The Republic of the Union of Myanmar

National Energy Management Committee

National Energy Policy

2014

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Chapter 1

Myanmar Reform Program

Introduction

1. Myanmar is the largest country in mainland Southeast Asia with a total land area of 676,577 square kilometers and a population of about 60 million people. It shares borders with 40% of the world's population in the People's Republic of China to the north and northeast, Lao People's Democratic Republic (Lao PDR) and Thailand to the east and southeast, and Bangladesh and India to the west and northwest. With a 2,800-kilometer coastline that provides access to sea routes and deep-sea ports, Myanmar has the potential to serve as a gateway between East Asia, South Asia, and Southeast Asia. Myanmar has rich natural resources, including arable land, forests, minerals, natural gas, and freshwater and marine resources.

2. Myanmar has been taking initiatives to transform the socialist economy into a market economy. The mandate of the new government of President U Thein Sein, elected in 2010, is to chart a new direction for the country. Emerging from decades of isolation, Myanmar is undergoing a major economic, social, and political transformation. With abundant natural resources, a strategic location in Southeast Asia, and a large and young population, Myanmar has a unique opportunity to lay the foundation for a brighter, more prosperous future for its people.

3. In pursuit for a continued people based reforms, President U Thein Sein, on 11 May, 2012 called for the development of policies and reform strategies that can achieve people-centered development, civic participation and human resource development, effective and transparent use of public financial resources, sustainable regional development, decentralization and greater autonomy for local government, and poverty reduction.

National Framework of Economic and Social Reforms

4. The National Framework of Economic and Social Reforms (FESR-2012), draws upon the guidelines set by the President as well as the existing priorities set in

the Fifth Five-Year Plan and other annual and sector plans and priorities identified by the government. The FESR sets out the policy direction for the next three years and outlines the framework for subsequent long-term reforms for implementation. The framework, incorporating inputs and feedbacks from several rounds of extensive discussions with concerned departments and senior officials of the government, reinforces the reform initiatives already underway and details complementary measures that can add value to it. The FESR is also designed as a policy linkage between the existing plans of the government to the National Comprehensive Development Plan (NCDP), a long-term plan that the Government of Myanmar (GOM) is now developing through broad consultations and bottom-up processes.

5. While FESR's major focus is on delivering immediate and tangible benefits to the people of Myanmar in the shortest possible time frame, it also aims for two broad objectives for the medium-term;

(a) To move the ongoing reform process forward and make it irreversible so that Myanmar can become a modern developed nation that meets the aspirations of its people for a better life; and

(b) To accelerate Myanmar's greater integration with the international community.

6. It is envisaged that FESR will help Myanmar achieve sustained economic growth and poverty reduction that will facilitate further progress in the national reconciliation and democratization processes currently underway, and the political advancement necessary for Myanmar to establish itself as a modern developed nation.

Chapter 2

Energy Sector

Energy Resources Endowment and Consumption in Myanmar

1. Myanmar is the 40th largest country in the world and is the largest country in the South East Asia Region having an area of 676,577 sq kilometer while population density is 92 person / sq km. The geography/ topography is constituted of Northern Hill ranges, Western Yoma, Eastern Shan Highland, Central Plains and Coastal areas.

2. Northern Hill Ranges are continuous with Himalian Mountains and have the highest Khakaborazi Mountain with 19295 ft high, the Western Yoma continues from Myanmar's Northern Hill Ranges to Rakhine Coastal area in the south. The Eastern Shan highland with average elevation of 3000ft covers most of Myanmar's eastern part, the Central Plains locating between Eastern Shan Highland and Western Yoma is constituted of Ayeyarwady River valley, Chindwin River valley, Sittaung River valley.

3. The climate of Myanmar is mainly of South – West Monsoon climate and can be roughly divided into 3 different climatic seasons: summer season, rainy season and cold season. From March to May of a year is summer season with average temperature 100°F, Mid May to October is rainy season with rainfall varying with different regions of the country. Along the Rakhine and Tanintharyi region annual rainfall is up to 200 inches while in Central Region is only 40 inches.

4. With mountain ranges trending to north to south and the South West Monsoon climate, the rivers and streams flowing in the mountain ranges can be recognized as the abundant water resources of country.

5. As the major valleys of the country, Myanmar has Ayeyarwady, Chindwin, Sittaung and Thanlwin river valleys. In addition Myanmar is sharing part of the South East Asia largest Mekong river valleys in the eastern part of region. Along the Rakhine coastal region, small river valleys such as Saingdin, Lemro, Kaladan, Ann,

Thahtay, Thandwe, Kyeintali are occurring. Similarly, Tanintharyi river valleys, Parchan river valley occur along the Tanintharyi Coastal areas and Bago river valley, Bilin valley are located as separate river valleys.

6. As a country grows comprehensively in economy and social development sectors, the need for energy also grows dramatically. Especially developing country attempting to have growth in economic sector, energy is essentially the required input. Similarly, for Myanmar with her economic policy transformation process ensuring new investments, there is dramatic growth in the infrastructure development and construction works calling for higher demand for energy.

7. Myanmar primary energy consumption pattern is mainly of firewood/charcoal, crude oil, natural gas, coal and hydro power. The energy consumption pattern is gradually moving from non commercial energy such as firewood/charcoal to commercial energy. In Financial Year 2011-2012, consumption of firewood/charcoal is decreased to 76.41% of total energy consumption while crude oil and natural gas consumption is increased to 15.03%.

8. Myanmar, since 2011, has transformed to a democratic state, adopting reform program in political, economic and social sectors. As the economic reform can accelerate the national reform processes, the inadequate supply of electricity in the country becomes the major issue to be addressed immediately in order to achieve the quick progress in economic reform.

9. It is justifiably stated that electricity is a main driving force for the country development. Per capita consumption of the country indicates the living standard in the country. Myanmar's per capita electricity consumption is 180 kWh, reaching only to 30% of the population. Although traditional energy use of fuel-wood and charcoal is dropped to 76.41% , the low electricity per capita consumption are the trademark of the energy poverty, while neighboring countries such as Thailand has high electricity per capita consumption of 2079 kWh.

10. The electricity generation as practiced in most of the countries have a adverse impact on environment and human kind. It must be implemented large scale energy

development program, taking into account of the environmental impact and poverty reduction.

11. For Myanmar to be on track with its economic development path, it is required to study first the demand of the electricity and to proceed with the drafting of electricity policy which would correspond to Myanmar's resources endowment, considering for minimum impact on the environment and at the same time having maximum transparency in the course of implementation.

12. A study up to 2012 of the Ministry of Electric Power indicated that there are as many as 92 sites each having more than 10 MW with potential total installed capacity of 46099.30 MW. Similarly as many as 210 sites of small and medium size each having less than 10 MW with a total potential installed capacity of 231.25MW are investigated.

13. The Ministry of Agriculture and Irrigation is the leading entity for Myanmar's Agriculture sector, with main responsibilities to lay down policy for development of agriculture sector and to implement measures to improve the living standard of population. The water supply program for agriculture sector accompanying micro hydro projects implemented by Ministry of Agriculture and Irrigation is in many ways contributing to renewable energy development in Myanmar.

14. Coal deposits are mainly identified in Kalewa area in Chindwin River valley, Sagaing Region. Similar occurrences are also found in Magway region, Tanintharyi region and Shan State and Ayeyarwady Region. As Myanmar's coal sector requires technology for exploration and production of coal deposit, it is important that coal sector has cooperation from International companies. Only then production target and sufficiency can be expected.

15. Myanmar is rich in forest resources and as such forest sector is one of the pillars required to support National socio economic development Program. In order to have the sustainable environment, climate and ecology, sustainability of forest resources is important. Forestry sector is supplying the energy requirement of country i.e. firewood/charcoal from its renewable forestry resources. As a resultant,

deforestation of Myanmar in 1990-2010 (within 20yrs time) is 0.55% annually, the main cause being the production of firewood and charcoal.

16. Eight programs established in 2011 for Rural Development and Poverty Alleviation include environmental conservation and protection and the President of the Republic of the Union of Myanmar is the Chairman of the programs. Similarly, the Environmental Conservation Law, Promulgated on 30th March 2012, prescribes to accelerate the work program for Green Economy.

17. In order to respond to today's global challenges, it is mentioned in the Green Growth policy statement that one of the major programs is to conserve, protect and develop the forest resources. It is the primary objective of the Myanmar forestry policy to promote and contribute to Green Growth policy which in effect would lead towards Myanmar's sustainable development.

18. The energy use in the country is mainly get from firewood and charcoal. According to the National Forestry Sector Master Plan, firewood consumption is 76.6% of total energy consumption in year 2000 and it is targeted to reduce 58% and 46% of total energy consumption in 2020 and 2030 respectively.

19. Private participation in national economy is about 70% and government participation is about 30%, all-round support is being provided as a national objectives for the economic and industrial development of the private sector country's GDP is only 26% and it is targeted to increase by 35% to 40%. In order to attract the private sector participation, subsidizing program in the energy sector should be avoided because the private sector is based on profit driven model. Only then energy efficiency and energy conservation will practically play with a motive.

20. Although Myanmar has abundant endowment of natural gas, crude oil and other energy resources compared to other developing countries, Myanmar is not yet in the position to extract those resources at reasonable production cost in order to fulfill domestic demand. Currently, the possibility to improve the declining production is still low due to the lack of technology and low investment.

21. Since a few years ago, Myanmar has been cooperating with foreign companies in the petroleum exploration and production activities. Crude oil

production of the country is declined due to the production limit of each well and pressure drop of production wells. As it is practiced in neighboring countries, Myanmar needs to employ modern production technology in order to increase the current production level As Myanmar has good potential to increase the production of crude oil and natural gas it is important to reform Myanmar energy sector as a critical measure for economic development.

Current Situation and Performance

22. Inadequate energy supply has emerged as one of the most serious infrastructure constraints on sustainable economic growth in Myanmar. The challenges in the energy sector are enormous; possibly the most pressing are the declining oil and gas production which has resulted in its substantial importation with large foreign currency requirement.

23. The energy infrastructure is old and utilizes outdated process design and technology. The government has been unable to allocate sufficient funds for the rehabilitation and maintenance of equipment, machinery, and parts, and for expansion programs. For decades, there has been no provision of capital expenditure for new assets in generation, transmission, and distribution network system of the energy sector. As a consequence, most energy sector plants and equipment have reached the end of their economic life and are technically obsolete.

24. Currently, about 30% of the country's total population of 60 million has access to electricity. Out of the total population, about 70% lives in rural areas. Myanmar relies heavily on traditional biomass, mainly fuel-wood from natural forests for its energy needs, which accounts for about 76% of its total primary energy supply. Myanmar's energy mix is dominated by fire wood/charcoal, followed by petroleum products, hydroelectricity, natural gas, and coal. Table 1 shows the energy consumption in year 2011.

Table 1: 2011 Energy Consumption

Firewood/Charcoal	76.41 %
Petroleum Products	8.58 %
Hydroelectricity	7.96 %
Natural Gas	4.96 %
Coal	2.07 %

25. In Myanmar, the consumption of traditional energy (firewood/charcoal) is high where as the commercial energy usage is about 23.6 % only. During 2011, energy consumption per capita of the country, in terms of ton of oil equivalence (TOE), was as low as 0.21 TOE when compared to Malaysia's energy consumption per capita of 2.7 TOE, China 1.8 TOE, Thailand 1.6 TOE, Indonesia 0.9 TOE, Vietnam 0.8 TOE, India 0.6 toe and Sri Lanka 0.5 TOE. Myanmar's oil & gas consumption is also the lowest as compared to neighboring countries as shown in Table 2 .

Table 2: Oil and Gas Consumptions in Neighboring Countries

Country	Crude Oil Consumption (KBOPD)	Natural Gas Consumption (MMCFD)
Bangladesh	104	1923
Cambodia	72	-
P.R.C	9758	12635
India	3473	5907
Indonesia	1430	7664
Malaysia	600	2755
Singapore	2797	850
Thailand	1080	4505
Vietnam	758	822
Myanmar	~100	240

Source: BP World Energy Statistical Review 2012

KBOPD= Thousand Barrels of Oil per day

MMCFD= Million Cubic Feet per day

(a) **Natural Gas:** The current natural gas production in Myanmar is about 1865 mmcfd, of which, 1,100 mmcfd is exported to Thailand, about 400 mmcfd to the People's Republic of China (PRC), and the remaining 365 mmcfd is for the domestic market. A conservative estimate for domestic demand for natural gas during 2013 is about 700 mmcfd whereas the supply is only 50% of the demand. Combined with poor maintenance and a lack of compression in gas pipelines, the existing gas gathering and pipeline distribution system are old and operate at a significantly lower capacity and efficiency. Also, due to reduction in the flow of gas the generation capacity of gas-fired plants is low. Table 3 shows the details of natural gas production and its utilization

Table3: Natural Gas Production and Utilization

Offshore Gas Fields	Production (Mmcfd)	Export Thailand (Mmcfd)	Export PRC (Mmcfd)	Domestic Export
Yadana	900	700	-	200
Yetagun	400	400		
Shwe	500		400	100
Onshore Gas Fields	65			65
Total	**1,865**	**1,100**	**400**	**365**

(i) About 60% of the domestic natural gas is distributed to 10 gas-fired power plants, 12% is distributed to fertilizer plants and about 10% is used to produce compressed natural gas.

(ii) Zawtika offshore gas field is expected to start production in late 2013 or 2014 at the rate of about 300 mmcfd, out of which, 200 mmcfd for export to Thailand and 100 mmcfd to be supplied to Myanmar market. Natural gas export is an important source of revenue for the government.

(iii) There is increasing interest shown by the foreign companies in oil and gas development and operations. In response to the Government's tender offer, 75 expressions of interest from foreign companies were received during the period January to April 2013 which is currently under review.

(iv) To improve the onshore oil (7,400 bopd) and natural gas (65 mmcfd) production level of the Myanmar Oil and Gas Enterprise (MOGE), joint cooperation works are underway with the foreign companies.

(b) Crude Oil: Myanmar is one of the world's oldest oil producers, having exported its first barrel in 1853. The current crude oil production in Myanmar is about 19,400 bpd, of which, 12,000 bpd from offshore, and 7,400 bpd from onshore. The onshore production is mainly come from the Salin sub-basin, The country's oil production is low when compared to other oil production countries. About 16 foreign companies are presently working on 17 onshore blocks and 15 foreign companies are involved in exploration or production on 20 offshore blocks, all in partnership with the state-owned Myanmar Oil and Gas Enterprise (MOGE). The foreign companies include Total and Chevron, who cooperated in a venture in the early 2000s, and has now given them the opportunity to further new agreements. In 2011, the MOE offered 18 onshore blocks for bidding and awarded eight of these to six foreign companies. In January 2013, the MOE put up a further 18 onshore blocks for tender, and an additional 30 offshore blocks in April 2013. These rounds have attracted significant interest, with over 75 letters of interest submitted for the onshore blocks. Competitive bidding

is expected to stimulate an even higher level of interest in the offshore blocks before 14 June 2013. Initially, the government planned to offer these rounds in September 2012 but they were delayed to ensure that the tendering of exploration contracts was transparent and up to international standards. The government expects at least another 20 offshore blocks to be offered by the end of 2013.As part of the wider reform process, Myanmar is expected to boost crude oil production to meet growing demand.

