are in the seven states (see Table 6). Although the major hydropower plants are located in the states, the regions have more sub-stations, grid lines, and connections, and therefore will be electrified sooner. The electrification rate and coverage area depends on how many existing 33kv sub-stations are in each area. As of 2017-18, Karenni, Yangon, Mandalay and Naypyidaw had the highest electrification rates, with 79.24, 83.2, 53.49 and 52.46 percent respectively (see Table 7).³⁹ Although Tenasserim is the least electrified state of all (11.16 percent), the region is excluded from first phase of NEP (see Table 6 and 7).

As mentioned above, sufficient capital is key to the successful implementation of the master plan to provide universal access to electricity by 2030. According to the MOEE website, it costs US\$ 800 per household to secure electricity access, or US\$ 5.4 billion for 6.73 million households. To complete Phase I, US\$ 670 million is needed to meet the target of providing 626,785 households electricity access. These costs include the installation of 11kv and 400v cable lines, transformers, and the electricity posts, and excludes the cost of generation as well as the installation of 66kv, 33kv, 133kv, 230kv, and 500kv lines, the construction of

39 <https://www.moee.gov.mm/mm/ignite/contentView/55>

substations, and more. The MOEE is scheduled to construct power cable networks and transformers from December 2018 through 2020, after three years of negotiating with funders, bidding the tenders, purchasing materials, and signing contracts with bid winners.

At present, the MOEE is implementing the NEP with a US\$ 400 million loan from IDA (300 million for extension of the existing national grid, 20 million for staff capacity building, and 80 million for electrification of off grid households). MOEE says that it needs an additional US\$ 270 million for 2015-2019 projects. Therefore, it may be difficult to meet Phase I targets of electrifying 50 percent of households by 2020 (see Table 7). Moreover, due to the lack of funding and financing, the MOEE speculates that more than 1.3 million households will not have access to electricity in the next 10 years and they are therefore recommended for “pre-electrification” through the use of mini-hydropower plants, solar, diesel hybrid generators, biomass, and other sources.

The recommended pre-electrification areas are in Kachin State, which contributed more than US\$31 billion in revenues for the union government (or 48 percent of GDP) from the sale of jade in 2014,⁴⁰ Shan State, which is home to the largest border trade with China that nets millions of USD annually, Karenni State, where the country’s first mega hydropower plants are stationed, and Chin State (see Map 3).

Transmission Sector

The Department of Power Transmission and Systems Control (DPTSC) is responsible for developing the national grid, including the switchyard, transformer stations/substations, cable line networking, and national system control. The current transmission system has three types: 1) on-grid, or the National Grid Lines, 2) mini-grid, or small grid lines that branch off from either the national grid, a sub-station, or directly from a power station and 3) off-grid, or power cables that are not connected with either the national grid or any other trans-state/region power line.

At present, Myanmar’s domestic power network consists of high voltage (500kv, 230kv, and 232kv) cable lines, medium voltage (66kv, 33kv, and 11kv) cable lines, and 400v low voltage lines that connect directly to residential consumers (see Figure 3). The national grid covers the majority of central and lower Myanmar, but connection for the far eastern, western, northern, and southern parts of the country is still in the planning stage (see Map 4).

As of 2017-18, all the towns (449) in Myanmar have electricity access by means of on and off grid. Over 20,000 sub-stations were transmitting electricity to 319 of 449 towns by means of the national grid. Electricity produced off-grid, such as through diesel generators, mini hydropower plants, and mini solar power plants, was transmitted to 125 of 449 towns.⁴¹

Mandalay, with an average daily energy consumption of 532 MW, has 21 sub-stations of 66kv and 578 sub-stations of 33kv that transmit electricity to 680,000 households, or 63.8 percent of the city’s population. Yangon, with an average daily energy consumption of over 1,250 MW, will have 100 percent universal access to electricity at the end of 2019, according to a 2014 Castalia Strategic advisor group report. The energy consumption of Yangon and Mandalay is higher than that of all the states and regions combined (1,790 MW).

The NEP 2019-20 fiscal year plan expands the long-term transmission plan in the central part of Myanmar while some of the states are in the short-term plan (see Chart 8).

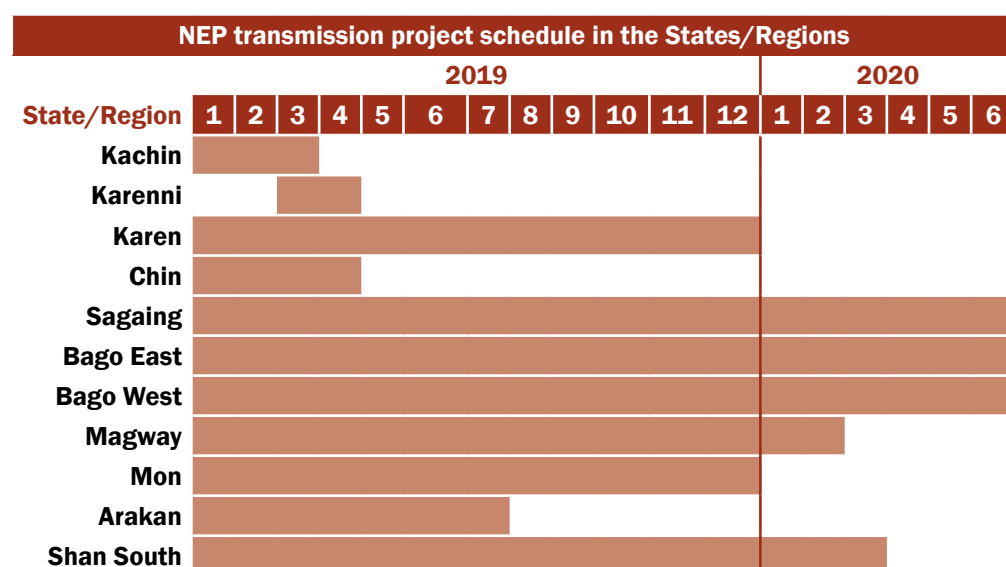
As a member of the Greater Mekong Sub-region (GMS), Myanmar also plans a south-north 500kv high voltage cable line network (see Map 5) as part of its policy to integrate with the GMS power network (see Map 6). Most likely, Myanmar will have a high voltage grid line with Thailand in order to export electricity. Electricity exports to Thailand could come from the planned 7,100 MW Tatsang/Mongtong hydropower project in Shan State, the 4,000 MW Ywathit hydropower project in Karenni State, and/or the 1,360 MW Hatgyi hydropower project

40 <https://www.globalwitness.org/en/campaigns/oil-gas-and-mining/myanmarjade/>

41 <https://www.moe.gov.mm/mm/ignite/contentView/55>

in Karen State (see Map 6). China, Myanmar's biggest investor (especially in the energy sector), is currently importing electricity from Kachin and northern Shan states through 500kv and 220kv power transmission lines. China's plan to construct hydropower dams with the installed capacity of more than 21,304 MW is designed to boost electricity supplies in China. Given all the existing factors, Myanmar will likely choose the energy corridor scenario 1/2 south-north power network (see Map 5). This power corridor provides a smooth path to buy and sell power with the neighbouring countries.

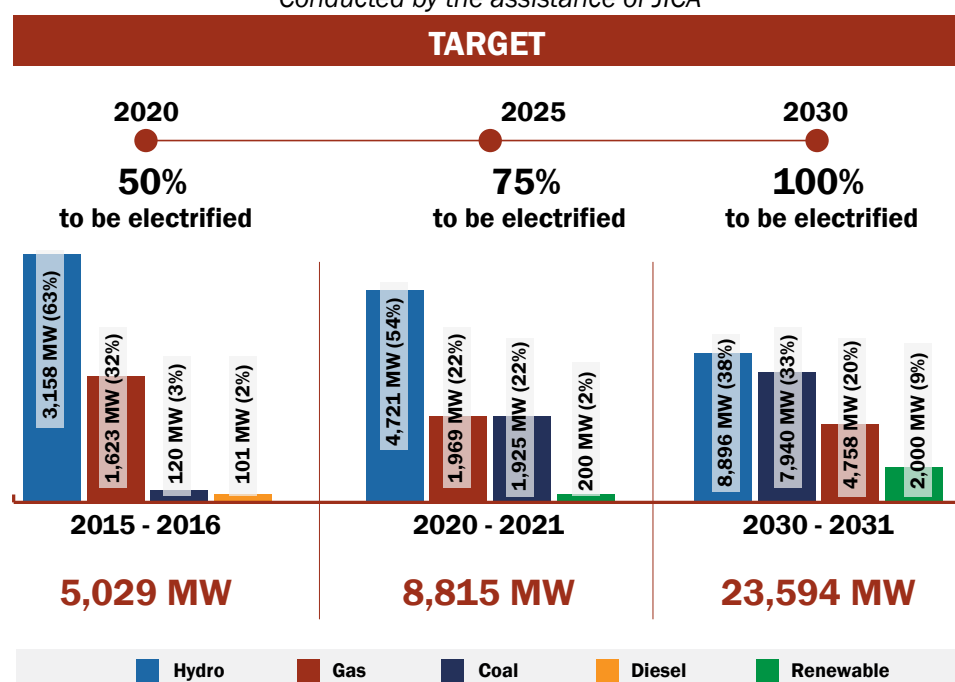
Chart (8) Transmission construction schedule in each state/region



Source: MOEE

Chart (9) Myanmar Energy Master Plan 2030

Conducted by the assistance of JICA



Source: Myanmar Energy Master Plan

Table (6) Villages within two miles of existing 33kv sub-stations slated for electrification in the first phase of the NEP

Sr.	State	Number of Village	Number of Households	Population	Proposed Plan		
					11kv/33kv (mile)	11/0.4kv and 33/0.4kv Distribution & transmission	
						Quantity	Capacity (kvA)
1	Kachin	5	902	4,399	14.40	9	900
2	Karen	5	185	1,118	2.00	4	250
3	Karen	67	7,554	39,188	65.54	69	9,200
4	Chin	4	181	801	8.00	4	250
5	Mon	78	11,972	66,357	64.80	78	10,750
6	Arakan	21	2,563	13,487	28.90	28	2,800
7	Shan (South)	275	24,571	113,832	313.02	317	35,550
	Shan (North)	186	12,866	61,342	144.60	221	15,400
	Shan (East)	22	1,913	7,351	19.24	24	2,430
Total		663	62,707	307,875	660.50	754	77,530

Division							
1	Tenasserim	No villages around 2 mile radius from the grid in the first phase of NEP					
2	Sangaing	961	124,169	588,731	912.27	987	124,750
3	Mandalay	393	79,445	164,349	472.33	401	55,300
4	Magway	664	89,330	420,417	709.96	758	91,930
5	Naypyidaw	94	20,358	75,087	96.98	114	19,340
6	Bago (East)	591	75,178	297,911	640.98	630	83,775
	Bago (West)	858	76,688	278,968	748.33	911	74,600
7	Irrawaddy	650	75,281	297,875	648.62	628	70,950
8	Yangon	206	23,602	103,163	240.00	206	30,965
Total		4,417	564,051	2,226,501	4,469.47	4,635	551,610

Grand Total	5,080	626,758	2,534,376	5,129.97	5,389	629,140
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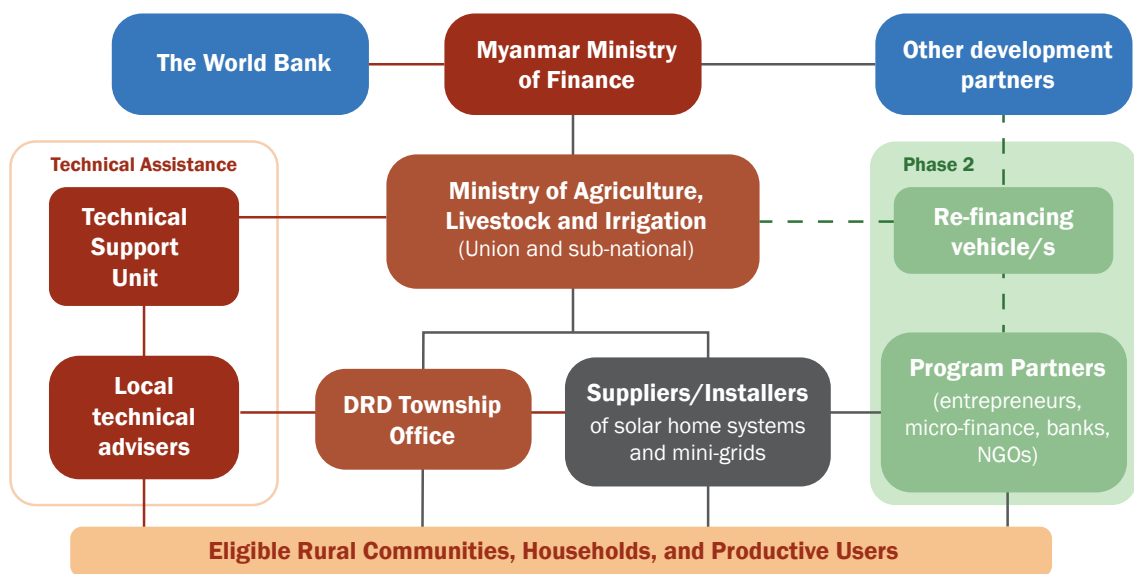
Table (7) Electrified households as of September 2017 and households to be electrified according to proposed projects to be carried out in Financial (Year 2017-2018)

Sr.	Region/ State	Total Number of Households	Households already electrified as of September 2017		Households to be Electrified in 2017-2018 Fiscal year	
			Quantity	Percent	Quantity	Percent
1	Kachin	269365	130296	48.37	134122	49.79
2	Karen	57274	44283	77.32	44136	77.06
3	Karen	308041	63320	20.56	64646	20.99
4	Chin	91121	19483	21.38	29465	32.34
5	Mon	422612	194432	46.01	208567	49.35
6	Arakan	459772	74408	16.18	76608	16.66

7	Shan	1169569	347317	29.7	359505	30.74
8	Naypyidaw	262253	135183	51.55	146319	55.79
9	Sagaing	1096857	356639	36.17	386040	35.2
10	Bago	1142974	413447	25.01	421991	36.92
11	Magway	919777	230024	16.07	233815	25.42
12	Ayerawaddy	1488983	239276	10.3	255168	17.14
13	Tenasserim	283099	29161	28.57	30136	10.65
Total		7,971,697	2,277,269	81.21	2,390,518	29.99
14	YESC	1,582,944	1,285,580	81.21	1,320,000	83.4
15	MESC	1,323,191	687,985	51.99	734,353	55.5
Total		10,877,832	4,250,834		4,444,871	40.86

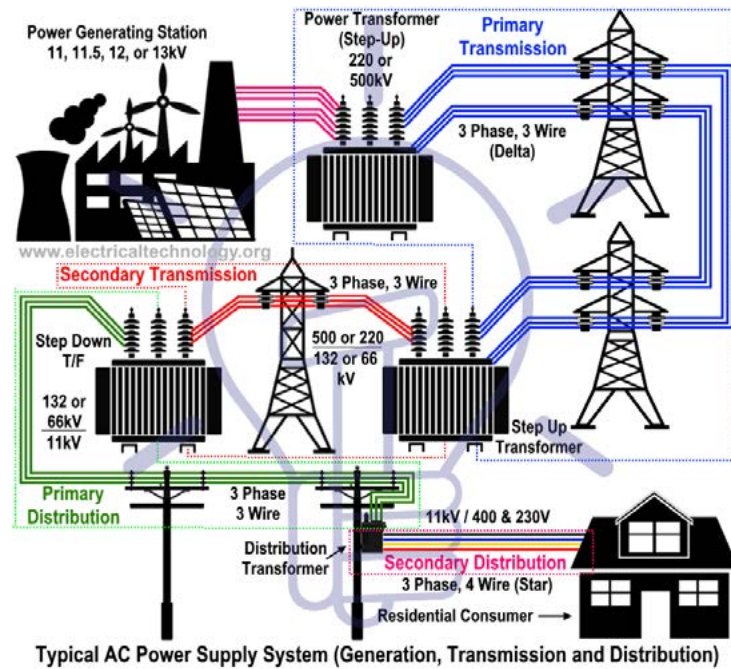
Source: MOEE

Figure (2) Electrification Program Off-grid Component Design Proposal (2015-20)



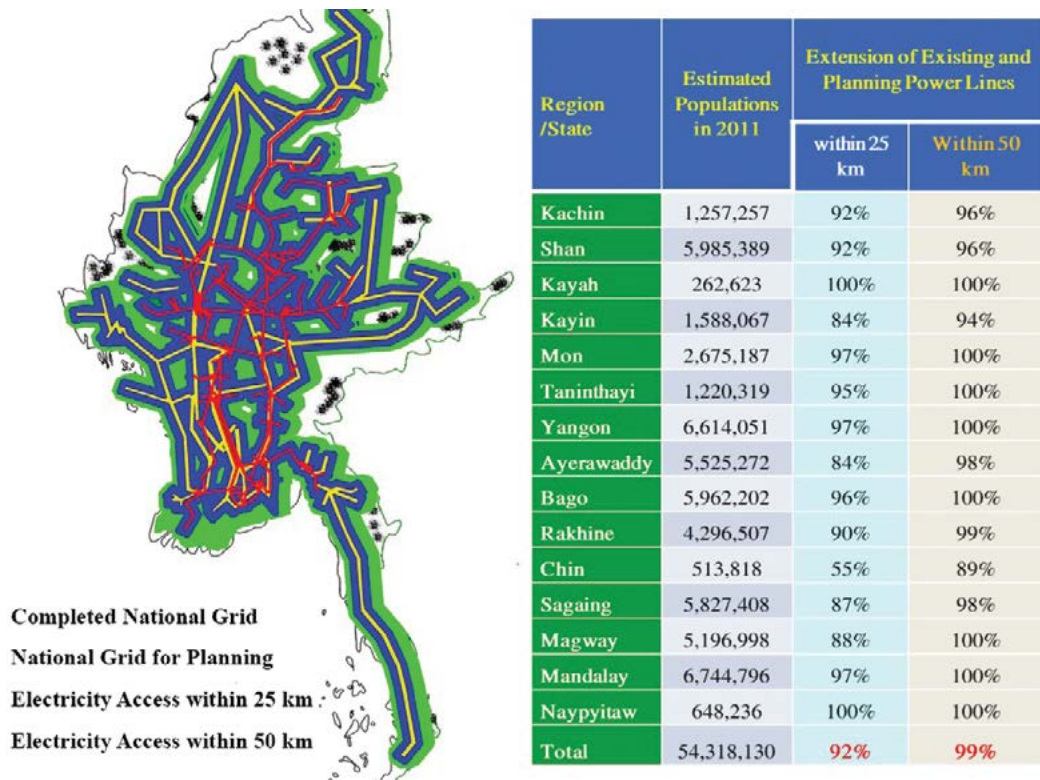
Source: Myanmar National Electrification Project ESMF

Figure (3) Sample of Power Transmission Networking System



Source: www.electricaltechnology.org

Map (3) Myanmar National Grid Network

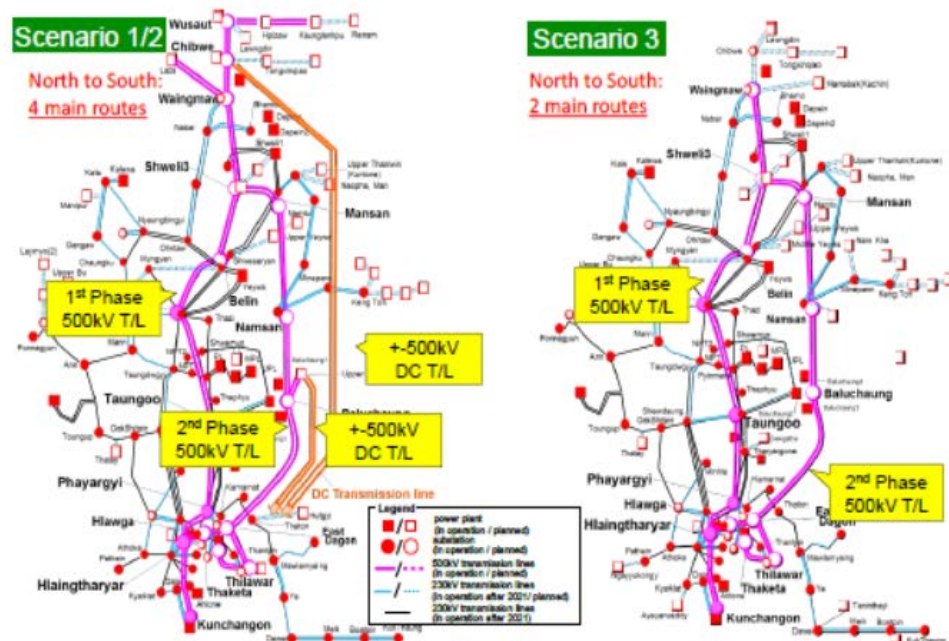


Source: MOEE

The NEP's plan to expand the national grid throughout the country is expensive, slow, and inefficient given the modern technology required and the people living beyond the reach of the national grid will need to wait for many more years before getting access to electricity. The people who are most affected by this policy are those in the ethnic states/regions as they are far from the grid.

Map (4) South to North High Voltage National Grid Line Scheme

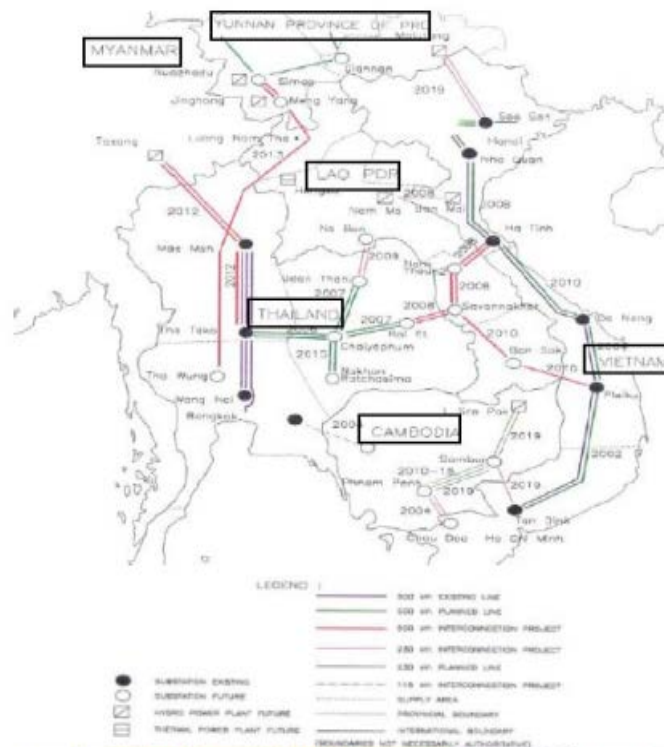
MOEP-NEMP Transmission proposals for Three Scenarios of Generation Expansion



Source: Myanmar Energy Master Plan 2030

Map (5) Master Plan for GMS High Voltage Grid Integration Network

Masterplan for GMS EHV Grid Integration (June 2013)



Source: "The GMS Road Map and Work Plan for Expanded Energy cooperation" (from materials presented at the second Subregional Forum).

Source: Myanmar Energy Master Plan 2030

1.3.7 Energy and Power Plant Development Projects and Conflicts

The majority of the power plants, especially hydropower plants, are located in the natural resource-rich ethnic states. The major renewable natural resources for hydropower—the Irrawaddy, Salween and Chindwin rivers—originate in the ethnic states in the north and flow to the sea in the south. Hydropower and energy development projects in ethnic areas have caused many environmental and social impacts, and armed conflicts are ongoing, particularly in Kachin, Shan, Karen, Arakan and Tenasserim.

After the bilateral ceasefire agreement between the KIO and the former military junta in 1994, development projects, including hydropower investments, were carried out across Kachin State by both parties, together with Chinese investors. Hydropower plants on the Nmai and Mali rivers and other tributaries have been implemented both in Myanmar Army and KIO controlled areas. Currently four hydropower plants provide 24-hour electricity to the people in Myitkyina, Bamaw, and Waimaw, but the unit price is higher than the government rate (35-100 kyat for the household consumption). Memoranda of Understanding (MOUs) have been signed with China for 18 hydropower plants with the installed capacity of 21,259 MW in Kachin State. President Thein Sein suspended the controversial proposed Irrawaddy Myitsone dam in 2011 due to public outcry and the KIO sending an open letter of opposition to the Beijing and Naypyidaw governments. All these projects are located under mixed-controlled areas and add fuel to long-standing conflict. In June 2011, the 17-year ceasefire agreement ended with bloodshed when the Myanmar Army wiped out KIA's strategic post next to the Tarpein 1 hydropower plant in Bamaw district. In April 2018, the armed conflict between the KIA and the Myanmar Army erupted in the Danai area, where China is pursuing its One Belt One Road project and a new industrial zone, an onshore gas block is open to Russian exploration, and amber mining has been taken over by the central government, all in previously KIA-controlled areas. The conflict in Kachin State alone has displaced over 120,000 people.

In March 2011, the Myanmar Army mobilized 3,500 troops to attack the Shan State Army-North (SSA-N) near the upper Salween dam sites, which ended a 22-year ceasefire. The upper Salween dams will flood major areas controlled by Shan armed groups and displace tens of thousands, but 90 percent of the electricity generated from the dams will be exported to Thailand and China (see Map 6). In May 2011, four Chinese engineers surveying upstream of the proposed Tasang (Mong Tong) dam site on the Salween River disappeared and the Myanmar Army sent three battalions to search and rescue.



*Picture (1). Villagers fleeing to the refugee camp due to the armed conflict in Tenasserim Photo in 1997
© EarthRights International*

In December 2007, the Karenni National Progressive Party attacked 20 Myanmar Army trucks transporting hydropower investors surveying the Ywathit dam; three persons were killed, including a foreign technician.⁴² On March 18, 2018, two Shan people on their way to Nawng Bing village were shot dead without any reason by Upper Yeywa dam security force Infantry Battalion 23 in Kyaukme Township, northern Shan State.⁴³

In 2006 and 2007, in Karen State, two persons from the Electricity Generating Authority of Thailand (EGAT) surveying the Hatgyi dam on the Salween River were killed by a landmine and a grenade. Consequently, in November 2007, the Myanmar Army forced the Democratic Karen Benevolent Army (DKBA), whose headquarters were next to the Hatgyi dam site, to turn into a border guard force, but the DKBA refused. The armed conflict has escalated several times near the dam site, notably in 2014, 2016, and 2018. Since the first confrontation, 7,400 villagers from over 35 villages have become IDPs; none have yet to return (KHRG and KRW 2018).

Apart from military confrontations near dam sites, militarization and human rights violations along the oil and gas pipelines in Tenasserim, Mon, Arakan, and Shan are also well-documented. For the sake of the dual pipeline security and energy profit interest, the Myanmar Army has been trying to clear out ethnic armed organizations (EOs) stationed along the pipeline route in northern Shan State, which is home to more than four major EOs (BNI 2013).

The Myanmar Army built up at least 30 Infantry Battalions, military outposts, camps, barracks, and sentry camps along the Yadana gas pipeline in Tenasserim, where Dawei, Karen, Mon and other ethnic peoples reside (see Map 6). “TOTAL Battalions” were given the duty to protect the project and company, but villagers suffered forced labor, extrajudicial killings, rape, and torture, and were forced to flee to refugee camps (ERI 2008).

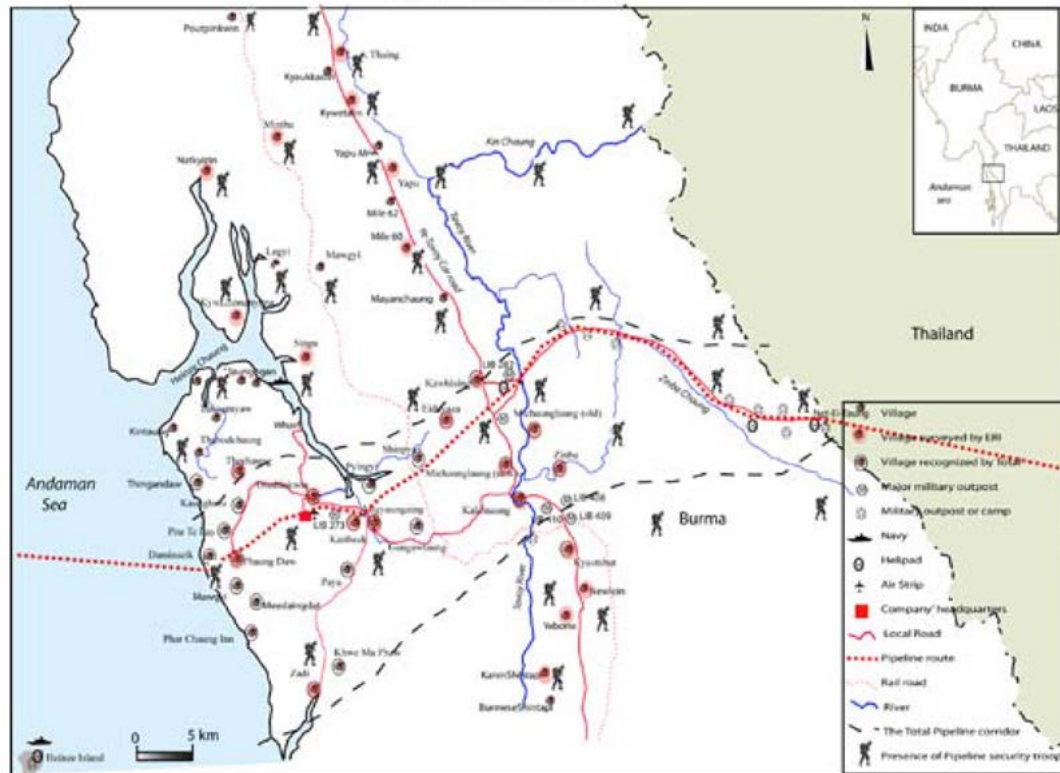
Arakan, another state hosting energy and economic corridor development, has suffered a similar fate at the hand of energy export, and geopolitical maneuvering. In August 2000, Daewoo International Company signed a memorandum of understanding with MOGE to explore, produce, and market the Arakan natural gas deposit, with the intention of selling the gas to India. After the military’s brutal crackdown in the saffron revolution of 2007, the former military regime sold the gas to China in June 2008 as a reward for Chinese defending Myanmar at the UN Security Council (Steinberg and Fan 2012). China National Petroleum Corporation (CNPC) signed a MoU with the Myanmar Ministry of Energy to construct, manage, and operate the Myanmar-China gas and oil pipelines, an offload port, terminal, and storage, and transportation facilities. As soon as the projects began, militarization, land confiscation, and relocation by local authorities, the regional commander, battalion commanders, and police officers commenced, affecting citizens in 22 townships in Arakan, Magway, Mandalay and northern Shan State (see Map 7). From 1988 to 2006, military bases have increased from 3 to 43 IBs in Arakan state (see Map 9). Light Infantry Battalion (LIB) 542, 543, and IB 34 are stationed at the Kyauk Phru Initial Gas Terminal and navy bases including nine sub stations are positioned on the eastern side of Ramree Island to monitor the restricted zone around the offshore rigs (see Map 8).

Energy and electrical infrastructure development without the consent of local people or state/regional governments is giving more profit to the union government at the expense of local people. For the sake of project site security and territory control, the government brought in many Myanmar Army battalions to the ethnic areas. As a consequence, armed conflict, land confiscation, extrajudicial killings, forced migration, and a host of human rights violations have been and continue to be committed. More armed conflict and social chaos may unfold if the central government continues to irresponsibly manage mega hydropower plants and pipelines.

42 <http://burmacampaign.org.uk/hydropower-dams-fuelling-conflict-in-burma/>

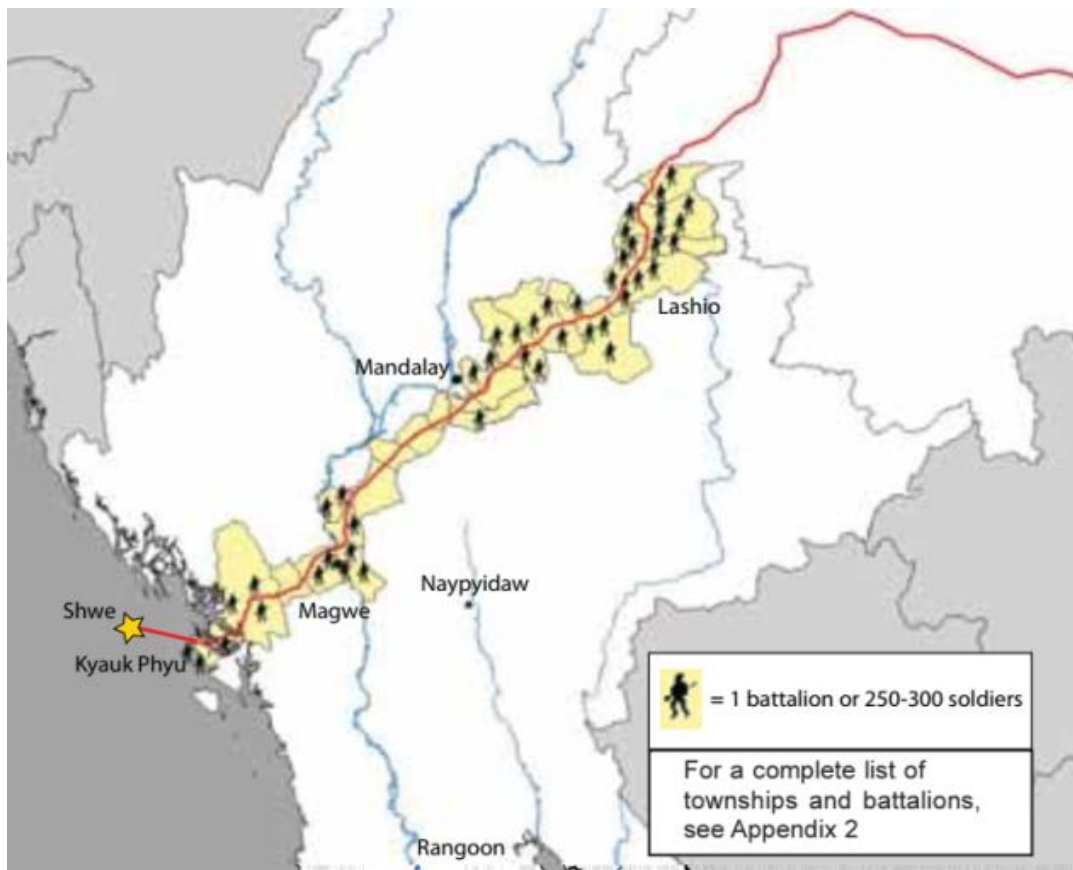
43 <http://www.shanhumanrights.org/eng/index.php/videos/308-drowning-a-thousand-islands>

Map (7) Yadana gas pipeline and military camps



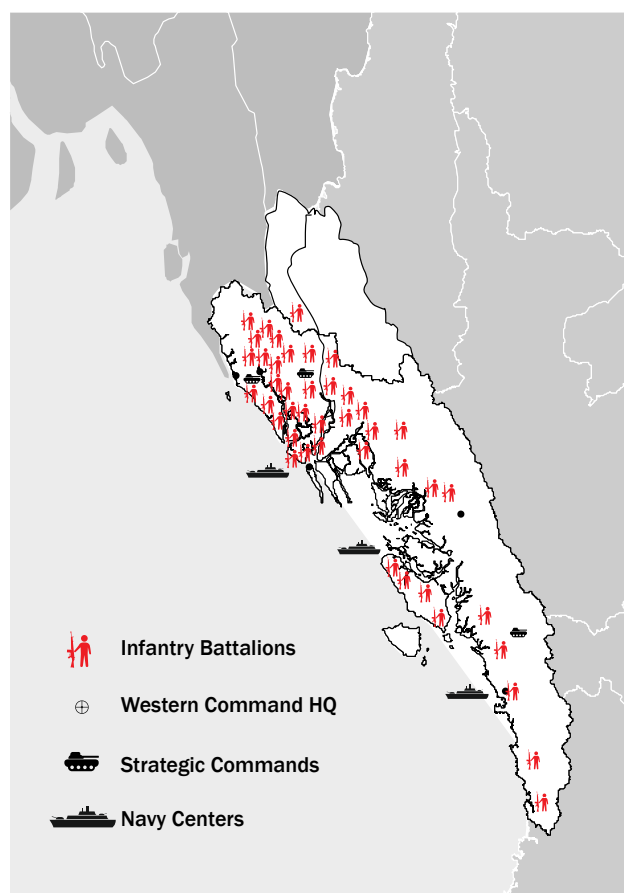
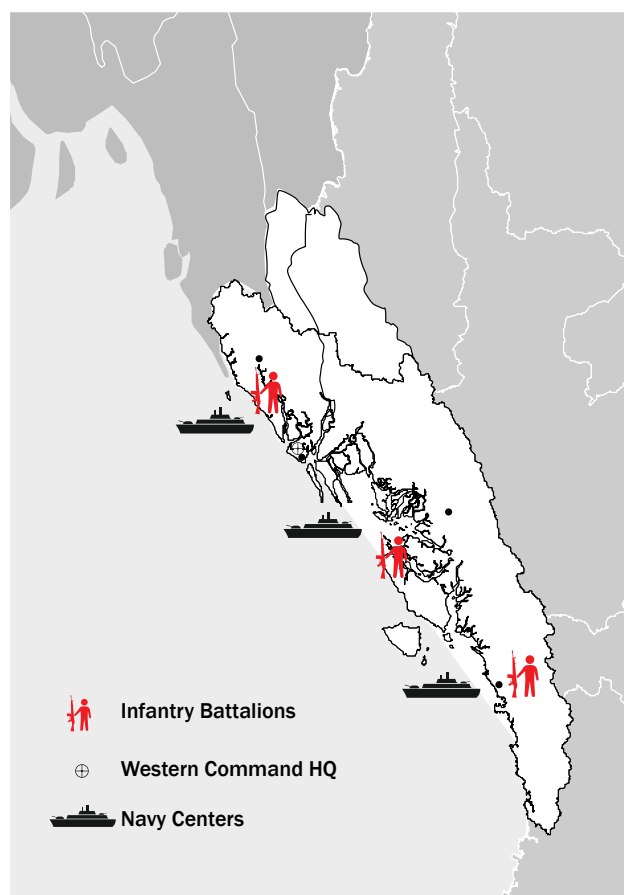
Source: Shwe Gas Movement

Map (8) Military security camps along the Shwe gas pipeline



Source: Shwe Gas Movement

Map (9) Thatmadaw in Arakan state from 1988-2006



Source: ERI

Conclusion

Myanmar has four major rivers and hundreds of tributaries, an abundance of onshore and offshore gas, oil, coal, and other energy resources. Yet Myanmar cannot provide basic electricity access to the whole country. In order to meet the demand, Myanmar has approved a plan to provide universal electricity access by 2030 by developing the energy sector, including building more hydropower plants. As existing and planned hydropower plants are located in the conflict zones and coal power plants draw social opposition and are environmentally damaging, the government is prioritizing gas power plants to meet energy needs. However, Myanmar is selling billions of USD worth of natural gas to China and Thailand while new gas plants generate power with imported gas. To implement its 2030 plan, the government approved the NEP and will carry it out in three phases throughout the country. NEP priority areas are not the homes of major hydropower plants, where decades long armed conflict is occurring, but the dry zone of central Myanmar. Energy politics continue to play out among the ethnic armed groups and the Myanmar Army against the backdrop of Chinese investments in mixed administrative areas. Moreover, many serious human rights violations have been perpetrated in connection with energy projects. The former military regime turned its back to tackling these abuses and it remains to be seen how the semi-civilian government will protect citizens, rectify past actions, and secure the energy needs of the country.

CHAPTER 2: THE ROLE OF THE STATE/ REGIONAL GOVERNMENTS IN ENERGY GOVERNANCE

2.1 Energy Executive Body of the State/Regional Government

Energy governance in Myanmar involves a complex array of departments. This chapter focuses solely on energy and energy related natural resources (oil and gas). For decades, the energy sector was nationalized under the military regime. The state/regional governments had no mandate or authority over electricity generating power plants. Revenues from the energy sector, which amounted to billions of dollars in foreign currency, were not disclosed to the public and the government annually announced that it had to inject billions of Kyat in subsidies into the sector. The country suffered chronic electricity shortages and information about the negative impacts of energy projects was heavily censored. Until the parliament of the quasi-civilian government and the semi-opened media started questioning the “Other Accounts” (both onshore and offshore) owned by the energy ministries, the public had no clue how energy revenues were spent. This remains opaque today.

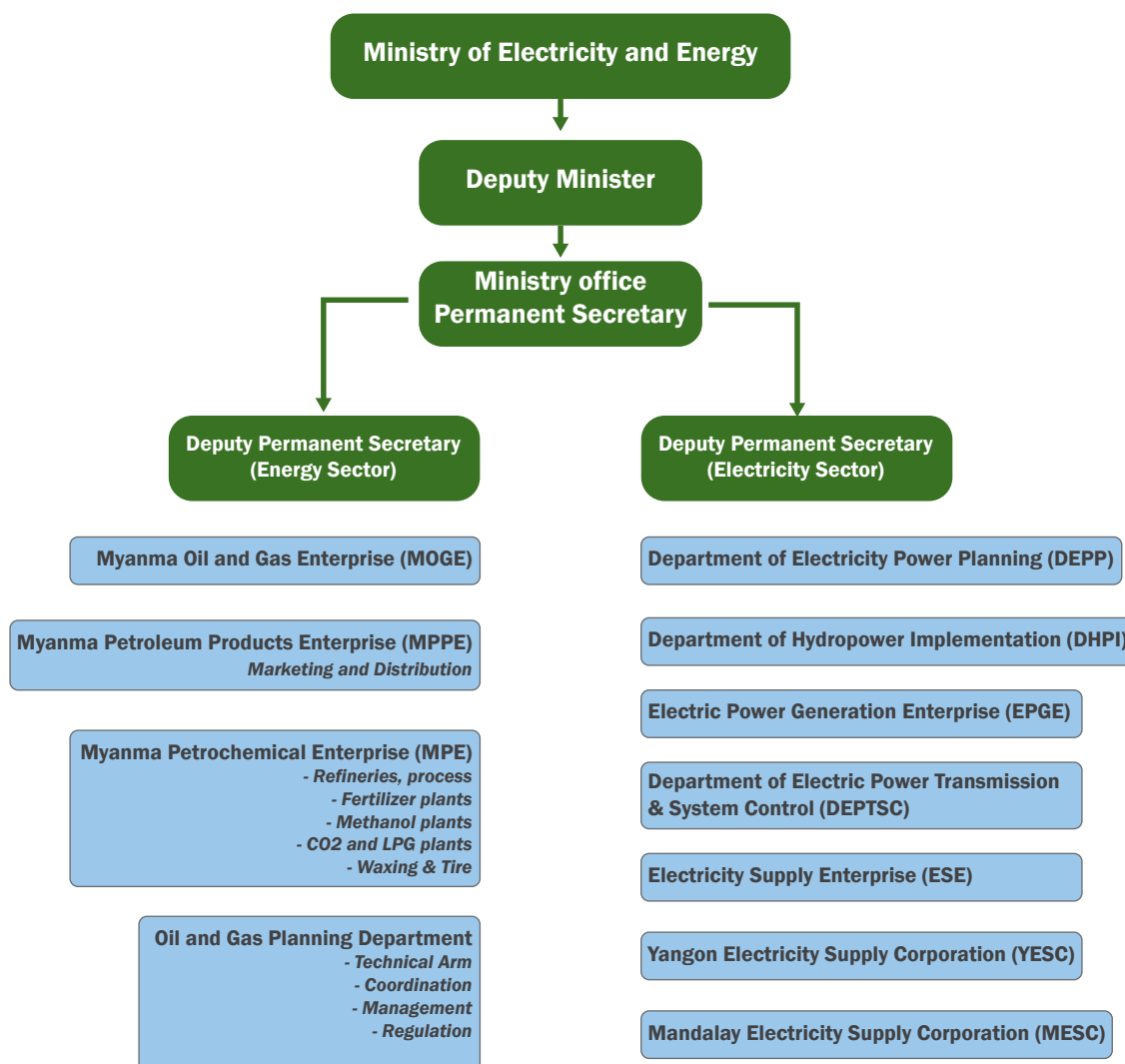
In the past the majority of high-ranking staff in the energy ministry were retired military personnel or those who had a close relationship with the military; this trend has not been completely erased today. It was very rare to see civilian Energy and Electricity Ministers until 2011. After the hybrid government came into office in 2011, civilians and experts have been brought into the ministry. Before the NLD government, the energy and electricity sectors were run by three ministries: the Ministry Energy oversaw oil and gas; the Ministry of Electric Power (1) oversaw electricity generation (mainly hydropower plants) in upper Myanmar (from Mandalay to Kachin State); and the Ministry of Electric Power (2) did the same for lower Myanmar, from Mandalay to Tenasserim region.

After the NLD government took office, all three ministries were merged into one, the Ministry of Electricity and Energy (MOEE), in order to scale down ministry expenses and run more efficiently. The MOEE is comprised of a ministry office, four departments, five enterprises, and two corporations. The ministry is run by the minister, a deputy minister, a permanent secretary, two deputy permanent secretaries (one for energy

and the other for electricity); all departments and enterprises are supervised by the Director Generals, Managing Directors, and Departmental Heads (see Chart 11). The MOEE has full authority to grant concessions and explore, construct infrastructure, produce, distribute, sell, and buy energy, and grant licenses to other entities to operate projects. It is the only institution that has the mandate to build, manage, and operate the National Grid Lines across the country.

The energy-related institutions, structure, and flow of authority at the state/regional government level remain very vague. State and regional governments are given management authority over only small and medium hydropower plants (those that generate less than 30 MW), including production and distribution from those plants. These projects must not have more than US\$ 20 million investment capital and they must be located wholly within the borders of the state or region. If the state/regional government or investors want to sell the electricity from the small or medium-sized power plant to the national grid, the decision whether to buy or not lies with the union government. It is not clear whether state/regional governments have any authority over other power plants (such as gas, coal, solar, and wind plants), which would generate under 30 MW and have less than US\$ 20 million investment capital.

Chart (10) Structure of the Ministry of Electricity and Energy



Source: MOEE

The functions of the each department in the MOEE

The Office of the Ministry is headed by two deputy permanent secretaries: one for the energy sector and the other for the electricity sector. The permanent secretaries are responsible for administrative duties, capacity trainings, registering and issuing licenses, levying taxes, and law enforcement. They are the liaison officers between the ministry and the Hluttaws. The Office cooperates with the state/regional governments, and monitors the monthly revenues and expenditures of the departments, enterprises, and corporations of the MOEE.

The department of electric power planning (DEPP) plays a critical role in drafting and promulgating electricity related laws, regulations, investment procedures, project assessments, trans-border electricity trading, distribution and transmission, contracting, and relations with international financial institutions and regional energy associations. (At the moment, the World Bank (WB), the Asian Development Bank (ADB), the International Finance Corporation (IFC), the Japan International Cooperation Agency (JICA), the Japan Electricity Power Information Center, Inc. (JEPIC), and some Chinese financial institutions are funding power development projects in Myanmar). One of the responsibilities of the department is to cooperate with regional power associations, including the Head of ASEAN Power Utilities/Authorities (HAPUA), for realization of the ASEAN Power Grid and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)⁴⁴ to develop regional energy security and power trading among the members in future.

The department of electric power generation enterprise (EPGE) mainly deals with power sales to domestic consumers and neighboring countries. It purchases electricity from independent power producers (IPP), collecting the Royalty Power (a free share of electricity from the IPP), maintaining and monitoring existing power plants that are under the government management as well as loan repayments. The plants under IPP are managed and maintained by the IPP. EPGE works closely with MOGE to allocate gas to the gas power plants. The EPGE sells electricity to the Electricity Supply Enterprise (ESE), the YESC, and the MESC, which then retails the electricity to customers around the country, in Yangon, and in Mandalay.

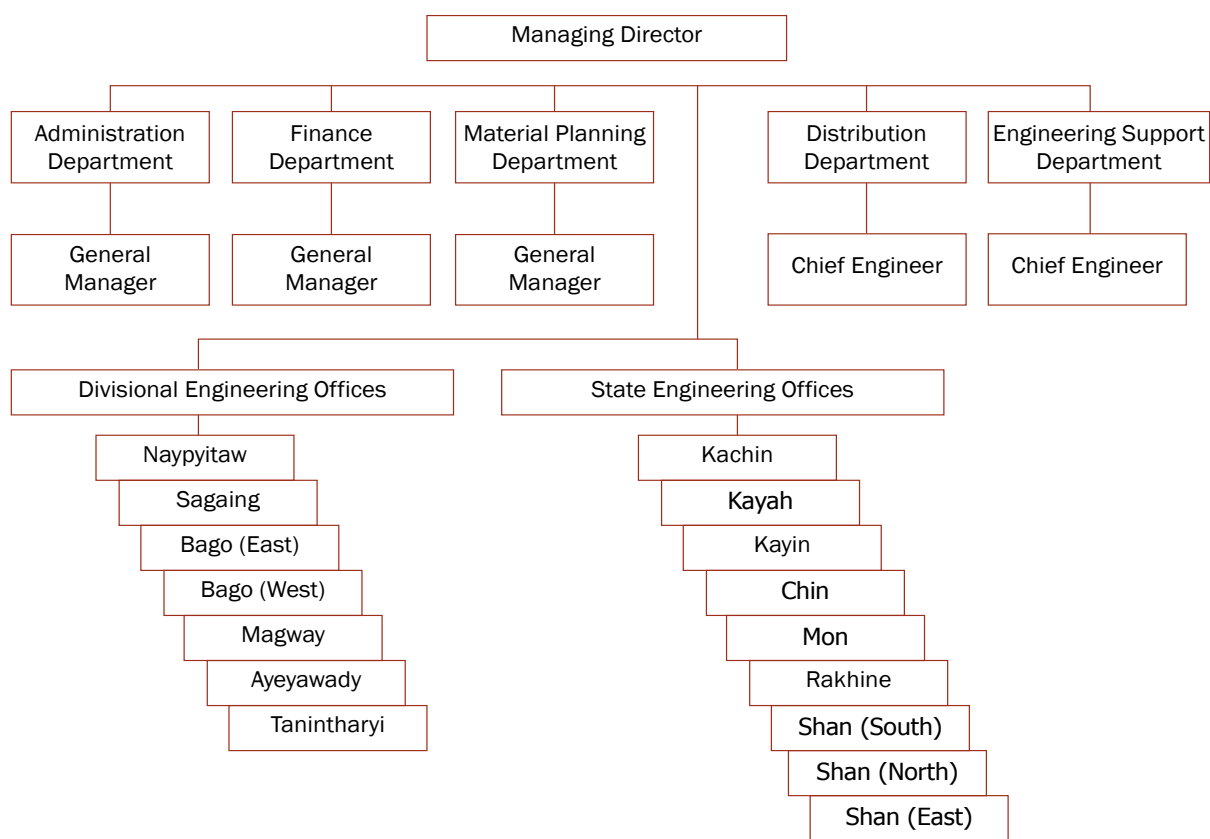
The department of hydropower implementation (DHPI) is responsible for the initial process of designing and building hydropower plants and ensuring that feasibility studies are conducted. It takes a leading role in seismic, geological, metrological and hydrological survey work for dam construction. In addition, it coordinates with international organizations and other agencies for receiving grants and loans, acquiring land and disbursing compensation, reporting monthly to the related departments and international financial aid agencies, and handing over completed hydropower plants to the related department.

The Electricity Supply Enterprise (ESE) is in charge of electricity distribution. The ESE is the only department or state enterprise that buys electricity from all the types of power plants in Myanmar and redistributes it to consumers. No other single company, enterprise, or state department has this authority to retail energy, with the exception of retail operations for the small-scale power plants under state/regional government control. The ESE has 16 electrical engineering offices across the country and various sub-offices at the township level (see Chart 13). These Union offices in the state/regional government ministries manage revenues from retailing electricity, distribute the fiscal budget allocations to the departments in the states/regions, and cooperate with the Office of the Working Committee for the Development of Border Areas and National Races of Ministry of Border Affairs for electrification of the border areas. In addition, the ESE is responsible for electrifying off grid rural areas (with for example small hydropower or fuel-generated power).

⁴⁴ The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is composed of Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan, and Nepal, and countries in the Greater Mekong Sub-region (China, Laos, Myanmar, Thailand, and Vietnam).

Chart (11) ESE structure

Structure of Electricity Supply Enterprise



Source: MOEE

The Department of Power Transmission and System Control (DPTSC) is responsible for installing transmission lines, system control, and maintenance of the 230 kV, 132 kV, 66 kV and 33 kV transmission lines that are directly connected to primary sub-stations and 230kV and 132kV sub-stations across the country. The DPTSC has 62 head offices, 14 transmission or grid line offices, and two planning directorate offices (North and South). Yangon has a separate system control center, while Naypyidaw holds the system control center for the rest of the country. In addition, the DPTSC is responsible for acquiring land and disbursing compensation in order to install transmission lines, as well as connecting the national transmission lines with the ASEAN grid.

State/Regional Government Structure

The state/region government structure is similar with the union government's: it has the executive, legislative and judicial bodies. However, in the legislative body, the state/region has only unicameral legislative body while the union has bicameral legislative body. The entire government, however, is under the authority of the Union Government; it must abide by union laws and policies, and implement union projects that are to be undertaken in the Region or State with the approval of the Region or State Hluttaw concerned (Myanmar Constitution, Article 251). The president of the Union nominates and appoints, with the Hluttaws' approval, a Chief Minister for each of the fourteen states and regions in Myanmar. The chief minister in turn selects and appoints ministers to head the state/regional ministries, including the energy- and electricity-related ministries, either from the elected Hluttaw members or from an outside entity (the private sector). However, the anatomy and composition of the ministries of the state/regional governments differs from the union ministry. For example, the relevant union ministry is the Ministry of Energy and Electricity, while in Karenni State it is the Ministry of Roads, Transportation, and Electricity (see Table 12).

The state/regional minister for border affairs and security is appointed by the union ministry of border affairs, which is headed by the Lieutenant General of the army, who is appointed by the Commander-in-Chief of the Defense Services. According to the 2008 constitution, the state/regional government has the right to request a list of suitable Defense Services personnel nominated by the Commander-in-Chief through the state/regional Hluttaw's approval⁴⁵ (Article 262).

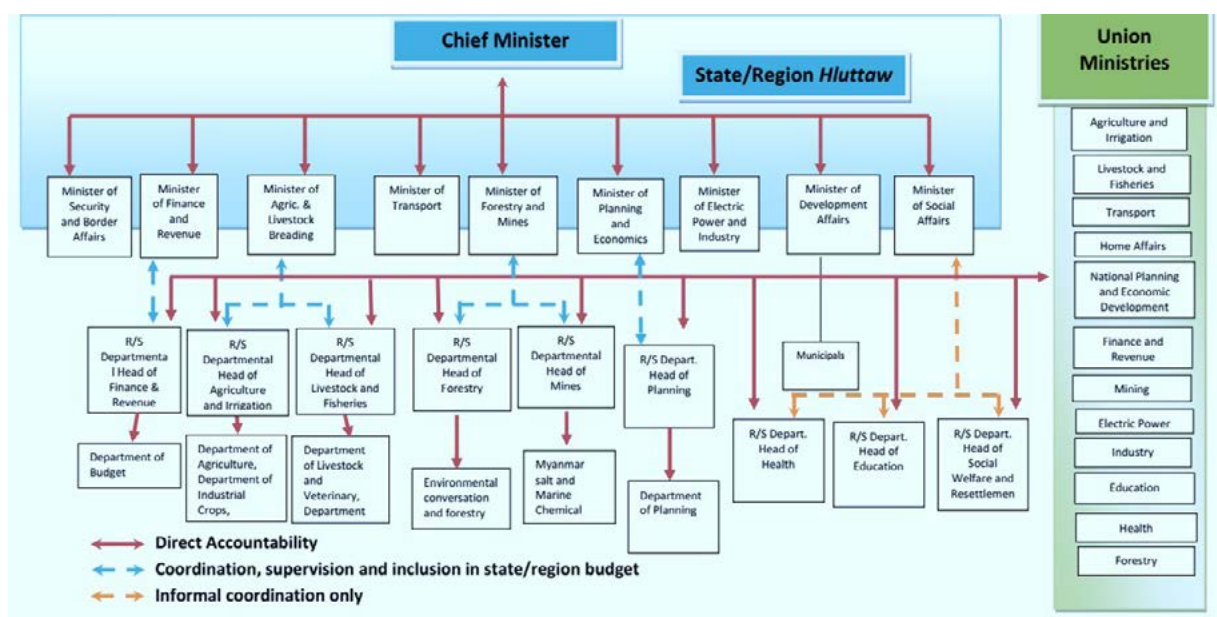
An important department that has no minister in the state/region government, but plays a major role in the state/regional government cabinet's administrative work, is the General Administration Department (GAD) of the Union Ministry of Home Affairs (MoHA), which is also headed by a Lieutenant General who is appointed by the Commander-in-Chief. An unelected GAD senior officer has the paramount responsibilities of the Ex-officio Secretary of the state/regional government. Moreover, the office of GAD in each respective area is the office of the state, regional, self-administration zone, and Naypyidaw governments (Article 260).⁴⁶ The GAD used to report directly to the MoHA, which has the mandate to appoint and dismiss GAD staff (AF 2014)⁴⁷. However, after officially transferring GAD to the newly created Ministry Of the Office of the Union Government, which is headed by the former Air Force Colonel Min Thu, in December 2018, there is no clear announcement about whether GAD will be directly accountable under the president or is still partially reporting to the MoHA of the Commander-in-Chief, under which the police department, fire department and other internal security related departments are still instituted. All the union departments in the state/regional government must also report directly to their mother union ministries as well as to the respective state/regional cabinets (see Chart 12).

45 Article 262, a) ii) request for a list of suitable Defence Services personnel nominated by the Commander-in-Chief of the Defence Services to assign responsibilities of Security and Border Affairs.

46 Article 260. The Head of the General Administration Department of the Region or State is the ex-officio Secretary of the Region or State Government concerned. Moreover, the General Administration Department of the Region or State is the Office of the Region or State Government concerned.

47 On December 26, 2018, the GAD was officially transferred to the civilian government and its head executive ministry was newly created as the Ministry of the Office of the Union Government in Naypyidaw. The ministry is headed by the former Air Force Pilot, Colonel U Min Thu.

Chart (12) Administrative organization of state/regional government



Source: Asia Foundation

Energy Governance

The roles of the ministers in the state/regional cabinets are very vague. There is no separate energy and electricity ministry like the MOEE in any state/regional government. For example, as seen in the diagram above, the electrical ministry is combined with industry and power, and in Kachin and Karenni, the electricity is combined with road and transport within one ministry.

On the other hand, the union ministry (MOEE) operates its own departments and enterprises, such as the ESE, the DTSC, and the EPGE in each state and region except in Yangon and Mandalay (see Chart 13) to take charge of all generation, transmission, distribution, and marketing of electricity. These Union departments located in the states and regions are paid by the Union and need to report directly to the MOEE when cooperating with the state or regional ministry. The Department of Rural Development (DRD) of the MOALI is responsible for the off-grid electrification plan under a US\$ 80 million loan from the World Bank. The project is part of the MOEE's pre-electrification project. However, the Yangon and Mandalay Electrical Supply Committees (YESC and MESC) have a different energy governance model. They are both under the control of the MOEE when they cooperate with the Yangon government. They have full authority to manage and operate transmission from high voltage 66kV lines down to distribution to customers, to build and generate more than 30 MW facilities with the approval of the MOEE, and their staff is paid by the MOEE. Yangon and Mandalay do not have Union staff from ESE, DTSC, and EPGE, like other states and regions do. The YESC and MESC staff collect the fees from the customers and send them back to the Union, and in turn they receive their own separate energy budgets from the Union.

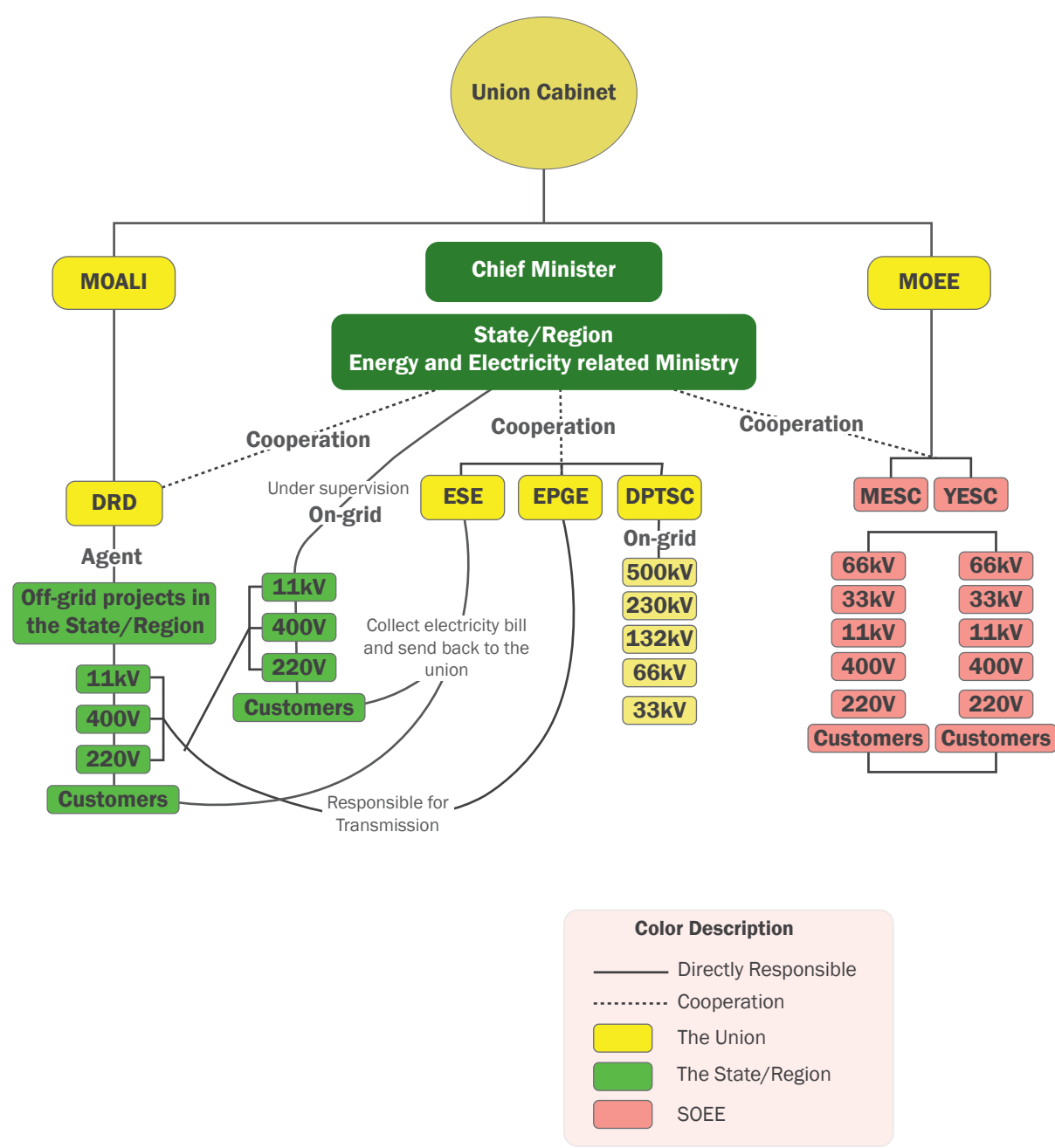
According to Section 251 of Myanmar's 2008 constitution, the state/regional governments are obligated to implement union policies, laws, and regulations.⁴⁸ Within the existing limitations of 0-30 MW power plants with less than US \$ 20 million investment and on less than 100 acres of land, three primary roles are granted to the state/regional governments: 1) providing land use approval, licenses, and permits to operate, 2) public consultation and engagement and coordinating with the relevant Union departments, and 3) review and negotiating with MOEE in the matters of Union level projects in their executed areas (AF

⁴⁸ The Region or State Government shall, subject to the policies adopted by the Union Government and Union Laws, implement projects that are to be undertaken in the Region or State with the approval of the Region or State Hluttaw concerned.

2019). No state/regional government has been granted any authority over onshore or offshore gas and oil projects.

Looking at the energy governance system in Chart 13, and as described above, we can see that the Mandalay and Yangon governments have privileged authority to operate independently. The electrification rates in these areas are also far higher than in the states/regions. It deserves more research to determine how this independent management contributes to more efficient provision of electricity.