(c) **Crude Oil Pipeline:** Under an agreement between Myanmar and the People's Republic of China, the China National Petroleum Corporation (CNPC) is constructing a crude oil pipeline parallel to the gas pipeline at a cost of US$ 2.25 billion, which is expected to complete by the end of 2013. The crude oil pipeline will be 771 km long and will deliver the crude oil to Chongqing via Yunnan province of PRC. PRC will purchase crude oil from Middle East and Africa and will be shipped to Myanmar. The pipeline will transport the crude oil from Myanmar to south-western PRC. The project also involves the construction of a new deep-water crude unloading port and oil storage facilities on Myanmar's Maday Island. CNPC owns a 50.9% stake in the pipeline through its wholly-owned subsidiary, SEAP. MOGE owns the remaining 49.1%. SEAP will be responsible for the construction and operation of the pipeline, while Myanmar's government will provide security.

(d) **Oil Refinery:** The Myanmar Petrochemical Enterprise (MPE) runs the country's three oil refineries with total rated capacity of 50,000 BPD – Chauk Refinery (6,000 BD), Thanbayagan Refinery (25,000 BD) and Thanlyin (20,000 BD). However, the refineries are old and average refining capacity is only 41%.

(e) **Liquefied Petroleum Gas (LPG):** There are three liquefied petroleum gas (LPG) plants in Myanmar with a production capacity of 42-50 million cubic feet per day (mmcfd).

(f) **Fertilizer Plants:** At present, Myanmar has five urea fertilizer factories using natural gas with a total capacity of 2,000 metric tons per day.

(g) **Coal:** Myanmar's coal extraction and utilization has been slow and advanced technology application has been lacking due to lack of investment funds and the remote occurrences of coal resources. Previously, there were only 3 active coal mines in Myanmar in Sagaing Region and in northern Shan State and lately there are as many as 57 private and government mines producing about 700,000 metric tons a year. The coal mining sector requires special attention to address the environmental and social issues, as the mines are open-cut. Myanmar coal is generally of low quality lignite and sub-bituminous. The Ministry of Mines has estimated coal reserves at about 540 million tons, Myanmar has identified by end May 2013 a total coal occurrence of 560 places and however, a much smaller amount is classified as proven reserves. Coal production has increased significantly over the past 15 years, with current annual production at about 700,000 tons. Domestic coal produced is used in one coal-fired power plant, Tigyit power plant with rated capacity 0f 120 MW but operates at only 40% capacity. As the coal mines are open-cut, it requires special attention to address the environmental and social issues. The Ministry of Mines expects to have increased production of coal up to 5 Million Tons in the year 2030is calling for expedited exploration and extraction of coal with technology and funding from foreign investors.

(h) **Electric Power:** Ministry of Electric Power is supplying electricity to the whole of Myanmar in two parts; the first part is for electricity use-intensive Yangon region and Mandalay region with the electric power grid system connecting large electric power generation plants with high voltage power lines, and the second part is for remote area of the country with electric power supplied by isolated diesel power generators and small hydro power plants. The following tables (4) and (5) shows electricity supply situation within national grid and outside of electric power grid in 2012-2013;

Table 4: Electric Power Generation within National Grid

Types of Power Plants	Number of Plants	Installed Capacity(MW)	Electricity Generation in 2012-2013(GWh)
Hydropower	20	2,780	7,722.138
Natural Gas	10	714.9	2,882.980
Coal Fired	1	120.0	265.051
Total		**3614.9**	**10,870.169**

Table 5: Electric Power Generation in off Grid

Types of Power Plants	Number of Plants	Installed Capacity(MW)	Electricity Generation in 2012-2013(GWh)
Diesel Generator	578	78.999	50.743
Small Hydropower	71	33.330	44.114
Total		**112.329**	**94.857**

(i) According to September 2013 Statistics, total installed capacity of Myanmar is 3831.5 MW and out of that only 1911 MW (50%) is produced. Maximum peak load is 1930 MW. Out of total electricity generated (19874.8 GWh) 72% from hydro power, 25% is from Diesel and Steam including natural gas and 3% is from coal.

Table 6: Electricity Generation, Consumption and Demand in the Summer and Rainy Season in 2013

Subject	Summer Season(MW)	Rainy Season(MW)
Electricity generated by Hydro Power Plants and Coal Fired Power Plants	1315	1552
Electricity generated by Gas – Based Power Plants	373	381
Total Electricity generation	**1688**	**1933**
Electricity Consumption	**2060**	**1914**
Necessary/Surplus Electricity	(-) 372	(+) 19
Percentage of electricity supply	**81.94%**	**100.99%**

(ii) Before 1988, Myanmar's electrification rate is 10.6% increasing to 23.2% by 2009, 29 % by2012-2013. Ministry of Energy and Ministry of Electric Power plan to improve electrification rate to 45% by 2020-2021 and to 60% by 2025-2026. Myanmar's per capita electricity consumption is only 180KWh and is very much lower compared to its neighboring countries.

Table 7: Per Capita Electricity Consumption in Neighboring Countries

Country	Electricity Consumption (%)	Per Capita Electricity Consumption(kWh)
Bangladesh	41.0%	252
P.R.C	99.5%	2631
Cambodia	24.1%	131
Indonesia	64.6%	590
Malaysia	99.5%	3614
Thailand	99.4%	2045
Vietnam	97.7%	918
Myanmar	30.0%	180

(iii) By 2012, 29% of Myanmar's population had access to electric power grid system while 16% is supplied with electric power from grid system. Because of low accessibility to electric power system, because of low per capita income and because of lack of appropriate infrastructure, Myanmar is consuming least energy in the South East Asia countries. There are differences in the availability of electric power on account of income disparity and location differences. For instance, in May2013 Yangon city enjoyed 75% of electricity power production while it is 70% in NPT, 44% in Kayah State and 37% in Mandalay Region. The following are Overview of Electricity Sector, Myanmar;

Table 8: Overview of Electricity Sector, Myanmar

No.	Subject	Unit	Installed (MW)	Firm (MW)	Energy (GWh)
1	Capacity (July 2013)				
	Hydropower		2,780	986	13,871.8
	Coal-Based Power		120	27	600
	Gas-Based (MOEP- Owned)		715	427	3,946
	Gas-Based as BOT		216.5	215	1,457
	Total		3,831.5	1,655	19,874.8
2	Peak Demand			1,930	
	Reserve (calculated)	%		-	
			Installed MW	**Energy GWh**	
3	Capacity Addition (Completion by 2016 or earlier)				
	Hydropower		491	1,930	
	Gas-Based (MOEP-Owned)		396	2,775	
	Gas-Based (private)		2,471	17,316	
	Total		3,358	22,021	

			FY2011	FY2012	FY2013
4	Annual Power Generation	GWh	8,633	10,424	10,965
5	Self consumption(Plants)	GWh	148	160	186
6	Energy Transmitted	GWh	7,751	9,408	10,027
7	Transmission Losses	GWh	734	856	752
	As percentage of losses	%	8.5	8.2	6.8
8	Power Sale	GWh	6312	7,717	8,254
9	Distribution Losses	GWh	1439	1,692	1,772
	As percentage of Losses	%	18.56	17.98	17.67
10	Annual Power Sale	GWh	6,312	7,717	8,254
	General Purpose	%	42	33	44
	Industry	%	36	48	32
	Commercial	%	21	18	20
	Others	%	1	1	3
11	Electrification Ratio [a]	%	25	27	29
	Rural	%	10.5	27	32.6
	Yangon	%	66	71	75
	Mandalay	%	30	33	36
			FY2011	FY2012	FY2013
12	Per Capita Electricity Consumption	kWh/y		160	180
13	Transmission line(km)				

	230 kV	Km	2,970	3,172	3,172
	132 kV	Km	2,369	2,466	2,466
	66 kV	Km	3,582	4,019	4,211
14	Installed Capacity in Substations (MVA)				
	230 kV		3,260.0	3,990.0	4,290.0
	132 kV		1,578.5	1,783.5	1,783.5
	66 kV		1,978.1	2,580.6	2,610.6
15	Staff (October2013)				16,598
16	Tariff		**Connections Dec 2012**	**Tariff MK/kWh**	**Tariff $/kWh**
	General and Domestic [b]		2,547,714	35	0.036193
	Foreigners			116.4	0.12
	Small – three phase		53,105	75	0.0773
	Bulk supply		7,784	75	0.0773
	Purchase from Hydropower			20	0.0206
	Purchase from Shweli			CNY0.189/kWh	0.0307 [c]
17	Transfer price to distribution			37	0.0381
	Average sale revenue for ESE [d]	App-rox		40	0.0412

BOT = build-operate-transfer; CNY = yuan (Chinese yaun); ESE = Electricity Supply Enterprise; FY = financial year, e.g., FY2013 ends in March 2013; GWh = Gigawatt-hour; IPP = independent power producer; km = kilometer; kVA = kilovolt-ampere; kWh = kilowatt-hour; MD = Managing Director; MK = Myanmar kyat; MVA = Megavolt-Ampere; MW = Megawatt

[a] Electrification Ratio is number of households with electricity connections (2,556,714) ÷ total number of households in Myanmar (8,905,674)

[b] The total number of households is estimated as 8,905,674. The general purpose consumers have single phase connections and domestic have three phase connections; both are for households

[c] $1 = CNY6.337 (July 2013)

[d] The average collection includes a MK1,000/month charge for maintenance fee and kVA-based capacity fee for large consumers

Source: Assessment of Myanmar Power Sector. September 2012. Data confirmed and updated by MOEP during discussions by Ail Terway, ADB Power Sector Advisor under TA-8244 MYA: Building Institutional Capacity of Ministry of Power

Note : Starting April 1st, 2014, the schedule of electricity tariff rate as per below would be applied and the submission is made by the President of the Government of the Republic of the Union of Myanmar to Pyithu Hluttaw.

Public (Household use)	1 Unit up to 100 Unit	35 Kyats per Unit
	from 101 Unit and above	50 Kyats per Unit
Public (Industrial use)	1 Unit up to 5000 Unit	100 Kyats per Unit
	from 5001Unit and above	150 Kyats per Unit
Government (Office use)		50 Kyats per Unit
Government (Industrial use)		100 Kyats per Unit

(iv) **Electricity Supply to Yangon and Mandalay City** : Yangon is the main commercial City in Myanmar. Its Power demand is the highest among other cities in the country, especially in summer. In the summer of 2013, the peak load in Yangon was about 850 MW. Nowadays, the growth rate of electricity consumption has

been rapidly increased in line with the multi-sectors development of Myanmar year after year. Compared to other Region and State in Myanmar, the growth rate of electricity consumption in Yangon is extremely high and its annual power demand growth rate is about 15 %. The electricity for Yangon Region has been fed from National Grid. The electricity generation of Myanmar Power System is mainly relied on Hydropower Generation. Even though it is enough power to distribute in the rainy season, there is power shortage due to the declination of generation by hydropower plant in summer. So, Yangon City Electricity Supply Board has practiced load shedding program and amounted to 130 MW in last summer. During this period, supplying electricity to the commercial consumers and industrial zones were usually cut off, in order to supply sufficient to residential consumers. Yangon City Electricity Supply Board has implemented upgrading projects for the improvement of distribution system in Yangon within the allocated budget in line with the growth of consumption. Some of the underground cables in Existing Yangon Distribution Network have been embedded since 1926. Implementation of the upgrade projects and regular maintenance programs are not sufficient because the budget allocation is inadequate. Therefore, using the aging facilities and overloading of distribution network are critical issue to supply electricity stability and reliability, and reduction of losses.

(v) Yangon City Electricity Supply Board has laid down short-term and long-term plans and is implementing for the improvement of Yangon Distribution System. Along with state-own the budgets to get the financial assistance for implementation of those projects, feasibility studies have been carrying out to set the

funding from ADB (Asian Development Bank), JICA (Japan International Cooperation Agency), NEDA (Neighboring Countries Economic Development Cooperation). Furthermore, the Ministry of Electric Power has performed many tasks in order to supply sufficient power in summer such as setting-up of gas-engines addition to the existing 4 Gas Turbine Power Stations in Yangon Region. Not only that, privates companies also were invited to submit the proposal for supplying electricity to industrial zones as IPP(Independent Power Producer), and to supply the LNG(Liquefied Natural Gas) to fulfill the required fuel for the gas turbine power stations by using FSRU(Floating Storage Degasification Unit).

(vi) Gas-Based Power Generation: Ministry of Electricity Power is operating 10 numbers of electric power plants in the whole country including Hlawga, Ywama, Ahlone, Thakata. Out of 10 electric power plants, 9 plants are gas- based power plants and Ngantae Power Plant is steam turbine. In Yngon region, there is total installed capacity of 470.7 MW with 4 gas turbine power plants (317.7 MW) and combined cycle power plant(153 MW) utilizing the waste heat of the gas turbine. Although total installed capacity of thermal power plants is 714.9 MW, Mann gas turbine power plant(36.9 MW) is undergoing major repair since 2005, and remaining steam power plants are degraded because of poor performance of steam turbine, the firm power is only 427 MW(60%).

(vii) To supplement the electric power in Yangon region, Independent Power Producers (IPPs) operated power plants (4 numbers) are already completed during summer months of 2013, having 216.5MW. Natural Gas for operation of those IPP plants is to be

supplied by Ministry of Electric Power on his own account. And electric power generated from those plants is supplied to the grid system. Two numbers of Natural Gas Power Plants (2x120 MW), a gift by Government of Thailand, are to be constructed in Ywama Power plant compound. Insein township, Yangon region. It is targeted that 1 plant is to operate by December 2013, and another plant by March 2014.

(viii) Another IPP power plant having an installed capacity 43.5 MW is to be operational by summer 2014 and is located in Mawlamying Power Plant compound, Mon State. Gas engine plants utilizing natural gas from Shwe Project, Kyaukphyu, Rakhine State is operating since 15 September 2013.

(ix) **Hydropower Generation Plant** : MOEP is operating 20 hydropower plants and 1 coal - fired power plant. The oldest hydropower plant was constructed in 1960, another 2 plants in 1985 and 1989, 3 more plants in 1992-1998, 8 more hydropower plants in 2000 and 2010, 6 more hydro power plants during 2010-2012. Total installed capacity of hydropower plants is 2780 MW and largest unit size is 197.5 MW in Yeywa. Out of 20 hydropower plants, 12 plants are 50 MW and above and are medium size. During summer months in 2013, firm generation capacity is 986 MW (35% of installed capacity) and cannot generate full power because of low inflow of water.

(x) Baluchaung hydropower plant (168 MW) is operating for more than 50 years and is planned to undergo general maintenance program in 2014 with assistance of Japan Government Overseas Development Assistance program. Ministry of Electric Power is planning to complete construction of Nancho (40MW) and Phyu Chaung (40MW) in 2013-2014, Upper Paunglaung(140MW) and,

Baluchaung3 (52MW) in 2014-2015 and Upper Baluchaung (30MW) in 2015 -2016. For Ongoing projects such Thahtay (111MW), Upper Yeywa(280MW), Upper Kyaing Taung (52MW), loan facility are already in hand to purchase the required Hydraulic Steel Structure & Electro Mechanical Equipment in time. In addition, middle Paunglaung (100-115 MW) and Dedote (40-60 MW) are to be implemented in due course.

(xi) Ministry of Agriculture and Irrigation is responsible to construct water reservoirs and dams to store water and distribute to agricultural lands in the whole country. Up to date total number of irrigation infrastructure (dams and reservoirs) is about 240 and most of the dams (including multipurpose dams) are installed with Hydel unit. Plans to install mini hydro units in the potential feasible dams and reservoirs will have benefit for supply of electricity to the neighboring rural populations, thus improving the living standard and reducing poverty. Similars plans are already on the table to install minihydro plants in the potential feasible dams and irrigation canals.