Chart (13) Energy sectors that are governed by both State/Region and Central government



Source: Extracted from multiple sources

Generation

The Electricity Law and Regulation that was adopted in October 2014 grants the MOEE authority over the energy and electricity sector. According to Article 13, the MOEE has full authority to grant, explore, and build mega hydropower projects, produce, distribute, sell and buy energy, and give licenses and mandate to build, manage, and operate transmission lines connected to the national grid. There is no such independent authority given to the state or regional governments. However, Article 9 of Electricity Law does allow state/regional governments to manage small and medium power plants,⁴⁹ which do not produce more than 30 MW and do not have more than US\$ 20 million in investment capital. Such management includes production and distribution from those power plants. The state/regional government must get an EIA approved by the Union to build the power plant and MOEE has the authority to buy or to deny and any energy the state or region may want to sell to the national grid.

Distribution

There are two types of energy for distribution: on grid and off grid. The Union manages, controls, constructs, and implements the on-grid or all high voltage projects (including 33-500kV lines and the stations related to those lines), while the state/regional governments are allowed to oversee only 11kV substations, and 11kV, 400V, and 220V cable lines that are directly delivering energy to consumers. The Union allocates the fiscal budget for the Union and for the states and regions. The Union budget covers maintenance and extension projects for the high voltage lines and the state/regional budgets cover all the transmission and distribution down to the 11kV system. It is not clear what independent staff the state/regional ministries have, as it is the offices of the union-level departments, such as the DPTSC and ESE, which are the core implementers of all projects in the states and regions, with the exception of Yangon and Mandalay.

Apart from on-grid projects, off-grid projects are being rapidly and widely implemented across the country to fulfill energy demands and reach 2030 electrification targets. The implementers of these off grid projects are also not the state/regional governments; rather, budgets from the Union are allocated to the Department of Rural Development (DRD) of the Union Ministry of Agriculture, Livestock and Irrigation (MOALI) to take in charge of these projects.

Marketing

The state/regional governments can issue licenses and open bids to foreign or domestic investors for the small and medium power plants, production, distribution, and transmission down to the 11kV system, which is governed by the state/regional government. On the other hand, Article 81 of the Electricity Law stipulates that any private power supplier that wants to sell electricity to the national grid must get approval from the MOEE. The state/regional government is also not granted any authority to buy or sell energy outside of the country; only the Union has this authority.

Article 41 mentions that the MOEE has the right to establish a reasonable per unit price for electricity, while Article 42 grants the same right to the state/regional governments for the electricity it produces that is not connected to the national grid. However, the state/regional government must first determine the locally reasonable price with the help of the MOEE. Revenues from the sale of energy in the states and regions are collected by the ESE (see Chart 13), not by the state/regional government. There is no direct accounting of the flow of those revenues back to the state/regional governments (they are ostensibly part of the meager fiscal budget for the energy sector granted by the union to the respective states and regions).

⁴⁹ The law does not specify which type of power plant. Currently, the MOEE is giving licenses to the IPPs for the power plants run by solar, hydropower, fuel, gas and coal. Since there are no wind power and nuclear power plants operating in the country, it is hard to say whether the MOEE will grant licenses to the IPPs for these.

2.2 Energy Related Taxation Authority of the State/Regional and Union Governments

According to Schedule Two of the 2008 Constitution, the state and regional governments are empowered to enact laws and collect taxes only in relation to power generated and managed by the state/regional governments' small and medium power plants (see Appendix 7). The states/regions are not required to send these accumulated taxes to the union government. All taxes on the power sector apart from those specified in Schedule Five are collected by the Union Government and the union ministries (see Appendix 9). Although the majority of existing power plants are located in the states and regions, there is currently no power plant run by a state or regional government in Myanmar. The taxes and revenues generated from the sale of electricity from the states/regions are collected by the ESE and flow directly to the Union Government, not to the state/regional government accounts. The states and regions must rely on Union allocations for their fiscal budgets, which are disassociated from the revenues generated in the states and regions. The majority of the revenues collected from the power sector across the country are used by the Union for maintenance, project extension, and power purchasing (AF 2019).

The Union Government levies the following types of taxes on the companies that form joint ventures with the MOEE:

- Royalty Power Share (Electricity) to EPGE (between 7-15 percent of the total power produced dependent upon the project capital cost)
- Free Share (electricity) (5-25 percent MOEE holds in the joint venture, excluding royalty power)
- Commercial tax (a sales tax payable after a five-year exemption period)
- Income tax (based on profit)
- Withholding tax on interest (15 percent)
- Withholding tax on contract (3.5 percent)

Energy related natural resource (Oil and Gas) Sector

The Oil and Gas sector is the bread earner for Myanmar's GDP. The sector is solely under the management of MOGE of MOEE. When it operates in the oil and gas industries, it usually creates a consortium, which usually is teamed up with the foreign investors and includes MOGE. Oil and Gas Consortiums must provide the non-tax items mentioned below directly to the MOGE (see Chart 14) (To understand more about non taxes, see Appendix 11).⁵⁰ The Internal Revenue Department of the Ministry of Finance collects taxes, while non-taxes directly go to MOGE. Pipeline transit fees are annually given to the respective state/regional governments. The Yadana and Yetagon pipelines, which pass through Kanbawk Township in Tenasserim region to Thailand, earn US\$ 1 million annually in transit fees, yet the region remains one of the poorest electrified and least developed. The land fee is also paid annually based on the area covered by the pipelines (ASI 2015). However, whether the Shwe gas dual pipeline transit fees and land rights fees are given to the local government in Arakan State remains unknown.

The Adam Smith International Institute estimates that 40 percent of Myanmar's extractive industries revenues are managed by ministries and state-owned economic enterprises (SEE) through Other Accounts (OAs) at the Myanmar Economic Bank (MEB). These revenues are beyond government oversight and not included in the budget. MOEE's 3 offshore OAs and MOGE's 14 OAs are in Singapore. In total, the Myanmar government has 4,319 onshore and offshore OAs, including 517 AOs in states and regions. The government has announced that it will close all OAs in the 2019-20 fiscal year. Consortium members or investors can make payments to MOEE or MOGE's Other Accounts located offshore; in the past they were often used as a way to avoid sanctions and facilitate payments outside of Myanmar. The MOGE then reports financial receipts to the departments of internal revenue and budget of the

⁵⁰ If the transfer is in Myanmar currency, it should be made through the Myanmar Economic Bank; transfers in foreign currency should go through Myanmar Foreign Trading Bank.

Ministry of Finance. If MOGE does this, then are the financial receipts “beyond oversight and not in the budget”?

Non-taxes that go to directly to MOGE

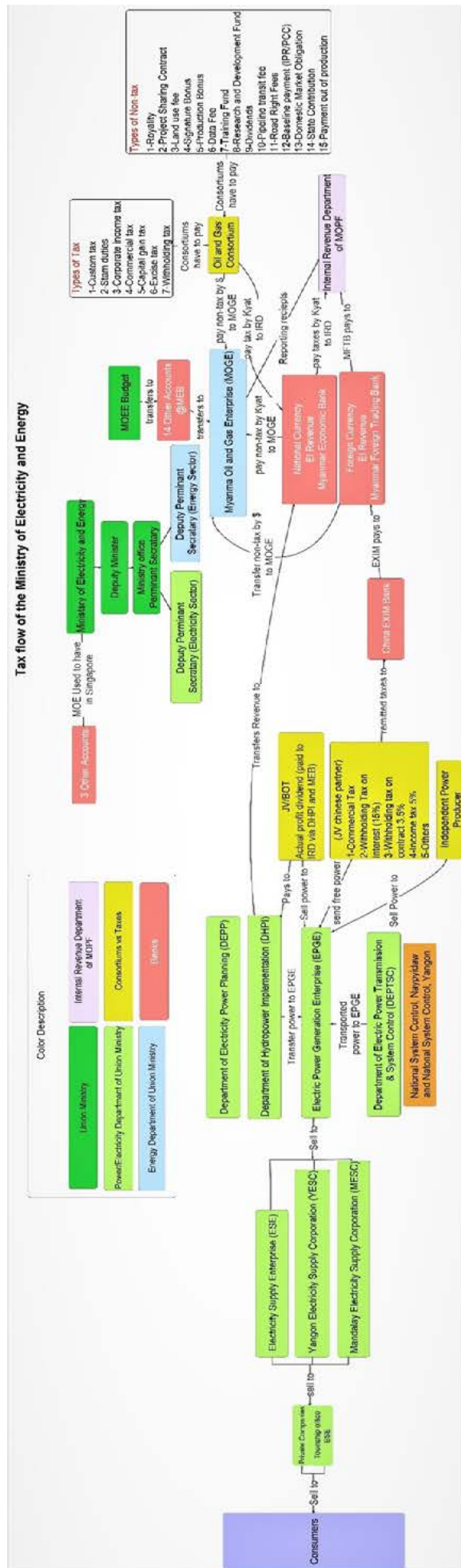
1	Royalty	6	Production Bonuses
2	Production Sharing/split	7	State Contribution
3	Land Rent	8	Data Fee
4	Pipelines transit fee	9	Training Fund
5	Signature Bonus	10	Research and Development Fund

Apart from these non-tax items, the consortium must also pay the taxes described below directly to the departments of internal revenue and budget of the Ministry of Finance.

Taxes that go directly to the Internal Revenue Department of Ministry of Finance

1	Customs tax	5	Capital gain tax
2	Stam duties	6	Excise tax
3	Corporate income tax	7	Withholding tax
4	Commercial tax		

Chart (14) Tax flows to the Ministry of Electricity and Energy



Source: The information for this chart is abstracted from various secondary sources.

2.3 Energy-related Legislative Authority of the State/Regional Governments

The state/regional Hluttaws (assemblies) have the constitutional right of legislative authority, but in the power/energy sector, their legislative authority is extremely superficial. In theory the assembly has the authority to oversee and provide checks and balances on the work of the ministers, but in practice this does not occur. State/regional assemblies can also approve the electrical bills submitted by the related committee. The lists in Schedule Two of the 2008 constitution are the only constitutional legislative rights granted to the states/regions for the energy sector. These include rights to legislate on matters of streetlights, small (0-10 MW) and medium (10-30MW) scale power plants, production and distribution (see Appendix 7). There is no other legislative authority granted to the state/regional government in terms of planning, designing, exploration, construction, generation, production, distribution, electrification projects or retailing national grid and off-grid electricity managed by the union government. All these authority are left exclusively to the union legislative list (see Appendix 8).

The Union government signs MoUs with investors for large-scale power plant projects in the states/regions without discussing or even informing the respected state/regional assemblies, ministries, or public. This has created social and environmental problems in the states/regions and has created delays in several projects. This gap needs to be urgently addressed to avoid further delay of project implementation and unnecessary negative impacts.

2.4 The Role of State/Regional Governments in Energy Investment Sector

The 2008 constitution stipulates that all natural resources found within the territory of Myanmar are owned by the Union, which enacts laws to supervise the extraction and use of those resources. Accordingly, the state/regional governments have an insignificant role over any investment in extracting or using natural resources. All investments that require more than US\$ 20 million of capital within the country, any investment, either by a foreign or domestic investor, that requires more than 1,000 acres of land (for agriculture) or 100 acres of land (for business), or any cross border investment exceeding US\$ 1 million, and investment activities that are essential to the national strategy need permission from the Myanmar Investment Commission (MIC) or the state/regional Investment Committee.

The Commission has 13 members; all (except one) hold union-level government positions (see Table 8). There is no representative from the states or regions on the commission. Under the Myanmar Investment Rule (MIR) (2017), the state/regional governments are allowed to have their own investment committee/commission offices, but these are headed by the chief minister and the union government's Department of Investment and Company Administration (DICA) office. Having a DICA office head the state/regional investment committee/commission indicates the limited ability of the state/regional governments to execute projects.

Schedule Two of the 2008 constitution gives the state/regional government authority over investments that do not exceed US\$ 20 million, including those in energy infrastructure, production, and distribution, from small and medium size power plants that do not connect to the national power grid. This means that if a proposed small or medium hydropower plant needs more than 100 acres of land or more than US\$ 20 million of investment, it will be implemented by the union government, not by the state/regional government.

However, Yangon and Mandalay have privileged granted authority to manage projects with over US\$20 million in investment capital in the energy sector with the approval of MOEE.

Table (8) Myanmar Investment Commission (MIC)

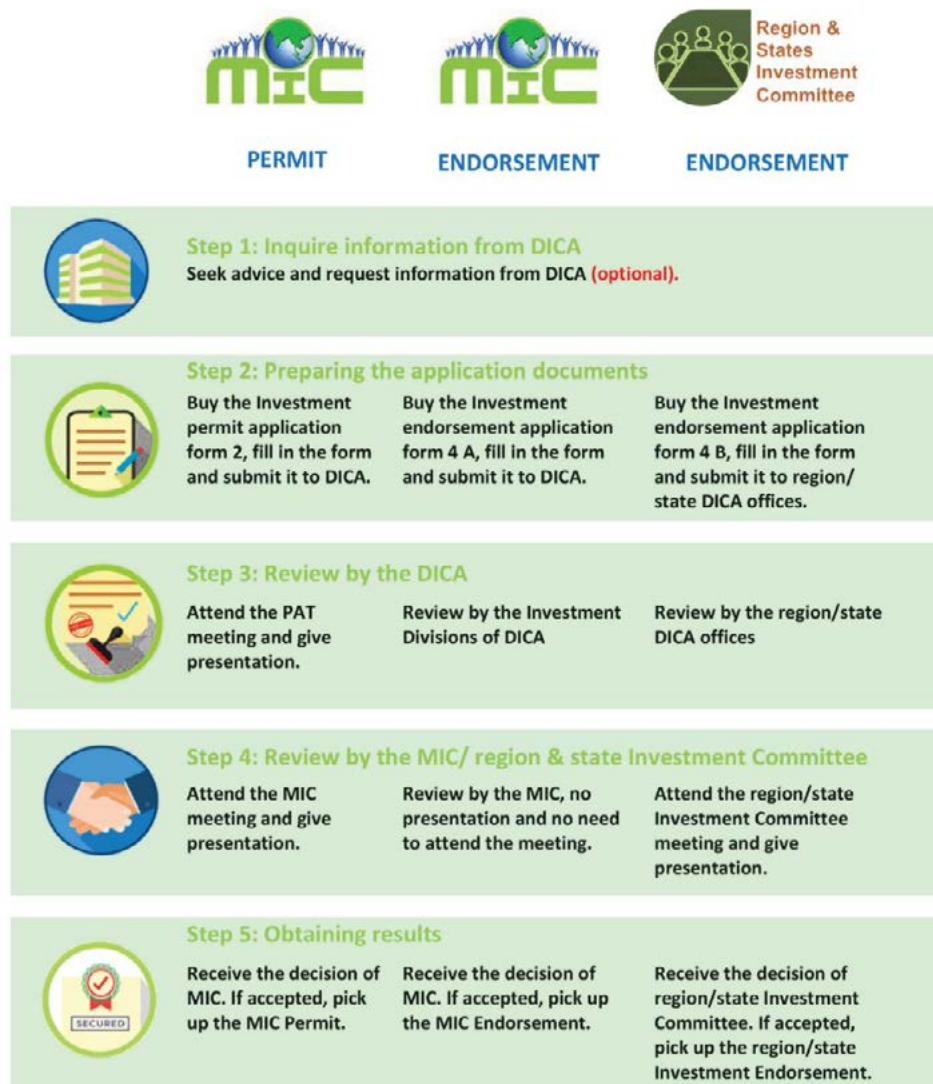
NO.	MEMBER NAME	FUNCTION	INSTITUTION	ROLE
1.	H.E. U Thaung Tun	Union Minister	Ministry of the Office of the Union Government	Chairman
2.	H.E. Dr. Than Myint	Union Minister	Ministry of Commerce	Vice Chairman
3.	H.E. U Tun Oo	Union Attorney General	Union Attorney General Office	Member
4.	U Set Aung	Deputy Minister	Ministry of Planning and Finance	Member
5.	Daw Nilar Kyaw	Minister	Yangon Regional Government	Member
6.	Dr. Aung Tun Thet	Economist		Member
7.	U Khin Maung Yee	Permanent Secretary	Ministry of Natural Resources and Environmental Conservation	Member
8.	U Toe Aung Myint	Permanent Secretary	Ministry of Commerce	Member
9.	U Htein Lwin	Permanent Secretary	Ministry of Electricity and Energy	Member
10.	U Htay Chun	Deputy Director General (Retired)	Directorate of Investment and Company Administration	Member
11.	U Aye Lwin	Central Executive Committee Member	Republic of the Union of Myanmar Federation of Chambers of Commerce and Industry	Member
12.	U Aung Naing Oo	Director General	Directorate of Investment and Company Administration (DICA)	Secretary
13.	Daw Mya Thuza	Deputy Director General (Retired)	Directorate of Investment and Company Administration (DICA)	Joint Secretary

Source: Republic of the Union of Myanmar Union Government Notification No. 61/2018, Re-Organization of Myanmar Investment Commission

Investment Registration Process

Every normal business needs to register at the centralized Directorate of Investment and Company Administration (DICA) office, get permission from the Myanmar Investment Commission (MIC), and get an endorsement from the state/regional investment commission in order to operate. This requires five steps as illustrated in Chart 15.

Chart (15) Investment Registration Process

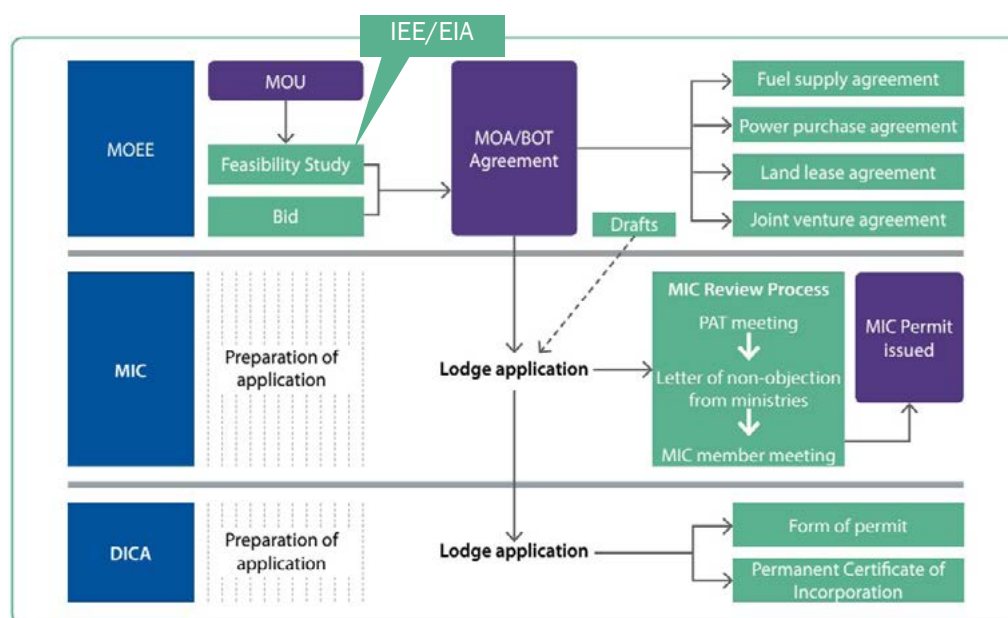


Source: DICA

The procedures differ according sector. In the case of energy investments, the MOEE announces the tender for a new power plant. The interested foreign investors, together with any local partners, submits their expression of interest to the MOEE. After winning the bid, the company has to conduct an Initial Environmental Examination (IEE) during the MOU period. If the MOEE accepts the project, the company then signs the first legally binding document, the MOA, with the MOEE, and carries out an EIA. The MOA includes the land lease, joint venture agreement, fuel supply agreement, and power or electricity purchase agreement (see Chart 16). The company then must submit its proposal, including the MOA and supporting documents through the DEPP to the MOEE and the MIC. The MIC reviews the proposal with the help of the Union Attorney General's Office (UAGO) for a legal perspective. After receiving feedback from the MIC, IRD, UAGO, and MOF, the company will get a final yes or no from the MIC (see Chart 15). The entire process may be done within 10 weeks, not including the IEE/ EIA feasible study period. During this time the state/regional government is not consulted. The role of the state/regional government is not only limited in the areas of investment, generation, distribution, transmission and electrification decisions, but it is also clearly limited in the area of impact assessment as well.

In a joint venture, the foreign investors are not allowed to own more than 80 percent of the project. In a Build-Operate-Transfer (BOT) project structure, however, foreign investors can own 100 percent of a Myanmar entity, which concludes the BOT agreement with the government. Usually, (union) cabinet approval is obtained before the concession is granted by means of the MOA.

Chart (16) Hydropower Investment Procedures



Source: DICA

When applying for a MIC permit under Article 36⁵¹ of the MIL, which includes investment activities essential to the national strategy,⁵² investors in the sectors of mining, oil and gas, energy and other services must submit the following documents in their MIC permit application package:

Documents that go to directly to MOGE

- 1 Proposal form (2)
- 2 Copy of company registration certificate
- 3 Copies of identification card /passport
- 4 Financial documents (Bank statement)
- 5 Joint Venture agreement if any (only in the form of JV-foreign investors are not allowed to own more 80% of the JV)
- 6 Lists of machinery and equipment (to be imported)
- 7 List of raw materials
- 8 Construction materials (not available locally)

51 Section 36. The investor shall submit a proposal to the Commission and invest after receiving the Permit for the following investment activities stipulated in the rules; (a) investment activities that are essential to the national strategy; (b) large capital intensive investment projects; (c) projects which are likely to cause a large impact on the environment and the local community; (d) investment activities which use state owned land and buildings; (e) investment activities which are designated by the Government to require the submission of a proposal to the Commission.

52 Information, communication, medical, bio or similar technologies, logistics/energy infrastructure, urban development, new cities, natural resources, media and etc. (Investment value exceeding US\$ 20 Million), Cooperation with a Government organization (Investment value exceeding US\$ 20 Million), Investment made in a border region or conflict affected area, Investment made across the national border, Investment made across the States and Regions, Occupying or using more than 1000 acres of land for agricultural related purposes, Occupying or using more than 100 acres of land for non-agricultural related purposes.

- 9 Land Rights Authorization form (7-A)
- 10 Evidence of land ownership
- 11 Land lease agreement (draft)
- 12 Location map/layout plan
- 13 Recruitment of employees (local/foreigner)
- 14 Social security for the employees, social welfare plan, CSR plan, firefighting system
- 15 Production plan
- 16 In submitting proposal, in accordance with the section 36 of MIL, any proposals having the following conditions shall be submitted through the relevant ministry:
 - a. Having a significant ownership interests in the investment by the government organization;
 - b. Having been granted or intending to grant concession by the government department or government organization; or
 - c. Being acquired or authorized by law to do so by the government department or government organization (you may not need to show all these procedure)

2.5 Procedure for Environmental Impact Assessment or an Initial Environmental Examination

After the investors sign a MoU, during the feasibility study period, they must carry out an Environmental Impact Assessment (EIA) or an Initial Environmental Examination (IEE), depending on the project size. The 2012 Environmental Conservation Law (ECL) and the 2014 Environmental Conservation Rules have important implications for domestic and foreign investors in this regard. According to Article 7 of the ECL, the Ministry of Natural Resources and Environmental Conservation (MONREC) is the main body responsible for ensuring compliance with this law. MONREC is responsible for facilitating the settlement of environmental disputes and developing and implementing a system of environmental impact assessment (EIA) and its social impact assessment (SIA) component. According to the new Environmental Impact Assessment Procedure released in December 2015, investors have to carry out either an initial environmental examinations (IEE)⁵³ or an environmental impact assessment (EIA) for any power plant, depending on its size (see Table 9). Both IEEs and EIAs must include an environmental, social, and health impact assessment, and an environmental management plan (EMP) before the project is implemented, and follow the standards of international financial institutions, including the World Bank, and Asian Development Bank, for the non-voluntary resettlement of indigenous people. If the investors fail to follow the Environmental Impact Assessment Procedure, including the required social impact assessment, a fine of US\$ 1-10,000 and/or the suspension or revocation of the project may be implemented with the approval of the (union) ministry. Yet, it is hard to know whether the 2015 Environmental Impact Assessment Procedure and the Environmental Conservation Law of 2012 are applicable to projects completed during the former military regime.

After reviewing the EIA or IEE, MONREC decides whether to approve or reject the project. If approved, MONREC issues an Environmental Compliance Certificate (ECC), which is necessary for project construction and operations to commence. Approved projects must

53 Initial Environmental Examination or IEE Type Project means a Project judged by the Ministry to have some Adverse Impacts, but of lesser degree and/or significance than those for EIA Type Projects. It means generally those which:

- Are limited in scope or size;
- Have well known environmental and social impacts that for the most part are temporary, local and reversible; or
- Have impacts which can be mitigated and managed by well-proven and available technologies and practices but with respect to which specific controls, measures and alternatives must be assessed, designed and implemented.

commence within two years of the issuance of the ECC. Project implementers must submit EIA compliance reports to MONREC every six months. Any breach of the EIA procedures by the project implementer may result in penalties or administrative punishments.

Table 9 EIA and IEE Requirements for Power Plant Projects

	Initial Environmental Examination (IEE)	Environmental Impact Assessment (EIA)
	Installed capacity >1 MW but <15MW	Installed capacity >15 MW
Hydro	Reservoir volume (full supply level) <20,000,000m ³	Reservoir volume (full supply level) >20,000,000m ³
	Reservoir area (full supply level) <400 hectares	Reservoir area (full supply level) >400 hectares
Gas	5MW to 50MW	<50MW
Coal	1MW to 10MW	<10 MW
Wind	5MW to 50MW	<50 MW
Solar	<50 MW	<50 MW
Nuclear	-	All

Source: MONREC

Although the majority of Myanmar's electric power generating plants are in the ethnic states/regions, the union government and union-level ministries rigidly control energy governance. The state/regional governments and their cabinets have very limited authority related to unimportant energy related matters. The union has its own departments and offices in the state/regional government cabinets. Those departments and offices are directly responsible to their mother ministries in the union government, and there is little cooperation with the state/regional cabinets. The union gives some extremely limited authority to the states and regions to produce and distribute electricity from small and medium power plants that are not connected to the national grid. No word mentions the rights of the states or regions to explore and build power plants. Projects that have investments over US\$ 20 million investment capital or are considered of national strategic interest require permission from union level offices and departments. All revenues from the sale of energy flows directly to the union accounts, except minimal taxes on the power plants managed by the state/regional governments. The states and regions in turn receive a fiscal budget that is determined by the union and is wholly inadequate for energy development projects in the state/region. There is no profit to the state/region or affected communities and areas. The limitation of exercising authority and revenue sharing to the state/regional governments is paralyzing the energy infrastructure in the states and regions.



Picture (2) Moe Byae Dam in Moe Byae town, Pekong township, Shan State in August 2017
Photo by ENAC



CHAPTER 3: CASE STUDIES – LAWPITA HYDROPOWER PLANTS AND MOE BYAE RESERVOIR

3.1 Brief Background of the Social Economy of Karenni State

Kayah, or Karenni, is a natural resource-rich state in Myanmar with an area of 11,731.5 km.² It is located in the eastern part of Myanmar, bordering Shan State to the north, Karen State to the south, and Thailand to the east. It consists of seven townships. According to the 2014 Myanmar census, it has a total population of 286,627, making it the least populated state in Myanmar.

Kayah/Karenni people migrated to Southeast Asia from the Mongolia region, settling in the current land of Karenni State in B.C. 739 (Oo Reh 2014, pp.16). Karenni chieftains waged war against Burmese kings and British colonialists since the early 17th century; neither could control the entire Karenni area. When the British conquered Burma/Myanmar, the eastern Karenni area fell to the British, but the western Karenni area was left as an independent land (Oo Reh 2014, pp.24). Nevertheless, when Myanmar gained independence from Britain in 1948, both the western and eastern Karenni states became part of Myanmar.

Independence from the British on January 4, 1948 did not bring peace and prosperity to the people of Karenni State. The first armed conflict started with a Karenni group supported by the Anti-Fascist Peoples' Freedom League (Burmese) and the United Karenni States Independent Council in August 1948. Soon after, the United Karenni States Independent Army (UKSIA) was formed on August 17, 1948. The UKSIA helped the Karen National Defense Organization (KDNO) to capture Taungoo in Bago in October 1948 and cooperated with the KDNO and Naw Seng from the Kachin Rifles in operations to successfully capture Taunggyi, Shan State. The UKSIA had vast territory to control. However, due to severe battles with the union government in Karenni State, UKSIA had to withdraw from the urban to the rural areas. In 1957, the Karenni National Progressive Party (KNPP) was formed to work in the political arena. In 1978, the differing ideologies between communists and liberalists split the KNPP and the Karenni Peoples' Liberation Front was born. The splinter groups transformed into a border guard force in 2009, while the KNPP remains to walk on the same path.

Ethno-demography

The name of the state is still controversial: the official name is Kayah, but the local people use the name Karenni, which includes the majority Kayah, nine sub-ethnic groups (the Kayaw, Geko, Geba, Padaung (Kayan), Bre, Manu-Manaus, Yintale, Yinbaw and Bwe), and other non-Karenni groups (the Chin, Kachin, Karen, Mon, Arakan, Shan, Burmese, Indian and others) living in the state. Each group has its own language, unique culture, and traditional dress. According to the Ministry of Home Affairs website, over half of the population of 163,703 people in Karenni State are Karenni, 40,314 are Shan, and 38,294 are Burmese. The majority of the Karenni people (75,728 out of 163,703) are residing in Demawso township and in Loikaw. In Loikaw, Burmese comprise the second largest population after the Karenni.

Economy

The state contributed 0.36 percent of the overall Myanmar GDP in the 2016-17 fiscal year; this is expected to rise to 1.6 percent in the 2017-18 fiscal year. Although Karenni's contribution to the country's GDP was low in FY 2016-2017, the current economic growth of Kayah State predicts a continuous improvement in the contribution percentage. The GDP value projections for the two districts of Kayah State in FY 2017-2018 are MMK 184,519 million for Loikaw District and MMK 32,301 million for Bawlake District (KIC 2018).

Major products of the state are crops such as paddy, maize, and sesame, and minerals such as lead, antimony, and tin-tungsten. These products are exported to China and Thailand across the border, while some are sent to Mandalay, Yangon, and Shan State. Therefore, the cash crop market is depending on demand from central Myanmar and neighboring countries.

Natural resources

The state is rich in natural resources, especially fertile land, water, and minerals, such as one of the oldest hydrothermal quartz vein-type tin-tungsten ore, gold, tin, antimony, lead and lead mixed ore, and industrial use limestone. Tin-tungsten ore has been mined in Mawchi, Hpasawng Township, and Bawlake district⁵⁴ since 1930.

The union government's Department of Mines No (1) Mining Enterprise manages the production of antimony and lead and lead mix ore while the No (2) Mining Enterprise manages the production of gold and tin-tungsten. The Karenni State government's Ministry of Natural Resources and Environmental Conservation controls 7,024 acres of large mine sites, 722 acres of small mine sites, and 583 acres of small testing mine sites, for a total of 8,329 acres. Currently, 13 companies are extracting natural mineral resources in the state: Thura Kan Chon Mining Co. Ltd., Hawk Eye Mining Co. Ltd., Trade Supporting Myanmar Co. Ltd., Kayah Golden Gate Mining Co. Ltd., C1, Htee Day Star, Kayan Mining Co. Ltd., Asia A & T, Thuwana Shwe Zin, Kayah Htar Ni Mining Co. Ltd., Kayah State Mining Co. Ltd., Ye Htut Kyaw Mining Co. Ltd., and Lae Mu Kho.

Land

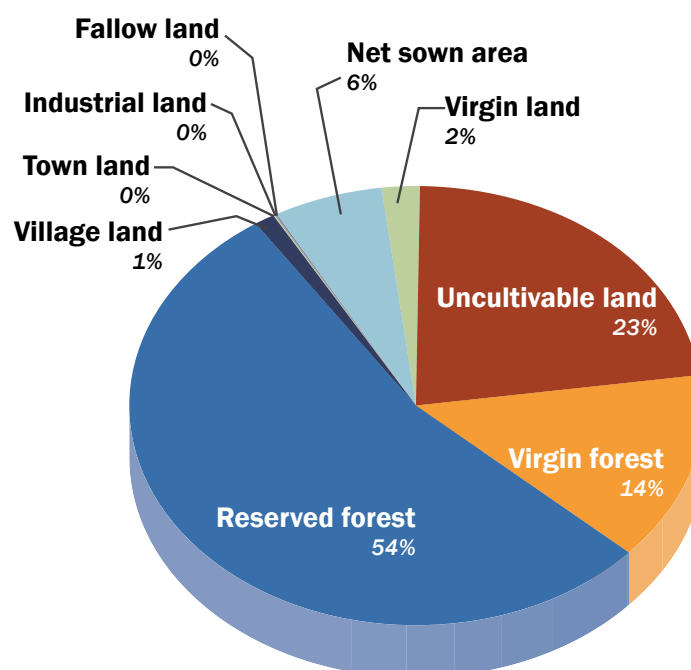
There are six classifications of land in Karenni State: net sown area, fallow land, cultivable land, reserved forest, other forest, and "other land." The total net cultivated area in Kayah State is about 0.17 million acres, 8,393 acres of fallow land, 413,313 acres of virgin forest and 40,514 acres of virgin land (see Figure 4). A total area of 462,220 acres can be utilized as land for agricultural, livestock rearing, and other suitable businesses.

⁵⁴ <https://www.mindat.org/loc-192241.html>

There has been a reallocation of 300 acres of forest and 200 acres of cropland for commercial use. Two hundred acres of this is allocated to police battalions, staff residences, and industry. The remaining 300 acres is allocated to four government offices, four businesses, three crop warehouses, three fuel filling stations, and two telecommunication towers. All the land area abandoned by the military will be allotted for agriculture while the rest of the land will be for government officials and their offices (KIC 2018).

Some virgin land is allowed to be allocated to four types of businesses: 1) agriculture, 2) livestock, 3) mining and 4) others (such as hotels and hospitals). Any agribusiness using under 50 acres of land must get approval from the state government, while any such business using over 50 acres of land must get permission from the union government. Any other business (beside agriculture) must be approved by the union government.

Figure (4) Land Utilization by Sector in Karenni State



Source: KIC

Water

There are many streams, a major river, and multi-purpose dams in the state. Prominent among them are the Salween River, which flows from China through Karenni to Shan State, the Balu and Nampawn rivers, which flow from Shan State, and the Htoo and Paunglaung streams from Shan State. Many other small streams and creeks flow within the state.

The water from irrigation canals funded by the government and local citizens is used for agricultural purposes. Although some government and self-built dams are in Loikaw District, there are only two dams funded by the government in Bawlakhe District. Major water resources for irrigated agricultural land comes from the government funded Moe Byae Dam built in 1968 and the Ngwe Taung Dam built in 1965. The Daw Ta Char Dam in Bawlakhe Township is mainly for potable water. According to the Karenni State irrigation department, the government has built 22 dams (2 large and 20 small and medium size) and 10 were self-funded by communities. In total, 46,720 acres of farming land is annually irrigated from the 32 dams.

Border Trade

Karenni State has 8 border points (BP) with Mae Hong Son province in Thailand, namely BP 9 to 16. BP-11 in Ywathit Township and BP-13 in Mase township, Bawlake district opened as official trade points in October 2017. Warehouses have been built at BP-13 for storing imported goods from Thailand before they are distributed throughout the state and other regions. Although the trade volume is still extremely small (US\$ 1.02 million in 2016-17) compared with other states, it is expected to increase in the future. According to the Department of Commerce, from September 2017 to February 2018, a total of 33,482 tons of rice, maize, and sesame were exported to Thailand from Karenni State, with a total value of Kyat 13,642 million (KIC 2018).

Tourism and Hotels

Tourism and Hotels is a booming business in Karenni State. The union and state government have both been promoting tourism in the state after the Myanmar Army and the KNPP signed a ceasefire agreement. Since then, the Ministry of Hotel and Tourism officially declared the state open to tourism and the numbers of hotels, motels, ecotourism spots, and restaurants have been increasing rapidly. According to local tour companies, the state was listed among the top 5 most attractive international tourist sites in 2015. In 2017, Htee Nee La Leh and Pan Pet villages in Demoso township were awarded the ASEAN Community-Based Tourism Award by the ASEAN Secretariat. Although the Thai cities of Mae Hong Son and Pai, which are next to Mese, Karenni State, have more than 300,000 visitors annually, only around 9,000 visitors come to Karenni State from Thailand. Once both governments agree to develop the border crossing at Mese BP-13, it is expected that more tourists from the Thai side will flow into the state and boost the local economy.

There are about 15 private hotel construction projects underway in the state. In December 2017 construction of an 11-storey hotel began on one acre of land in Minelone Ward of Loikaw Township. The hotel will be the highest building in the state, constructed by Myanmar New Ray Co. Ltd. with an expected budget at least US\$ 5 million.

Other Businesses

According to a Karenni State business opportunities survey in 2017, the state has an industrial ward in which 94 percent of the registered businesses are small and medium enterprises.⁵⁵ Among them, there is only one foreign company, Thailand CP Company, which operates an animal feed shop.

⁵⁵ Surveyed businesses were 63% from Loikaw District and 37% from Bawlakhe District. Almost 94% of the enterprises were interviewed at their head offices and the remaining over 6% were interviewed in branch offices or factories. Only an industrial ward exists in Kayah State instead of industrial zone. Of the 49 businesses interviewed, 48 were locally owned, while only one was foreign owned Thai company operates a branch shop for manufacturing and sale of CP animal feed. The study revealed that 92% of the registered firms in Kayah State are SMEs¹¹ where there are up to 99 employees and only 8% are large firms with over 100 employees.

3.2 History of the Lawpita Hydropower Plants

After independence, the new Karenni, the resource-rich and least populated state, became the home of the first ever and biggest hydropower plant in Myanmar. The Lawpita Hydropower Plants today provide electricity for Yangon, Mandalay, Bago, Naypyidaw, and other parts of the country, while local residents cannot enjoy their locally-produced electricity or revenues from its sale. Eventually three hydropower plants were built in Lawpita village, 14 miles southeast of Loikaw, the capital of Karenni State. The water needed for the plants comes from Moe Byae reservoir in Pekong Township, southern Shan State. The township borders Karenni State and the majority of the residents there are Karenni people. Indeed, Moe Byae was originally a district of Karenni State, but it was demarcated as part of Shan State during the Ne Win regime. The original source of water for the reservoir is from Inn Lay Lake, a tourism hotspot of Myanmar, and the Balu Chaung (River).

The Balu Chaung/Lawpita hydropower plant (2) was designed and constructed by Japan with war reparation funds to Myanmar (money from a postwar reconstruction fund); it cost approximately Yen 12.5 billion. It was the biggest power plant project ever in Myanmar after independence in 1948 and Japan's biggest overseas project after WWII.

In 1953, the government commissioned the American technical consultant company KTAM (Knappen Tippetts Abett McCarthy) to investigate suitable places for hydroelectric power generation and KTAM suggested three locations: Akyab (Sittwe) in Arakan, Zaungtu in Pegu, and 3 hydropower plants in Balu Chaung/Lawpita area in Karenni. However, only the Lawpita (2) hydropower project was implemented, with Japan's Nippon Koei Co., Ltd. and Japanese Official Development Assistance. Mr. Yutaka Kubota, President of Nippon Koei Co., Ltd., was travelling around the world to conduct market research when he stopped in Myanmar for a transit. He coincidentally had the chance to meet with the Vice-Minister of Public Works and Industry of Myanmar in September 1953 and was introduced to the proposed power generation projects. In November 1953 he decided that the Balu Chaung/Lawpita was the most suitable place for hydropower development.



*Picture (3) Lawpita Power Plant (2)
Photo by ENAC*

In April 1954, Myanmar and Nippon Koei Co., Ltd. signed an agreement for the project implementation and started the necessary assessments, detailed project design and planning.⁵⁶ Construction began in February 1955 with labor (approximately 20 engineers and other skilled laborers) from Nippon Koei Co., Ltd. (design and supervision capacity building) and Kajima Corporation (with approximately 150 engineers and other skilled laborers for construction, planning, guidance, and education of execution). Construction equipment and laborers were supplied by the Electricity Supply Bureau of Burma (hereinafter: ESB), which controlled construction work directly.

After the Lawpita hydropower plant (2) was commissioned (with 3 engines in the first phase in 1960 and second phase with another 3 engines in 1970), Lawpita (1) was built in 1987 and commissioned in 1992. Finally Lawpita (3) was built by privately owned Shwetaung Group during 2008-2014. (The plant numbers are not based on the year they were built, but rather based on their location. Plant (1) was the second power plant built, but it is located the first place next to Loikaw, Plant (2) in the second place, and Plant (3) in the third place).

All three power plants are directly under the union government's control. The state government has no role in managing the operation of the power plants, or the distribution, transmission, or retail of the electricity they produce.

Lawpita Power Plant (2)

The Lawpita (Balu Chaung) power plant (2), with the installed capacity of 168 MW, had two phases of construction. The first phase (February 1955-March 1960) included 250 miles of 230 kv transmission lines from Loikaw to Taungoo to Yangon. A substation in Yangon that supplied 84,000 kW of power and cost Yen 1.89 billion was funded with Japanese war reparations funds to Myanmar. The second phase, to generate another 84,000 kW of power, 225 miles of 132kv transmission lines, and sub-stations in Mandalay, was completed at the end of 1974. During 1992-94, the plant was renovated with a Yen 3,460 billion loan from the Japanese Overseas Economic Corporative Fund and in 2003-04, repairs to turbine equipment, transmission lines, and switch yards were done with a Yen 23.6 million grant from the Japan International Cooperation Agency (JICA). During 2014-15, another set of repairs was carried out on generating equipment, substation and penstock equipment, with a Yen 6,669 million loan from JICA. The annual generation of electricity and revenues from the Lawpita (2) power plant during 1960-2016 is shown in Table 10.

The power output from the plants depends on the water supply. When the dam can supply a sufficient amount of water, especially in rainy season, the plants can run at full capacity. But when the dam has lower water levels, the water supply to the plants decreases and the output of gigawatt hours drops as well.



Picture (4)
Lawpita
Power
Plant (2)
Photo by ENAC

56 http://archive.alpha-canada.org/SFPTGA/JapanBurmaPeaceTreatyReparationsOverview_with_URL.htm

Electricity usage prices in Myanmar

The estimated revenues generated by the Lawpita 2 power plant noted in Table 10 are based on a per unit price of 50 Kyat. Myanmar has the lowest per unit price in ASEAN as of June 2019. Households pay K35 per unit for up to 100 units of consumption, K40 per unit up to 200 units, and K50 above 200 units in urban areas. The rate for commercial and industrial users ranges from Ks 75/kWh - Ks 150/kWh. However, the government has changed the per unit price according to the usage categories as below starting in July 2019.

Table (10) Comparison of Old and New Per Unit Price of Electricity'

	Types of Consumers	New Rate		Old Rate	
		Units	Kyat	Units	Kyat
Non-commercial use	▪ Residential homes	1-30	35	1-100	35
	▪ Religious Buildings	31-50	50		
		51-75	70	100-200	40
		76 to100	90		
		101-150	110	>200	50
		151-200	120		
Commercial Use	▪ Companies	1 to 500	125	1-500	75
	▪ Industries	501-5000	135		
	▪ Street Light	5001-10000	145	500-10000	100
	▪ Embassies				
	▪ International Organizations	10001-20000	155	10000-50000	125
	▪ Temporary Usage				
	▪ State owned Enterprises and business	20001-50000	165	50000-200000	150
	▪ Government Departments				
	▪ Non-governmental Organizations	50001-100000	175	>300000	100
	▪ Irrigation purposes	>100001	180		

Table (11) Annual Revenues and Power Generation of Lawpita/Baluchaung No. 2 Power Station, 1960-2016

Sr.	Fiscal Year	Unit Generation (GWH)	Estimated Revenues (Based on Price of 50 Kyat per Unit)	Sr.	Fiscal Year	Unit Generation (GWH)	Estimated Revenues (Based on Price of 50 Kyat per Unit)
1	1960-1961	181.09	9,054,500,000	32	1991-1992	1019.37	50,968,500,000
2	1961-1962	205.66	10,283,000,000	33	1992-1993	1007	50,350,000,000
3	1962-1963	228.5	11,425,000,000	34	1993-1994	1172	58,600,000,000
4	1963-1964	250.61	12,530,500,000	35	1994-1995	1190	59,500,000,000
5	1964-1965	271.07	13,553,500,000	36	1995-1996	1224	61,200,000,000
6	1965-1966	272.72	13,636,000,000	37	1996-1997	1192	59,600,000,000
7	1966-1967	265.64	13,282,000,000	38	1997-1998	1205	60,250,000,000
8	1967-1968	292.9	14,645,000,000	39	1998-1999	641.08	32,054,000,000
9	1968-1969	314.17	15,708,500,000	40	1999-2000	672.32	33,616,000,000
10	1969-1970	348.36	17,418,000,000	41	2000-2001	1219.08	60,954,000,000
11	1970-1971	408.75	20,437,500,000	42	2001-2002	1255.09	62,754,500,000
12	1971-1972	475.03	23,751,500,000	43	2002-2003	1277.94	63,897,000,000
13	1972-1973	480.72	24,036,000,000	44	2003-2004	1242.01	62,100,500,000
14	1973-1974	262.84	13,142,000,000	45	2004-2005	1225.54	61,277,000,000
15	1974-1975	517.89	25,894,500,000	46	2005-2006	1259.68	62,984,000,000
16	1975-1976	531.79	26,589,500,000	47	2006-2007	1297.63	64,881,500,000
17	1976-1977	602.28	30,114,000,000	48	2007-2008	1278.88	63,944,000,000
18	1977-1978	671.72	33,586,000,000	49	2008-2009	1248.84	62,442,000,000
19	1978-1979	703.13	35,156,500,000	50	2009-2010	1262.43	63,121,500,000
20	1979-1980	725.15	36,257,500,000	51	2010-2011	631.91	31,595,500,000
21	1980-1981	720.2	36,010,000,000	52	2011-2012	927.91	46,395,500,000
22	1981-1982	915.36	45,768,000,000	53	2012-2013	1097.82	54,891,000,000
23	1982-1983	946.56	47,328,000,000	54	2013-2014	1049.08	52,454,000,000
24	1983-1984	992.62	49,631,000,000	55	2014-2015	972.6	48,630,000,000
25	1984-1985	1019.87	50,993,500,000	56	2015-2016	766.7	38,335,000,000
26	1985-1986	908.22	45,411,000,000		Total	45393.4	2,269,670,000,000
27	1986-1987	943.48	47,174,000,000				
28	1987-1988	899.73	44,986,500,000				
29	1988-1989	820.82	41,041,000,000				
30	1989-1990	901.49	45,074,500,000				
31	1990-1991	979.12	48,956,000,000				

Table 11 shows the official data on the total unit of electricity produced from Lawpita Power Plant 2 in each fiscal year between 1960 and 2016. The estimated revenues from producing the total units of electricity produced in each fiscal year are calculated at the rate of 50 Myanmar Kyats per unit.

Source: The units in the above table are taken from the official data acquired from Lawpita Power Plant 2 in August 2017



Lawpita/Balu Chaung Power Plant (1)

The Balu Chaung/Lawpita power plant No. (1), with the installed capacity of 28 MW, was completed in 1992 and connected to the national grid with an annual output capacity of 200 million units. It cost Kyat 935.1 million. The power plant was constructed with Japanese war reparation funds and is a wholly state-owned plant. The annual generation of electricity and revenues from the Lawpita (1) power plant during 1992-2017 is shown in Table 12.

Picture (5) Lawpita Power Plant (1), Photo by ENAC

Table (12) Annual Revenue and Power Generation of Baluchaung No. 1 Power Station

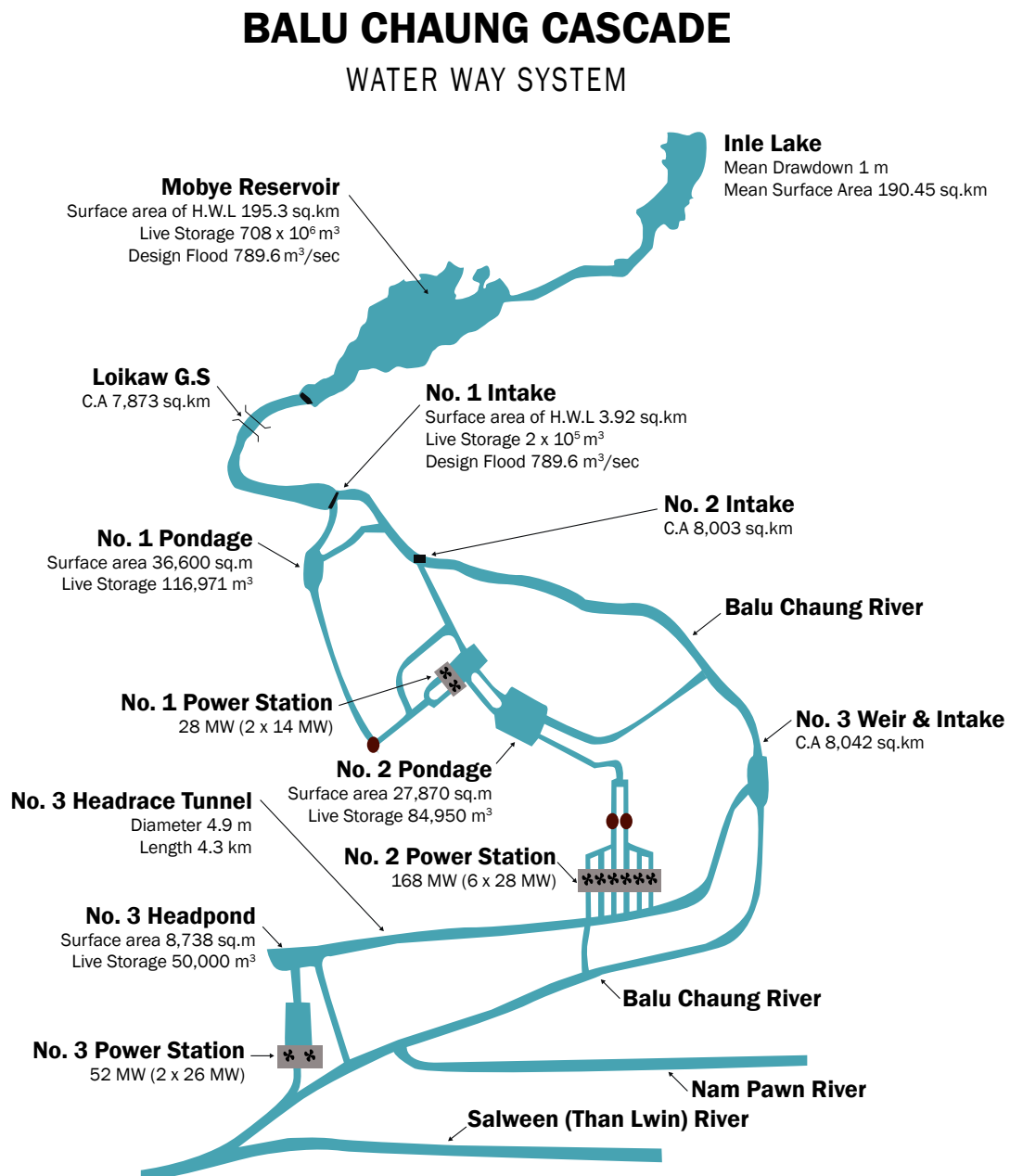
Sr.	Fiscal Year	Estimated	Unit Generation (GWH)	Estimate Revenue base on 50 Kyat per Unit
1	1992-1993	200	104.53	5,226,500,000
2	1993-1994	200	232.72	11,636,000,000
3	1994-1995	200	214.18	10,709,000,000
4	1995-1996	200	214.41	10,720,500,000
5	1996-1997	200	209.57	10,478,500,000
6	1997-1998	200	221.07	11,053,500,000
7	1998-1999	200	103.17	5,158,500,000
8	1999-2000	200	112.68	5,634,000,000
9	2000-2001	200	215.96	10,798,000,000
10	2001-2002	200	225.32	11,266,000,000
11	2002-2003	200	230.43	11,521,500,000
12	2003-2004	200	224.88	11,244,000,000
13	2004-2005	200	219.43	10,971,500,000
14	2005-2006	200	227.43	11,371,500,000
15	2006-2007	210	215.89	10,794,500,000
16	2007-2008	210	228.18	11,409,000,000
17	2008-2009	210	226.32	11,316,000,000
18	2009-2010	210	95.26	4,763,000,000
19	2010-2011	210	157.86	7,893,000,000
20	2011-2012	200	196.87	9,843,500,000
21	2012-2013	171	178.7	8,935,000,000
22	2013-2014	175.8	187.05	9,352,500,000
23	2014-2015	179.3	187.05	9,352,500,000
24	2015-2016	164.95	139.0631	6,953,155,000
25	2016-2017	170	81.0143	4,050,715,000
Total			4,649.0374	232,451,870,000

Source: Lawpita plant (1)

Lawpita/Balu Chaung Power Plant (3)

The Lawpita power plant No. (3) was constructed during 2008-14. It has a total installed capacity of 52 MW and an annual power output of 334 million kWh. The plant was built by the Shwe Tawng Group, a crony-owned company, under a BOT (Build-Operate-Transfer) agreement. The company sells the electricity at a rate of 64.5 kyat/kWh to the Myanmar Electric Power Generation Enterprise (EPGE). While the company earns an annual income of Kyat 21,543,000,000 (million 334kWh x 64.5kyat x 1 year), MOEE's estimated annual revenues are Kyat 16,700,000,000 (million 334kWh x 50kyat x 1 year) from retailing the electricity to consumers.

Chart (17) Balu Chaung cascade waterway system



Source: Field Trip

Planned hydropower plants

According to the Burma Rivers Network,⁵⁷ the government is planning to build the Ywathit dam and the Pawn dam in Karenni State. The Ywathit dam on the Salween River will have an installed capacity of 4,500 MW and an annual production 21,789 kwh; the power will be exported to Thailand. It is scheduled to be completed in 2030. However, when the Shwe Tawng Group and China Datang Overseas Investment were conducting the initial geographical assessment in December 2010, a conflict erupted between the convoy of Myanmar Army soldiers escorting a group of engineers to the dam site and a Karenni armed group and three persons were reportedly killed. The Pawn dam, with an expected installed capacity of 130 MW, will be on the Pawn River, which flows through the middle of Karenni State to meet with the Salween River at Hpasawng. It is scheduled to be completed in 2020. However, construction seems to be halted for the moment as the KNPP and the local people are opposing the projects.

3.3 Karenni State Government and Power/Electricity Governance

The Karenni State government cabinet is composed of seven ministries, a Hluttaw, a Chief of Justice, and a state auditor general. According to Section 261 (a) of the 2008 constitution, the chief minister of Karenni State, like that of all states and regions, was selected and appointed by the union president. Also like other states and regions, there is no separate ministry for electricity in the Karenni government. The roles of the state/regional ministers are ambiguous and they have very limited decision-making power. As seen in Table 13, the electricity sector is combined with the Roads and Transport sector under the administration of a minister.

Table (13) Government Structure of Karenni State, 2018

Sr.	Minister	Ministry
1	U L Phaung Sho	Chief Minister
2	U Hla Htway	Speaker of Kayah State Hluttaw
3	U Hla Myo Swe	Ministry of Bamar Ethnic Affairs
4	Colonel Myint Wai	Ministry of Security and Border Affairs
5	U Khin Maung Phyu	Ministry of Roads, Transport and Electricity
6	U Boss Ko	Ministry of Agriculture, Livestock and Irrigation
7	Dr. Aung Kyaw Htay	Ministry of Development Affairs and Social Affairs
8	U Te Reh	Ministry of Natural Resources and Environmental Conservation
9	U Maw	Ministry of Planning and Finance
10	U Sai Kyaw Zan	Chief Justice
11	U Aung Maung	State Auditor General

Source: MOI

⁵⁷ http://burmariversnetwork.org/index.php?option=com_content&view=article&id=522:ywathit-dam&catid=14&Itemid=147

3.3.1 Administrative Authority

There is no specific administrative or legislative authority of the Karenni State government over the Lawpita hydropower plants. The union government directly administers all the power plants, taxation, revenues, the budget, the electricity production, and transmission, while the state government's only role is to assist in implementing the Union policies and projects in the necessary areas, such as electricity distribution within the state boundary. According to fieldwork conducted for this paper, local grievances over the rigid centralized energy administration are growing stronger as the union government fails to develop the energy infrastructure and other development sectors in the state. One local resident reported:

“When they started constructing the Lawpita plants (2 and 1), the government promised to electrify the whole Karenni state. But up to 2017, there were very few streetlights in Loikaw. It is false promises and no profit sharing to the local people. The state government should have the authority over administration, taxation, distribution, retailing, and others.
(Mr. Nye Reh, interviewed in August 2017)

The locals want the state government to have administrative authority and consumers to have sufficient energy services with minimum usage fees. Mr. Be Du from the Kayan National Party explained, “per unit price [of electricity] should be lower than other areas, as the plants are from here” (interview, August 2017).

Though the Lawpita power plants generate estimated annual revenues of US\$ 27-78 million from Plant 1, US\$ 214-433 million from Plant 2 and US\$ 111 million from Plant 3, the union government fails to electrify the state and develop other sectors. It indicates that the centralized energy governance brings no profit to the people of the state/region, and only the social burden (see Tables 10 and 11).

3.3.2 Taxation authority

The annual revenues from the three power plants are not deposited into the state government's bank account. According to Mr. Aung Kyaw Hein, the General Director of the Ministry of Roads, Transport, and Electricity of Karenni State, “all revenues from the power plants go directly to the union government bank account (interview, August 2017). The state government also does not have any taxation, distribution, or transmission authority over any power plant that produces more than 30 MW. Currently, the state government does not manage any power plant.

All the revenues from the sale of electricity in the state are collected by the offices of the ESE (of the MOEE) in the state and sent back to the union government in Naypyidaw. The state ministry in turn must submit a budget proposal to the union ministry to cover its fiscal expenses. The revenues from the power generation therefore do not benefit the local people or the state government, and the rigid centralized control over the power plants burdens the state government and the local people.

The local people want to utilize the revenues from the power plants to develop the energy/ power infrastructure and other sectors in the state. According to Mr. Be Du of the Kayan National Party:

“All the Lawpita power plants (1, 2, 3) should be under the Karenni government’s management, and the revenue from the power plants should be beneficial to the local people. If this happens, the state will have more fiscal budget than the current union budget allocation and can do more development projects.
(interview, August 2017)”

3.3.3 Generation, Production, and Transmission

The generation, production, and transmission of electricity in the states/regions are also directly governed by the union ministry. Under the Electricity Law and Schedule Five in 2008 constitution, the state government is not allowed to govern generation, production, or transmission, except in the case of power plants that generate less than 30 MW.

The state government has authority over only two types of transmission in the state, under two kinds of budgets; these are for the installation and maintenance of transmission lines and transformers within the state’s borders.

The state’s Ministry of Roads, Transport, and Electricity has authority to handle 11kv power lines, including transmission services, issuing licenses, opening tenders to private companies, maintenance, installing transformers and new transmission lines, and expanding new transmission lines to rural areas. The state government, therefore, is directly responsible for providing electricity to consumers only from the 11kv sub-station (see Figure 3). Executing this task, however, is controlled by the fiscal budget allocated from the union and therefore is also totally dependent on the central government. The union ministry directly governs everything above 33kv to 66 kv lines, sub-stations, and installation projects under the Union ministry’s budget. Although there are six transformers for Loikaw, light for public places, such as streetlights and public park lights, are inadequate (see photos 6).

Transmission lines and stations from Lawpita power plants within Karenni State as of March 31, 2015

Sub-stations

Installed capacity

132/66/11kv, 60MVA (Xian XD, China)
132/33/11kv, 50MVA (Fortune, Taiwan)
Total - 110MVA

Transmission Lines

66kv Distribution Lines (3 lines and 87 miles long each)

1. Shartaw Line
2. Bawlake-Hpar Saung Lines

33kv Distribution Feeder

1. Loikaw Feeder
2. De Maw So-Pruso Feeder
3. Moe Byae-Pekon (Phaekong)-Sung Pyaung Feeder

Distribution Regions

1. Karenni state and Shan state

Transmission lines from Lawpita power plants outside of Karenni State as of March 31, 2015

Transmission Lines

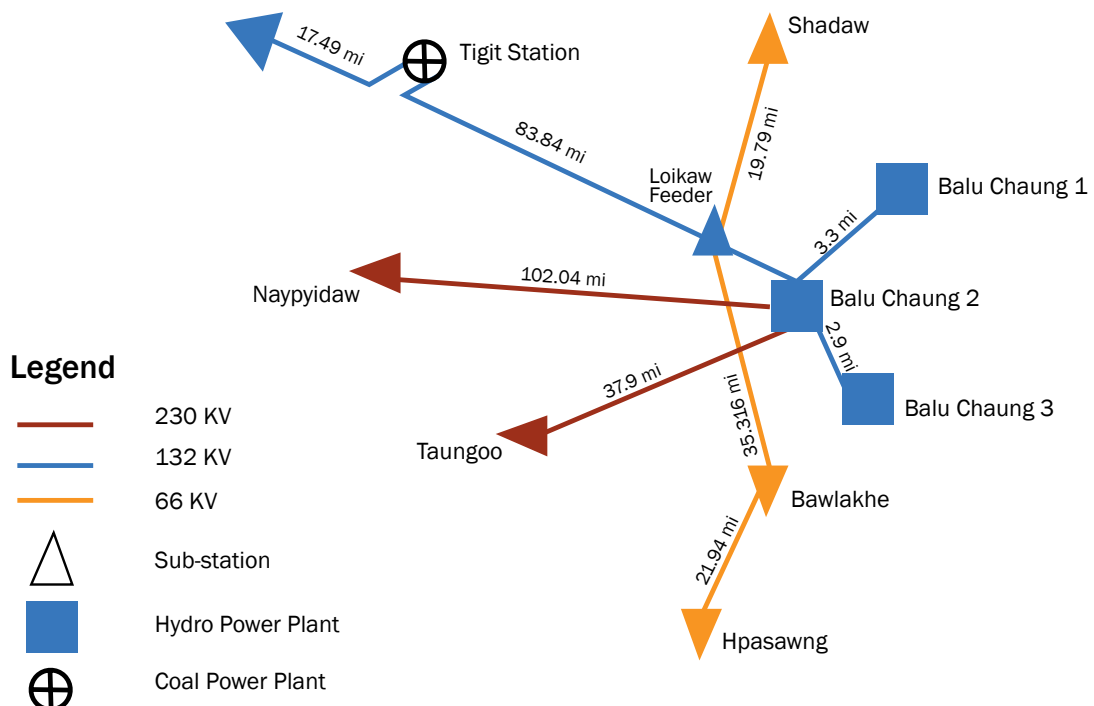
230kv Transmission Lines (Chart 18)

1. Naypyidaw (runs 102.04 miles long from Lawpita Plant (2) to Naypyidaw via Phaekon and Pinlong in Shan)
2. Taungoo (runs 47.9 miles long to Taungoo, Bago from Lawpita plant (2)) the continue to Yangon
3. 132kV to Kalaw, Shan to Mandalay (Provides from Naypyidaw station)