(xii) Coal - fired power plant : Tigyit power plant having installed capacity 120MW is using lignite coal as a fuel. Because of poor quality of lignite in comparison to specified quality, the power plant produces only 20% of total capacity. The coal reserves is 20 Million tons P1 grade and 5 million tons have been produced. Because of Tigyit power plant's location on the Shan Highland in the east of Myanmar, very far away from the nearest seaport, it is difficult and costly to use imported coal. Yangon Coal-Fired Power Plant (Kyun Gyan Gon) (phase1- 300MW) is proposed to be constructed by local private company while another Yangon Coal-Fired Power Plant (Htantapin 270 MW), Kalawa Coal-Fired Power Plant (540MW), Bokpyin Coal-Fired Power Plant

(500MW), Yangon Coal-Fired Power Plant (Thilawa Special Economic Zone 650 MW), Ngayotekaung Coal-Fired Power Plant (540 MW), Kyaingtone Coal-Fired Power Plant (25 MW) and Yangon Coal-Fired Power Plant (Kyauktan 500 MW) are to be implemented with foreign investment.

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and Yangon Coal-Fired Power Plant (Kyauktan 500 MW) are to be implemented with foreign investment.

(i) Renewable Energy: Wind and solar energy are in the early stages of experimentation and development in Myanmar. At least three wind power projects are currently operating, while two companies undertook feasibility studies in 2011 to conduct further investigation for potential development of 4,032 MW of wind energy. Pilot projects have been run for solar energy, and the Ministry of Science and Technology (MOST) has helped to ensure that research continues into harnessing solar energy in rural areas where there is no access to the national grid system. Solar energy is being introduced in a limited way through photovoltaic cells which are used for battery-charging stations and water pumping.

(i) Biomass: Biomass, an important source of energy supply in Myanmar, accounts for about 75% of total primary energy supply. In 2008, forest wood accounted for 62% of all primary energy consumption, which was more than three times the crude oil and petroleum products. The dependence on biomass is largely because approximately 70% of the population lives in rural areas. Of the total biomass-sourced energy, over 90% is fuel- wood, most of which is harvested from natural forests. Such a high usage of forest wood is a major threat to Myanmar's overall environment situation. The scale of dependence on biomass is therefore not only an energy supply issue, but also raises concerns about widespread environmental degradation.

(ii) Biogas: Ministry of Science and Technology is working on production of biogas from animal waste materials. The Ministry is also doing research on expanded use of low cost household bio- digester system in the rural villages.

(iii) **Liquid Biofuel (Biodiesel/ Ethanol)** : The Ministry of Agriculture and Irrigation (MOAI) is considering the production of liquid biofuel as a substitute for gasoline and diesel consumption in consultation with other Ministries. The Myanmar Chemical Engineers' Group has constructed four biofuel plants with a total annual production of 1.95 million gallons. In addition, the Myanmar Economic Cooperation has supervised the commercial operation of two plants with a combined capacity of 1.8 million gallons per year.

(iv) **Geothermal Energy**: Geothermal energy has considerable potential for commercial development in Myanmar. A total of 93 sites have been identified, with 43 have being tested. Additional work is required to be completed to exploit geothermal potential for either electric power generation or steam for industrial applications.

(v) **Solar Energy** : There are potentials for commercial utilization of solar energy because Myanmar is geographically located near the Equator The Ministry of Electric Power is conducting preliminary investigation to construct solar power plants with FDI in Minbu, Magway Region, and Myingyan, Mandalay Region. With the private/ individual arrangements, solar energy is widely used in rural area for lighting at night time and charging of small batteries.

(vi) **Hydro Energy** : Four major river systems; Ayeyarwady, Chindwin, Sittaung, Thanlwin have their origin in the northen Tibetan Highlands and flowing into the Gulf of Martaban. Ayeyarwady river and its tributaries have drainage area which is

more than 50% of the total land area of the country, also in Rakhine coastal area and Tanintharyi Coastal area, steep and short length river systems are flowing direct to the Gulf of Martaban. Such topographic features and Monsoon season are blessing Myanmar with abundance of water energy resources. Wave and Tidal Power along the Myanmar's coastal region is the potential of hydropower resource for energy generation. Energy can get from Hydrogen Fuel which is extracted from water. It has been proofed as the potential renewable energy to fulfill the future global energy demand.

(vii) **Wind Energy** : Myanmar is being blessed with highlands and coastal areas and it has the potential for exploitation of wind energy in Tanintharyi Region, Mon State, Shan State, Kayin State, Chin State, Rakhine State, Ayeyarwady Region and Yangon Region to produce as much as 4000 MW of installed capacity and investigations are being undertaken.

(j) **Nuclear Energy** : The country has few uranium deposits. However, details are not available. Once the country has reached an advanced stage of economic development and its commercial energy sources are nearing exhaustion, the civilian use of nuclear energy, as a long term potential option, may be studied. With the aim of utilizing civilian nuclear energy to a certain scale in energy production, Ministry of Science and Technology is conducting preliminary studies

Chapter 3

National Energy Policy

Why National Energy Policy?

1. Myanmar in 2011 starting to adopt Democratic System and directing towards economic, social and comprehensive development, is implementing a variety of reform processes in the political and economic sector. Those state development measures initiated by President U Thein Sein are recognized by international community, achieving Myanmar's deserving position in the international community.

2. Myanmar for the last 50 years has been an isolated country with minimum development in the economy of the country. Myanmar needs to systematically explore and exploit the various energy resources such as crude oil, natural gas, electricity, coal, and renewable energy which are the main driving forces for economic development.

3. To manage systematic exploitation of natural resources, national energy policy with short term and long term objectives are essential. The energy policy must direct towards a comprehensive development program including political, economic and social sector.

4. The national energy policy aims to systematically explore the available energy resources of the county in order to supply the demand of the country and to export as value added products for surplus resources, thus ultimately targeting to sustainably improve the living standard of the country people.

5. Myanmar shall formulate effective policy and programs in order to achieve sustainable energy supply at an affordable price. At the same time, measures to minimize impacts on environment resulting from the energy resources exploration works shall be emphasized.

6. Energy policy of some countries are studied and found that energy policy is not different for different kinds of energy but is overarching, crosscutting and embracing all different kinds of energy.

7. For example, energy policy of the United State of America stresses to develop and secure energy supply, provide consumers with choices to use costs and save energy, and to innovate ways to clean energy future.

8. The energy policy of the People's Republic of China emphasizes to give priority to energy conservation, to rely on domestic energy resources, to encourage diverse development and promote scientific technology and innovation and also to expand international cooperation and improve livelihood of the people.

9. India's integrated energy policy emphasizes to reduce energy requirement through energy efficiency and conservation to augment energy resources supply, to rationalize fuel prices to be in line with free market prices promoting efficient fuel choices and substitution. India's national energy policy emphasizes further to promote coal import, accelerate power sector reform, cut costs of power production, encourage renewable energy with local management solutions, enhance energy security, promote energy R&D, promote household energy security, and create an enabling environment and regulatory oversight for competitive efficiency.

10. The short term energy policy of Thailand drives to restructure and improve energy industry management, to procure more energy supply, promote energy conservation and efficiency, promote alternative energy, establish energy pricing structure, establish measures for clean energy and promote private sector and public participation in policy making. As the long term energy policy, it is stressed to acquire more energy supply in a sustainable manner with efficiency.

11. As the strategy, the energy policy of Thailand emphasizes to review the past growth of economy, long term development plan of country, to update energy demand and focus, to investigate energy supply options, and based on this review to formulate long term energy supply development and identify the most feasible energy supply option. In summary, energy policy must aim achieving;

(a) Physical security, avoiding involuntary interruption of supply

(b) Price security, providing energy at affordable prices to consumers

(c) Geopolitical security, ensuring that the State maintains independence in its foreign policy on matters relating to energy

12. It is learned that the energy policies of other nations are prepared to cover all kinds of energy and they are reviewed and revised based on annually variable/ changeable energy statistics. For Myanmar National Energy Policy, nine policies are set as a framework and these policies have been prepared based on current situation to cover all kinds of energy. In addition, national energy policy will be reviewed and revised annually to harmonize with the new situation. However, the revision will be done within the framework. A secure energy system will tend to be characterized by,

(a) A diverse mix of different energy sources and fuels, with the capability to switch between these different fuels once it is necessary.

(b) Diversity of suppliers of energy without excessive reliance on imported supply which have a risk of disruption beyond the host country control.

(c) Diverse routes of imported supply, avoiding excessive reliance on particular supply corridor.

(d) Reducing energy intensity by means of energy efficiency and conservation measures so that excessive energy requirement is decoupled from GDP growth.

(e) Implement effective management and efficient operation of infrastructures in order to minimize losses in transition.

(f) Formulate a pricing policy reflecting long term economics of both consumers and suppliers.

Energy Sector Issues and Constraints and Recommended Actions

13. The following are energy sector issues and constraints and recommended actions:

Issues and Constraints	Recommended Action
A. Energy Resources Development	
(1) The major impediments and constraints are the lack of adequate financing for rehabilitation and maintenance of existing energy infrastructure; and for investment in new assets to undertake development of energy resources.	(a) The Government recognizes that for the funding sustainability the private sector involvement will be crucial for energy sector development. To mobilize the financing from the private sector, there is a need for a strong enabling framework, and long term incentive to attract private investment.
(2) Lack of access by private sector investor to appropriate tariff structure, financing mechanisms, and an appropriate legal and regulatory regime.	(a) To attract private sector funding, there is a need for the Government to establish an appropriate tariff structure to ensure adequate return on investment and for funding sustainability of private investment in the energy sector
	(b) For sustainable economic development, Myanmar should implement market-based reforms; create competitive sector structure; strengthen market regulations to ensure

Issues and Constraints	Recommended Action
	investor confidence and to attract private capital for energy sector funding sustainability; and focus on creating competition as the driving force for improvement and private sector participation as a vehicle for creating a competitive environment.
(3) Distortion in the pricing structure requiring unsustainable energy subsidy and the resultant macroeconomic imbalances, lack of coordination and decision making regime, and the governance issue.	(a) Government would implement a rationalized pricing and subsidy policy (market-based energy pricing that reflects the true cost of supply and externalities costs) a prerequisite for sustainable program.
(4) Subsidies have resulted in the abuse of energy utilization and wastage in consumption by all categories of consumers, provided disincentive for instituting energy conservation and efficiency improvement programs in the industrial sector, and the root cause for the lack of public desire to save energy.	(a) To lower the overall energy sector subsidy, the Government would have two pronged approach. - **First,** it would require the energy and electricity producing utilities, to reduce their respective cost of operation/ generation by at least 20% through loss reduction, increased revenue collection, and

Issues and Constraints	Recommended Action
	efficiency improvements. Their operating cost structure will be scrutinized to affect savings. - **Second,** Government would then consider adjusting upwards the tariffs.
B. **Electric Power sector** (i) low electrification rate, with persistent power supply shortages in Yangon; (ii) high technical and nontechnical losses (27%) due to poor maintenance of transmission and distribution systems; (iii) lack of technical capacity among staff; (iv) lack of proper national electric power demand projection; (v) a least-cost electric power generation plan is not prepared;	(a) To lower the overall energy sector subsidy, the Government would have two pronged approach. - **First,** it would require the energy and electricity producing utilities, to reduce their respective cost of operation/ generation by at least 20% through loss reduction, increased revenue collection, and efficiency improvements. Their operating cost structure will be scrutinized to affect savings.

Issues and Constraints	Recommended Action
(vi) lack of a planning function, including supply and demand projections and analysis of alternative supply options; (vii) government controlled pricing; (viii) an absence of energy efficiency and climate change policies; (ix) and an absence of legal safeguard requirements.	- **Second**, only after the utilities have achieved their targeted cost reduction, Government would then consider adjusting upwards the tariffs to consumers as follows over a five year period. (b) As an initial step, the Government may consider for the next two year period an increase in the block tariff of the industrial, entertainment, and commercial sectors by about 20% each; about 20% increase in tariff of those domestic consumers that use high kWh consumption (predetermined by the government) per month; middle income group by 10%, followed by lower middle income group by 5%-7%; and leaving unchanged the life line tariff for the poor. (c) Average increase in transportation sector would be aimed at about 25% on a declining scale, from a higher

Issues and Constraints	Recommended Action
	rate at the upper end of economically affluent consumers to only 10% for public transportation system used by the less affluent and poor. (d) Depending upon the improvement in the economy and the national income level, the government for the third to fifth year period, may increase further the level of tariff increases for each segment of consumer.
C. **Renewable Energy Development** (1) Government current policy support, budgetary provision, and regulatory regime favor the development of fossil-fuel based bulk energy supply sources against the development of renewable energy resources.	(a) The Government recognizes that the past practice of investment in mainly the traditional commercial power supply sources alone is not sustainable and will not be sufficient to bridge the demand-supply gap. This trend will be addressed during the proposed Energy Sector Policy, with provision of major investment for RES development. (b) The Government would formulate a Policy Framework

Issues and Constraints	Recommended Action
	for the Development of Renewable Energy Resources, outlining the government policy statement on renewable energy development, as well as defining the strategy to be followed in the medium to longer terms. The policy would place increased emphasis on the design, demonstration, and pilot testing of dispersed off-grid, community embedded, and standalone renewable energy systems, including their financing and marketing modalities and integration with all social and physical infrastructure development in the rural areas (e.g., poverty alleviation, rural electrification). The framework would list all potential RES projects, outlining priorities and sequencing, along with funding requirements which would be based on completed studies and prototype evaluations with specific RES and market targets and funding arrangements.

Issues and Constraints	Recommended Action
(2) One of the critical constraints delaying implementation of renewable energy projects in Myanmar is the availability of financing in the amount and terms, as renewable energy projects have high front end capital cost per kWh installed and requires debt with much longer maturity than is usually available	(a) The Government recognizes that it has to expand its role in the financing, development and implementation of RES programs to address climate change issues. For sustainable development, it will streamline budget priorities, and long term investment options. The Government is also considering providing added incentives to RES development. (b) The Government need to ask the assistance for financial assistance guarantee and currency exchange arrangement in accord with the international organization or multilateral (c) While the Government's priority is to reduce energy sector subsidy to make funds available for undertaking the urgently needed energy sector development program, and other social and economic development in the country, however, there appears to be an economic case for

Issues and Constraints	Recommended Action
	providing some financing subsidies in the initial phase of renewable energy development program because of their positive externalities both locally and globally. The subsidies will be designed to kick start an infant industry but will have a limited time span.
(3) Subsidized energy prices (petroleum products and electricity), especially to the rural communities and agriculture sector, where RES options are most often targeted, makes it difficult for RES technologies to compete on financial basis with conventional energy supply options.	(a) Government would liberalize import of RES technologies, equipment and parts; and encourage joint venture partnership with foreign manufacturers, developers, and licensees. (b) During the Plan Period, The Government would initiate expanded measures on promoting awareness on benefits and opportunities of renewable energy supply options and the related development facilities, together with the emphasis on

Issues and Constraints	Recommended Action
	the expanded role of renewable energy in the national energy mix to ensure a low carbon economy.
(4) Past barriers to the import of new technologies have also resulted in delays in the adaptation of new and cost-effective developments in many advanced RES option.	(a) Government would encourage the participation of the national universities and colleges and other stakeholders to undertake research and development covering renewable energy resources and facilitate the development of technologies suitable for Myanmar requirements.
(5) There is lack of consumer awareness on benefits and opportunities of renewable energy; lack of stakeholder/ community participation in energy choices and renewable energy projects	(a) Government would also undertake a program of public campaign through print and electronic (radio, TV, others) media to create consumer awareness.
D. **Industrial Energy Efficiency Improvement and Conservation Program**	
(1) There is a large financing gap for energy efficiency and conservation investments in the industrial sector,	(a) Government would mainstream energy efficiency measures in the overall energy sector policy, and implement

Issues and Constraints	Recommended Action
especially for medium and large-sized energy conservation investment projects.	demand side-management plans to improve energy efficiency.
(2) While the majority of industrial energy conservation investments are financially viable, most concerned enterprises, with very low energy cost in the overall cost per unit of output, would rather invest in business expansion than energy conservation.	(a) Tapping the energy efficiency potential in existing industrial stock, the government would undertake a two-pronged approach, focusing on: – the development and implementation of viable technical and business models for industrial energy conservation financing; and - providing extensive capacity building and training program to ensure the implementation of existing policies and regulations for promoting energy conservation investments.
E **Information Dissemination and Stakeholders Consultation** (1) Stakeholders dissatisfaction results from Lack of information	(a) Governments Plans to have stakeholders, entrepreneurs and ministries consultation through NEMC.