132kv Transmission Lines

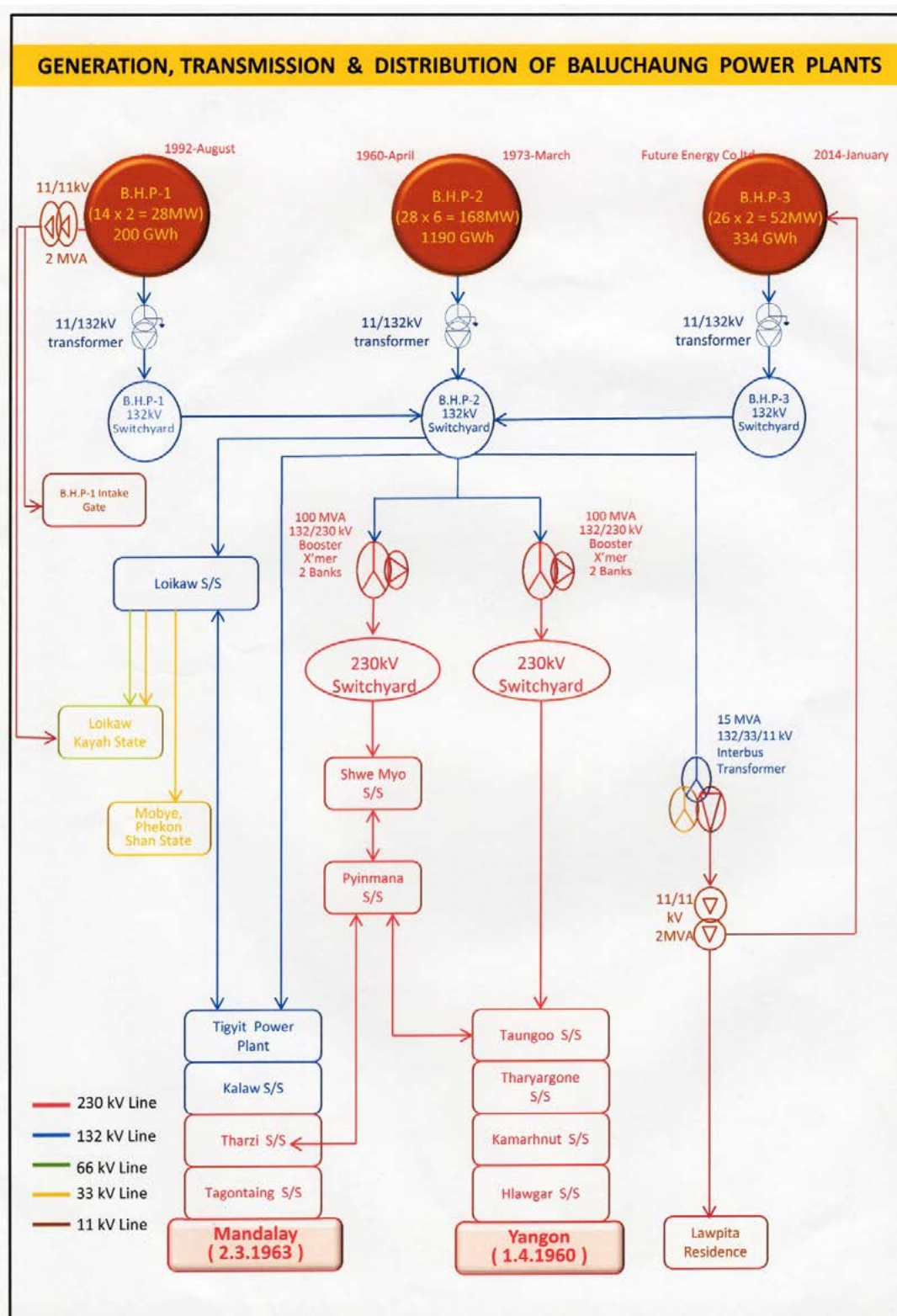
1. Lawpita-1 line
2. Lawpita- 2 line
3. Tigit-1line (connects with Tigit coal power plant in Tigit near Pinlong Shan state)
4. Tigit-2 line

Chart (18) National Grid Lines, main station, sub-stations, and destinations



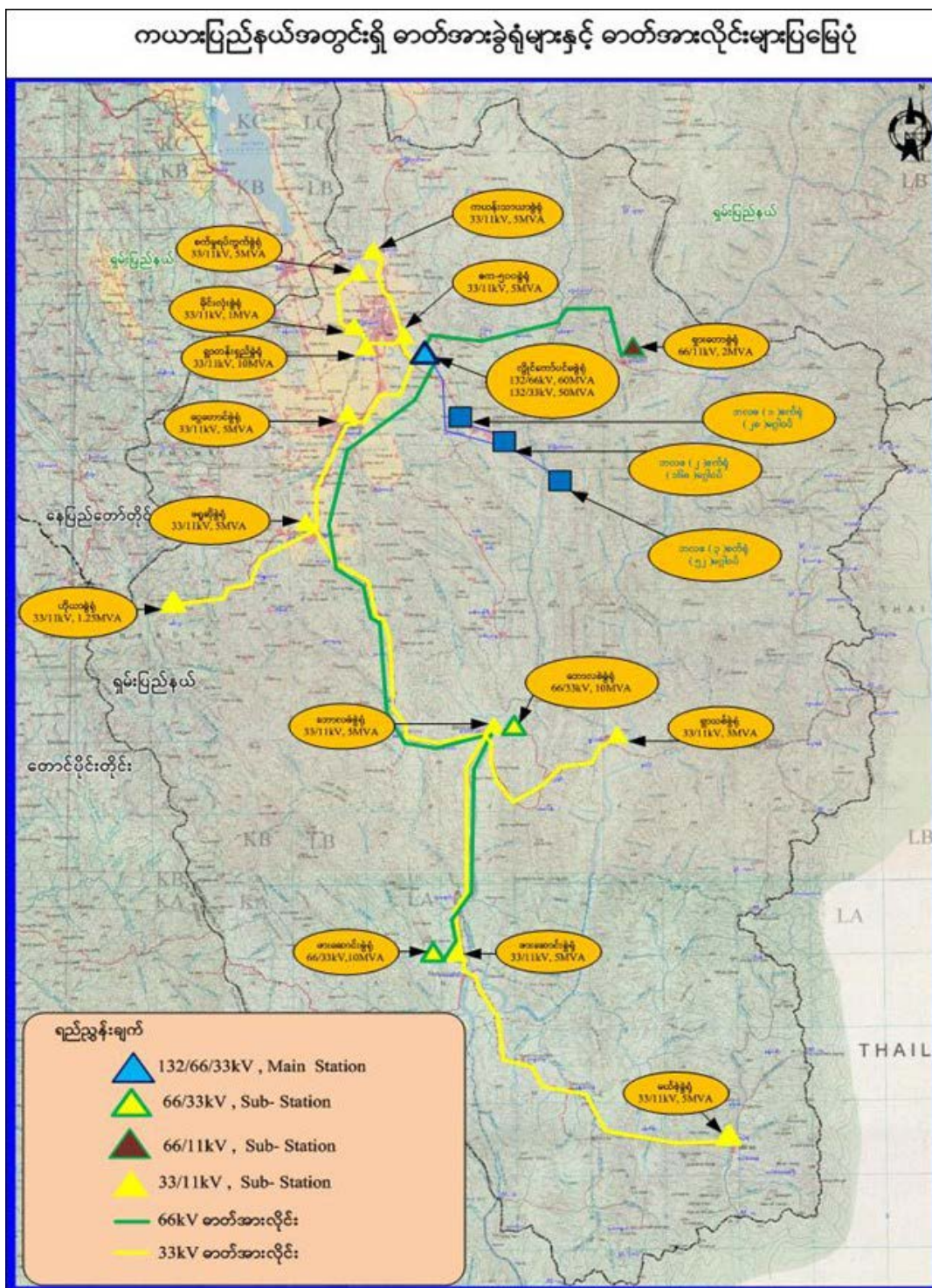
Source: Electrical Department in Loikaw

Chart (19) Generation, Transmission, and Distribution System of the Lawpita plants



Source: Field Trip (2017)

Map (10) Sub-station and transmission lines in Karenni State in 2018



Source: MOEE

3.3.4 Distribution and Electrification

State/regional ministries have two types of budgets—state and union—for use in distributing power. The state budget is to be spent for the installation and maintenance activities for 33kv sub-stations, 11kv and 400v transmission lines, and transformers that are carried out by the state ministry responsible for electricity-related matters. The ESE offices of the MOEE in the states/regions use the union budget to directly govern the installation, maintenance, transmission, and opening of tenders for sub-stations and stations above 33 kv and all high voltage lines (higher than 33kv).

Electrification

The power plants in Karenni State generate millions of US dollars in revenues annually, yet the electricity infrastructure of the state remains poorly developed. Rapid electrification began only after the Thein Sein government took power in 2011. Although the power plants in Karenni State have been commissioned since 1974 (indeed they are Myanmar's oldest), only 72.92 percent of the households in the state were electrified as of early 2019.⁵⁸ Although the state was granted the right to use up to 88 MW of electricity from the Lawpita power plants, in 2017 it was only able to use 18.25 MW due to poor electrical infrastructure and low consumption. The majority of electrified households are using power for lighting, entertainment, and charging mobile phones. Since the state government does not have the right to sell electricity, it cannot sell any surplus electricity. If the state government had the right to sell surplus power, it could fund improvements to electricity infrastructure and other development projects.

According to the Ministry of Roads, Transport, and Electricity of Karenni State, 51,151 of a total of 57,274 households will be electrified after 2018-19. On the other hand, according to fieldwork data collected for this paper in August 2017, only four of seven townships had been recently electrified and only the town dwellers have good access to electricity. The villages in these townships did not have electricity access yet. One quick solution for rural electrification depends on how the state government can contribute to family-use solar power systems. In

Picture (6) Main Road Lights in Loikaw, August 2017, Photo by ENAC



58 <http://www.moe.gov.mm/mm/ignite/page/54>

July 2017, the chief minister of Karenni State distributed some solar cells for families in Lawpita village, where Myanmar's oldest power plants are located (interview with Mr. Be of the Kayan National Party, August 2017).

Some villages are trying to get electricity through their own effort by partnering with the MOEE. However, as they must partially share the costs with the government to connect to the existing grid, it is still a great burden for poor villages. Local residents explained it this way:

“

The ESE offices of the MOEE in the state only pay for the installation services and check the standard quality of the equipment, such as transformers, cables, posts, and so on for the community-funded electrification project.

(Mr. Khun, interview in August 2017).

Although power supplies are available in the villages within the state, some families cannot afford to buy the meter box for 90,000 kyat, wires, and other equipment. No matter how big or small their house is, a family needs to spend at least 200,000-300,000 kyat to get the power supply at home.

(Mr. Maung Oo, Department of Roads, Transport, and Electricity, interview in August 2017).

”

A household must apply and wait around one month to be approved before buying a meter box. As mentioned above, buying the meter box at the official price is not easy for some villagers, who also need to pay for the cable lines that run from the electricity post to the home. Some villagers cannot afford these expenses.

Picture (7) Electrification Condition of a house in a village in Karenni State, Photo by ENAC



More than that, the government officers from the electrical department do not come to read the meter usage regularly, instead estimating the usage fee and not providing any official usage receipt. In some cases, the staff only comes to check the meter unit usage once or twice a year, but the unit usage fee must be paid regularly to the office based on the same usage amount every month, whether you use the same amount of units or not. If a consumer fails to pay the monthly usage fee at the office, the electricity services are cut off. After the 2015 election, one BGF office in Loikaw, which used to pay around 2,000 kyat per month for electricity, had to start paying more than 10,000 kyat per month regularly, without any official receipt. One local woman had this experience:

“My home has been electrified for over a month, but no officer came to read the meter yet. The installation of 6 light bulbs (15W each) and a meter box cost me around 300,000 Kyat”

(Mrs. Naw Eh,
interview in August 2017).

While the state ministry is responsible only for installation and supply of low voltage power, costs for street lights, new transformers, and maintenance of the electricity grid lines within the city must be covered by the Loikaw Municipal government. Public lights in Loikaw remain extremely inadequate due to poor budget allocation from the union ministry (see photos 8 and 9).

3.4 Electrification, Social and Environmental Impacts due to Moe Byae Reservoir for the Lawpita Power Plants

Before independence, Moe Byae was a township belonging to Karenni and Pekong was just a town. After 1948, Moe Byae was incorporated into Pekong township and became part of Shan State after the military coup in 1962. The majority of the people in Moe Byae and Pekong are Kayan; Shan and Inn Thar live around Inlay Lake, and Burmese migrants reside there as well. The hydropower dam for the Lawpita power plants was built in Moe Byae town, Pekong township, Taunggyi district in southern Shan State.

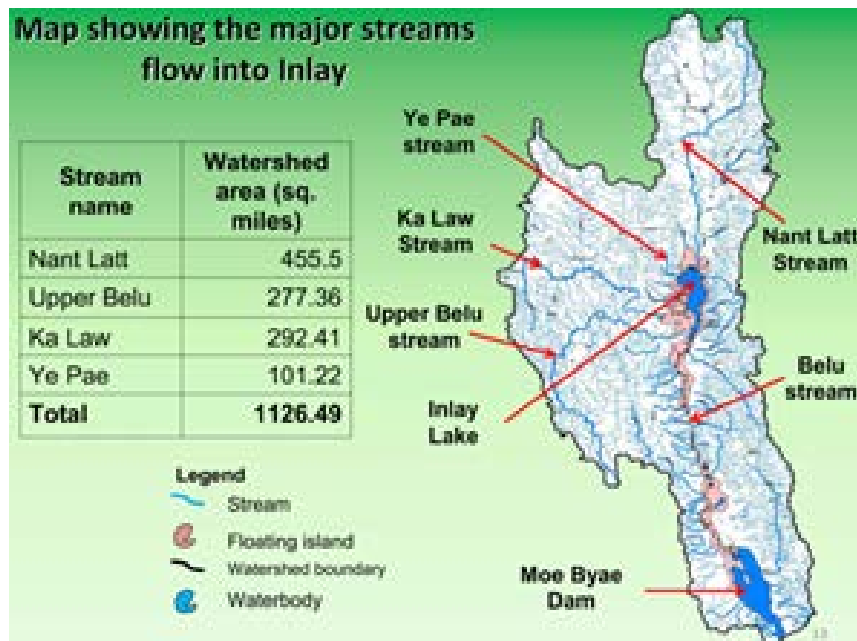
The Moe Byae reservoir was built under the administration of Colonel Maw Shwe, the minister of Project and Industry and Major Hpe Than, the chairman of electricity supply during the New Win regime. The reservoir was designed and built by ORRJE & Co. and Widmark and Platzer Co. from Sweden. Construction began in January 1968 and was completed on September 30, 1971 by using a workforce of 2,656 persons. The reservoir is 76 square miles; the highest water level is 2,897 feet above sea level and the lowest water level is 2,880 feet above sea level. It is surrounded by a 2,905-feet high earthen wall. The water levels are controlled by four gates that release water via the Balu River to the first intake. From there the water goes into the reservoir through a canal, then on to the No. (1) power plant via an iron pipeline. There is another reservoir on the way to the No. (2) power plant, and the water then flows via pipeline to power plant (3). Finally, all the water used for the power plants meets with the original Balu River and flows into the Salween River.

Electrification in Moe Byae and Pekong area

The national grid lines pass over the roofs of some villagers' homes, leaving them with no electricity access. Some villages that were relocated for the reservoir also have no access to the electricity (see photo 12). People in Moe Byae are very excited and eager to get electricity by any means. Four villages (Su Myu Lao Duo, Daw Paku, Nyaung Pin Thar, and Kan Oo) were relocated and farms submerged by the reservoir. The government told the villagers that they would get electricity; they did get some, but not nearly enough. Su Myu Lao Duo, located next the reservoir, has such poor electrification that the children cannot read their school books in the evening due to the poorly installed cables and low lighting. Therefore, the village formed a village electrification committee and collected money to improve electrification. The cost per household varies from US\$500-1,500 (according to the total number of households in a village) to buy a transformer, the concrete posts, and cable networking, and pay service fees. Some of the villagers are willing to get the electricity, though they do not use it for businesses purposes. Some took out loans to contribute to the village electrification committee to get electricity. Due to the bad economy, some could not pay back the loan and lost their land. A farmer from Moe Byae explained:

A friend of mine from Setdawya village near Moe Byae loaned money from the local moneylender and contributed to the village electrification committee in order to get electricity in his home. Finally, he could not pay back the loan with interest and lost his land.

(Mr. Aung Moe, interviewed in August 2017).



Source: MOECAP (2014)





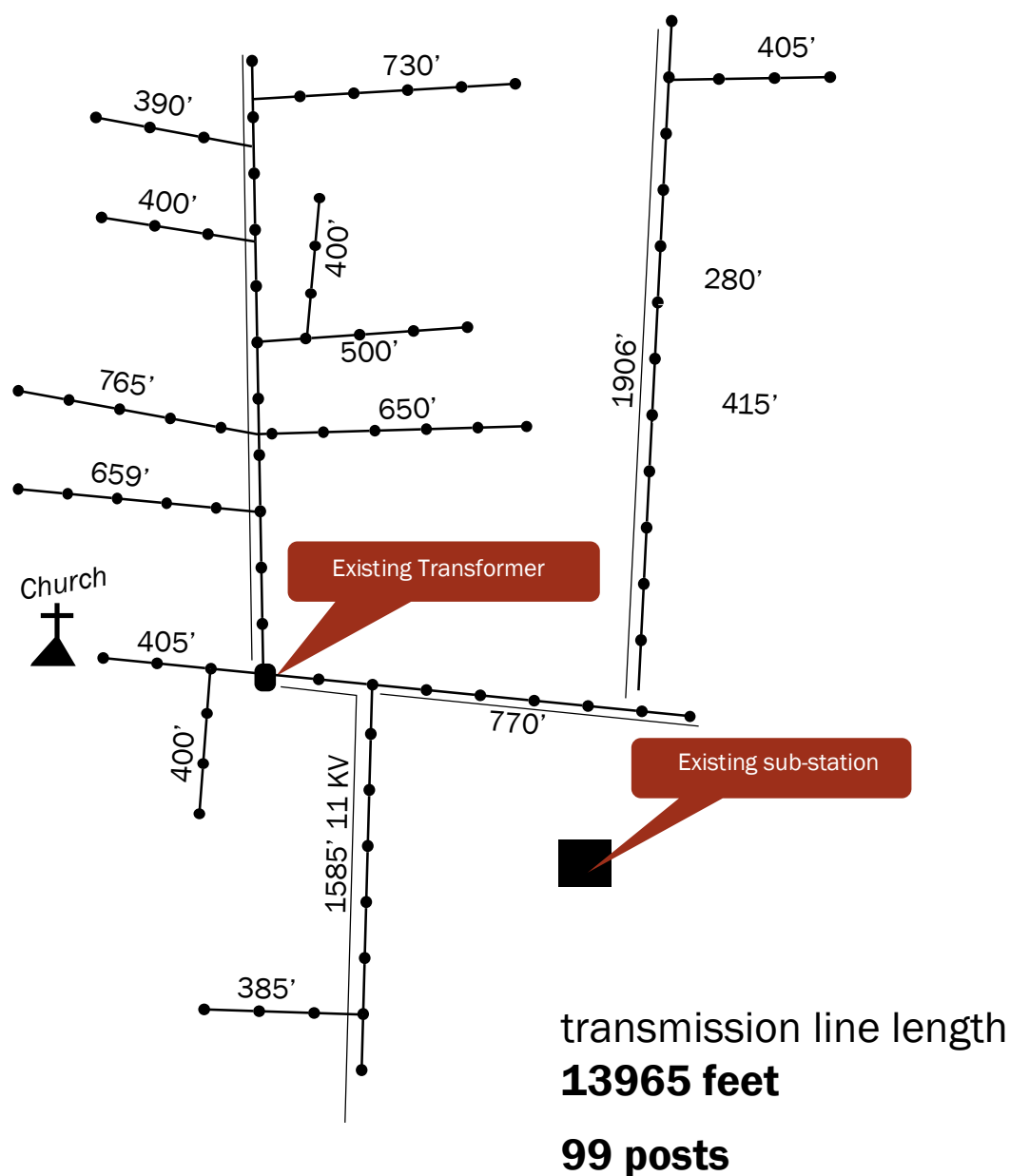
Picture (8) Moe Byae Dam in Moe Byae town, Pekong township, Shan State in August 2017
Photo by ENAC

By 2015 Su Myu Lao Duo village had installed 99 electricity posts, cable lines, and a transformer (see photo 11 and Document 1). It cost them around Kyat 40 million (US\$ 40,000). However, they could not afford to buy enough cable to cover all the households in the village. To cover the remaining households, the village needs to spend another MMK 40 for cable lines, which they cannot afford.

Picture (9). The village community had funded a transformer, transmission lines and posts as of August 2017



Document (1). The village community funded a transformer, transmission lines, and posts



Source: Field Trip

Although Pekong got electricity access quite a long time ago, the power voltage was extremely low. The town has street lights, but they do not work well at night. According to locals, the light is only as bright as a red tomato. However, when the Thein Sein came into office in 2011, the street lights, the transformers, and grid lines were upgraded.



National Grid Line

Picture (10). A house next to the national grid line
with solar electrification in Southern Shan State
Photo by ENAC



Social Impacts

During the reservoir construction period, local residents suffered from massive relocation, land confiscation, forced labor and injuries from unexploded ordinances. Over 33 villages, approximately 10,000 people, were forced to relocate for the reservoir around 1952. Over five villages and thousands of acres of farmland were submerged and hundreds of acres of teak and timber were chopped down and carried away. Most of the relocated villagers were forced to settle down in Pekong and Moe Byae with only a small amount of compensation. Among the 33 villages, only the Inthar village of Zawoi Zagar received proper compensation. A local resident explained:

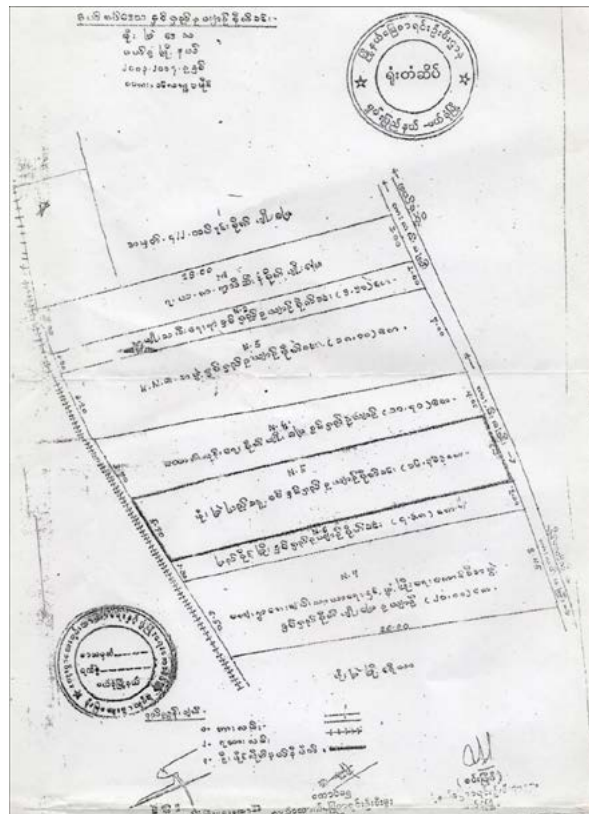
“

“Around 50-60 households now reside in the new Zawoi village. They each received five acres of farming land, a meter box, and residential land. The rest of the Kayan relocated people got only a plot of residence land without any other compensation”

(Interview with Mr. Aung Ko in August 2018).

”

Document (2) Map of land confiscated by the security forces and local authorities around the Moe Byae dam



Source: Field Trip

The dam impacted not only the relocated families, but also the villages on the hill to the east of the dam, who were forced to move under the premise of securing the dam from ethnic armed groups. The west bank of the dam is secured by Light Infantry Battalion (LIB) 421, 422, and 336, which have confiscated local farm lands

The military stationed around the reservoir confiscated land for security purposes and the Myanmar Army's self-sufficiency policy. This precipitated many social grievances. In addition to the thousands of acres of farmland submerged by the reservoir, in 1992 the dam security force Light Infantry Battalion 422 confiscated 2,000 acres from 217 families in Moe Byae. In early 2018, LIB 422 returned around 160 acres to the original farmers; lands confiscated by LIB 421 and 336 have so far not been returned. The building and installation of 132kv transmission lines running through Pekong and Moe Byae from Loikaw to Kalaw-Mandalay happened simultaneously with dam construction. An area of 150 square feet around each pylon for the national grid lines was also officially confiscated for the security reason, without any proper compensation.

The military not only confiscated massive amounts of farmland for the Lawpita project, but also committed human rights violations.

Forced Labor

When the LIB 422 set up to secure the Moe Byae dam, it had to construct a military base from scratch. Although it may have had a budget for the base construction, the LIB forced villagers around the dam area to build the barracks, the fences, and other facilities without paying any wages. In those days, iron and concrete building material was less available and very expensive, therefore, all the base buildings were built with local products such bamboo, thatch, and wood. Everything was done manually:

I had to go for building the military base on the weekends when I was a student. My hands got scarred and the military didn't give us a single kyat for our labor.

(Mr. Aik Ko, interviewed in August 2017)

Apart from the free human labor, local vehicles were also taken for transportation tasks. Locals explain that if you had a mini truck or a Htawlargyi (a vehicle made in China with a traditional engine and manual start), you had to transport wood, bamboo, thatch, and other materials as demanded.

We had a Htawlargyi and very often had to carrying things for free for the military. After some weeks, the engine broke down and my elder brother got sick and could not go for them. A group of soldiers came to our house with their car and asked for the Htawlargyi to carry things. My brother replied that he was sick and the vehicle had broken down. The soldiers got angry and beat my brother in front of me at home. At that moment, some of my elder brothers came back home and saw the soldiers beating my brother and fought off the soldiers. But my brothers had to run away from home and hide somewhere for a while because they were afraid that the soldiers would come back to arrest them. At that time, I was about 8 years old.

(Mr. Maung Nai, interviewed in August 2017).



Picture (11) Moe Byae Dam Security Light Infantry Battalion 422



Picture (12) Pylons surrounded by fencing , Photo by ENAC

The burdens of the pylons

While relocation for the dam caused many troubles for the villagers, more trouble came when LIB 422 was stationed near the dam. On the one hand the Myanmar Army had the responsibility to protect all the power facilities in the area and on the other hand ethnic armed groups would bomb the pylons. Instead of guarding the pylons themselves, Myanmar Army soldiers forced villagers to secure the pylons at nighttime. When the soldiers patrolled at night and saw that any villager had fallen asleep, they got kicked by the soldiers. The military laid down landmines under some pylons, which killed people and animals. In one case, the son of a farmer died due to the mine exploding under the pylon. When the police came to investigate the case, the father tried to take a policeman's gun to shoot the police. Such incidents happened not only in Moe Byae, but also across Karenni State. Until 2011, people had to provide free and forced labor to build fences for the pylons (see photo 14), guard the pylons at night, and clean the plants and bushes around the pylons. Many animals and people died from landmines laid around the pylons by the Myanmar Army. When a landmine exploded accidentally, the animal owner or victim's family had to compensate for the price of the landmine; the dead or injured animal was not returned to the owner.

“One of my friends from a village near Loikaw visited his girlfriend in another village. On the way back home at night, he peed in the pylon area and the bomb exploded. He died on the spot.”

(Mr. Mawshe, interviewed in August 2017)

Around 1995, some of the border guard forces in Karenni State started guarding some pylons and got paid a small amount for their services. Sometimes, the local people had to porter for the military who came to do an annual check of the pylons' security status. These inhumane treatments ended in 2011. However, the clearance of unexploded ordinances laid under the pylons is left unanswered as the fences around the pylons were still in place as of August 2017 (photo 14).

Conclusion

Myanmar's oldest and very first hydropower plants are located in Karenni State, yet the people and the government of the state have no authority to manage, tax, sell or distribute power from the plants. These authorities are all under the central government's control. The state government is just an ad hoc administrator ordered to implement the central government's policies and projects. Moreover, the energy and electricity related ministry's works are controlled by staff from the department of the union ministry in the state government's cabinet. Therefore, sufficient electrification is totally dependent on the good will of the union government.

The electrification status in both Karenni State and the Moe Byae area, which made many sacrifices for the power plants, is still underdeveloped compared to such places as Yangon, Mandalay, Bago, Naypyidaw, and Magway. In addition, the majority of the power generated in Karenni State is sent to Yangon, the commercial hub, via Bago and Naypyidaw, and to Mandalay, the second commercial hub, via Kalaw in Shan State, Tharzi, and Pyin Oo Lwin. The local people continue to suffer from the severe negative impacts of the power plants and reservoir for the sake of urban development. The local residents in Lawpita village, where the Lawpita power plants are located, are still using home-use solar cells for their electricity.

Moreover, unexploded ordinances around the pylon area killing and injuring both animals and humans, land confiscation for the projects, and reservoir security battalions' forced labor and countless human rights violations are still troublesome for the local residents.

Table (14) Total Existing Potential MW of Hydropower'

Type	Sr	Name	Status	Installed Capacity MW	Year	Exported MW	Location	Developer
HPP	1	Balu chaung 1	Built	28	1992	-	Loikaw	MoEE
HPP	2	Balu chaung 2	Built	168	1974	-	Loikaw	MoEE
HPP	3	Balu chaung 3	Built	52	2014	-	Loikaw	Future Energy
Total Existing MW				248				
HPP	6	Ywathit	MOA	4,000		3,600 (Thailand)	Ywathit	CDOI/STH
HPP	4	Hawkham (upper)	MOU	180		-		TEI/HCTC
HPP	5	Nam Pawn (lower)	MOU	105		-		TEI/HCTC
Total Potential MW				4,285		3,600		
Grand Total				4,533		3,600		

Source: IFC, 2017

CHAPTER 4:

IMPLICATIONS

The energy sector in Myanmar has been centralized since after independence from the British. The energy sector has not developed, making Myanmar a country with one of the lowest energy consumption rates in ASEAN. As mentioned in the introduction, just under 40 percent of households in Myanmar were able to access electricity in 2018. Although many mega hydropower plants have been built and billions of US dollars worth of natural gas have been produced, energy resources are prioritized for export rather than for domestic consumption. In order for Myanmar to meet its energy needs, state/regional governments should be given more roles in energy governance.

The tight central control over energy is crippling Myanmar not only in the energy sector, but also in terms of economic growth generally, leaving it lagging behind neighboring countries. Within the country, the individual states and regions with high amounts of proven energy resources fare among the worst in economic and social indicators. For example, Arakan State and Tenasserim Region, where the biggest oil and gas fields are located, rank among the very bottom in the country for access to affordable electricity, energy infrastructure, and other areas (see Charts 5 and 6). People in Tenasserim Region are still paying over 400 kyat per unit for electricity, while Yangon residents are paying less than 100 kyat per unit. Furthermore, in the case of the Lawpita hydropower plants, although electricity is produced in Karenni State and the dam reservoir is in Shan State, both states have received very minimal benefits from the project: while most of the electricity from Lawpita is sent directly to big cities such as Naypyidaw, Yangon, and Mandalay, the local people are left to pay the costs of the socioeconomic and environmental damage. With low electrification rates, hydropower projects fueling armed conflict, human rights violations, social chaos, land eviction, forced relocation, and low economic and development indicators (see Picture 15). It is clear that more than 60 years of rigid centralized energy governance is not a good model for Myanmar.

The union government should decentralize most of the executive, legislative, and judicial authority related to energy to the state and regional governments. Along with this decentralization, Schedules 1, 2, and 5 and sections 37 (a and b) in the 2008 constitution should be amended. Increased privatization of the energy sector with proper safeguards should also be implemented. This will help alleviate the energy crisis in the country and at the same time lessen socioeconomic and political grievances in the states and regions. Less burden and responsibility will fall to the union government to provide nationwide energy security, giving it more time and resources to focus on other problems. As the people in the states and regions are the most knowledgeable about their needs, they are the most suitable persons to manage and control their resources.

There are some good examples of energy decentralization in Myanmar. Buga Company in Kachin State has been providing 24 hours of electricity to Myitkyina and Waimaw through an off-grid project since 2006. Moreover, private investors in a solar project in Magway and Mandalay regions are providing more 40 MW of off-grid electricity. Building the

plants, generation, transmission, and distribution works are much faster than centralized management. When the rest of the country is experiencing blackouts, the electricity supply in Myitkyina, Waimaw, Sappya village in Meiktila, Mandalay, and Minbu in Magway are stable.

Energy inequality in Myanmar

(satellite images of S.E. Asia after dark)

1992



2010



“The satellite image of Myanmar after dark shows the country’s economy at night—an area of almost uninterrupted blackness, surrounded by seas of light in India’s (relatively poor) state of West Bengal, China’s (relatively poor) Yunnan province and the north-west of Thailand.

Among other things, the researchers’ satellite-enhanced number-crunching reveals that:

- Three regions of Myanmar—Yangon, Mandalay and Naypyidaw—emit 40% of the country’s light at night-time. (Yangon alone accounts for 22% of it.)
- GDP per head in these three areas is more than twice as high as the national average”

We can also see from these two snapshots of light emitted at night, that the growth of electricity distribution over this 18 year period dramatically increased in Vietnam, China and Thailand, all countries which do not prioritise export of power. Whereas in Laos and Myanmar, we can see very limited expansion of power over 18 years and only to central areas, whilst the outlying areas remained black. Both of these countries prioritise export of power to other countries, mainly to Thailand and China.