Myanmar Energy Sector Policy, Policy Framework and Strategy

14. The main objective of the Myanmar Energy Sector Policy is to ensure energy security for the sustainable economic development in the country; and to provide affordable and reliable energy supply to all categories of consumers, especially to those living in the remote areas that are currently without electricity. The policy aims to achieve the Government's overarching objective of poverty reduction and improvement in the quality of life of its people. The policy also aims to increase foreign exchange earnings through energy exports after meeting the national demand.

15. The Energy Sector Policy incorporates a framework to expand the renewable energy infrastructure that is based on fuel that is free and self-renewing: the sun, the wind, biomass, hydro, and geothermal, and gradually reduce the energy infrastructure that depends on fuel that continuously rises in price, is dirty, dangerous, causes global warming, and destroys the habitat of this planet. The government will encourage deploying green technologies in a range of sectors including energy and enact policies for clean energy development for low carbon economy.

16. The Energy Sector Policy places special emphasis on community –based renewable energy development projects in the remote areas of the country to help expand the rural development program, and to provide livelihood opportunities to the rural poor. Provision of community-level energy infrastructure development activities, with special provisions for women participation, is also intended to help improve children education, health, clean water supply, and reduce exposure to indoor air pollution, as well as overall rural environmental improvement.

17. Myanmar has made international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and the related Kyoto Protocol, which Myanmar ratified in 2003. The Government is fully aware that without adequate environmental and social safeguards, climate change mitigation and adaption policies, and energy efficiency regulations, Myanmar's energy and electric power sectors will continue to be vulnerable to environmental challenges.

18. The Energy Sector Policy aims to integrate the social and environmental considerations in the national energy planning and in the complete cycle of energy development.

Institution/Organization Responsible for Energy Sector Policy Implementation

19. Recognizing the critical importance of energy for sustainable economic development and the wellbeing of the people, the Government in 9th January 2013 established the National Energy Management Committee (NEMC), with Vice President of the Government of the Union of Republic of Myanmar as the Patron and the Union Minister for Energy as the Chairman. The implementation and the execution of the Myanmar Energy Policy will be under the guidance and coordination of the National Energy Management Committee and with the support of all concerned organizations/agencies as well as the civil society. The Government has also constituted an Energy Development Committee (EDC) to support the activities of NEMC. The Membership of NEMC and EDC, their respective roles, responsibilities, and tasks are outlined in **Appendix A** and **B**.

20. The National Energy Management Committee, with its uniquely positioned administrative status and leadership, shall coordinate among the stake holders for the successful implementation of the Energy policy. It is also tasked to look into the appropriateness of the institutional structure and organizational set up of the energy sector entities, and formulate capacity building program to fulfill the long term needs of the sector.

Energy Policy, Objectives and Work Programs of Respective Ministries

21. The following are energy policy, objectives and work programs of respective ministries:

(a) Oil and Gas Sector

Policy	Objective	Work Program
(1) Emphasize to fulfill the domestic energy requirement on a priority basis. Utilize the discovered crude oil and natural gas resources for the most benefit and effective use of the region and its population	(1.1) To supply energy (Crude Oil and Natural Gas) required for the economic development country	- To supply domestic requirement of crude oil and natural gas on the first track basis. Invitations are made to the foreign oil companies to cooperate with local companies for petroleum exploration and production in onshore and offshore areas - Appropriate rules, regulations and procedures are to be prescribed for the implementation of shallow hand dug well drilling activities under supervision of State and Regional Government
	(1.2) To supply fuels, urea fertilizers and petrochemical raw materials required for the industrial sector, agricultural sector and other sectors	

Policy	Objective	Work Program
	(1.3) To collaborate with international and regional organizations in matters relating to energy	- New exploration and drilling programs are to be prioritized in addition to maintenance programs in the existing producing wells - To install and operate new natural gas pipeline network for the energy security and national security of the State with the supervision of the State and if required collaboration from international companies
	(1.4) To establish strategic oil stockpiling in order to contribute stability of security and economic of the state	- Considering economic viability, availability of feed stock, environmental impact and strategic requirement, local private investment and

Policy	Objective	Work Program
		external private investment shall be entertained for refineries , LPG extraction plants, Lubricant Plants, Methanol Plants and Crude Oil and Petroleum Products transpor -tation
(2) To implement sustainable energy development	(2.1) To monitor and update continu -ously energy utilization pattern and the demand for different types of energy resources of Myanmar	- In order to more effectively manage national energy sector which is crucial for national economic develo- pment, National energy management committee is established.
	(2.2) To strengthen capacity of performance of Myanmar tech - nicians and to nurture new generation of Scientists and Technology by utilizing modern technology in	- Petroleum drilling work and seismic exploration work are to be privatized as a separate companies together with relevant foreign companies on a joint venture basis and such companies

Policy	Objective	Work Program
	the oil and natural gas projects	participate in the tendering process in competition with similar foreign companies. - Necessary study is to be made with the objective if upgrading MOGE to become an operator in the offshore petroleum E&P work. - Investment potential with of part of profit which MOGE has obtained from its venture in the offshore petroleum E &P work is to be studied and pursued.
(3) To promote energy efficiency and conservation	(3.1) In order to minimize the impact of energy use on environment and to reduce wastage in energy use. Means for energy	

Policy	Objective	Work Program
	conservation will be imple - mented.	
(4) To promote alter- native energy uses for household energy	(4.1) To utilize other fuel types than firewood/ char- coal as a house- hold fuel	
(5) To promote private sector participation in energy sector		– Considering economic viability, environmental impact and strategic requirements, investment coope -ration of local and oversea private sector will be sought in the storage and distri -bution of petroleum products.
(6) To minimize environmental impact and social impact in the energy implementation projects		
(7) To promote ex- tended utilization of new energy		

Policy	Objective	Work Program
resources and renewable energy resources		
(8) To cooperate with other relevant organizations for the compilation of reliable and accurate statistics pertaining to energy production, energy supply, demand and energy projection		

(b) Electricity Sector

Policy	Objective	Work Program
(1) To expand electric power grid system and to transmit more electricity, available hydro energy, wind energy, geothermal energy, solar energy, and other energy resources will be exploited for possible electri -city generation so that electric power can be supplied adequately the whole of Myanmar	(1.1) To construct electric power transmission lines and substations and to draw up plans for electri - city distribution to industries and general population, duration the fifth short term plan.	- To manage integration among the electric power consumer sectors so that electric power require - ment of the country can be adequately supplied.
(2) To promote private sector participation in the electric power generation sector, distribution sector which are to be operated accordingly modern technology	(2.1) In the rural areas remotely located from the grid system, technology support and policy support will be given to develop community based electric power generation capacity with renewable energy resources.	- In order to manage and supervise the electric power generation, tran- smission and distribution, supervisory control and data analysis (SCADA) system is to be installed.

Policy	Objective	Work Program
	To implement measures for the full capacity operation of hydro power plants, coal - fired power plants, and natural gas power plants. To expedite timing completion of ongoing hydro power projects. To encourage private sector participation in the future hydro power plants, coal - fired power plants, and gas power plants.	Invitation for local and external private expertise and international funding agency is to be extended for timely completion of ongoing projects and for implementation of new projects. To manage different options of energy resources in the generation of electric power, and harmonize the supply & demand
(3) To review and systematically manage electric power generation system and transmission system to have minimum impact on environmental and social	(3.1) To implement and operate electric power generation system and transmission system in accordance with international practice	– Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) study will be conducted and approval from Ministry

Policy	Objective	Work Program
		of Environmental Conservation and Forestry will be sought for all the ongoing projects and future projects.
(4) To restore existing State Owned Electric Power Organizations in order to promote local and external in-vestments in the sector	(4.1) Joint venture companies will be established in order to expedite electric power gene-ration, transmission and distribution work and also to promote private participation in the electric power sector also to operate as the Electricity Regulator in the trans boundary electric power interconnection grid	- Private sector participation is being promoted and implemented in the construction and expansion of electric power lines and sub-stations in the Yangon region and other States and Regions across the country. Independent Power Producer (IPP) programs are soon to be promoted as has been operating in the neighboring countries

Policy	Objective	Work Program
(5) To review and reform existing electricity laws and regulations with the assistance of local and external legal experts in order to align with the current economic reform policy	(5.1) Review and Revision with the assistance of Asia Development Bank (ADB) in collaboration with other external experts, existing electricity laws, rules and regulations are in the process in order to promote investment and in order to align with Foreign Investment Law	- Technical standard and specification, gene-ration code, transmission code, distribution code and grid code are in the drafting process with the assistance of consultants in the local and private organizations. In order to speed up the performance and standard of the electric power generation, transmission, distribution work of Myanmar electric power sector. Capacity Building in competitive

Policy	Objective	Work Program
		practices in the investment of local/external private sector and in the standard practices of electric power purchase agree-ment etc. are to be conducted in the form of work shop, discussion, local and external conferences etc. energy pricing policy concepts are also to be studied in collaboration with other energy sector such as oil, natural gas, coal etc.

Policy	Objective	Work Program
	(5.2) To expand the electric power system to all the States and Regions of the country. To supplement sufficient electric power inspection of gas turbine power plants, new construction of coal – fired power plant, and constr-uction of Power plants based on wind energy and solar energy to be implemented in addition to hydro electricity	- Installation of additional voltage regulator equipment (shank rector, capacitor bank), installation of low loss trans-formers, line materials etc. installation of digital meter system are to be done in the existing gene-rating plants and substations in order to reduce trans-mission losses and in order to transmit electric power in accord with standard practices

Policy	Objective	Work Program
	(5.3) To expedite rural electrification program as part of national electrify-cation programs in collaboration with other rural deve-lopment agencies	– Systematic investigation and Feasibility Study will be conducted for Renewable Energy resources such as solar, wind and mini hydro resources in the States and Regions Imple-mentation and construction of off grid system will be coordi-nated with the other relevant organizations regarding tech-nical and other matters.
	(5.4) To expedite timely completion of ongoing projects and to operate full capacity generation and transmission of completed power plants	– Ministry of Electric Power has planned to conduct site survey for feasibility of wind power projects in Mon State, Kayin State and Thanintharyi

Policy	Objective	Work Program
		Region and if feasible, implement the projects in those areas, and will conduct the feasibility surveys in other States and Regions.
		- The Ministry of Electric Power is expediting timely completion and full capacity operation of the completed power plants.

(c) Policy Objectives and Work Programs regarding Electric Power Generation from water reservoirs and canals

Policy	Objective	Work Program
(1) To promote use of hydropower for rural electrification and agricultural water	(1.1) To prioritize multi - purpose water reservoir projects	- To maintain generation capacity of existing hydro power plants and to generate more electric power with higher inflow of water
(2) To conduct investigation of the remaining hydro-power resources and to produce more electric power out of those renewable hydro power resources	(2.1) To install micro hydro turbine units in the conduit and irrigation canals of the existing, ongoing water reservoirs and to produce electricity power for rural villages	- To install mini hydro turbines in the existing water reservoirs and irrigation canals and to investigate potential for installation of micro hydro power generation in the completed water reservoirs and dams
(3) To investigate potential for energy production out of crops, biomass, animal waste	(3.1) To encourage large scale production of bioethanol, bio-diesel with local and external investment and to encourage community level	- To operate such energy production facility based on crops, plants and animal waste with minimum impact of envir-onment

Policy	Objective	Work Program
	bioethanol production in the rural area	
(4) To expand energy production based on renewable energy resources	(4.1) To plan short term and long term programs for renewable energy development	- To promote private participation in the production of fuel out of the seeds on the community basis
(5) To protect against depletion of natural resources	(5.1) To standardize the blending ratio of biofuel according to time scale (eg. 2015, 2020, 2025, 2030)	- To encourage energy production from mini hydro , from bio-mass (biogas, biodiesel, and bioethanol) is to be encouraged as sources of rural energy supply
(6) To use energy effectively to conserve energy	(6.1) To use biofuel in transportation and industrial sector and to export surplus. To expand use of biofuel short term and long term basis in order to reduce impact on environment and impact on climate change	- To implement hydro power projects with investment of State or with investment from local/external sources.

Policy	Objective	Work Program
(7) To conduct technology development works for plantation of feed stock plants to produce biodiesel and bioethanol. To conduct R&D work for production of biomass energy from agricultural residue and waste		- To adopt zero waste system in the production of biofuel and renewable energy development works
(8) To expand cultivation of sugarcane, cassava, palm oil, etc. and related industry use of waste material effectively as energy source as part of the biofuel production process		- To prescribe laws, rules and regulations for production of biofuel storage, distribution and utilization
(9) To implement poverty reduction program by establishing pilot villages using renewable energy		- To establish standard and specification on biofuel and renewable energy

(d) **Energy Policy, Objective and Work Program relating to Coal Sector**

Policy	Objective	Work Program
(1) To study the coal policies of ASEAN member countries	(1) To develop Myanmar Coal Sector on the basis of best practices of ASEAN member countries	- State Scholar, workshop and seminars and discussion will be conducted in order to have exchange of experience of technology
(2) To conduct comparative study on coal resource, development program, demand & supply of Myanmar and ASEAN member countries	(2) To investigate new occurrences of coal resources as the future development of coal sector is imminent in Myanmar	- To systematically exploit the newly discover coal occurrence in Myanmar
(3) To collaborate with ASEAN member countries in the coal sector development works	(3) To engage clean coal technology and to employ measures to minimize environmental impact in the exploration and exploitation of coal	- To prescribe laws, rules and regulations to enforce clean coal technology in the coal-fired electric power plant & industrial utilization

Policy	Objective	Work Program
(4) To exchange technology for advance use of coal in promoting wood substitute fuel consumption to prevent defore-station	(4) To invite local and foreign investment and technologies for upgrade of coal	- To produce coal briquette and fuel stick using advance techno-logy to minimize emission of CO_2 , NO_2 and SO_2
(5) To collaborate with ASEAN member countries for the construction of coal-fired power plants equipped with clean coal technology in order to supple-ment energy requi-rements	(5) To collaborate with ASEAN member countries to aggre-gate in the appli-cation of Clean Coal Technology	- To provide the clean coal tech-nology in the currently planned five coal-fired power plants
(6) To collaborate with ASEAN member countries for the develop-ment of coal based industry	(6) To encourage the technological requirement of coal based industry in Myanmar	- To enforce use of proper tech-nology in the coal exploration, extraction and utilization works in Myanmar

Policy	Objective	Work Program
(7) To collaborate with ASEAN member countries in the development of quality specification laboratory techniques and coal marketing techniques in order to promote trading of coal among the countries	(7) to promote coal marketing based on standardize specification	– To establish research facility and to collaborate with coal producer companies in order to promote coal trading in the region
(8) To coordinate with other relevant Ministries in Myanmar with other ASEAN member countries for the conduct of Environmental Impact Assessment (EIA) studies caused by the coal projects	(8) To implement measures for reduction of environmental impact caused by coal utilization	– To cooperate with ASEAN member countries in the technology for reduction of environmental impact caused by coal use
(9) To be responsible and to lead in the collaboration program with the relevant countries	(9) To promote development of coal sector in Myanmar	– To establish coal sector development committees and to coordinate

Policy	Objective	Work Program
		with other relevant ministries
(10) To allow the coal export with the approval of the Union Government	(10) To promote development of domestic energy sector	– To use Myanmar coal mainly for domestic market to establish reserve coal resources for future generation
(11) To safely carry out exploitation of coal by open pit method and underground method	(11) To carefully carry out preventive measures on the danger of workers and mines in the exploitation of coal	- To collect the matters relating to mine safety, safety and health of workers in lines with inter-national standard – To share it to the partner companies by making discussion and workshop
(12) To reuse old closed mines of coal after extraction	(12) To systematically carry out "mine reclamation" of the old closed mines in line with mine closure plan	- To collect tech-nologies of the ASEAN countr-ies for "mine reclamation" - To share it to the partner companies

Policy	Objective	Work Program
		by making discussion and workshop - To check their effectiveness and efficiency

(e) **Energy Policy, Objective and Work Program of Ministry of Environmental Conservation and Forestry**

Policy	Objective	Work Program
(1) Sustainability of water and hydro power resources	(1.1) To protect the watershed areas of main dams and major rivers	- Developing protection strategies for water shed areas of main dams and major rivers after thorough assessment of their current situation - Preparing control measures soil erosion and sedimentation processes in watershed areas - Sustainable development of livelihood systems of local people in collaboration with different organizations - Initiating Payment for Ecosystem Services by the service users to incur the protection cost

Policy	Objective	Work Program
(2) Protection of natural forests which are the main source of biomass energy	(2.1) To maintain the sustainable production of natural forests by reducing fuel-wood production from natural forests to 46% in 2030 from 71.4% in 2000	- Implementation of measures for natural forest protection in accordance with 30 years National Forest Master Plan - Forming more local supply working circles for various ecological zones in District Forest Management Plans - Planning the strategies to supply fuel-wood shortage in central Dry Zone and Mangrove areas of Myanmar - Exploitation of fuel-wood from trees outside forests such as from crop lands, homestead gardens and fencings

Policy	Objective	Work Program
(3) Establishment of forest plantations to fulfill the fuel-wood energy	(3.1) To supply fuel-wood in an interim term before other energy sources are not fully accessed	- Establishment of village supply plantations - Establishment of Community Forests
	(3.2) To reduce pressure on natural forests by rehabilitation of degraded and / or denuded forest lands	- Implementation of tree planting programmes to support rural housing - Establishment of private forest plantations - Providing tech-nologies and necessary support to establish forest Plantations
(4) Fuel-Wood substi-tution and efficient use of energy	(4.1) To reduce depen-dent to natural forests for fuel-wood collection (4.2) To reduce the cost for fuel-wood and hence leading to poverty reduction	- Cooperation with line mini-stries to access alternate energy sources such as electricity, natural gas, etc. - Promotion of using agricul-tural residues as a substitute for fuel-wood

Policy	Objective	Work Program
	(4.3) To reduce carbon dioxide (CO2) emission	- Promotion of using efficient stoves - Encouraging domestic bio-gas production
(5) Research and extension	(5.1) To find out the technologies of biomass energy production, which has less harm to natural resources	- National research programmes to assess the current situation and potentiality of production and utilization of biomass energy. - Dissemination of research results for broader use among the people
	(5.2) Public awareness and people participation in sub-stainable use of energy	- Extension programmes to the people for better understanding of the benefits and use of renewable energy

Policy	Objective	Work Program
		- Public awareness programmes for energy development and their benefits to the people for which the government invests large amount of revenue

(f) **Energy Policy, Objective and Work Program of the Renewable Energy Sector**

Policy	Objective	Work Program
(1) To promote utilization of renewable energy resources in order to sustainably develop the social and economic livelihood of the country	(1.1) To contribute to electricity requirement of the rural areas and remote areas by utilizing renewable energy resources	- To conduct investigation works on the potential renewable energy resources for the country - To implement programs for potential electricity generation projects on the basis of the investigated works on renewable energy resources - To study beforehand the requirements of type and volume of energy that would be required for construction of the project
(2) To promote educational programs relating to renewable energy	(2.1) To promote more utilization of re-renewable energy in the electricity	- To conduct programs for education and awareness

Policy	Objective	Work Program
development	generation	campaign in the use of renewable energy
(3) To encourage foreign investment and government/ private sector participation in the development works relating to renewable energy	(3.1) To improve contribution of renewable energy to the energy requirement of industrial sector and commercial sector	– To invite investment and assistance for local and external sources in the renewable energy development programs – To coordinate in compilation of up to date data and information on the basis of study on different types of renewable energy
(4) To promote rural electricity generation programs based on renewable energy	(4.1) To protect and maintain the resources and environment for the long run , by utilizing renewable energy re-sources	– Ministry of Science and Technology in coordination with other relevant ministries to expedite rural energy supply programs in order to supply more energy to rural areas

Policy	Objective	Work Program
		- To implement plans contributing to energy requirement, commercial and social development of the areas where such RE fuels are to be developed
(5) To encourage R & D works in renewable energy development programs	(5.1) To conduct educational campaign on renewable energy development and to encourage R&D in the renewable energy development	- To conduct National and International Training Programs, workshops, Conferences and Seminars in order for the Renewable Energy researchers to improve their performance in renewable energy development
(6) To promote energy efficiency & conservation and quality standardization activities		- To cooperate and coordinate with other relevant Ministries to draw up relevant laws, rules and regulations for the energy eff-

Policy	Objective	Work Program
		iciency and conservation - To coordinate with other relevant Ministries in drawing up specification and standardization corresponding to National and ASEAN standard

(g) **Energy Policy, Objective and Work Program relevant to Energy Efficiency and Conservation**

Policy	Objective	Work Program
(1) To conduct awareness raising campaign and capacity building regarding energy efficiency and conservation programs	(1.1) Energy efficiency and conservation program to contribute to energy demand required due to economic development	- To implement ways to develop human resources in order to implement the energy efficiency and conservation program successfully
(2) To prescribe relevant legal frame work including laws, rules and regulations etc. required for implementation of energy efficiency and conservation programs	(2.1) To decouple social economic development and energy demand by way of efficient energy use and conservation	- To formulate and implement laws, rules and regulations in order to implement contribution of energy by way of efficient energy use and conservation counter acting the demand growth caused by social economic development

Policy	Objective	Work Program
(3) To establish a dedicated department responsible for successful implantation of energy efficiency and conservation programs	(3.1) To reduce cost of energy in the production industry and to improve economic competency	- To seek ways and means for the successful implementation of projects and program beneficial to a country by coordinating with regional and international organizations having experiences in energy efficiency program
(4) To implement resources mobilization and exchange of experience of problem in coordination with international organizations who are working on energy efficiency and conservation programs	(4.1) To reduce the greenhouse emission resulting from increased energy use by reducing the energy demand growth engaging measures for energy efficiency	- To implement targets for energy efficiency and conservation program within the ASEAN region which is to reduce 5% on year 2005 consumption by year 2020 , and 8% reduction on base year 2005 by year 2020

Policy	Objective	Work Program
(5) To formulate funding mechanism in order to succe-ssfully implement energy efficiency and conservation pro-gram	(5.1) To specifically be used for techno-logy application, the purchase of the necessary testing equipments in the successful imple-mentation of energy efficiency measures under the program's activities and to facilitate and en-courage the participation of the entire nation in these activities	- To review the current policy. objective and work programs on the basis of new development or by annual basis

Chapter 4

Energy Sector Development Plan

1. President U Thein Sein, at the Development Reform Program Meeting in June 2012, stated that the country needs to increase the electrification rate from the current level of 26 % to 75 % by the end of year 2021/2022. The President, further stated that in order to achieve the target of 75 % electrification rate, the country must increase its generation capacity during the next 10 years at the rate between 500 MW to 1,000 MW on the yearly basis reaching a total of about 16,665 MW at the end of the 10 year period.

2. The Government recognizes that additional capacity for electric power generation, transmission, and distribution must be established on a priority basis for sustainable economic development, and for poverty reduction. The domestic oil and natural gas supply must be expanded to meet the country's growing demand and to reduce the country's dependence on imported oil. Priority will be given to the exploration, development, and exploitation of oil and natural gas reserves, and the installation of additional oil refinery, gas treatment, transmission, and distribution facilities.

3. The Government strategy for new electric power generation plants to be constructed in the next 2030-2031 will be based on energy mix of 38% (8896 MW) hydropower, 20% (4758 MW) of natural gas, 33% (7940 MW) of coal and 9% (2000 MW) of renewable sources.

Accordingly, the Government strategy calls for:

(a) The process of exploration and development of oil and gas fields to be accelerated, and increased foreign investment in this sector to be encouraged;

(b) The development of recently discovered, large reservoirs of natural gas to be expedited;

(c) Upstream infrastructure including pipelines to be developed for efficient transportation of imports of hydrocarbons and the discovered resources;

(d) The natural gas and petroleum sector to be deregulated and the privatization process of entities involved in commercial operations be expedited for greater efficiency for private sector investment;

(e) The price of LPG to be deregulated and the use of compressed natural gas (CNG) to be encouraged; and

(f) A regulatory authority to be established for the orderly operations and development of the electricity, natural gas and petroleum subsectors.

Electric Power Generation

4. Although Myanmar has a total installed capacity of 3831.5 MW within the grid system, it can generate 51 % (1958.5 MW) of total installed capacity. It cannot adequately supply the peak load of 1930 MW in the whole year basis. The main cause of this problem is because of the fact that the generation mix within the grid system is not corresponding to consumption pattern and it is an improportionate system just having an installed capacity and not practically working.

5. Electricity demand within the grid system is not significantly varying on the monthly basis but the consumption is higher during summer months from February to April. Peak demand occurs two times in a day period. In order to supply stable and continuous electric power suitable thermal power plants and hydro power plants operating on run off river basis are employed as base load generation while for peaking time reservoir type hydro power plants are employed as part of generation mix.

6. The electric power system of Myanmar is based on hydro electricity, natural gas based power plants and coal-fired power plants. In the hydro power generation run off river type Baluchaung 1 and 2 plants, Kyaingtoung plant and Shweli Plant are used as base load while for peak load there are 16 hydro units based on reservoir

system. Out of those 16 reservoir type hydro power plants, Sedawgyi, Kinda, Thaphanseik, Mone, Yenwe, Khapaung, Kyi-on- Kyiwa are generating electric power depending on the irrigation water availability.

7. Those hydro power plants which need to operate partially to supply peak load are now operating as base load power plants because of shortage of hydro power plant which needs to run 24 hour basis. On the other hand, gas turbine power plants (10 numbers) with the installed capacity of 714.9 MW are not getting full acquirement of natural gas and not properly maintained which otherwise could have generated nearly 90% of installed capacity.

8. The current situations are Thermal power plants are not properly maintained, Thermal plants are not supplied with full acquirement of natural gas , thermal plants are not getting specified quality natural gas such that base load has to be supplemented with other means , And peaking load by thermal power plant such that the generation mix not properly managed resulting in deterioration of gas turbine power plant causing difficulty in operating a hydro power plant, causing instability in the electric power distribution system

New Capacity Addition for Electric Power Generation

9. The following are New Capacity Addition for Electric Power Generation:

(a) **New Gas- Based CCPP Power Plants:** Ministry of Electric power plans to construct two power plants in Tharkayta (503MW and 513MW), one power plant in Hlawga (486MW) , one power plant in Kanbauk (525MW), one power plant in Mawlamyine (230MW), one power plant in Kyaukphyu (50MW),), one power plant in Thaton (106MW), one power plant in Ayeyarwady/Yangon (500MW), either by ministry investment or private sector investment and including other private sector investment, total installed capacity is 2913 MW. The natural gas requirement for those plants is 633 MMCF per year. Additional gas requirement is to be supplied by imported LNG and new gas supply from MOGE. Once all the gas turbines are in place, an additional

electric power amounting to 16520MWh (152% of current supply) will be available.

(b) **New Hydropower Projects :** Ministry of Electric Power is adding new hydropower generation capacity at various stages of implementation.

(i) Out of 11 new hydropower plants having an install capacity of 2132MW and generating 7865 MWh of electrical energy. 7 plants are constructed out of government budget allocation.

(ii) Ministry of Electric Power is also investigating another four hydropower projects with the aggregate capacity of 379 MW.

(iii) Ministry of Electric Power is implementing 43 hydropower projects with the aggregate capacity of 42225.5 MW on Joint Venture/BOT basis.

(iv) In addition, Ministry of Electric Power has investigated 92 locations with the aggregate potential for installed capacity of 46099.3 MW.

(v) Of the above plans, hydropower projects in No.2 and No.3 are planned to implement on BOT basis between Ministry of Electric Power and foreign investors and implementation period may take for example 5 - 6 years for a 140MW hydropower project.

(vi) In summary, some of the hydropower projects are still in the feasibility study stage, 9 projects with Peoples' Republic of China, 2 projects each with India, Korea, Thailand- based organizations amounting to a total 17 hydropower projects are on the line.

(c) **Coal-Fired Power Plants:** The private sector has signed MOUs for developing coal-fired power plants with an aggregate installed capacity of 3325 MW and Feasibility Studies are under preparation.

Transmission and Distribution System

10. Myanmar has in its electric power grid system 230 kV line (1982.65 miles), 132 kV line (1542.24 miles) and 66 kV line (2631.92 miles), together with 35 numbers 230 kV substations (4290 MVA), 34 numbers 132 kV substations (1783.5MVA) and 127 numbers 66 kV substations 2610.6 MVA). Studies indicate that 230 kV lines have restricted capacity for electric power transmission and thus upgrading to 500 kV lines are in progress and this arrangement will ease electric power supply constraint in Yangon region and southern part of Myanmar.

11. Five year plan for installation of electric power lines is shown in diagram -1 and diagram -2. The proposed installation of 500KV line will contribute to stability within the grid system, reduce the power losses, supply more electric power for southern part of Myanmar.