Source:<http://www.economist.com/blogs/banyan/2012/10/electricity-myanmar>

4.1 Executive Authority

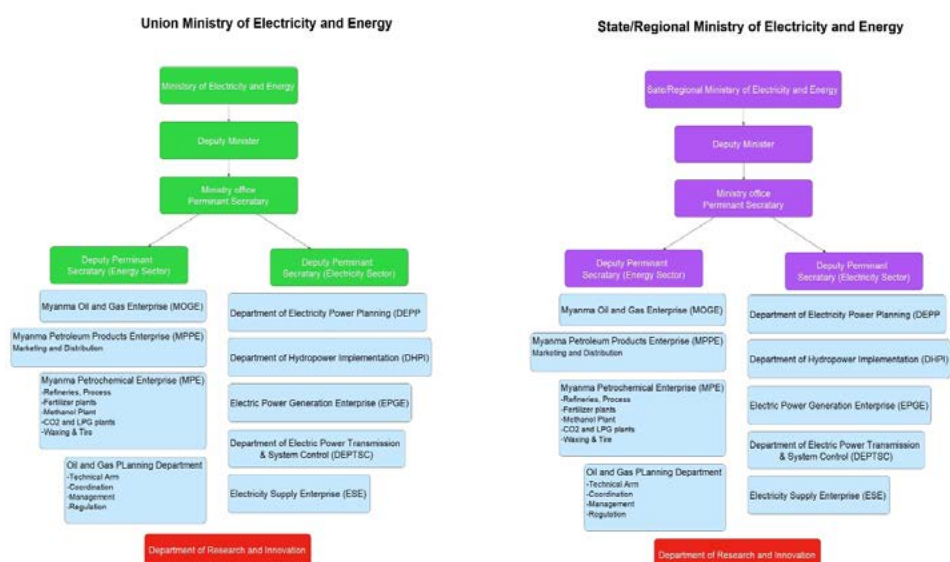
Energy governance in Myanmar is currently extremely centralized, with the state and regional governments having almost no executive authority over energy matters in their own states and regions. Although the states/regions have their own ministries, the departments or offices of the union government's ministries in the state/regional government cabinets execute nearly all decision-making and management in the energy sector. Moreover, the union ministries, such as the Ministry of Energy and Electricity, the Myanmar Investment Commission, the Ministry of National Planning and Economic Development, the Ministry of Environmental Conservation and Forestry, and the Ministry of Labor, Employment and Social Welfare are able to unilaterally issue licenses to investors in states/regions. Some of the departments from the above ministries have offices or sub-departments at the state/regional government level, further indicating the oversized role of the union government in the states and regions.

In addition, the 2008 constitution (Schedules 1, 2, 5 and section 215) and the Myanmar Investment Law and Rules limit the state/regional governments' authority only to management of 1) small-scale hydropower plants (less than 30 MW and less than US\$ 20 million investment capital) and 2) small-scale business investments (that use less than US\$ 1 million for cross border investment and less than 100 acres of land). These authorities are for management only, leaving executive authorities of exploration, build, generation, transmission, and distribution out of the states/regions, and trans-border electricity export/import projects only to the union.

In order to more directly answer to and be held accountable for the energy needs of their own populations, the state/regional governments should have more executive authorities, such as the ability to explore, build, develop, and manage energy projects and the authority to generate, sell, distribute, and tax in their own states and regions, with the exception of nuclear power plants. The state/regional government should have its own departments as MOEE does, such as ESE, EPGE, DPTSC, DHPI, and DEPP, to help fulfill energy demands and ensure economic growth.

In other federal countries, such as the US and Canada, the federal or Union government does not hold every executive mandate related to the power and energy sectors. The majority of executive authority are constitutionally and clearly granted to the state/provincial governments, with the exception of some important provisions, such as regulating nuclear power plants, interstate and trans-border energy trading, and export and import of energy (see Appendix 10). Only in some cases, for example if a project falls within both federal and state/provincial jurisdiction, are both the federal and state/provincial authorities executed.

Chart (20) Sample Model of Union versus State/Regional Ministry of Electricity and Energy



4.2 Legislative and Judicial Authority

The 2008 constitution stipulates that all natural resources found within the territory of Myanmar are owned by the Union, and provides for the enactment of laws for the Union to supervise the extraction and use of natural resources. The Union's legislative list in Schedule One of the constitution (see Appendix 8) covers a wide range of energy-related matters, such as petroleum, natural gas, other liquids and substances declared by the Union Law to be dangerously inflammable, power plants, energy drilling, exploration, production, and distribution of electricity. The State/Regional parliaments can enact laws within the framework of Schedule 2 of the Constitution. Schedule 2 is extremely limited in energy-related matters, giving the states and regions management authority over only medium and small-scale electricity production and distribution that is not linked to the national power grid, and the provision of public lights.

The state/regional government should have the right to legislate beyond Schedule Two, such as over energy related natural resources, matters of investment, land allocation, exploration, drilling, building, selling, generation, transmission, and distribution within their own states/regions. The state/regional governments should also be given judicial authority over the energy sector. As the laws will be made at the state/regional level, the judicial processes should also be handled by the states/regions, rather than the union.

In the case of the US and Canada, both countries have given authority to the states/provinces in managing energy sectors within the state/provincial boundaries. The state/provincial governments regulate electricity generation, transmission, distribution, and retail sales. The federal, or union, government regulates interstate transmission, transportation, and wholesaling of electricity, nuclear power plants, and the import and export of energy.

In summary, the union and state/region jurisdictions should be clearly divided as follows:

Union jurisdiction

1. Regulation of interstate energy exploration, drilling, building, generating, transmission, transportation and distribution, such as national grid and interstate gas pipelines.
2. Energy and electricity wholesale sales to the national grid, between states, or to foreign countries.
3. Regulation of new energy plants and licensing natural gas facilities
4. Export and import of energy.
5. Regulation of all nuclear-related activities, including uranium mining and mills, nuclear power, research, and nuclear waste management.
6. Regulation of trans-boundary environmental impacts, environmental assessments and environmental permits within federal jurisdiction.
7. Setting taxation and royalties policies on union lands or union-owned projects.
8. Establishing policies in the national interest (for example economic development, energy security, R&D, energy statistics, regulating energy product standards and labeling).
9. Interstate and international movement of energy and energy goods.

State/Regional jurisdiction

1. Exploration, drilling, building, generating, transmission, distribution and retail sale of electricity or energy sources and gas pipelines within the state/region.
2. Development and management of resources within state boundaries.
3. Regulation of energy supplies to the consumers in the state.
4. Taxation policy and securing royalties as resource owners in the state.
5. Policies in the state's interest (economic development, energy security, R&D, energy management programs, energy statistics, regulating energy product standards and labeling),
6. Intra state free movement of energy goods.

4.3 Taxation Authority

Sharing political powers should come with sharing taxation authority. Without taxation authority, the state/regional government cannot collect revenues to develop energy infrastructure and implement other local development projects. As it is today, the state/regional governments have to wait for funding from the union government in order to implement any project. Under the current governance system, state/regional governments have very limited authorities to collect taxes and fees from the energy sector. All of the revenues from energy investments and sales are under the union government's control, except for a few taxation authorities listed in Schedule Five of the 2008 constitution, as indicated below.

**“Water tax and embankment tax based on dams and reservoirs managed by the Region or State and tax on use of electricity generated by such facilities managed by the Region or State.”
(Schedule 5)**

All the taxes levied on the power plants in the country and energy related natural resources (oil and gas) go directly to the union government. Below is the current flow of taxes, which is abstracted from a 2015 Adam Smith Institute International report.

Energy Sector Taxes that Flow to the Union Account

1. Royalty/Free Electricity to EPGE (between 7-15% dependent upon the project capital cost)
2. Free Share (5-25% MOEE holds in the joint venture, excluding royalty electricity)
3. Commercial tax (a sale tax⁵⁹ payable after a five-year exemption period)
4. Income tax⁶⁰ (based on profit)
5. Withholding tax on interest (15%)
6. Withholding tax on contract (3.5%)

Energy Related Natural Resources Sector Taxes that Flow to the Union Account

Non-tax fees marked in red flow directly to MOGE

- | | | |
|----------------------------|----------------------|----------------------------------|
| 1-Royalty | 5-Signature Bonus | 9- Training Fund |
| 2-Production Sharing/split | 6-Production Bonuses | 10-Research and Development Fund |
| 3-Land Rent | 7-State Contribution | |
| 4-Pipelines transit fee | 8- Data Fee | |

Taxes that flow to the Department of Internal Revenue of Ministry of Finance

- | | |
|------------------------|---------------------|
| 1-Customs duties | 5-Capital gains tax |
| 2-Stam duties | 6-Excise taxes |
| 3-Corporate income tax | 7-Withholding tax |
| 4-Commercial tax | |

⁵⁹ Commercial tax means that tax is paid by local producers and manufactures on the value of products being produced. It is also referred to as the Goods and Service Tax (GST).

⁶⁰ In the US, the federal government collects only income tax. Broad-based tax collection authority belongs to the states.

As explained in Chapter 1, the union gains millions of US dollars in taxes from energy related natural resources (oil and gas) projects. It has been reported that some of the above-listed tax revenues go to the Other Accounts of the MOEE. Three accounts are offshore accounts based in Singapore and fourteen accounts are onshore accounts. Some union parliamentary members requested that all these other accounts be shut down in 2017.⁶¹ The NLD government has said that it will abolish the Other Accounts held by the government ministries and agencies during the 2019-20 fiscal year. However, the government does not mention specifically whether this include both onshore and offshore accounts.⁶²

Although the majority of the power plants and oil and gas projects are in the states/regions, these tax revenues do not go to the state/regional government accounts. Since the state/regional governments cannot collect revenues from energy production within their state/regional boundaries, they cannot upgrade existing infrastructure and construct new infrastructure. In the case of Karenni State, villagers have been financing energy-related infrastructure on their own, because both the state and union governments could not provide enough funds for projects. If the state has rights to collect taxes and to manage the Lawpita power plants, the state government could earn revenues from taxing the power plants and use those revenues to fund new energy related infrastructure and other socio-economic development projects in Karenni State.

To solve the chronic infrastructure and development deficits in the states/regions, the authority to collect royalties, free shares, commercial taxes, training funds, road right fees, land use fees, pipeline transit fees, and others should be granted to the state/regional governments. The union government could still collect taxes on transaction projects or investments, and other matters that the union has the right to manage. Sharing taxation authority with the state/regional governments will lessen the burden and responsibility on the union government and the state/regional governments will have more responsibilities and more budget to provide basic energy infrastructure and other social and economic development.

4.4. Small scale energy projects and decentralization

Mega power plant projects cause social and environmental damage, fuel the conflict, and are unsafe for the local people if the dams collapse. Mega power plants require a national grid to transport electricity. National grid transmission lines and substations are expensive, take a long time to build, and are inefficient at transporting power to consumers. Even if enough power is generated, if the government cannot afford to build transmission lines across the country, the electricity cannot be delivered to local people. Therefore, decentralized small-scale energy projects are the best solution for Myanmar's energy shortage; as such they should be supported and promoted. For example, a privately-run Mali power plant generating 10.5 MW of off-grid has been providing 24-hour electricity to Myitkyina and Waimaw in Kachin State since 2006. In Minbu, a privately-built solar power plant producing 40 MW began supplying electricity to the national grid in June 2019. Both projects are examples of quick and efficient responses to the energy needs of Myanmar. The states and regions need such smaller and safer power plants.

Small-scale energy projects bring many benefits to local people and governments. They are faster to build and can directly provide for the energy needs of local people. As the production from small-scale projects is closer to local end-users, such projects do not require large transmission lines or transfer stations to transport the electricity; only mini-grids are needed. Small-scale energy projects also accelerate decentralization, involving people in decisions about their own resources, and supporting local job creation. Therefore, supporting and promoting small-scale, privately-run and community-managed energy projects cultivates a federal structure in which local people and governments have the powers to manage their own affairs.

61 <https://www.irrawaddy.com/news/burma/time-abolish-ministries-accounts-nld-lawmaker.html>

62 <https://www.irrawaddy.com/news/accounts-union-govt-ministries-agencies-scrapped.html?fbclid=IwAROG-pz7SDW041U7LS4Mybk321sNgvzh3jOZRKBoUQCIZMSBxvEN0XcFCDkk>

CHAPTER 5:

CONCLUSION AND RECOMMENDATIONS

Centralized energy governance, mismanagement of energy use priorities, and human and financial resource deficiency is crippling the energy and electricity sector, making it impossible to provide for the energy needs of the people of Myanmar. The majority of natural gas resources have been exported to neighboring countries instead of being harnessed for local energy needs. If Myanmar continues to prioritize export and the energy sector continues to be centralized, Myanmar's energy master plan, with its goal of universal electricity access by 2030, will be almost impossible to achieve. In order to achieve 2030 targets, more small- and medium-scale solar, gas, hydropower, and wind power plants should be promoted and supported in a decentralized energy governance system.

The majority of energy resources are located in the conflict-affected states and regions. Since the conflicts are ongoing in the ethnic areas, implementing these mega power projects in conflict affected ethnic areas will be difficult. Therefore, small-scale energy projects, such as micro-hydropower plants, wind, and solar energy that can be easily implemented could be the best solution for Myanmar's energy needs, particularly in rural areas. Developing gas power plants may be another good solution for Myanmar's energy security as the country has trillions of cubic feet of offshore and onshore natural gas reserves.

Currently the union government controls the decision-making powers and revenues from energy projects. In the National Electrification Plan, union ministries are in charge of on grid (the MOEE) and off grid (the MOALI) energy schemes. The union ministries implement union legislation in the energy sectors; the state/regional governments are merely to implement the laws, rules, and regulations decided by the union government. This centralized governance system is a major roadblock hindering Myanmar's energy sufficiency.

There is a huge gap between the union and the state/regional governments in terms of the revenues generated in the states/regions and the budgets allocated to them from the union. Taxation, licensing, and management of energy investments and projects are completely under the union government's control. Although the state/regional governments have their own energy-related ministries, the departments of the union ministries in the state/regional government cabinets have nearly all the taxation authority. Additionally, the revenues generated from the sale of energy resources, except the very few managed by the state/regional governments, are collected by the union government agencies and deposited into the union government accounts. The union then ostensibly distributes them back to the states/regions in the form of a fiscal budget, which is insufficient for the state/regional energy projects.

Therefore, energy-related infrastructure in the states/regions remains severely underdeveloped. Electrification of Karenni State, where Myanmar's very first mega hydropower plants are built, and Arakan and Tenasserim, where offshore gas projects provide massive amounts of gas to neighboring countries, lag far behind big cities like Yangon and Mandalay. Such conditions are evidence that the rigid union government control over the energy sector is not addressing Myanmar's chronic energy deficiency.

The top-down union governance and unfair share of political and fiscal powers with state/regional governments is a root cause of the country's civil war. The major energy resources are located in ethnic areas, yet state and regional governments have almost no executive, legislative, judicial, and taxation authority over these resources. This has been a key issue in the resumption of armed conflict between the government's army and ethnic armed organizations. In 2011, the 17-year ceasefire agreement between the KIO/KIA and Myanmar Army was broken due to the conflict over the Tapein II hydropower plant in the KIO-controlled area. The conflict continues today and 120,000 people remain displaced and vulnerable.

Local peoples suffer severe negative impacts from energy projects, but do not receive benefits. Extra judicial killings, torture, arrests, and land confiscation occurred along the Shwe gas pipelines to China and Yadana pipeline to Thailand. The revenues from the sale of gas go to the union government, not to affected communities. The people from Lawpita village in Karenni State still have to use small solar cells while transmission lines pass over their rooves. Rural people have sacrificed their farmlands and homes for the energy security of the urban areas.

The centralized control of energy production and distribution over the last 30 years has proven to be slow and primarily beneficial to large urban centers in central Myanmar at the expense of ethnic states and regions. Prioritizing the export of energy for cash, rather than for local use and development is inefficient, as Myanmar has to pay more for imported energy than it earns from exporting it. This approach also hinders the development of Myanmar, as it is not only exporting energy, but also exporting development and jobs to neighboring countries. The availability of new renewable energy technology means that Myanmar no longer needs to follow the old style of a centralized grid approach, which relies on energy sources, such as coal and large-scale hydropower, that have severe negative impacts. The solution for Myanmar's energy future is to devolve authority within a new federal union to the states and regions so that they can equitably, quickly, and cheaply develop local energy sources close to their populations and promote local development and jobs toward a sustainable and peaceful society.

In addition to the ENAC Energy Sectoral policy recommendations (see Appendix 1), this paper makes additional recommendations toward positive changes in energy sector:

1. Myanmar is still in the process of political negotiation and national reconciliation and armed conflicts are still ongoing in some parts of the country. Therefore, the ongoing hydropower and mega project investments in armed conflict afflicted states/regions should be put on hold and any new projects should be started only with the consent of local people and ethnic armed organizations in the areas in order to avoid any conflicts.
2. Authority should be devolved within a new federal union to the states and regions so that they can equitably, quickly, and cheaply develop local energy resources close to their populations and promote local development and jobs towards a sustainable and peaceful society.
3. Myanmar should encourage and support the development of less costly small and medium power plants, sustainable and renewable resources, such as water, solar, wind, and biomass for the sake of state/regional electricity sufficiency, to minimize environmental damage and negative social impacts.
4. Myanmar should prioritize domestic energy self-sufficiency instead of export. Compared to neighboring countries, electricity access rate in Myanmar is still low. Universal electricity access at reasonable rates and electricity and energy security should be prioritized; only when all citizens have access to electricity, should any surplus be exported.
5. State/regional governments should have the right to explore, drill, build, generate, transmit, distribute, and sell energy resources, electricity, and energy and electricity related infrastructure within the states/regions and state/regional administered areas. This right should not be limited by the investment capital volume or size of the power plant, but rather only by the severity of social and environmental impact.
6. All levels of government should have a systemic benefit-sharing mechanism with state/regional governments and affected communities for any energy projects located in the states/regions.

References

- Abe M., Dutta M., K. (2014). A new framework for Myanmar's SMEs: UNESCAP Working paper No. 142. Retrieved from: <http://www.unescap.org/resources/new-policy-framework-myanmar%E2%80%99s-sme-development-awp-no-142>.
- Adam Smith International (2015). Chapter 5: Contracts and Beneficial Ownership. In Institutional and Regulatory Assessment of the Extractive Industries in Myanmar (pp. 86-105). Retrieved from: <https://www.adamsmithinternational.com/explore-our-work/west/myanmar/governance-of-myanmars-extractive-industries>
- Adam Smith International (2015). Institutional and regulatory assessment of the extractive industries in Myanmar (Vol. 2). Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/504691467992478731/Main-report>
- ADB (2018). Myanmar: Institutional Strengthening of National Energy Management Committee in Energy Policy and Planning; Project Number: 46389-001 Technical Assistance Number: 8356 June 2018
- ADB (2014). Chapter (4) Foundations for inclusive growth: Myanmar Unlocking the Potential Country Diagnostic Study: (pp.103-148), Philippines, Asia Development Bank.
- ADB (2015). Power Sector Development in Myanmar: ADB Economic Working Paper Series No. 460, ISSN 2313-6537 (Print), 2313-6545 (e-ISSN) Publication Stock No. WPS157710-2, Philippines. Retrieved from; <https://www.adb.org/sites/default/files/publication/175801/ewp-460.pdf>
- ADB (2012). Myanmar Energy Sector Initial Assessment: ADB Economic Working Paper Series, ISBN 978-92-9092-902-4 (Print), 978-92-9092-903-1 (PDF) Publication Stock No. RPS125206-3, Philippines. Retrieved from; <https://www.adb.org/sites/default/files/institutional-document/33719/files/myanmar-energy-sector-assessment.pdf>
- Arakan Oil Watch (2016). Breaking the Curse: Decentralizing the natural resource management in Myanmar. Retrieved from: <http://arakanoilwatch.org/report-breaking-the-curse/>
- Arakan Oil Watch (2012). Danger Zone: Giant Chinese industrial threatens the Myanmar's Arakan coast. Retrieved from: <http://arakanoilwatch.org/danger-zone/>
- Arakan Oil Watch (2012). Burma's Resource Curse: The case for revenue transparency in the oil and gas sector. Retrieved from: [http://www.burmalibrary.org/docs13/Burmas_Resource_Curse\(en\)-red.pdf](http://www.burmalibrary.org/docs13/Burmas_Resource_Curse(en)-red.pdf)
- Asia Foundation (2019). Decentralization Power: The Role of State and Region Governments in Myanmar's Energy Sector.
- Asia Foundation (2015). Conceptualizing Public Sector Reform in Myanmar. Retrieved from: <https://asiafoundation.org/resources/pdfs/PSRFullreportENG.pdf>
- Asia Foundation (2014). Administering the State in Myanmar: An Overview of the General Administration Department. Retrieved from: <https://asiafoundation.org/resources/pdfs/GADEnglish.pdf>
- Asia Foundation (2013). State and Region Governments in Myanmar. Retrieved from: <https://asiafoundation.org/resources/pdfs/StateandRegionGovernmentsinMyanmarCESDTAF.PDF>
- BNI (2013). Economics of Peace and Conflict. Retrieved from: <http://www.mmpeacemonitor.org/mpm/bni-reports#>
- EGRE, D. (2007). United Nations Environment Programme. Dams and Development Project: Compendium on Relevant Practices - 2nd Stage.
- ÉGRÉ, D., ROQUET V., and DUROCHER C. (2002). Benefit Sharing from Dam Projects Phase 1: Desk Study. Retrieved from: <http://documents.worldbank.org/curated/en/406951468326991910/pdf/702810ESWOP1100tBenefits0Lit0Review.pdf>.
- Emmerton M., Thorncraft S., Oksanen S., Soe M., Hlaing Ky., Thein Y., and Khin M. (2015). Chapter C: Energy Resource Inventory: Myanmar Energy Master Plan, Project Number: TA 8356-MYA

- ERI (November 2014). Analysis of EIA for Phase I Thilawa SEZ. Retrieved from: https://earthrights.org/wp-content/uploads/thilawa_eia_analysis.pdf
- ERI (2008). The Human Cost of Energy: Chevron's continuing role on financing and profiting from human right abuses in military rule-Burma (Myanmar). Retrieved from: <https://earthrights.org/publication/the-human-cost-of-energy/>.
- ERI (2009). Getting It Wrong: Flawed "Corporate Social Responsibility" and Misrepresentations Surrounding Total and Chevron's Yadana Gas Pipeline in Military-Ruled Burma (Myanmar). Retrieved from: <https://earthrights.org/publication/getting-it-wrong/>.
- ERI (2009). Total's impact: Human Rights, Environmental, and Financial impacts of Total and Chevron's Yadana Gas Project in Military-ruled Burma (Myanmar). Retrieved from: <https://earthrights.org/publication/total-impact/>.
- ERI (2010). Energy Insecurity: How Total, Chevron, and PTTEP contribute to Human Rights Violation, Financial Secrecy, and Nuclear Proliferation in Burma (Myanmar). Retrieved from: <https://earthrights.org/wp-content/uploads/energy-insecurity.pdf>.
- ERI (2010). Broken Ethic: Norwegian Government's Investment in Oil and Gas Companies Operating in Burma (Myanmar). Retrieved from: <https://earthrights.org/publication/broken-ethics/>.
- Findlay R., Cyn-Young Park, Jean-Pierre A. Verbiest (July 2015). Chapter (VI) Development Strategy for Achieving Inclusive and Sustainable Growth. In Myanmar: Unlocking the Potential, A Strategy for High, Sustained, and Inclusive Growth, ADB Economics Working Papers No. 437 (pp.19-30), Philippines, Asia Development Bank.
- Global Witness (2014). The shell starts to crack?: Real owners of Myanmar's oil and gas blocks come forward. Retrieved from: <https://www.globalwitness.org/reports/shell-starts-crack/>.
- Global Witness (2015). Jade: Myanmar's "Big State Secret". Retrieved from https://www.globalwitness.org/documents/18095/Jade_full_report_online_hi_res.pdf
- IFC (2017). Chapter (V) Hydropower Project: Strategic Environmental Assessment of Hydropower Sector in Myanmar (pp.11-67), International Finance Corporation, World Bank.
- IFC (May 2017). Hydropower: Strategic Environmental Assessment (SEA) of the Hydropower Sector in Myanmar.
- Jagan L., Egeteau R (2013). Chapter (5) Reimagining Burma's Security and Foreign Relations for the 21st Century. Soldiers and Diplomacy in Burma: (pp.340-469)
- KHRG & KRW (2018). Development or Destruction: Human Rights Impacts of Hydropower Development on Villagers in Southeast Myanmar. Retrieved from: <https://progressivevoicemyanmar.org/wp-content/uploads/2018/07/Development-or-Destruction-English.pdf>.
- KIC (2018). Kayah State Investment Opportunity Survey Report, Kayah Investment Committee (KIC).
- MITI (2015). Study on the new power plant project in Mawlamyaing, Mon state, Myanmar: Study on economic partnership projects in developing countries FY 2014.
- MIN, Aung and KUDO, Toshihiro (2012). "Newly Emerging Industrial Development Node in Myanmar: "Ports, Roads, and Industrial Zones Along With Economic Corridor." In Emerging Economic Corridors in the Mekong Region, Edited by Masami Ishida, BRC Research Report No. 8, Bangkok Research Center, IDE-JETRO, Bangkok, Thailand.
- MMRD (2015). Mandalay Investment Opportunity Report. Retried from: http://www.dica.gov.mm/sites/dica.gov.mm/files/documentfiles/en_mandalay_investment_opportunities_survey_final_report_160217_mic_jica_mmr.pdf
- NEMC (2014). The republic of the Union of Myanmar National Energy Management Committee: National Energy Policy.
- NEMC (2015). Myanmar Energy Master Plan: Chapter (B) Historical Energy Balance (pp.51-136).

- Peter H. Calkins and Ngu Wah Win (2013). Impacts of Cyclone Nargis on Social Capital and Happiness in Slightly and Heavily Affected Areas of Myanmar, *Natural Disasters - Multifaceted Aspects in Management and Impact Assessment*, DOI: 10.5772/54140. Available from: <https://www.intechopen.com/books/natural-disasters-multifaceted-aspects-in-management-and-impact-assessment/impacts-of-cyclone-nargis-on-social-capital-and-happiness-in-slightly-and-heavily-affected-areas-of->
- PWC (2017). Chapter (3) Myanmar Infrastructure: Myanmar Business Guide, (pp. 23-38). Myanmar, Price Water Cooper Myanmar Co., Ltd.
- PYO (2011). Poison Clouds: Lessons from Burma's largest coal project at Tigyt. Retrieved from: <http://www.burmalibrary.org/docs11/47252781-Poison-Clouds-in-English.pdf>
- SGM (2009). Corridor of Power: China's Trans-Burma Oil and Gas. Retrieved from: <http://burmariversnetwork.org/chinese/images/stories/documents/corridorofpower.pdf>
- SGM (2013). Drawing the Line: The case against China's Shwe Gas Project for Better Extractive Industries in Burma. Retrieved from: <http://burmacampaign.org.uk/media/DrawingTheLine.pdf>.
- SGM (2011). SOLD OUT: Launch of China Pipeline Project Unleashes Abuse Across Burma. Retrieved from: <http://www.burmapartnership.org/2011/09/sold-out-launch-of-china-pipeline-project-unleashes-abuse-across-burma/>.
- Shrestha P., Lord A., Mukherji A., Shrestha R., K., Yadav L., and Rai N. (2016). Benefit Sharing and Sustainable Hydropower: Lessons from Nepal. The International Center for Integrated Mountain Development. Retrieved from: lib.icimod.org/record/32026/files/icimodResearchReport2016_2.pdf
- Steinberg, D., and Fan, H. (2012). *Modern China-Myanmar Relations: Dilemmas of Mutual Dependence*. ISBN13 9788776940966, NIAS Press: Copenhagen, Denmark.
- Thorntan, Scott E. (2015). The History of Oil Exploration in the Union of Myanmar. Retrieved from: http://www.searchanddiscovery.com/documents/2014/41439harun/ndx_harun.pdf
- UNHCR (2014). Mon State Profile: updated on June 2014. Retrieved from: <http://data.unhcr.org/thailand/download.php?id=222>.
- WB (1992). The Power Sector: Energy Sector Investment and Policy Review Study (pp. 48-63), Chapter (5). Report Number- 10394 BA, World Bank
- WB (2002). Benefit Sharing from Dam Projects Phase 1: Desk Study.
- UNDP (2015). Local Governance Mapping: Mapping the State of Local Governance in Myanmar: Retrieved from: <http://www.mm.undp.org/content/myanmar/en/home/library/poverty/TheStateofLocalGovernanceChin/mapping-the-state-of-local-governance-in-myanmar-background-and.html>.
- The Canadian Constitution (1867-1982). The constitution Acts

Appendix

Appendix 1: Policy Recommendations from Ethnic Nationalities Affairs Center (ENAC)

Source: ENAC (Jan 2019), Sectoral Policy Recommendations for Building a Future Federal Democratic Union (draft), p70-74)

Policy Recommendations during Interim Period

1. Ongoing energy projects must be reviewed according to the benefits of local ethnic people and human rights, and stopped if necessary.
2. Any planned projects shall be stopped until a peace agreement is achieved and only suitable projects shall be implemented afterwards.
3. In implementing energy projects in ethnic areas, consultations shall be made with EAOs and native ethnic nationalities and their consent obtained before the project is started.

General Policy Recommendations

1. The native ethnic communities and representatives from the ethnic nationalities shall participate in drafting energy policies.
2. The federal constitution shall clearly define the right to manage and share the benefits of energy between the federal government and states.
3. States shall have full authority to manage their own energy policy independently in their respective areas. The energy matters relating to other states in the union shall be negotiated.
4. Sale of energy to foreign countries must be reviewed and energy self-sufficiency must be prioritized.
5. The local population shall participate in every level of prescribing and implementing the energy policy to fulfill the energy needs in the state.
6. Laws, rules, and policies that encourage small-scale power projects and renewable energy projects shall be enacted in accordance with ethnic federal democracy and be implemented as a priority.
7. The present electricity distribution system is highly wasteful and must be urgently improved. Energy shall be equitably shared among states.
8. All fossil fuel power stations that burn coal to produce electricity must be terminated and any other energy projects that cause negative impacts on the environment and on the lives of ethnic people shall be reviewed and stopped.
9. In the implementation of energy projects, environmental impact assessments and social impact assessments shall be initially performed and the process shall be carried out in accordance with Free, Prior, and Informed Consent.
10. Any significant impacts that stem from energy projects shall be addressed by just and accountable policies and remediation programs.
11. Energy produced in ethnic states shall be utilized for the sustainable development of that state's ethnic nationalities.