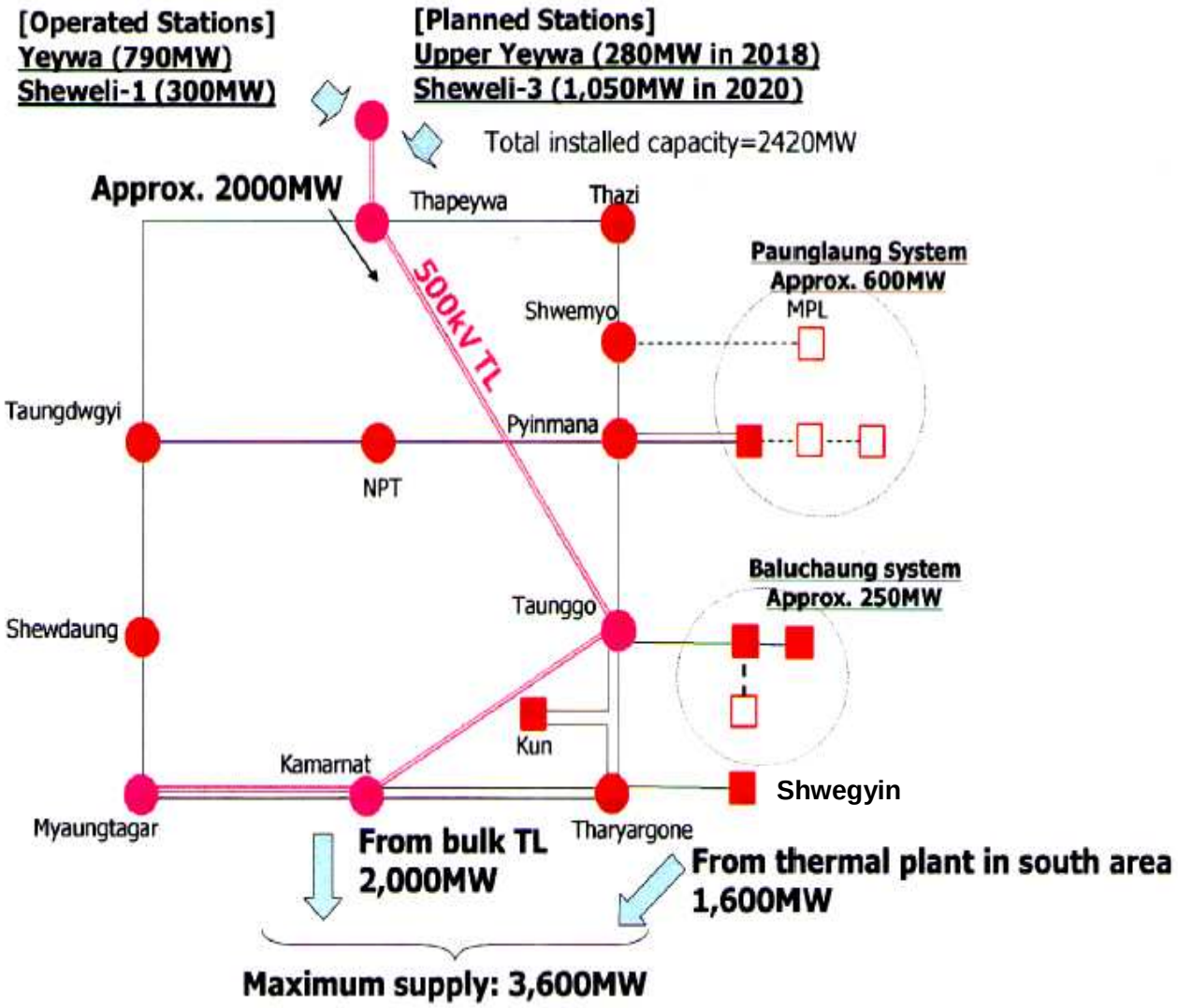

Figure-1 One Line Diagram of Transmission Line to be Implemented for Short - term Plan.

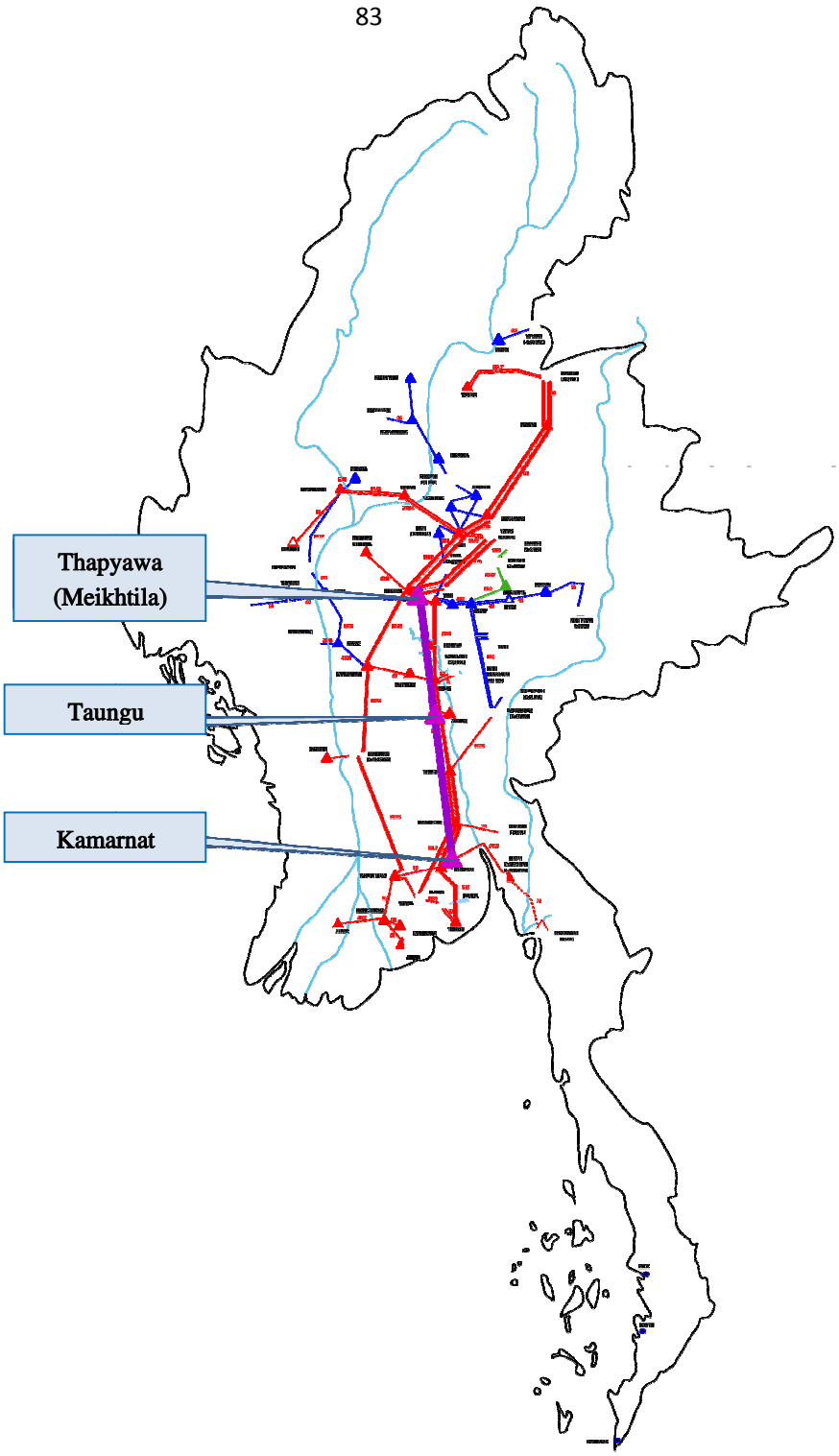

Figure-2 Thapyawa - Taungu - Kamarnat (500 kV) Transmission Line to be Implemented to Finish within Short - term

12. A 250 Km long- 500 kV transmission line, first in Myanmar is under implementation with bilateral assistance from Serbia. The Asian Development Bank and the Government of Japan are assisting the second stage of 500 kV transmission system - a 125 km long near Yangon.

13. All transmission grid energy meters were replaced with state-of-the-art static energy meters in end 2012; the better accuracy has improved energy accounting and transmission loss is now measured as about 4% as compared to 7.5% earlier. The Procurement for phase 1 of a new SCADA system, under an international competitive bidding procedure, is in progress.

Rural Electrification through Renewable Energy Sources Development

14. The rural electrification is one of the top priorities of the Government under the energy sector development plan. Considering the enormous potential of renewable resources in the country, Government plans are to expand the development of solar energy, wind energy, mini-hydropower, and also increased the production of biofuels.

15. Solar and wind and power projects with less than 1 MW, as well as mini-hydropower projects of less than 20 MW capacities, are economically attractive because they do not use fossil fuel and can be implemented quickly.

16. A foreign company has prepared a proposal to install small turbines with aggregate capacity of 8 MW, on existing irrigation canals as the water flow is fairly regular and about 50% utilization factor is possible. By connecting these small renewable projects to the grid, MEPE will avoid use of gas, which will reduce the average cost of generation and make more gas available for export. These types of projects will be attractive to private sector because of the assured dispatch. The development of such projects can be expedited by establishing a separate fast-track procedures for power purchase.

(a) **Biomass for Rural Household Cooking and Electricity:** The biomass from natural forest resources or agriculture residue can be processed to provide clean rural energy. The biomass can be first gasified and piped

to village homes for cooking and when it is not required for cooking, used in gas engines to generate electricity. MOST already has about 175 bio-digesters in service that provide fuel and electricity, these have to be evaluated and expanded with improvements, where necessary.

(b) Firewood/charcoal : The Government recognizes that it is quite likely that Myanmar's use of firewood/charcoal as household fuel will continue for some time. This will result in further degradation of Myanmar tropical forest. In order to reduce the rate of forest degradation for the protection of forests, the Ministry of Environmental Conservation and Forestry has been implementing measures for protection of forests. The major element of the program includes firewood plantation, fuel briquette/pellets production and distribution, sales of energy efficient stoves and over all greening programs.

Natural Gas and Crude Oil

17. About 16 foreign companies are presently working on 17 onshore blocks and 15 foreign companies are involved in exploration or production on 20 existing offshore blocks, all in partnership with the state-owned Myanmar Oil and Gas Enterprise (MOGE). The foreign companies include Total and Chevron, who cooperated in a venture in the early 2000s, and has now given them the opportunity to further new agreements.

18. The MOE offered 18 onshore blocks for bidding and awarded eight of these to foreign firms. In January 2013, the MOE put up a further 18 onshore blocks for tender, and an additional 30 offshore blocks in April 2013. These rounds have attracted significant interest, with over 75 letters of interest submitted for the onshore blocks.

19. Currently, MOE is in the process of evaluating the bids submission on 18 onshore blocks targeting award by October, 2013. Final bid submission for 30 offshore blocks is set on 23 November, 2013 for expected award by early 2014.

20. Myanmar, under its development plan, is expected to boost oil production to meet growing demand.

Oil Refinery

21. The current expansion plan includes the construction of a new refinery near Minhla with a capacity of 20,000 BD to process crude oil from the Myanmar-PRC oil pipeline that will be available in 2014. To improve operations of the refineries, the government is considering a joint venture with a foreign company for the Thanlyin refinery.

Chapter 5

Energy and Electric Power Sector Restructuring Program

Need for Enterprises Restructuring

1. A large number of departments, enterprises, organizations, and offices are involved in the energy and electric power sectors. A major challenge is to ensure that these entities work to their respective strengths in an integrated manner towards the implementation of the energy policy and the achievement of its aims and objectives.

2. To address the sectors efficiency improvement, governance issue, and to avoid duplication of efforts, there is a need to unbundle, restructure and consolidate the large energy and electric power sector entities for a better and improved delivery of services to the people.

3. The Government's initiatives for structural reforms in the energy sector is considered essential given the urgent need to introduce competition as the driving force for improvement and private sector participation as a vehicle for creating a competitive environment. Ensuring a stable supply of energy is essential for the country's economic recovery, which will result in additional job-generating activities for the poor as well.

Restructuring Program

4. The reform strategy is to restructure the energy and power sector by breaking up the sector's monolithic vertically integrated utilities; facilitating implementation of larger number of private energy and power projects; and introducing market-based reforms into the sector. To achieve these objectives, the sector is to be "unbundled," the state-owned assets in generation and distribution to be sold as separate business entities to the private sector to minimize the cost of energy and electricity by matching supply and demand under market-based

conditions. The formulation of policy and long-term planning will be the main function remaining at the Ministry of Energy and Ministry of Electric Power.

5. The restructuring program is expected to enhance the efficiency of the energy sector through the introduction of competitive market forces and the subsequent reduction in transmission and distribution losses. This will help reduce production costs across all industries, including agriculture and manufacturing, in the medium to long term.

6. The Government's plan is to move the power sector from an inefficient state-controlled monopoly to a competitive, market-driven system in order to produce the highest level of customer satisfaction. Under the restructuring program the Government's financial support to the energy and electric power sectors, including guarantees, would be phased out except as a last resort, e.g., for large, risky projects, or to meet social and environmental objectives such as supplying energy to rural communities. Thus, the restructuring program will consist of (i) a set of energy generation companies; (ii) non-discriminating access by generation companies to transmission and distribution services.

7. Under the restructuring program, each energy and power sector enterprise i.e., MOGE, MPPE, MPE, DHPP, DHPI, HPGE and YESB involved in commercial operation will be unbundled under two basic functions, namely

(a) Production/generation company (GENCO) covering sector development, and operational departments; and

(b) Distribution company (DISCO) formed from existing area electricity boards.

8. A separate National Transmission and Dispatch Company (NTDC), created out of the existing transmission grid, will operate the transmission system and control dispatch.

9. The GENCOs and DISCOs will be corporatized and then these corporatized unit be privatized or sold to the private sector.

Enactment of Privatization Law

10. In support of its energy and power sector privatization program the GOM will approve the privatization law to give legal cover to the privatization process. The privatization law will cover the process of transactions and protect the rights of the buyers and consumers. To secure the interest and confidence of the private investors, the law will also stipulate that a Government agency may not investigate any transactions one year after the completion of the transaction. Furthermore, the Privatization Law will protect the rights of both the workers and employers.

Establishment of an Independent Regulatory body for Energy and Power Sector (electricity and power sector, oil and gas, renewable and energy efficiency)

11. There is a need to establish the office of a Myanmar Energy and Power Regulating Authority (MEPRA) for the energy and electricity power sector. The Regulator, among others, will be responsible for:

(a) Ensuring the sustainable development of the country's energy and electric power sector, including preserving a critical balance between power demand and supply;

(b) Determining the tariff and other terms and conditions of the supply of electricity by the generation, transmission, and distribution entities;

(c) Prescribing standards and procedures to determine or revise tariff, terms and conditions for generation, transmission, interconnection, distribution, and supply to consumers by licensees;

(d) Protecting consumers from monopolistic prices, as well as the economic and social policy of the Government;

(e) Ensuring availability of capital investment program of licensee;

(f) Issuing and modifying licenses to the power generation and distribution entities;

(g) Prescribing and enforcing performance standards of public and private licensees;

(h) Charging levy and prescribing fines on licensees;

(i) Reviewing organizational affairs of licensees and encouraging uniform industry standards; and most importantly;

(j) Addressing consumer complaints with satisfactory solutions.

Establishment of a New Directorate for Energy Efficiency Improvement and Conservation Program

12. There is a need to establish a Directorate General of Energy Efficiency Improvement and Conservation Program. The rationale is to ensure the highest level of focus on the demand side that has the authority to plan and monitor the implementation.

Establishment of New Directorate General for Renewable Energy Resources Development

13. The Directorate General for Renewable Energy Resources Development may be considered to be in the Ministry of Energy. The main function will be to undertake and implement renewable resources development projects. The research and development activities may still be attached with the Ministry of Science and Technology.

Chapter 6

Energy Sector Policy Framework and Strategy

1. The Government seeks to improve the availability of energy supply in Myanmar through the development of the country's oil and gas, hydro, renewable energy resources, and improvement in energy efficiency in all sector of the economy and more particularly in the industrial sector. It will encourage greater private sector participation in the development of, and investment in, environmentally friendly and sustainable energy production technologies and promote environmentally sound investments to reduce the energy sector's dependence on fossil fuels and to prevent depletion of Myanmar's forest resources. Under the Government's new approaches for private sector partnership in energy development, it would expect the private sector to provide new and bold innovative financing instruments, unlike the old traditional lending modalities, that would enhance the provision of private capital, goods and service as well as safeguard the interest of the Government and its people.