Appendix 2: All Types of Power Plants across the Country

Power Plants in Kachin State												
Focused result of energy consumption at the high case in Kachin: 45.34MW in 2017-18 and 185 MW in 2030												
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country	
1	HPP	Mali	Built	10.5	-	2006	-	-	Waingmaw	Buga Co.	MM	
2	HPP	Dabak	Built	14	-	-	-	-	Waingmaw	Buga Co.	MM	
3	HPP	Chipwi nge	Built	99	26	2013	79	PRC	Chipwi	SPIC	PRC	
4	HPP	Tapein I	renewable	240	30	2011-2020	221	PRC	Bhamo	China Datang	PRC	
5	HPP	Upper Namtwan	Built	3.2		Jan. 2019			Putao			
Total Existing MW				373.2			300					
6	HPP	Chipwi	JVA	3,400		2020	1,700	PRC	Chipwi	CPI	PRC	
7	HPP	Dum Ban	MOU	130	16	2020			Wyunmaw	YBEP/Chan Yinn Khuu	PRC/MM	
8	HPP	Nam Li	MOU	165	19	2020			Wyunmaw		PRC/MM	
9	HPP	Dapein II	MOU	140	18	2022	70		Moemauk	DUHD	PRC	
10	HPP	Laza	JVA	1,900		2025	950		Sumprabum	CPIYN	PRC	
11	HPP	Tongxinqiao	JVA	340	61	2026	170	PRC?	Myitkyina	YEIG/GOEC	PRC/MM	
12	HPP	Gaw Lan	JVA	120	25	2026	60		Chipwi		PRC/MM	
13	HPP	Hkankawn	MOA	140		2026	70	PRC?	Tsawlaw		PRC/MM	
14	HPP	Lawngdin	MOA	600		2026	300	PRC?	Tsawlaw		PRC/MM	
15	HPP	Nam Tabak I	MOA	141	28	2027	-	PRC?	Waingmaw	China Guodian/Tun Thwin Mining)	PRC/MM	
16	HPP	Nam Tabak II	MOA	144	25	2027	-	PRC?	Waingmaw		PRC/MM	
17	HPP	Phizaw	MOA	2,000		2030	-	PRC?	Kanglanphu	CPI	PRC	
18	HPP	Khaunglanphu	MOA	2,700		2030	-	PRC	Kanglanphu	CPI	PRC	
19	HPP	Renan	MOA	1,200		2030	-	PRC	Khawbude	CPI	PRC	
20	HPP	Wutsok	MOA	1,800		2030	-	PRC	Myitkyina	CPI	PRC	
21	HPP	Myitsone	JVA	6,000	1,244	Suspended	5,400	PRC	Myitkyina	CPIYN/AWC	PRC/MM	
22	HPP	Tawog Hka	Identified	50	NA	NA	-	-		-	-	
23	HPP	Ta Rung Hka	Identified	150	NA	NA	-	-		-	-	
24	HPP	Ta Nai Hka	Identified	15	NA	NA	-	-		-	-	
Total Potential MW				21,135								
Grand Total				21,508.2								

Power Plants in Shan State											
Focused result of energy consumption at the high case in Shan: 189.29 MW in 2017-2018 and 355 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Zawgyi I	Built	18	4	1995	-	-	Yaksauk	MoEE	MM
2	HPP	Zawgyi II	Built	12	3	1998	-	-	Yaksauk	MoEE/MOALI	MM
3	HPP	Shweli I	Built	600	175	2009	200	PRC	Manthet Village	YUPD	PRC
4	HPP	Keng Tawng	Built	54	43	2009	-	-	Moeneane	MoEE	MM
5	HPP	Myogyi	Built	30	16	2016	-	-	Ywa Ngan	MOALI	MM
6	HPP	Kinda	Built	56	-	-	-	-	Kyaukse	MoEE	MM
7	HPP	Mongwa	Built	66	-	-	-	-	KengTung	ESDC	MM
8	Coal	Tigyit (Coal)	Built	120	20	2005	-	-	Naong Cho	CHMC/Edin	PRC/MM
				Total Existing MW		956	261	200			
9	HPP	Baluchaung (upper)	Construct	30	3	2019	-	-	Pin Laung	NeoEnergy Oasis	MM
10	HPP	Keng Tawng (upper)	Construct	51	-	2019	-	-	Keng Tawng	MoEE	MM
11	HPP	Yeywa (upper)	Construct	280	-	2019	-	-	Kyautme	MoEE	MM
12	HPP	Shweli 3	Construct	1,050	532	2020	-	-	Namkham	EDF SA	France
13	HPP	Shweli 2	MOA	520	138	2021	260	PRC	Namkham	HIE/AWC	PRC/MM
14	HPP	Nam Hsim	MOU	30	-	2020	-	-		PCR/SE	PRC/MM
15	HPP	Nam Lang	MOU	210	-	2020	-	-		PCR/SE	PRC/MM
16	HPP	Yeywa (middle)	MOU	700	-	2020	-	-	Nawng Khio	SN Power	Norway
17	HPP	Nam Pawn (upper)	MOU	150	-	2020	-	-		TEI/HCTC	SIN/MM
18	HPP	Hpak Nam	MOU	105	-	2020	-	-		TEI/HCTC	SIN/MM
19	HPP	Hpi Hseng	MOU	45	-	2020	-	-		TEI/HCTC	SIN/MM
20	HPP	Nam Lin	LocMoU	36	15	2021	-	-	Tachileik	MAM	MM
21	HPP	Nam Tu	LocMoU	100	47	2021	-	-	Hsipaw	NCEH	MM
22	HPP	KunLong	JVA	1,400	-	2023	700	PRC	Kunlong	Hanergy YN, MPC	PRC/MM
23	HPP	Mantong	MOA	225	63	2024	113	PRC	Minemaw	HydroChina/IGOEC	PRC/MM
24	HPP	Keng Tong	MOU	170	-	2025	85	<-PRC?		YNIC	PRC
25	HPP	Keng Yang	MOU	70	-	2025	35	<-PRC?		YNIC	PRC
26	HPP	He Kou	MOU	138	-	2025	69	<-PRC?		YNIC	PRC
27	HPP	Nam Hka	MOU	210	-	2025	105	-	Mong Sat	YNIC	PRC

28	HPP	Suo Lwe	MOU	240	2025	120	?	Moemeik	YNIC	PRC
29	HPP	Naopha	MOA	1,200	2026	600	PRC	Tangyan	HydroChina/ IGOEC	PRC/MM
30	HPP	Nam Paw	Covenant	20	2019	-		Muse	Great Hor Kham	MM
31	HPP	Mong Ton	MOU	7,000	2030	6,300	Thai	Mongtong	Three Gorges+EGAT	PRC/Thai
32	HPP	Mong Hsat	LocMoU	30		30			Suntac Power Co.	MM
33	HPP	Sedawgyi (upper)	GOM Plan	64		-		Mandalay	MOALI	MM
34	HPP	Nam Hkok	Identified	30					NA	NA
Total Potential MW				14,104	802					
Grand Total MW				15,060						

Power Plants in Karenni State											
Focused result of energy consumption at the high case in Karenni: 18.25 MW in 2017-2018 and 32.67 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Baluchaung 1	Built	28	26	1992	-		Loikaw	MoEE	Myanmar
2	HPP	Baluchaung 2	Built	168	155	1974	-		Loikaw	MoEE	Myanmar
3	HPP	Baluchaung 3	Built	52	52	2014	-		Loikaw	Future Energy	Myanmar
Total Existing MW				248	233						
4	HPP	Ywathit	MOA	4,000			3,600	Thailand	Ywathit	CDOL/STH	PRC/MYA
5	HPP	Hawkham (upper)	MOU	180			-			TEI/HCTC	SIN/MYA
6	HPP	Nam Pawn (lower)	MOU	105			-			TEI/HCTC	SIN/MYA
Total Potential MW				4,285			3,600				
Grand Total				4,533			3,600				

Power Plants in Karen State											
Focused result of energy consumption at the high case in Karen: 42.951 MW in 2017-2018 and 165 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Hutgyi	MOA	1,360		2021-22	1,224	Thai	Kamamung	Sinohydro+EGAT+IGOEC	PRC/THA/MM
2	Caol	Pha An (Coal)	MOA	1,280		2014			Pha An	TTL	
3	HPP	Thauk Ye Khat 1	Identified	150					Thandaung	Asia World	MM

4	HPP	Yunzalin	Identified	100														NA
5	HPP	Lam Pha	Identified	19.5											Lam Pha			NA
6	HPP	Myet Taw Chaung	Identified	10														NA
7	HPP	Pata		5											Kawareik			
8	HPP	Mehkata		120											Kyain Seikgyi			
Total Potential MW				3,045														

Power Plants in Mon State											
Focused result of energy consumption at the high case in Mon: 106.1MW in 2017-2018 and 418 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Ngantae	service	230		2014				Myanmar Lighting (IPP) Co., Ltd	MM
2	GPP	Thaton		118.9		2019				EPGE of MOEE	MM
3	Coal	MCL	service	49					Mawlamyaing	Thai SCB Cement	Thai-MM
Total Existing MW				397.9	230						
4	HPP	Belin	LocMoU	280		2021				HCDG	MM
5	Coal	An-Den	suspended	1,280					Ye	Toyo-Thai	
Total Potential MW				2125.8							
Grand Total				2523.7							

Power Plants in Arakan State											
Focused result of energy consumption at the high case in Arakan: 35.2 MW in 2017-2018 and 243 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Kyaukphyu	Built	100		2015			Kyaukphyu	V Power Holding (Singapore) PTE Co., Ltd	
Total Existing MW				100							
2	LNG	Kyaukphyu	construct	135		2019-22				Sino-hydro partnered with IGE	
3	HPP	Thahtay	Construct	111	34	2020	-		Thandwe	MoEE	
4	HPP	Lemro 2	MOU	90			-		Mrauk Oo	Tractabel	France
5	HPP	Than Dwe	Identified	39			-		Thandwe	NA	NA

6	HPP	Kyein Ta Li	Identified	28			-			NA	NA	NA
7	HPP	Saing Din	Identified	76.5			-		BuuTheeTaung	NA	NA	NA
8	Fuel	ShweSein Lan	NA	50			-		Kyaukphyu	State govt & Shwe Sein Lan		
9	Coal	Kyaukphyu	Withold	1.32			-			MOEP, Daewoo, POSCO, MCM Energy		
Total Potential MW				530.82								
Grand Total MW				630.82								

Power Plants in Tenasserim Division												
Focused result of energy consumption at the high case in Tenasserim: 23.55 MW in 2017-2018 and 290 MW in 2030												
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country	
1	GPP	Kanpauk		20		In service			Dawei	APU/MEPE		
2	Coal	Kawthaung	Built	8		Online			Kawthaung	Thanphyuthu Mining Co., Ltd.		
Total Existing MW				28								
2	LNG	Kanpauk		1,230		2019-22			Dawei	Total and Siemens	France, Germany	
4	HPP	Thein Kun Chaung	Identified	25		NA				NA	NA	
5	HPP	Tha Gyet Chaung	Identified	20		NA				NA	NA	
6	HPP	Glohong Kra	Identified	40		NA				NA	NA	
7	HPP	Sar Ra Wa Chaung	Identified	11		NA				NA	NA	
8	HPP	Taninthayi	Suspended	600		NA			Taninthayi	Italian-Thai	Thailand	
9	GPP	Thaninthayi		400		NA			Myeik	Marubeni, Edin group	Japan, MM	
10	GPP	Myeik	FS in 2015 200		NA			Myeik	Marubeni, Global Power Synergy, EGAT International and Sri Synergy from Thailand and local firm Ayeyar Hintha	Japan, Thai, MM		
11	Coal	Myeik	MOU	50					Myeik	Thanphyoethu Co. Ltd.	MM	
Total Potential MW				2,576								
Grand Total MW				2,604								

Power Plants in Bago Division											
Focused result of energy consumption at the high case in Bago: 223.66 MW in 2017 and 646 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Shwe Taung		55.35		1982			Phyu	MOEE/MOALI	
2	HPP	Zaungtu	Built	20	9	2000			Bago	MoEE	Myanmar
3	HPP	Yenwe	Built	25	14	2007			Kyauktaga	MoEE/MOALI	Myanmar
4	HPP	Kabaung	Built	30		2008			Oak Twin	MoEE/MOALI	Myanmar
5	HPP	Pa Thi	Built	10		2010			Taungoo	NA	
6	HPP	Shwegyin	Built	75	51	2011			Shwegyin	MoEE	Myanmar
7	HPP	Kun Chaung	Built	60		2012			Pyu	MoEE	Myanmar
8	HPP	Thauk Ye Khat-2	Built	120		2013			Taungoo	Gold Energy(Mya)	
9	HPP	Phyu Chaung	Built	40	28	2015			Phyu	MoEE/MOALI	Myanmar
Total Existing MW				435.35	102						
10	HPP	Baw Ka Hta (Thawkahta)	LocMoU	160		2021-22			Kyauk Gyi	Norway NVE/Toolei	
11	Floating Solar	Kun Chaung		30		Pilot project (Survey March 2017)				Norway Power Co., Ltd.	
12	Floating Solar	Zaung Tu		30		Plan				NA	
13	Floating Solar	Shwe Gyin		30		Plan				NA	
Total Potential MW				250	102						
Grand Total				685.35							

Power Plants in Irrawaddy Division											
Focused result of energy consumption at the high case in Irrawaddy: 115.8 MW in 2017 and 406 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Myanaung	Built	34.7		1984			Myanaung	MOEE	
Total Existing MW				34.7							

2	LNG	Milaunggyaik	NA	1,390		2019-22				Shwe TaungYan coastal	Hong Kong-based Zhefu Group, Gunvor Group from Switzerland and Supreme Group of companies from Myanmar	MM/HK/ Switz
3	Coal	Nga Youk Kaung	NA	540		NA				Nga Yoke Kaung	TATA	
Total Potential MW				1,930								
Grand Total				1,964.7								

Power Plants in Mandalay Division												
Focused result of energy consumption at the high case in Mandalay: 551.44MW in 2017-2018 and 2,731 MW in 2030												
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country	
1	HPP	Sedawgyi	Built	25	20	1989			Mandalay	MoEE	MM	
2	HPP	Yeywa	Built	790	175	2010			Kyaukse	MoEE	MM	
3	GPP	Kyaukse	Built	102		2015			Kyaukse	Alstom Power Rental Energy Holding Co., Ltd	US	
4	GPP	Taungtha	Built	95		2015			Taungtha	Aggreko International Project Co., Ltd	UK	
5	Solar	Solar	Built	150		2016			Wunwind	New York-based ACO's Convalt Energy	US	
6	Solar	Solar	Built	150		2016			Nabuaing	New York-based ACO's Convalt Energy	US	
7	GPP	Taungtha	Built	133		2016-17				Vpower-Hongkong		
8	GPP	Myingyan	Built	225		18-Jan			Taungtha	Singapore's Sembcorp Industries		
9	GPP	Kyaukse	built	145		May 18, 2019			Bellin, Kyaukse	The National Infrastructure Holding-led consortium (NIHC)		
Total Existing MW				1815								
10	HPP	Deedoke	MOU	60		2020			Pyinoolwin	Andritz Hydro	Austria	
Total Potential MW				60								
Grand Total				1,875								

Power Plants in Naypyidaw, Union Territory											
Focused result of energy consumption at the high case in Naypyidaw: - 162.29 MW in 2017-18 and -264.42 MW in 2021-22											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Nancho	Built	40	13	2013	-		Pyinmana	MoEE	Myanmar
2	HPP	Upper Paunglaung	Built	280		2015			Pyinmana	MOEE	
3	HPP	Nancho	Built	40							
Total Existing MW				360							
4	HPP	Paung Laung (middle)	MOU	100	39		-		Pyinmana	Energized Myanmar	SIN
5	Solar	Shwe Myo		10		Plan			Naypyidaw		
6	Solar	Thapyaysan		100		Plan			Naypyidaw		
Total Potential MW				210							
Grand Total				570							

Power Plants in Magway Division											
Focused result of energy consumption at the high case in Magway: 107.33 MW in 2017-2018 and 293 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Kyunchaung	Built	54.3		1974			Kyunchaung		
2	GPP	Mann	Built	36.9		1980			Mann		
3	HPP	Mone Chaung	Built	75	38	2004	-		Setoktaya	MoEE/MOALI	MM
4	HPP	Kyee Ohn Kyee Wa	Built	74	42	2012	-		Sidoktaya	MOALI	MM
5	HPP	Myitha	Built	40		2017	-		GaNaw	MOALI	MM
6	Solar	Minbu	Built	40		2019			Minbu	GreenEarthPower	Thailand
Total Existing MW				280.2							
6	HPP	Buywa	Construct	42		2018	-		Setotaya	MOALI	MM
7	HPP	Buywa (upper)	GOM Plan	150		2019	-		Setotaya	MOALI	MM
8	GPP	Myanaung		20		2019-22					
9	Solar	Minbu		220		2018-19					
10	HPP	Mindon	Identified	18						NA	NA
Total Potential MW				450							
Grand Total				730.2							

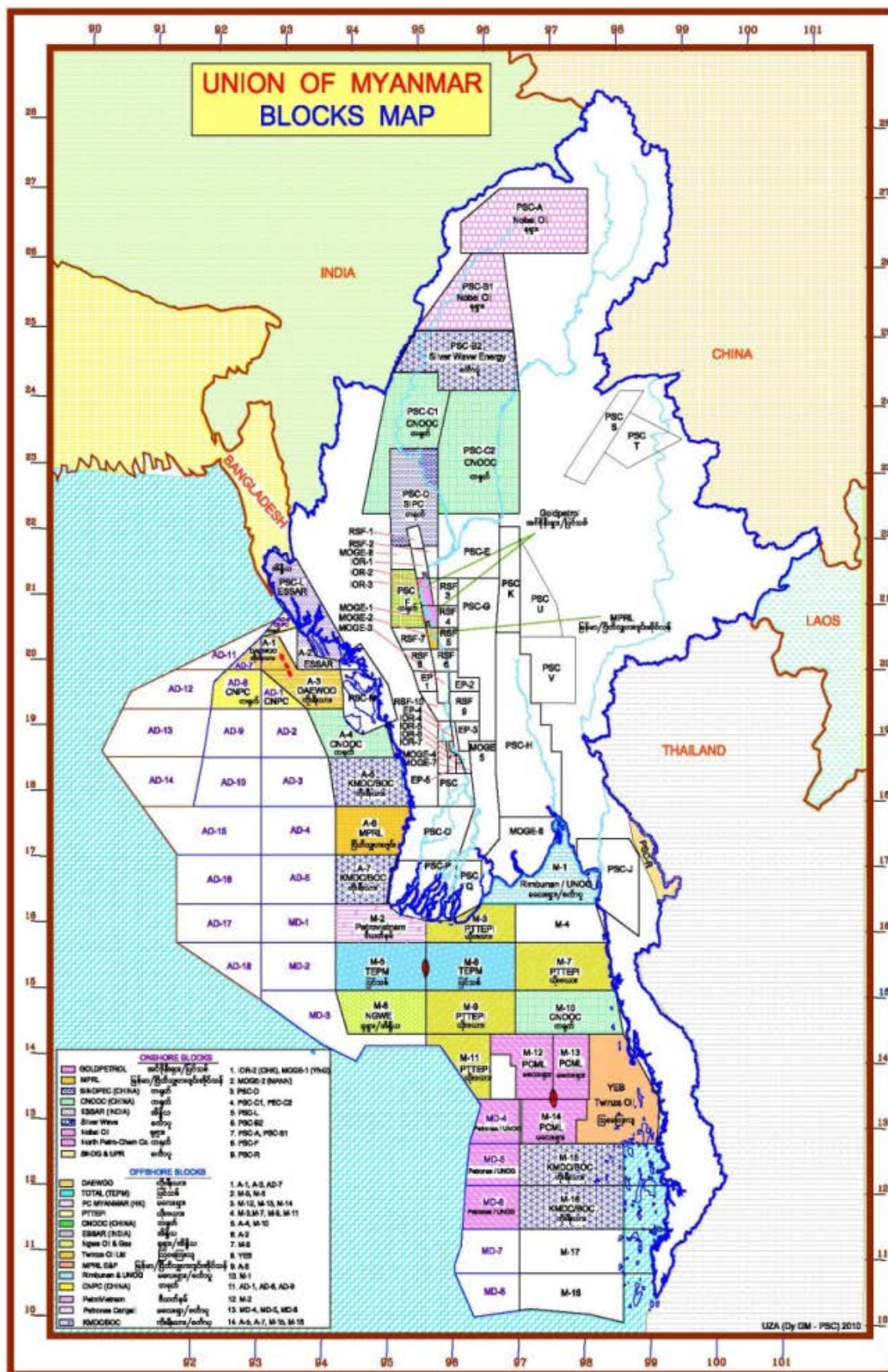
Power Plants in Sagai Division											
Focused result of energy consumption at the high case in Sagai: 216 MW in 2017-2018 and 325.97 MW in 2021-22											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Thapanzeik	Built	30	13	2002	-		Kyun Hla	MoEE/MOALI	MM
2	HPP	Yazagyo	Built	4		2015-16			Kalay	MoEE/MOALI	MM
Total Existing MW				34							
3	Solar	Sagai	NA		80					Andaman Capital Partners	
4	GPP	Puhtolon	NA	12		2019-22			Monywa		
5	Coal	Kalaywa	NA	540					Kalaywa	ISDN and Tun Thwin mining	
6	HPP	U Yu Chaung	Identified	12						NA	NA
7	HPP	Tamanthi	Suspended	1,200				India	Htamanthi	NHPC	India
Total Potential MW				1844							
Grand Total				1,878							

Power Plants in Chin State											
Focused result of energy consumption at the high case in Chin: 11.73 MW in 2017-2018 and 90 MW in 2030											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	HPP	Tikir	online	0.05		2019			Tanthlan		
Total Existing MW				0.05							
2	HPP	Lemro 1	MOU	600						Tractabel	France
3	HPP	Manipur	MOU	380					Kalay	CHEC/Sein	PRC/MM
4	HPP	Mi Chaung	Identified	200						NA	NA
Total Potential MW				1,180							
Grand Total				1,180.05							
Power Plants in Yangon											
Annual increase peak load of Yangon will be 1955 MW in 2019.											
No.	Type	Name	Status	Install MW	Firm MW	commission year	Export MW	Export	Township	Developer	Country
1	GPP	Ywama	Built	70.3		1,980					
2	GPP	Ywama (EGAT)	Built	240	240	2014			Yangon	EGAT	

3	GPP	Ywama (Zeya)	Built	52	2014					UPP Holding & Myanshwepyi Co., Ltd	IPP/BOT
4	GPP	Hlawga	Built	154.2	1995	88		Yangon			
5	GPP	Ahlone	Built	154.2	1995	76		Yangon			
6	GPP	Tharkayta	Built	92	1990	86		Yangon			
7	GPP	Thilawa	Built	50	2016			Yangon			
8	GPP	Hlawga	Built	50	2015					Myanmar Central Power Co., Ltd	IPP/BOT
9	GPP	Tharkayta	Built	50	2013					Max Power Pte.,Ltd	IPP/BOT
10	GPP	Ahlone	Built	121	2013					Toyo Thai Myanmar Power Co., Ltd	IPP/BOT
11	GPP	Tharkayta	Built	53.6	In operation	53.6		Yangon		CIC	IPP/BOT
12	GPP	Tharkayta	Built	106	2018			Yangon		U Energy Thaketa Power Co., Ltd, China's Union Resources and Engineering Co(UREC), Yunnan Energy Investment Group (YIEG)	IPP/BOT
Total Existing MA				1193.3							
13	LNG	Ahlone	NA	477	2019-22			Yangon		Yangon Region TTCL, Italian-Thai Development, Toyo Engineering Corporation	IPP/BOT
14	GPP	Hlawga	NA	468	NA			Yangon		Hydrolancang	IPP/BOT
15	GPP	Tharkayta	NA	503	NA			Yangon		BKB-Korea	IPP/BOT
16	GPP	Tharkayta	NA	513	NA			Yangon		UREC-china	IPP/BOT
Total				1,961							
Total Potential MW				3,154							
Total Existing MW of all types of Plants				6102.7							
Potential MW of all types of plants				55,781							
(the calculation includes some suspended plants such Myitsone, An Den coal plant)											

Source: Extracted from Multiple Source

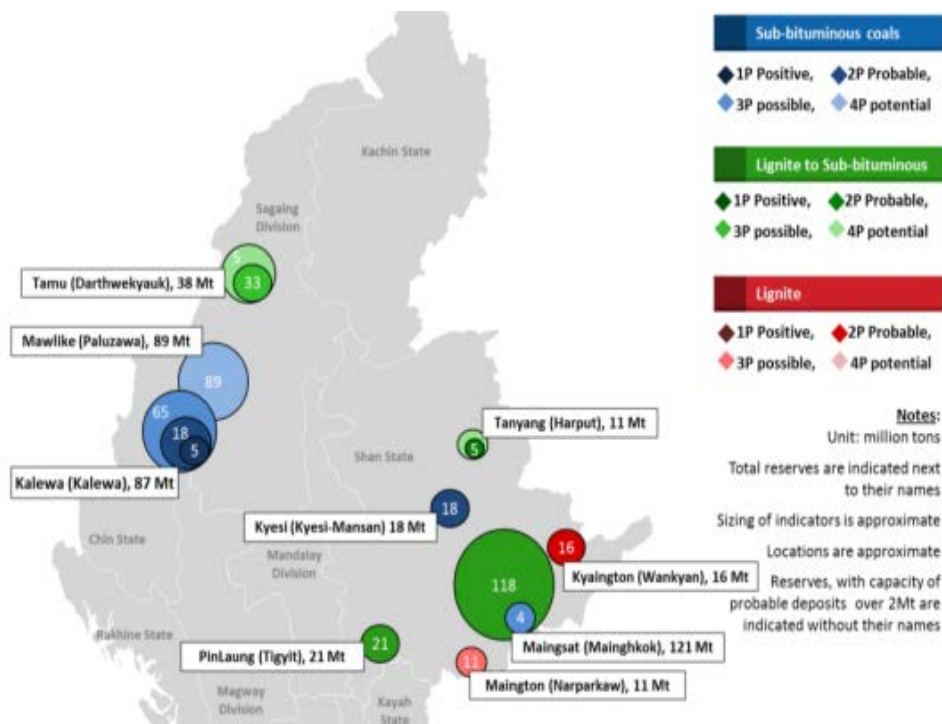
Appendix 3: Onshore/Offshore Oil and Gas blocks



Source: Myanmar Energy Master Plan

Appendix 4: Coal Resources Map

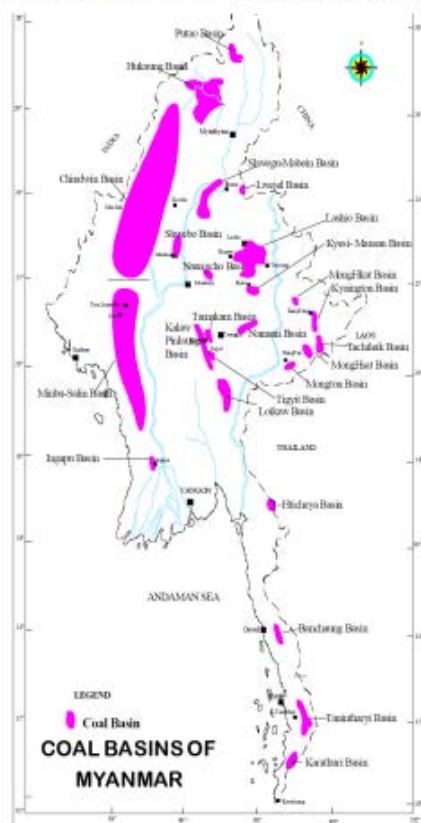
Location of Coal Reserves with a capacity of 10 million tons (Mt)



Sources: Myanmar Energy Master Plan

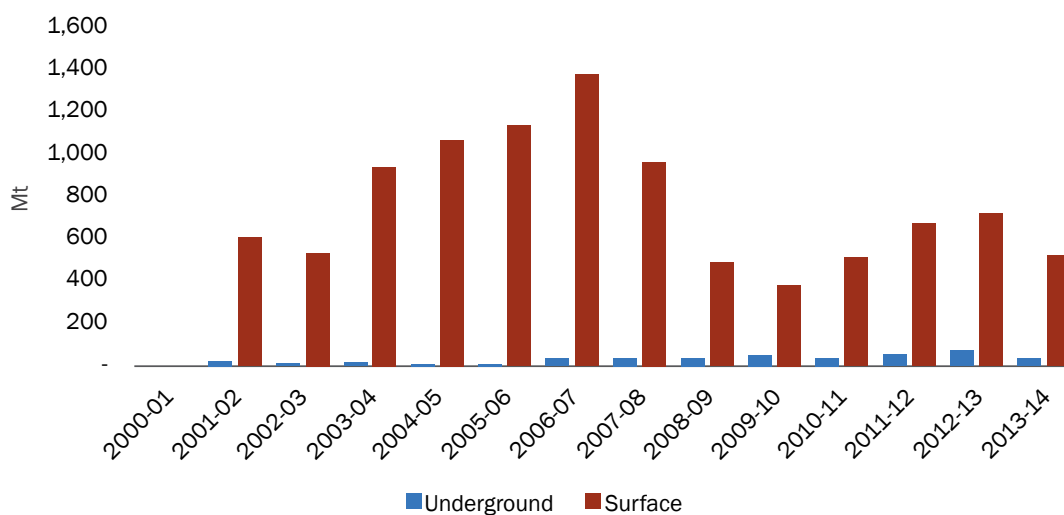
Myanmar Mineral Belts

Figure3-8 Places holding coal deposits underground in Myanmar



Source: Data based on DGSE information materials

Coal Production by mine type 2001-02 to 2012-13



Sources: Myanmar Energy Master Plan

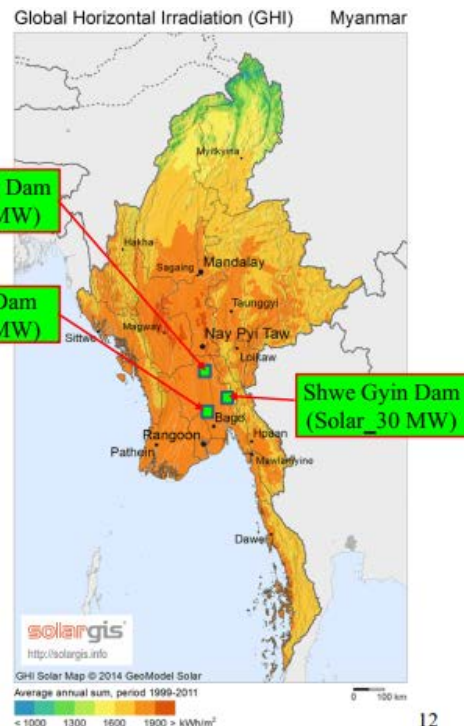
Sr.	Coal Mine	Location	State/ district	Proven Reserves (mtons)	Coal Grade
1	Thinbaung	Khin Oo	Sagai	0.08	Lignite
2	Paluzawa	Mawleik	Sagai	89.00	Sub-bituminous
3	Kalewa	Kalewa	Sagai	87	Su-tituminous
4	Dathwegyauk	Tamu	Sagai	33	Su-tituminous
5	Mahu Taung	Kani	Sagai	0.80	Lignite
6	Kyobin	Kawlin	Sagai	0.03	Sub-bituminous
7	Inbyin	Kalaw	Shan	0.22	Sub-bituminous
8	Namma	Lashio	Shan	2.80	Lignite
9	Sam Laung (Sam Lau)	Tibaw	Shan	1.60	Lignite
10	Mainghkok	Maingsat	Shan (East)	117.7	Lignite (mostly)
11	Tigyit	Pinlaung	Shan	20.70	Lignite
12	Kehsi Mahsam	KehsiMahsam	Shan	18.00	Sub-bituminous
13	Wankyan	Kyaington	Shan (East)	16.66	Lignite
14	Narparkaw	Mainton	Shan (East)	10.93	Lignite
15	Lweje	Moemauk	Kachin	0.20	Lignite
16	Kyauktaga	Natmauk	Magwe	0.54	Sub-bituminous
17	Myeni	Paung	Magwe	0.25	Sub-bituminous
18	Theindaw / Kawmabyin	Taninthayi	Taninthayi	2.00	Sub-bituminous
19	Maw Taung	Taninthayi	Taninthayi	3.60	Sub-bituminous
Total				405.89 million tons	

Sources: Myanmar Energy Master Plan

Appendix 5: Solar and Wind Power

Floating Solar Energy Source Map

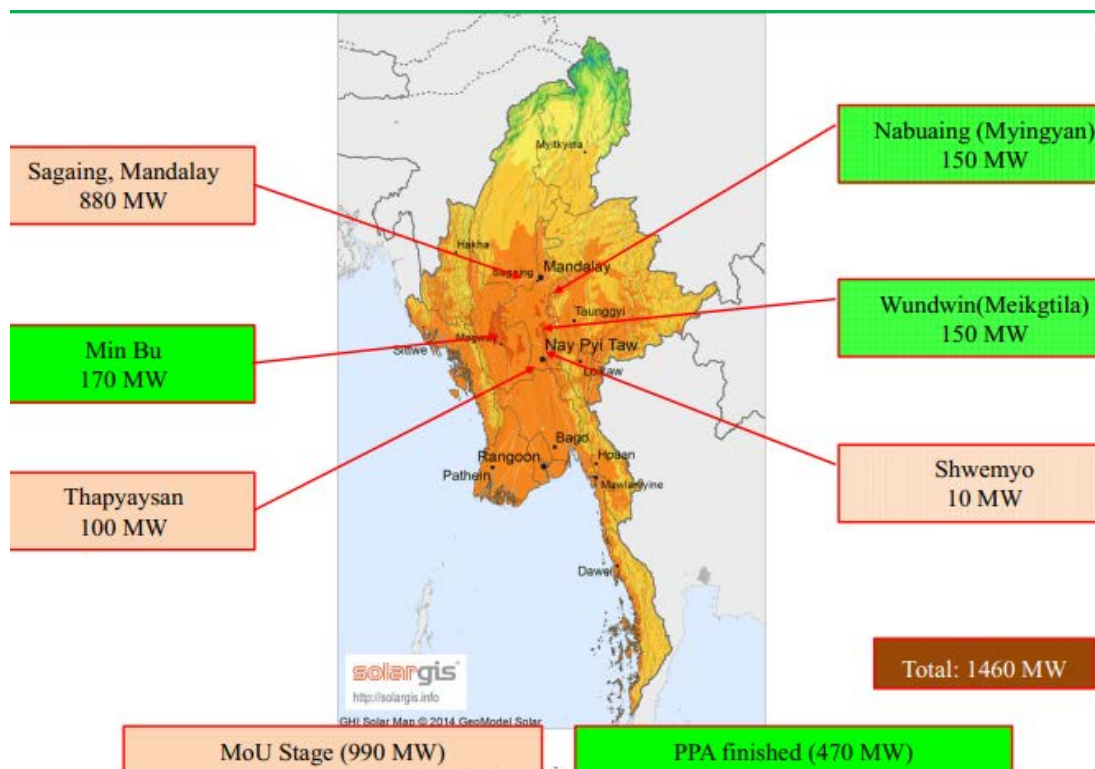
Land Cost	: No.
Installation Cost	: higher compare land based
Evaporation Rate	: Reduce 70%
Efficiency of Solar Panel	: Increase
Water Quality of Dam	: Improve
Cleaning of Solar Panel	: Easy
Installation time	: Less
TL & SS to access Grid	: No Need.