2. The government plans to have in place an appropriate legal and regulatory framework with enforcement mechanism; strong institutional and organizational structures with capacity building program to ensure sustainability. These policy instruments are intended to attract international private investment funds for energy development.

Main Features of the Policy Framework and Strategy

3. The following are the main features of the Policy Framework and strategy

(a) **Governance and Transparency** [1] : The Government of Myanmar (GOM), since taking the office last year, has strongly emphasized the importance of "good governance, and clean government" for sustainable economic growth and poverty reduction. The government

[1] As outlined in FESR 2012

has taken a series of actions to improve governance and its recently announce Framework for Economic and Social Reform (FESR) outlined a range of actions the government proposes to take under the public administrative reforms, information access, transparency, control of corruption, rule of law and participation and consultation. The government will formulate strategies, enact needed laws for passage by the Parliament, and outline action plan for implementation.

(b) **Extractive Industries Transparency Initiative**[2] **:** To ensure that the development and the extraction of natural resources produces real benefits to its people, GOM is presently reviewing the potential value of the Extractive Industries Transparency Initiative (EITI), a global standard for the promotion of revenue transparency. This standard requires that companies publish what they pay and government publishes what they receive. Under its FESR, the GOM is committed to early adoption of the standard, starting with an appointment of a senior government official in leading the efforts, followed by the formation of multi-stakeholder group and a secretariat to prepare the application and reporting procedures in the next two years.

(c) **Expansion of Electrical Power Supply on a Fast Track Basis :** President U Thein Sein, at the Development Reform Program meeting of June 2012, stated that the country needs to increase the electrification rate from the current level of 26 % to 75 % by the end of year 2021/2022. In order to achieve the target of 75 % electrification rate, the President further stated that the country must increase its electricity generation capacity during the next 10 years at the rate of about 500 MW to 1,000 MW on the yearly basis to reach a total of about 16,665 MW at the end of the 10 year period. While a master plan for electric power generation and distribution is under preparation, there is an urgent need of a program to replace old gas turbine plants with new and more efficient combined cycle plants that uses the same amount of gas and produces two to three times the amount of electrical power.

[2] As outlined in FESR 2012

(d) **Long Term Electricity Development Plan:** The main objective of electrical power sector is to produce and distribute electric power to the consumers at a price affordable by general population. To produce and distribute electric power at an affordable price, electric power generation has to be a least cost generation within the frame of long term sustainable development as practiced all over the world. A reliable and modern electric power system accessed by most population offering competitive for the industry and at the same time commercially viable for electric power producer priced at affordable level within the long term sustainable framework is essentially required. An electric power plan covering 20 years or 25 years long term development program has to base on the following;

(i) To formulae a long term electricity demand forecast for a variety of commercial activity for the purpose of contributing long term economic development GDP growth

(ii) To switch to a more proper generation mix other than the current system relying more on hydropower units to a system supplemented in addition to thermal power plant during summer months with renewable energy power plant such as solar and wind power

(iii) To privatize electric power generation based on locally available resources in order to safeguard energy security and energy independence of the country

(iv) The choice of specific option for electric power generation is to be based on the following standard-

- Analysis of generating capacity over the demand and efficiency over the performance
- Analysis of impacts on resources depletion
- Analysis of energy pay back ratio

- Commercial analysis on performance life and infrastructure
- Analysis on resources availability and pricing over the project life time
- Analysis on technology, efficiency and services
- Analysis on impacts on additional comprehensive production
- Analysis on employment opportunity, technical transfer and poverty reduction
- Analysis on CO2 emission
- Analysis on environmental foot print
- Analysis on kinds and volumes of waste products

(v) To implement the electric power development project with investment by State or by inviting local and international investments

(vi) To conduct by annual review of long term electric power demand requirement into draw up electric power development accordingly

(vii) To inform to the general public on the reserve of by annual review of electric power development plan

(e) **Energy Pricing and Subsidy:** Distortion in the energy pricing structure, in the past, requiring unsustainable energy subsidy has resulted in macroeconomic imbalances. The subsidies have resulted in inefficient energy utilization and wastage in consumption by all categories of consumers, provided disincentive for instituting energy conservation and efficiency improvement programs in the industrial and transport sectors, and the root cause for the lack of public desire to save energy. The Government subsidies in the energy sector, particularly the

petroleum products and natural gas, have stymied investment in the development of the country's energy resources. There is general consensus, including the concerned Government agencies, that the current level of subsidy is unsustainable and that the energy subsidies must be reduced. Reducing energy sector subsidy will initially result in hardships particularly to low income domestic households, but will make funds available to the Government for undertaking the energy sector development and other social sector programs that will help the Government to improve the quality of life of the people. The Government plans to move towards a gradual removal of energy subsidies[3], first mainly for electricity consumers and electric power utilities. Removing subsidies would encourage the entities to develop, produce, and distribute energy in a more efficient way. However, electricity tariff will rise as a result, and the government will be faced with the challenge of protecting the poorest in the country against unaffordable rising electricity costs. Thus, the government needs to prepare a plan for a gradual removal of indirect subsidies, together with a clear, transparent and well-reasoned public explanation of why the subsidies need to be reduced and eventually removed. The Government will undertake public consultation in advance of the removal of any subsidies, and hopes to receive support from all segments of the society, so that it could institute urgently the much needed action for subsidy reduction.

(f) **Optimization of Fuel Mix to Reduce Dependence on Imported Fuel :** Myanmar has an abundance of many types of energy resources that can be utilized for power generation, yet the fuel mix is dominated by fossil fuels. Among fossil fuels, the country is heavily dependent on coal, oil, gas, whose prices have increased significantly in the recent past, and impacted the cost of energy production. This has necessitated the provision of subsidy in the energy sector. However, the Government subsidies for fossil fuels have stymied investment in the development of

[3] As outlined in FESR 012

the country's alternative energy resources. To optimize the fuel mix for reducing the country's dependence on imported fuel, and for improving the environment, the Government intends to formulate a plan to support the development of renewable energy resources such as solar, wind, mini-hydro, biomass, etc., for power generation.

(g) **The Need for Renewable Energy Development :** Inadequate power supply has emerged as one of the most serious infrastructure constraints on sustainable economic growth in Myanmar. The Government recognizes that additional investments in traditional commercial power supply sources alone will not be sufficient to bridge the demand-supply gap. The heavy reliance on fossil fuels in the energy mix also raises major environmental concerns at the national, regional, and global levels. The burning of fossil fuels emits greenhouse gases (GHG) that cause climate change and impose substantial environmental and economic costs. It is therefore considered essential that the country must reduce emissions of greenhouse gases, ease growth in fossil fuel energy demand, curb the upward pressure on energy prices, and improve energy security. Thus, power systems based on renewable energy sources (RES) such as solar, wind, hydro, biomass, geothermal etc., and improvements in the energy efficiency and conservation programs in the existing facilities are considered promising solutions for alleviating some of the power shortages in the country and also in reducing GHG emissions. The Government recognizes that the energy plan, which focuses on expanding fossil fuel burning, is neither environmentally nor economically sustainable. The phenomenon of global warming, driven by fossil fuel consumption, places the fragile environment in Myanmar at the frontline of vulnerability to the adverse impacts of climate change, on water supply, agriculture output, natural disasters, and especially the sea level. The Government will undertake the deployment of low-carbon technologies in a range of sectors including energy supply, transport, buildings, industry, agriculture, forestry, and waste management. Ministry of Science and Technology

is conducting rural based R&D works on renewable energy development plans. In addition technology transfer, technology dissemination, conduct of many workshops, human capacity development for renewable energy development projects are carried out in addition to graduate and post graduate studies on renewable energy development. Because of the important role of efficient use of energy resources in directing the country to a secure and independent status in terms of energy resources development, electric power generation based on exhaustible energy resources such as crude oil, natural gas, uranium and coal are to be reduced.

(i) **Community-based Renewable Energy Resources Development Program for Poverty Reduction in Remote Areas of Myanmar :** The challenges facing eco`nomic development efforts in remote areas for poverty reduction are varied and complex and include:

- lack of employment-generating programs;
- lack of electric power to sustain economic development;
- limited livelihood opportunities;
- limited human capital investment and development;
- lack of empowerment;
- lack of financial services for the poor; and
- piecemeal approach to poverty reduction and limited over-arching anti-poverty programs.

(ii) The community-based renewable energy projects will help to

- meet local electricity demand in an environmentally and socially sustainable manner;

- improve access of rural areas to modern electricity services, and
- improve standards of living for the poor through provision of community-level infrastructure.

(iii) Due to the high cost of grid extension and the lack of alternative resources, onsite renewable energy development projects have been shown to be the most cost-effective power source for remote areas of the country. A systematic assessment of economically viable resources would be undertaken for specific renewable energy technology applications such as solar, wind power, biomass, and micro-and mini- hydropower. The increased use of renewable-resources-based electric power will also produce local environmental and health benefits such as reduced exposure to indoor air pollution, reduced pressure on forestry resources used to meet household heating and cooking needs, reduced local air pollution from diesel-fired generator sets, and direct economic benefits from the reduced need to purchase, transport and store fossil fuels in remote areas for power generation, heating and cooking. In addition to the environmental benefits, the community-based renewable energy resources projects will create opportunities for economic development, social empowerment and alleviation of poverty in underdeveloped and remote communities. These projects will also reduce greenhouse gas emissions that would otherwise be produced from diesel-based generator use. A Policy Framework for the Development of Renewable Energy Resources specifically for remote areas would be formulated by the Government which would provide the policy statement, as well as define the strategy to be followed in the medium to longer terms. The policy would place increased emphasis on the design, demonstration, and pilot testing of dispersed off-grid, community-embedded, and standalone renewable energy systems, including their financing and

marketing modalities and integration with other social and physical infrastructure development (e.g., poverty alleviation, rural electrification). The framework would list all potential renewable energy projects in the area, outlining priorities and sequencing, along with funding requirements which would be based on completed studies and prototype evaluations with specific renewable energy sources and market targets and funding arrangements.

(iv) **Key Factors for Sustainability of Community-based Renewable Energy Development:** The Government is aware that sustainability of the community-based renewable energy sources projects is primarily linked to the capacity built up within the communities themselves. Key factors which would be addressed during program design include the effective implementation of the community mobilization process, and the provision of technical and capacity building support to the communities to ensure the effective operation and maintenance of the system. The focus would be to

- deve67ylop self-reliant and self-managed organizations in the target communities;
- promote information dissemination, awareness building, and knowledge sharing with other remote community areas; and
- build strategic partnerships with the private sector and civil society.

(v) **Women Participation in Community-based Renewable Energy Development:** Women are the mainstream users and often providers of household energy in villages. Without their active involvement, any renewable energy project will not succeed. Women are not only the main users of household energy in

Myanmar, but also influence if not make many family purchases related to energy. To encourage women to be involved in various forms of renewable energy development programs, an entrepreneurship program, designed and targeted exclusively for women's participation, would be organized. The "Village Women Entrepreneurship" program would include special incentives and concessions so that they may invest in the renewable energy development in their respective areas and be a part of regional development and poverty reduction. To motivate women to set up renewable energy development projects, they should be extended microfinance credits with special concessions, such as favorable financing terms, and fee waivers on loans, legal expenses, documentation charges, etc.

(h) **Industrial Energy Efficiency Improvement and Conservation**: Myanmar's rapidly rising energy demand can be better managed to reduce the need for capacity expansion. Increasing energy efficiency, to ensure more economic value from each primary energy unit consumed, has significant economic and environmental benefits. Using energy more efficiently reduces the need to build new power plants and lowers imported fuel bills, potentially freeing up government funds for spending in social and other sectors of the economy. This spending, among others, could include the provision of electricity to the millions of people in the country who currently have no electricity supply. Increased investment in energy efficiency will help make Myanmar's energy sector more sustainable, affordable, and reliable. A growing number of countries in the region such as the People's Republic of China, India, and Thailand are already implementing energy efficiency initiatives as a least-cost solution to meeting rising power demand. Tapping the energy efficiency potential in existing industrial stock is essential in order to meet the energy efficiency objectives of the Government. It will institute a two-pronged approach, focusing on: (a) the development and implementation of viable technical and business

models; and (b) strengthening the implementation of existing policies and regulations for promoting energy conservation investments. A well-conceived and a systematic program of industrial energy improvement and conservation will be initiated. The key energy-intensive industrial sub-sectors and energy conservation projects with significant potential for energy efficiency improvements include: (a) electricity generating power utilities, (b) petroleum refinery, (c) loss reduction in natural gas gathering and transmission pipeline system, (d) fertilizer and chemicals, (e) pulp and paper, and (f) cement.

(i) The energy conservation program in these industrial sub-sectors will include:

- provision of modern process technologies replacing the old and obsolete,
- provision of energy saving industrial technologies such as more efficient industrial boilers, kilns, and heat exchange systems;
- recovery and utilization of by-product gas, waste heat and pressure;
- installation of highly efficient mechanical and electrical equipments, including motors, pumps, heating and ventilation equipments; and
- industrial system optimization to reduce energy use.

(ii) There is a large financing gap for energy conservation investments in the industrial sector. Given the economic and financial attractiveness of such projects, the government expected enterprises to invest capital funding from their own resources. However, due to unavailability of needed funds, the government expected results were not achieved.

(iii) Energy efficiency and conservation sector is taken charged by Ministry of Industry in collaboration with Myanmar Engineering Society and Renewable Energy Association of Myanmar. A comprehensive energy efficiency policy is required for effective implementation of EE&C and the Ministry of Industry is formulating a draft outline on three-years action plan of EE&C regulation as a first step in energy intensive factories on the basis of Vietnamese model, targeting to draft an energy efficiency and conservation law.

(i) **Market- Based Policies for Private Sector Financing in Energy Sector:** To attract large private sector investments in the energy sector and to ensure investors confidence, the Government plans are to provide a competitive tariff structure to yield a reasonable return on investment; establish a transparent legal and regulatory regime with adequate enforcement mechanisms; ensure transparent bidding and tendering procedures for new projects which must be perceived as fair by all concerned parties; and a fair and favorable taxation regime. The Government recognizes that equally important to the private sector investor is the concession agreement (CA) between the government and the investor, and the power purchase agreement (PPA) between the seller of electricity and the buyer (the government or entity) which must be fair to both the parties. To provide further confidence to the private investor, some of the risks associated with the complete cycle of energy development should be shared proportionately by the government and the investor.