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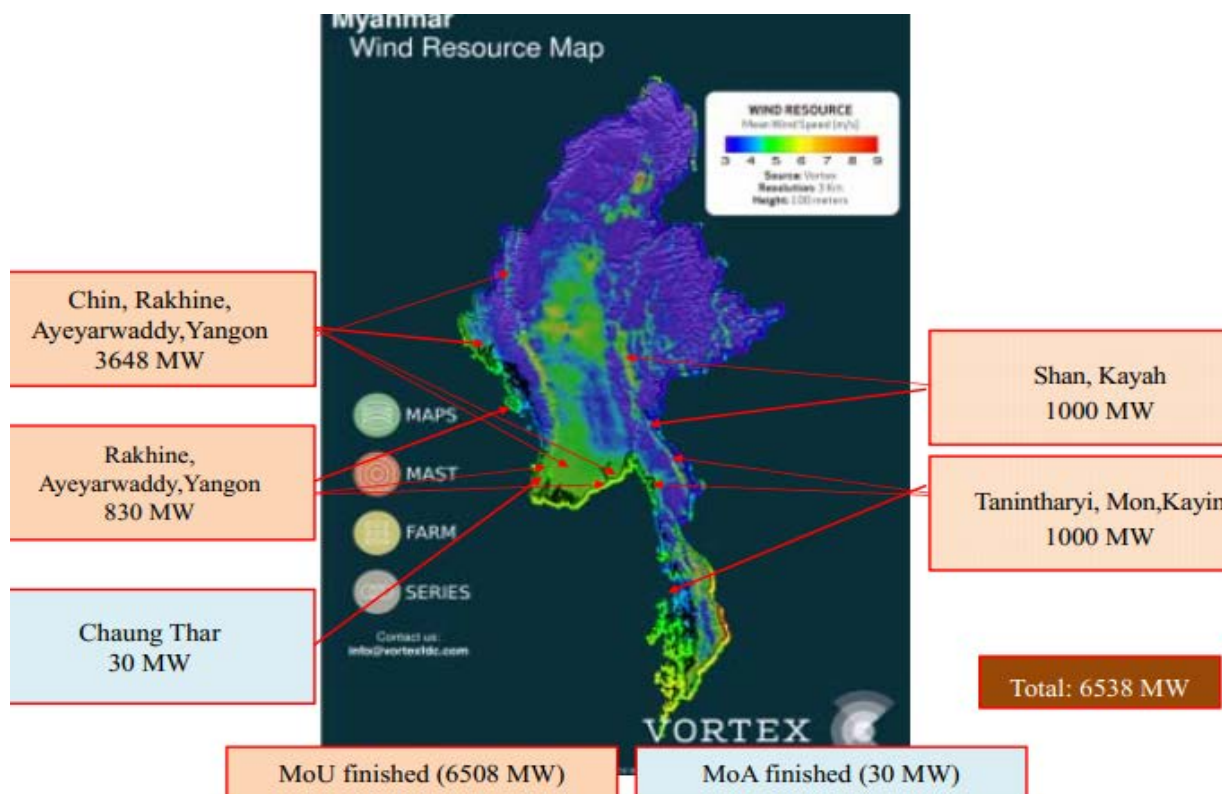
Sources: Ministry of Electricity and Energy

Solar Energy Map



Sources: Ministry of Electricity and Energy

Wind Energy Plan Map



Sources: MOEE

Appendix 6: Categorization of environmental review requirements for energy sector projects

No.	Type of economic activity	Criteria for IEE-type economic activities	Criteria for EIA-type economic activities
SPECIAL INVESTMENT PROJECTS			
1.	Projects in which investment is decided by the parliament or the government cabinet or the president	—	All sizes
POWER SECTOR DEVELOPMENT			
2.	Hydropower plants	Installed capacity ≥ 1 MW but < 15 MW and reservoir volume (full supply level) $< 20,000,000$ m ³ and reservoir area (full supply level) < 400 ha	Installed capacity ≥ 15 MW or reservoir volume (full supply level) $\geq 20,000,000$ m ³ or reservoir area (full supply level) ≥ 400 ha
3.	Nuclear power plants	—	All sizes
4.	Natural gas or bio-gas power plants	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
5.	Coal-fired power plants	Installed capacity ≥ 1 MW but < 10 MW	Installed capacity ≥ 10 MW
6.	Power plants from waste products	Installed capacity ≥ 50 MW	All activities where the ministry requires that the project shall undergo EIA
7.	Geothermal facilities	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
8.	Combined-cycle power plants (gas & thermal)	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
9.	Thermal power plants (other than the types in items 4, 5, 6, 7, and 8)	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
10.	Wind power plants	Installed capacity ≥ 5 MW but < 50 MW	Installed capacity ≥ 50 MW
11.	Solar power plants	Installed capacity ≥ 50 MW	All activities where the ministry requires that the project shall undergo EIA
12.	Onshore oil and gas seismic surveys	All sizes	
13.	Onshore oil and gas exploration drillings	—	All sizes
14.	Onshore oil and gas drilling and production activities; transportation activities including pipelines; pump stations, compressor stations, and storage facilities; ancillary and support operations; and decommissioning	—	All sizes
15.	Offshore oil and gas seismic surveys	All sizes	—
16.	Offshore oil and gas exploration drillings	—	All sizes

17.	Offshore oil and gas drilling and production activities; offshore pipeline operations, offshore transportation, compressor stations, and storage facilities; ancillary and support operations; and decommissioning	—	All sizes
18.	Petroleum refineries or natural gas refineries (including manufacturing of liquefied petroleum gas, motor gasoline, kerosene, diesel oil, heating oil, fuel oil, bitumen, asphalt, sulphur, and intermediate products—e.g., propane/propylene mixtures, virgin naphtha, middle distillate and vacuum distillate for the petrochemical industry.	—	All sizes
19.	Natural gas processing plants; production of liquid products from natural gas (this may include methanol and petroleum liquid products such as naphtha, gasoline, kerosene, diesel fuel, waxes, and lubes)	—	All sizes
20.	Natural gas liquefaction plants	—	All sizes
21.	Oil or natural gas terminals	—	All sizes
22.	Petroleum depots or liquid gas depots	Storage capacity: petroleum < 10,000 tn liquid gas < 2,500 tn	Storage capacity: Petroleum ≥ 10,000 tn Liquid gas ≥ 2,500 tn
23.	Oil or gas transmission or distribution systems	< 10 km	≥ 10 km
24.	Filling stations (including liquefied petroleum gas and compressed natural gas)	≥ 10 m ³ (10,000 liters) fuel storage capacity All activities where the ministry requires that the project shall undergo EIA	
25.	Petroleum-based organic chemicals manufacturing	—	All sizes
26.	Electrical power transmission lines ≥ 115 kV but < 230 kV	≥ 50 km	All activities where the ministry requires that the project shall undergo EIA
27.	Electrical power transmission lines ≥ 230 kV	All sizes	All activities where the ministry requires that the project shall undergo EIA
28.	High voltage (230 kV and 500 kV) transformer substations	≥ 4 ha	All activities where the ministry requires that the project shall undergo EIA

Source: AF (2019)

SCHEDULE TWO **Region or State Legislative List** **(Refer to Section 188)**

Source: Constitution of the Republic of the Union of Myanmar (2008), Schedule Two, page 188-190

1. Finance and Planning Sector

- a. The Region or State budget;
- b. The Region or State fund;
- c. Land revenue;
- d. Excise duty (not including narcotic drugs and psychotropic substances);
- e. Municipal taxes such as taxes on buildings and lands, water, street lightings and wheels;
- f. Services of the Region or State;
- g. Sale, lease and other means of execution of property of the Region or State;
- h. Disbursement of loans in the country from the Region or State funds;
- i. Investment in the country from the Region or State funds;
- j. Local plan; and
- k. Small loans business.

2. Economic Sector

- a. Economic matters undertaken in the Region or State in accord with law enacted by the Union;
- b. Commercial matters undertaken in the Region or State in accord with law enacted by the Union; and
- c. Co-operative matters undertaken in the Region or State in accord with law enacted by the Union.

3. Agriculture and Livestock Breeding Sector

- a. Agriculture;
- b. Protection against and control of plants and crop pests and diseases;
- c. Systematic use of chemical fertilizers and systematic production and use of natural fertilizers;
- d. Agricultural loans and savings;
- e. Dams, embankments, lakes, drains and irrigation works having the right to be managed by the Region or State;
- f. Fresh water fisheries; and
- g. Livestock breeding and systematic herding in accord with the law enacted by the Union.

4. Energy, Electricity, Mining and Forestry Sector

- a. Medium and small scale electric power production and distribution that have the right to be managed by the Region or State not having any link
- b. with national power grid, except large scale electric power production and distribution having the right to be managed by the Union;
- c. Salt and salt products;
- d. Cutting and polishing of gemstones within the Region or State;
- e. Village firewood plantation; and
- f. Recreation centers, zoological garden and botanical garden.

5. Industrial Sector

- a. Industries other than those prescribed to be undertaken by the Union level; and
- b. Cottage industries.

6. Transport, Communication and Construction Sector

- a. Ports, jetties and pontoons having the right to be managed by the Region or State;
- b. Roads and bridges having the right to be managed by the Region or State; and
- c. Systematic running of private vehicles within the Region or State.

7. Social Sector

- a. Matters on traditional medicine not contrary to traditional medicine policies prescribed by the Union;
- b. Social welfare works within the Region or State;
- c. Preventive and precautionary measures against fire and natural disasters;
- d. Stevedoring;
- e. Having the right of management by the Region or State, the following:
 - f. preservation of cultural heritage;
 - g. museums and libraries.
 - h. Theatres, cinemas and video houses; and
 - i. Exhibitions such as photographs, paintings and sculptures.

8. Management Sector

- a. Development matters;
- b. Town and housing development; and
- c. Honorary certificates and awards.

SCHEDULE ONE Union Legislative List (Refer to Section 96)

Source: Constitution of the Republic of the Union of Myanmar (2008), Schedule One, page 181-187

1. Union Defence and Security Sector

- a. Defence of the Republic of the Union of Myanmar and every part thereof and preparation for such defence;
- b. Defence and Security industries;
- c. Arms, ammunition and explosives including biological and chemical weapons;
- d. Atomic energy, nuclear fuel and radiation and mineral resources essential to its production;
- e. Declaration of war and conclusion of peace;
- f. Stability, peace and tranquility of the Union and prevalence of law and order; and
- g. Police force.

2. Foreign Affairs Sector

- a. Representatives of the diplomatic, consular and other affairs;
- b. United Nations;
- c. Participation in international, regional and bilateral conferences, seminars, meetings, associations and other organizations and implementation of resolutions thereof;
- d. Conclusion and implementation of international and regional treaties, agreements, conventions and bilateral agreements and treaties;
- e. Passports and identification certificates;
- f. Visas, admission into the Republic of the Union of Myanmar, stay, departure, immigration and deportation; and
- g. Extradition and request for extradition.

3. Finance and Planning Sector

- a. The Union Budget;
- b. The Union Fund;
- c. Currency and coinage;
- d. The Central Bank of Myanmar and financial institutions;
- e. Foreign exchange control;
- f. Capital and money markets;
- g. Insurance;
- h. Income tax;
- i. Commercial tax;
- j. Stamp duty;
- k. Customs duty;
- l. Union lottery;
- m. Tax appeal;
- n. Services of the Union;
- o. Sale, lease and other means of execution of property of the Union;
- p. Disbursement of loans from the Union Funds;

- q. Investment of the Union Funds;
- r. Domestic and foreign loans;
- s. Acquisition of property for the Union; and
- t. Foreign aid and financial assistance.

4. Economic Sector

- a. Economy;
- b. Commerce;
- c. Co-operatives;
- d. Corporations, boards, enterprises, companies and partnerships;
- e. Imports, exports and quality control thereon;
- f. Hotels and lodging houses; and
- g. Tourism.

5. Agriculture and Livestock Breeding Sector

- a. Land administration;
- b. Reclamation of vacant, fallow and virgin lands;
- c. Settlements and land records;
- d. Land survey;
- e. Dams, embankments and irrigation works managed by the Union;
- f. Meteorology, hydrology and seismic survey;
- g. Registration of documents;
- h. Mechanized agriculture;
- i. Agricultural research;
- j. Production of chemical fertilizers and insecticides;
- k. Marine fisheries; and
- l. Livestock proliferation, prevention and treatment of diseases and research works.

6. Energy, Electricity, Mining and Forestry Sector

- a. Petroleum, natural gas, other liquids and substances declared by the Union Law to be dangerously inflammable; Production and distribution of electricity of the Union;
- b. Minerals, mines, safety of mine workers, and environmental conservation and restoration;
- c. Gems;
- d. Pearls;
- e. Forests; and
- f. Environmental protection and conservation including wildlife, natural plants and natural areas.

7. Industrial Sector

- a. Industries to be undertaken by the Union level;
- b. Industrial zones;
- c. Basic standardization and specification for manufactured products;

- d. Science and technology and research thereon;
- e. Standardization of weights and measures; and
- f. Intellectual property such as copyrights, patents, trademarks and industrial designs.

8. Transport, Communication and Construction Sector

- a. Inland water transport;
- b. Maintenance of waterways;
- c. Development of water resources and rivers and streams;
- d. Carriage by sea;
- e. Major ports;
- f. Lighthouses, lightships and lighting plans;
- g. Shipbuilding, repair and maintenance;
- h. Air transport; Air navigation, control and airfields construction;
- i. Land transport;
- j. Railways;
- k. Major highways and bridges managed by the Union;
- l. Posts, telegraphs, telephones, fax, e-mail, internet, intranet and similar means of communication; and
- m. Television, satellite communication, transmission and reception, and similar means of communication and housing and buildings.

9. Social Sector

- a. Educational curricula, syllabus, teaching methodology, research, plans, projects and standards;
- b. Universities, degree colleges, institutes and other institutions of higher education;
- c. Examinations prescribed by the Union;
- d. Private schools and training;
- e. National sports;
- f. National health;
- g. Development of traditional medicinal science and traditional medicine;
- h. Charitable hospitals and clinics and private hospitals and clinics;
- i. Maternal and child welfare;
- j. Red cross society;
- k. Prevention from adulteration, manufacture and sale of foodstuffs, drugs, medicines and cosmetics;
- l. Welfare of children, youths, women, the disabled, the aged and the homeless;
- m. Relief and rehabilitation;
- n. Fire Brigade;

- o. Working hours, resting-hours, holidays and occupational safety;
- p. Trade disputes;
- q. Social security;
- r. Labour organizations;
- s. Managements by the Union, the following:
 - i. *Ancient culture or historical sites, buildings, monuments, records, stone inscriptions, ink inscriptions on stucco, palm-leaf parabaiks, handwritings, handiworks, inanimate objects and archaeological works;*
 - ii. *Museums and libraries.*
- c. Literature, dramatic arts, music, traditional arts and crafts, cinematographic films and videos; and Registration of births and deaths.

10. Management Sector

- a. General administration;
- b. Administration of town and village land;
- c. Tenants;
- d. Narcotic drugs and psychotropic substances;
- e. Union secrets;
- f. Associations;
- g. Prisons;
- h. Development of border areas;
- i. Census;
- j. Citizenship, naturalization, termination and revocation of citizenship, citizenship scrutiny and registration; and
- k. Titles and honours.

11. Judicial Sector

- a. Judiciary;
- b. Lawyers;
- c. Criminal Laws and procedures;
- d. Civil Laws and procedures including contract, arbitration, actionable wrong, insolvency, trust and trustees, administrator and receiver, family laws, guardians and wards, transfer of property and inheritance;
- e. Law of Evidence;
- f. Limitation;
- g. Suit valuation;
- h. Specific relief;
- i. Foreign jurisdiction;
- j. Admiralty jurisdiction; and
- k. Piracies, crimes committed in international waters or in outer space and offences against the international law on land or in international waters or in outer space

SCHEDULE FIVE **Taxes Collected by Region or States** **(Refer to Section 254)**

Source: Constitution of the Republic of the Union of Myanmar (2008),
Schedule Five, page 193-194

1. Land revenue.
2. Excise revenue.
3. Water tax and embankment tax based on dams and reservoirs managed by the Region or State and tax on use of electricity generated by such facilities managed by the Region or State.
4. Toll fees from using roads and bridges managed by the Region or State.
5. (a) Royalty collected on fresh water fisheries.
 1. Royalty collected on marine fisheries within the permitted range of territorial water.
6. Taxes collected on vehicles on road transport and vessels on inland waterway transport, in accord with law, in a Region or a State.
7. Proceeds, rent fees and other profits from those properties owned by a Region or a State.
8. Fees, taxes and other revenues collected on services enterprises by a Region or a State.
9. Fines imposed by judicial courts in a Region or a State including Region Taya Hluttaw or State Taya Hluttaw and taxes collected on service provision and other revenues.
10. Interests from disbursed by a Region or State.
11. Profits returned from investment of a Region or State.
 1. Taxes collected on extraction of the following items from the forests in a Region or a State:
 2. Taxes collected on all other woods except teak and other restricted hard woods;
12. Taxes collected on firewood, charcoal, rattan, bamboo, birdnests, catch, thanetkha, turpentine, eaglewood and honey-based products.
13. Registration fees.
14. Taxes on entrainments.
15. Salt tax.
16. Revenue received from the Union Fund Account.
17. Contributions by development affairs organizations in a Region or State concerned.
18. Unclaimed cash and property.
19. Treasure trove.

The Power of the states in energy/power sector in the federal countries

United States

Distribution of powers on Energy/power sector between state and federal governments are based on the commerce clause of the U.S constitution. Under the clause the U.S. Congress has been given power to regulate interstate commerce while the states have power regulate commerce within the state boundary.

One of the strongest justifications for the state regulation in the energy area is public safety. For example, the storage and distribution of gasoline may be regulated to protect the state's citizens from danger of personal injury. Similarly, the inherent dangers of operating motor vehicles justify state regulation under the police power despite an unavoidable impact upon interstate commerce.

The energy related sectors are managed and regulated by Federal Energy Regulatory Commission (FERC). It has jurisdiction over interstate natural gas pipelines, the transmission and wholesale sale of electricity and natural gas in interstate commerce and regulates the transportation of oil by pipeline in interstate commerce. FERC also reviews proposals to build interstate natural gas pipelines, natural gas storage projects, and liquefied natural gas (LNG) terminals, in addition to licensing non-federal hydropower projects.

FERC primary duties

- Regulating the transmission and sale of natural gas for resale in interstate commerce; Regulating the transmission of oil by pipelines in interstate commerce;
- Regulating the transmission and wholesale sales of electricity in interstate commerce; Licensing and inspecting private, municipal, and state hydroelectric projects;
- Approving the siting of and abandonment of interstate natural gas facilities, including pipelines, storage and liquefied natural gas;
- Ensuring the reliability of high voltage interstate transmission system; Monitoring and investigating energy markets;
- Using civil penalties and other means against energy organizations and individuals who violate FERC rules in the energy markets;
- Overseeing environmental matters related to natural gas and hydroelectricity projects and major electricity policy initiatives;
- and Administering accounting and financial reporting regulations and regulating businesses of regulated companies
- The states are responsible for energy matters relating to economic and energy security within their borders which include transmission, distribution, taxing, infrastructure within the states, retail sales.

Power Sharing between the Provincial and Federal Government in Canada

	Federal	Province/State	First Nation (Aboriginal)
Jurisdiction	the construction and operation of international transmission lines as well as the regulation of electricity export to the United States are matters that fall within the authority federal regulatory tribunal.of the National Energy Board, a federal regulatory tribunal.	Jurisdiction over electricity and natural resources and the rest of electricity and energy matters that are not in the list of Federal government.	granted the right of self-government. seek permits or approvals from a First Nations government entity, or to enter into resource-sharing arrangements.
	nuclear industry is also federally regulated; this responsibility falls to the Canadian Nuclear Safety Commission		
Legislature		<p>(b) development, conservation and management of non-renewable natural resources and forestry resources in the province, including laws in relation to the rate of primary production therefrom; and</p> <p>(c) development, conservation and management of sites and facilities in the province for the generation and production of electrical energy.</p> <p><u>Export from provinces of resources</u></p> <p>(2) In each province, the legislature may make laws in relation to the export from the province to another part of Canada of the primary production from non-renewable natural resources and forestry resources in the province and the production from facilities in the province for the generation of electrical energy, but such laws may not authorize or provide for discrimination in prices or in supplies exported to another part of Canada.</p> <p><u>Authority of Parliament</u></p> <p>(3) Nothing in subsection (2) derogates from the authority of Parliament to enact laws in relation to the matters referred to in that subsection and, where such a law of Parliament and a law of a province conflict, the law of Parliament prevails to the extent of the conflict.</p>	

Executive	Ministry of Natural Resources	Province's Ministry of Energy and Natural Resources	
Taxation Authority		In each province, the legislature may make laws in relation to the raising of money by any mode or system of taxation in respect of (a) non-renewable natural resources and forestry resources in the province and the primary production therefrom, and (b) sites and facilities in the province for the generation of electrical energy and the production therefrom,	
Environmental Protection	Joint responsibility on the environmental assessment of electricity developments-which level of government may be paramount, changes with various environmental, regulatory and government funding considerations.		
		Project developers must also obtain certain key environmental approvals at the provincial level.	

QUEBEC PROVINCE/STATE⁶³

Installed Capacity		45,402 MW in 2017 (largest producer in Canada)	
Power Plant		62 Hydroplants (98% of output), one wind facility, 28 Thermal facilities, (2 shutdown nuclear facilities), Natural gas, biomass, Solar, Wind, Petroleum	
Legislature		Hydro-Quebec Act, Act respecting the Régie de l'énergie (The Energy Board Act), Clean Energy Act	
Executive		Minister of Energy and Natural Resources	
Jurisdiction		✓	
Taxation Authority		✓	
Environmental Protection	subject to both Federal and Province laws and regulations		
Export to		USA (Quebec is the largest exporter of all provinces) Having interconnection with Ontario, New Brunswick, and the U.S. Northeast.	

ONTARIO PROVINCE/STATE⁶⁴

Installed Capacity		40, 123 MW in 2017 (2th largest producer)	
Power Plant		3 Nuclear facilities (60% of production), 66 hydropower facilities (26% of production), 7% from Wind, 5% from Natural Gas, Solar, Biomass and Petroleum	

⁶³ <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/qc-eng.html>

⁶⁴ <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/on-eng.html>

Legislature		Energy Competition Act 1998,	
Executive		Ministry of Energy, Northern Development and Mines	
Jurisdiction		✓	
Taxation Authority		✓	
Environmental Protection		✓	
Export to		Michigan (USA), Minnesota (USA), and New York (USA) Interconnection with Manitoba province and Quebec province	
British Columbia⁶⁵			
Installed Capacity		17, 701 MW in 2017 (4th largest producer)	
Power Plant		90% from Hydro, 6% from Natural Gas, Wind, Biomass and Petroleum	
Legislature		BC Hydro Act, Utilities Commission Act, U.S. Federal Energy Regulatory Commission's Order 888 pro forma tariff	
Executive		Ministry of Energy, Mines & Petroleum Resources	
Jurisdiction		✓	
Taxation Authority		✓	
Environmental Protection		✓	
Export to		USA and Alberta province Having interconnection with US and Alberta.	

⁶⁵ <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/bc-eng.html>

Appendix 11: Summary of Non-Tax Instruments contained in the Standard Terms and Conditions for PSCs

Non-Tax Instruments	PSC Onshore Blocks	PSC Offshore Blocks	PSC Deep Water Blocks	IPRC Onshore Blocks
Data Fee	None	Amount not specified (3)	None	Amount not specified (6)
Signature Bonus	Amount not specified (2)	Amount not specified (2)	Amount not specified (5)	Amount not specified (7)
Royalty	12.50%	12.50%	12.50%	12.5% (8)
Production Split	Crude Oil:	Crude Oil:	Crude Oil:	Incremental Crude Oil:
	Lowest threshold; up to 10,000 BOPD 60% MOGE and 40% Contractor	600 feet or less of water depth Lowest threshold; up to 25,000 BOPD 60% MOGE and 40% Contractor	2,000 feet or less of water depth Lowest threshold; up to 25,000 BOPD 60% MOGE and 40% Contractor	Lowest threshold; up to 5,000 BOPD 60% MOGE and 40% Contractor
	Highest threshold; Above 150,000 BOPD 90% MOGE and 10% Contractor	Highest threshold; Above 150,000 BOPD 90% MOGE and 10% Contractor	Highest threshold; Above 150,000 BOPD 90% MOGE and 10% Contractor	Highest threshold; Above 30,000 BOPD 85% MOGE and 15% Contractor
		More than 600 feet of water depth	More than 2,000 feet of water depth	
		Lowest threshold; up to 25,000 BOPD 60% MOGE and 40% Contractor	Lowest threshold; up to 25,000 BOPD 60% MOGE and 40% Contractor	
		Highest threshold; Above 150,000 BOPD 85% MOGE and 15% Contractor	Highest threshold; Above 150,000 BOPD 85% MOGE and 15% Contractor	
	Natural Gas	Natural Gas	Natural Gas	Incremental Natural Gas:
	Lowest threshold; up to 60 MMCFD 60% MOGE and 40%	600 feet or less of water	2000 feet or less of water	
	Highest threshold; above 900 MMCFD 90% MOGE	Lowest threshold; up to 300 MMCFD 65% MOGE and 35% Contractor	Lowest threshold; up to 300 MMCFD 65% MOGE and 35% Contractor	
		Highest threshold; above 900 MMCFD 90% MOGE	Highest threshold; above 900 MMCFD 90% MOGE	
		More than 600 feet of water depth	More than 2000 feet of water depth	
		Lowest threshold; up to 300 MMCFD 60% MOGE and 40% Contractor	Lowest threshold; up to 300 MMCFD 60% MOGE and 40% Contractor	
		Highest threshold; above 900 MMCFD 90% MOGE and 10% contractor	Highest threshold; above 900 MMCFD 80% MOGE and 20% contractor	
Non-Tax Instruments	PSC Onshore Blocks	PSC Offshore Blocks	PSC Deep Water Blocks	IPRC Onshore Blocks

Commerciality Bonus	None	None	None	Amount not specified (9)
Production Bonus	Crude Oil	Crude Oil	Crude Oil	Crude Oil
	Upon approval of development plan 0.50 MMUS\$	Upon approval of development plan 1.00 MMUS\$	Upon approval of development plan 1.00 MMUS\$	Lowest threshold; up to 2,000 BOPD for 60 days of consecutive production 0.20 MMUS\$
	Highest threshold; Above 150,000 BOPD for 90 consecutive consecutive days of production 6.00 MMUS\$	Highest threshold; Above 200,000 BOPD for 90 consecutive consecutive days of production 10.00 MMUS\$	Highest threshold; Above 200,000 BOPD for 90 consecutive consecutive days of production 10.00 MMUS\$	Highest threshold; Above 30,000 BOPD for 60 consecutive consecutive days of production 3.00 MMUS\$
	Natural Gas	Natural Gas	Natural Gas	Incremental Natural Gas:
	Upon approval of Development Plan 0.50 MMU S\$	Upon approval of Development Plan 1.00 MMU S\$	Upon approval of Development Plan 1.00 MMU S\$	Lowest threshold; up to MMCFD for 60 consecutive days of production 0.50 MMUS\$
	Highest threshold; above 900MMCFD for 90 consecutive days of production 6.00 MMU S\$	Highest threshold; above 900MMCFD for 90 consecutive days of production 10.00 MMU S\$	Highest threshold; above 900MMCFD for 90 consecutive days of production 10.00 MMU S\$	Highest threshold; above 150 MMCFD for 60 consecutive days of production 2.00 MMU S\$
Training Fund	Exploration period: 25,000 UIS\$ per year	Exploration period: 50,000 UIS\$ per year	Exploration period: 50,000 UIS\$ per year	Initial joint study period: 10,000 UIS\$
	Production period; 50,000 US\$	Production period; 100,000 US\$	Production period; 100,000 US\$	Pilot project period; 50,000 US\$
				Production period; 50,000 US\$
				Excess average production over 30,000 BOPD: 100,000 US\$ per year
Research and Development Fund	0.5% of Contractor's share of Profit Petroleum	0.5% of Contractor's share of Profit Petroleum	0.5% of Contractor's share of Profit Petroleum	0.5% of Contractor's share of Profit Petroleum
State	15% to MOGE with	Up to 20% after commercial	Up to 20% after commercial discovery and	15% undivided interest
Participation	MOGE's discretion	Reserve are greater than 5 TCF	Up to 25% of the reserves greater than 5 TCF	
Non-Tax Instruments	PSC Onshore Blocks	PSC Offshore Blocks	PSC Deep Water Blocks	IPRC Onshore Blocks
Income Tax (1) (4)	25% of Contractor's Net Profit	25% of Contractor's Net Profit	25% of Contractor's Net Profit	According to the Myanmar Income Tax Law
Sharing Profit on Sale or transfer of shares	40% of net profit up to 100 MMUS\$	40% of net profit up to 100 MMUS\$	40% of net profit up to 100 MMUS\$	40% of net profit up to 100 MMUS\$
	45% of net profit between 100 MMUSS\$ and 150 MMUS\$	45% of net profit between 100 MMUSS\$ and 150 MMUS\$	45% of net profit between 100 MMUSS\$ and 150 MMUS\$	45% of net profit between 100 MMUSS\$ and 150 MMUS\$
	50% of net profit above 150 MMUS\$	50% of net profit above 150 MMUS\$	50% of net profit above 150 MMUS\$	50% of net profit above 150 MMUS\$

Source: Adam Smith International (2015)

Table (5) Myanmar Commodity Balance: Onshore/Offshore Natural Gas 2000/01 to 2013/14 (MMcf)

Unit: '000 ton	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14
Production	183,421	292,174	356,248	371,811	426,171	437,729	460,442	476,829	405,521	439,615	450,379	464,935	467,005	482,276
Imports	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exports	128,530	242,787	295,598	304,600	353,408	368,913	389,827	399,562	327,802	373,873	365,709	364,985	362,156	372,663
Stock Changes (+ or -)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gross Inland deliveries (calculated)	54,891	49,387	60,650	67,212	72,763	68,816	70,615	77,267	77,719	65,742	84,671	99,950	104,848	109,614
Statistical Differences (+ or -)	2,108	4,136	5,290	7,513	4,776	7,794	1,330	-458	-1,618	7,740	6,102	5,282	7,825	-3,870
Gross Inland deliveries (observed)	52,783	45,251	55,361	59,699	67,987	61,022	69,285	77,725	79,337	58,002	78,569	94,668	97,024	113,483
Transform														
Total transform	32,826	29,066	33,689	39,329	44,668	41,325	37,646	42,014	40,447	23,705	41,985	52,988	58,194	61,046
Electricity	32,826	29,066	33,689	38,693	43,958	40,716	37,009	41,281	39,747	23,047	41,226	2,196	57,333	60,563
Other	-	-	-	636	710	609	637	733	700	658	759	793	861	483
Total Final Consumption	19,957	16,185	21,672	20,370	23,320	19,697	31,639	35,711	38,890	34,297	36,584	41,680	37,857	51,118
Industrial	8,768	9,323	13,400	13,754	15,742	10,694	16,262	18,570	20,734	18,599	19,160	18,799	16,010	19,364
Fertilizer Plant	3,942	3,296	4,588	6,462	4,335	4,837	5,139	5,617	5,332	2,796	2,818	6,816	7,906	6,126
Other Industry	4,826	6,027	8,812	7,292	11,407	5,857	11,123	12,953	15,402	15,803	16,342	11,983	8,104	13,238
Transport	74	73	9	74	150	1,440	3,357	4,813	6,006	6,664	7,040	7,165	6,725	7,254
Others	11,115	6,790	8,203	6,542	7,427	7,564	12,019	12,329	12,150	9,034	10,384	15,716	15,122	24,500

Source: Myanmar Energy Master Plan



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