(j) **Energy Export to Neighboring Countries : Myanmar is exporting natural** gas starting from 1998 to Thailand and hydroelectric power starting from 2009 to Yunnan Province, Peoples' Republic of China. These export programs has secured large amount of foreign exchange revenue for the country. Myanmar is able to supply only 43% of natural gas demand for the industry, transportation, and electric sector of the country, similarly there has been a cut of electric power up to 470MW

during the summer season resulting strong comments and among populations. It is proposed that future export of energy (natural gas and electricity) to neighboring countries is to be done considering the following:

(i) To prioritize long term domestic demand of energy and electric power of the State

(ii) For the hydropower project which has been agreed or about to be agreed for export to neighboring countries are to be reviewed and to reserve appropriate hydel projects for domestic use

(iii) To implement export hydropower project only after approval of Hydropower Development Plan

(k) **New Foreign Investment Law[4] : The law s**pecifically outlines the importance of expanding the energy sector, promoting advanced technologies, encouraging exports and undertaking energy efficiency in the sector. The law also covers foreign investment in the development of renewable energy resources, and deployment of energy efficiency and conservation technologies. As a further improvement to the Foreign Investment Law, which is currently applied on a case-by-case basis, the government intends to merge the foreign investment law with the Citizen Investment Law before the formation of the ASEAN Economic Community (AEC) in 2015. It is envisaged that such measures will further increase the business community's confidence. The New Foreign Investment Law of November 2012, which replaced the previous law of 1998, addresses some of major concerns of the private investors. The new law offers greater incentives to foreign investors including the following:

(i) 100% of the local enterprises can be foreign-owned;

(ii) Foreign investors can lease land for 50 years (previously 30 years), with two possible extensions of 10 years each;

[4] As outlined in FESR 2012

(iii) A five-year tax holiday (only three years previously); and

(iv) Protection of foreign-owned enterprises from nationalization, subject to issuance of relevant permit from the Myanmar Investment Commission (MIC).

(l) **Potential Financing Sources of Energy Sector Development :** The investment requirement for the energy sector development is huge. However, because of its limited resources, and the competing demand of other sectors of the economy, it recognized that the Government cannot allocate such a large capital outlay from its budgetary appropriation. Therefore, the Government will seek private sector investment for the development and the implementation of the energy sector program. To provide comfort and incentive to the private sector for investing in Myanmar, the Government may also seek the financing and the provision of political risk guarantees under ADB, the World Bank/MIGA facility with government counter guarantee. The involvement of the Multi Development Banks (MDBs), other multilateral institutions and donor community, in the development of the energy sub-sectors will provide an increased level of comfort to private investor. The MDBs joint partnership would help the Government manage risks. It is possible that the MDBs through their private sector arm, and other donors, may also consider facilitating the issuance of local currency bond and currency swap for financing the local currency cost of the energy sector development plan. The fact that the electricity tariff are much lower than it should be is the main deterrent to investment by private investor in electric power sector and it's also hindering promotion of energy efficiency program and national economic development. Reduced investment in energy sector projects have negative impact on the quality and stability of electric power generation and it retard the growth in economic development of the countries. Additionally it has damaging impact on social development such as health sector and education sector and that is why electric pricing policy is important not only for the financial stability of

electric power sector but also for wider economic and social development. In order to have long term sustainable potential in the economic sector, a transparent, strong and stable electricity pricing policy is required. The basis of the pricing policy must support to fully cover the cost of natural gas and electricity infrastructures and the pricing policy must be able to protect the impact on poor and lower energy consumers. If subsidy is required to achieve such protection on the poor and lower energy consumers, it must be transparent, must have sufficient budget, and must be acceptable in terms of financial principles.

(m) **National Electrification Program :** The electrification rate in Myanmar is only 30% of the population. Reaching energy supply (including electricity) to individual of widespread population is the major obstacle. 70% of total population is living in the remote and rural areas. Access to modern energy is one of the major factors for social and economic development including better health services and social services. Electricity development is one of the major causes resulting employment opportunity and better social services. For the economic development and poverty alleviation, the United Nations have earmarked the forthcoming decade 2014-2024 for implementation of Sustainable Energy For All (SEFA) Program with the objective of creating accessibility to modern electric power globally for all mankind by 2030 is to be underway starting from year 2015. Myanmar in collaboration with SEFA program is seeking technology and funding assistance from international funding agencies. The national electrification program is required to be prescribed in order to expedite electricity development program within the grid as well as in the off grid areas so that more people will have access to more electric power in Myanmar. It is necessary to expand the implementation programs by utilizing renewable energy resources such as micro hydro, wind, solar and bio energy in the remote areas of the country, earmarking, timelines for implementation. It is expected that Myanmar would be able to supply to every household by 2030. Electric power development works

in rural areas of the world and in South East Asia countries are implemented on the basis of the subsidy. Although it can be said that supporting in terms of capital investment is more practical, effective management and keeping separate head of work could be more appropriate because of the varying costs of expenditure.

Chapter 7

National Energy Sector Policy

Nine National Energy Sector Policies

1. To implement short term and long term comprehensive energy development plan based on systematically investigated data on the potential energy resources which are feasible and can be practically exploited, considering minimum impact on natural environment and social environment

2. To institute laws, rules and regulations in order to promote private sector participation and to privatize (100% FDI, Joint FDI, International IPP, local IPP/SPP/VSPP) State Energy Organizations in line with State Economic Reform Policy

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

4. To implement programs by which local population could proportionally enjoy the benefit of energy reserve discovered in the areas

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

6. To promote Energy Efficiency and Energy Conservation

7. To establish R,D,D&D (Research, Development, Design, and Dissemination) Institution in order to keep abreast with international practices in energy resources exploration and development works and to produce international quality products in order to manufacture quality products and in order to conduct energy resources exploration works in accordance with international standard

8. To promote international collaboration in energy matters

9. To formulate appropriate policy for energy product pricing meeting economic security of energy producers and energy consumers

National Energy Sector Policy, Objectives and Work Programs:

Policy(1): To implement short term and long term comprehensive energy development plan based on systematically investigated data on the potential energy resources which are feasible and can be practically exploited considering minimum impact on natural environment and social environment

Oil and Natural Gas Sector

1. The following are objectives and work programs of oil and natural gas sector:

   (a) **Objective**

   (i) To expedite further oil and natural gas exploration and production program in the already investigated geologically basins in the currently producing

   (ii) To employ technology for improve production from existing oil and gas fields and to explore for unconventional reservoir such as shale gas, coal bed methane and tight reservoir

   (iii) To enhance improve production from existing refineries and plants by executing systematic revamping program

   (iv) To investigate possible construction of new refineries and natural gas based industry on the basis of economic viability

   (v) To expand energy transportation infrastructure in order to transport energy consumers

   (vi) To expand utilization programs of CNG for oil substitute and LPG as substitute for domestic fuels

   (vii) To implement oil and natural gas exploration and exploitation works with minimum impact on natural environment and social environment

(b) Work Program

(i) Expedite further geological and geophysical program on a yearly basis, in the geological basins already investigated, conduct geological and geophysical in new areas to find new potential, working either jointly with international companies or independently own resources, expedite improve production program in producing oil and gas fields with application of state of art production technology. Such programs will be extended to shallow hand dug wells operated by private sector. Expedite programs to explore and investigate unconventional oil and gas reservoirs jointly with international companies having such technology in accordance with prevailing rules and regulations

(ii) Expedite revamping and maintenance program for the existing refineries as these are more than 30 years old

(iii) Conduct financial viability study for construction of new refineries and natural gas based industry based on potential new discovery or imported feedstock

(iv) Expand existing transportation infrastructure for transportation of oil and gas

(v) Expand wider use of CNG in transportation and expand wider distribution of LPG with import as well as domestic production

(vi) Conduct environmental impact analysis study and social impact studies in the energy exploration work so that there is minimum impact on natural environment and social environment

Electric Power Sector

2. The following are objectives and work programs of electric power sector:

(a) Objective

(i) To expedite construction of hydropower plant as Myanmar has high hydroelectric potential with an already investigated potential of more than 46000 MW installed capacity

(ii) To further investigate new potential hydropower sites and in the regional level to implement mini/micro hydropower plants were feasible

(iii) To investigate renewable energy such as wind, solar and geothermal resources for electricity generation

(iv) To generate electric power with a fuel mix consisting of natural gas, coal and renewable energy in addition to hydroelectricity

(v) To upgrade the production of electricity generation plant by maintaining and stringing

(vi) To expand transmission and distribution infrastructure in order to transport general energy consumers

(vii) To conduct EIA and SIA studies in the development works in electric power project so that minimum impact on natural environment and social environment

(b) Work Program

(i) Systematically implement the hydropower projects which have already been investigated up to October 2013 by the Ministry of Electric Power. Moreover review and revise the 30 year electricity development plan

(ii) Continuously execute new hydropower project as there is 108000MW potential hydropower sites in Myanmar as reported by World Bank as 1995

(iii) New energy and Industrial Development organization (NEDO) of Japan in its report on potential of renewable energy in Grater Mekong Subregion (97) mention that there are potential of 365.1 TWh / year of wind power, 51973.8 TWh/ year of solar in Myanmar. Myanmar needs to exploit these potentials for electric power generation starting with systematic mapping of those resources

(iv) Depending on the outcome of investigation on renewable energy potential sites, continue to implement for electricity generation

(v) Plan for renovation of existing/aged hydropower plants and Gas Turbine Power Plants

(vi) Implement measures to reduce the losses in transmission line and distribution line from power plants to end users and continue to expedite for the capacity improvement of transmission line and distribution line from power plants to remote areas end users

(vii) Conduct EIA and SIA studies in the electric power development program in order to minimize impact on natural environment and social environment

(viii) In the regions where RE can be utilized, RE based electrification programs (Grid tied, Mini Grid and Off Grid) shall be implemented in cooperation with national and international companies.

Coal Sector

3. The following are objectives and work programs of coal sector:

(a) Objective

(i) To employ advanced technology in order to have minimum impact on natural environment and social environment of the region in the neighborhood coal mine where exploration and production

(ii) To study coal sector policy of ASEAN member countries and develop coal sector of Myanmar

(iii) To expand coal exploration program in order to identify new coal resources

(iv) To emphasize minimum impact on environment in the coal extraction work s and to engage Clean Coal Technology

(v) To invite investment from local and foreign in order to upgrade coal extraction technology (Coal to Gas, Coal to Liquid) in Myanmar.

(vi) To collaborate with ASEAN member countries in order to engage Clean Coal Technology

(vii) To assist coal based industry with the technology and other requirement

(viii) To establish coal trading on the basis of systematic standard and specification

(ix) To minimize environmental pollution caused by coal utilization to promote coal sector development

(x) To develop coal work program for energy sector

(xi) To promote domestic energy sector

(xii) To carefully carry out preventive measures on the danger of workers and mines in the exploitation of coal

(xiii) To systematically carry out "mine reclamation" of the old closed mines in line with mine closure plan

(b) Work Program

(i) As there is potential for more occurrences of coal resources in Myanmar because of its geological endowment, to expand coal exploration programs either on ministries arrangement or with foreign companies in accordance with prevailing rules and regulations and also considering minimum impact on natural environment and social environment

(ii) To arrange foreign scholarship program, workshop, paper reading session and discussion and exchange of knowledge and technology

(iii) To systematically exploit new coal resources for the purpose of energy production to institute policy or rules and regulations for engagement of clean coal technology in the coal based industry employed technology for reduction of CO2 and SO2 emission from fuel sticks

(iv) To install clean coal technology in the existing coal- fired power plants.

(v) To employ modern equipment's and technology in the coal extraction works.

(vi) To establish research facilities for coal sector to collaborate with coal producer company for the creation of a coal trading market

(vii) To collaborate with ASEAN member countries for the technology to reduce environmental from use of coal

(viii) To establish coal sector development committee

(ix) To use coal for domestic use and to establish coal reserve for future generation

(x) To invite investment from local and foreign in order to upgrade coal extraction technology (Coal to Gas, Coal to Liquid) in Myanmar.

(xi) To collect the matters relating to mine safety, safety and health of workers in lines with international standard. To share it to the partner companies by making discussion and workshop

(xii) To collect technologies of the ASEAN countries for "mine reclamation" To share it to the partner companies by making discussion and workshop. To check their effectiveness and efficiency

Renewable Energy

4. The following are objectives and work programs of renewable energy:

(a) Objective

(i) To inventory renewable energy resources of Myanmar on the basis of 1997 report of New Energy and Industrial Organization (NEDO) Japan

(ii) To systematically investigate potential for renewable energy generation

(iii) To replace fossil fuels, the plantation of energy crops for the production of biofuels up to setting up of biofuel plants in cooperation with national and international companies will be planned and implemented.

(iv) To expedite measures to reduce cutting of forest resources for household fuels, as Myanmar may continue to use firewood/ charcoal as a dominant fuel

(v) To generate biomass energy, to establish energy plantations for harvesting biomass, national and international companies will be invited to participate. From them production of fuel pellets from biomass will be encouraged.

(vi) Regions where wind power can be utilized, especially hilly regions and coastal areas, to generate electricity by installing wind farms, mapping and inventory of wind power sites will be implemented in cooperation with national and international companies.

(b) Work Program

(i) Institute a separate directorate responsible for renewable energy development

(ii) If on the basis of studying made by the directorate indicate feasibility for construction of electric power plant for other industries, the said project would be transferred to other relevant ministries or other interested private parties

(iii) Plantations of Sugar cane, cassava, sweet sorghum, palm oil, jatropha curcus etc. will be encouraged by inviting private sector to participate. To mix bio-ethanol with gasoline and to mix biodiesel with diesel at appropriate proportions and use them extensively in transport vehicles and machineries will be planned and implemented.

(iv) Expedite the fuelwood plantation program and greening program of Ministry of Environmental Conservation and Forestry. Promote production of efficient stoves, production of fuel stick and construction of biodigesters to produce biogas from animal

waste and other suitable biomass and construction of biogasifiers to produce producer gas from rice husk, wood chips and other suitable biomass will be implemented with momentum.

(v) To generate biomass energy, to establish energy plantations for harvesting biomass, national and international companies will be invited to participate. From them production of fuel pellets from biomass will be encouraged.

(vi) Regions where wind power can be utilized, especially hilly regions and coastal areas, to generate electricity by installing wind farms, mapping and inventory of wind power sites will be implemented in cooperation with national and international companies.

Nuclear Energy

5. The following are objectives and work programs of nuclear energy:

(a) Objective

(i) To investigate long term potential for civilian use of nuclear energy program for Myanmar

(b) Work Program

(i) Long term use of nuclear energy for Myanmar will be pursued in accord with guidance from IAEA

Policy (2): To institute laws, rules and regulations in order to promote private sector participation and available to privatize (100% FDI, Joint FDI, International IPP, local IPP/SPP/VSPP) of State Energy Organizations in line with State Economic Reform Policy

1. The following are objectives and work programs of policy (2):

(a) Objective

(i) To restructure and to reset proportion of investment and the existing state organizations under Ministry of Energy and Ministry of Electric Power in accordance with current economic reform policy of the government and to promote private sector participation

(b) Work Program

(i) The guidance of National Energy Management Committee will be sought to implement the restructuring programs of state energy organizations in accordance with economic reform policy of the state

Policy (3): To compile systematic statistics on domestic and supply of various different kinds of energy resources of Myanmar

1. The following are objectives and work programs of policy (3):

(a) Objective

(i) To systematically compile the statistic on energy production distribution and utilization pattern and demand requirement for different types of energy to use as a basis for future formulation of state development program and project

(ii) To coordinate for supply of required energy volume and types based on the energy statistic

(b) Work Program

(i) Coordinate and update the statistical data by continuously conducting fields survey on relevant organizations and on relevant energy types

(ii) Implement measures to fulfill domestic energy requirement employing with minimum gap between demand and supply

capacity by employing modern production technology and by inviting investment and expertise from local and overseas

Policy(4): To implement programs by which local population could proportionally enjoy the benefit of energy reserve discovered in the areas

1. The following are objectives and work programs of policy (4):

(a) Objective

(i) To implement rural energy supply project in order to reduce the widening gap between rural energy use and urban energy use

(ii) To implement programs for sharing of economic benefit and for proportionate use of energy in the regions where the energy resources are developed

(iii) Restructuring of state organization under the Ministry of Energy and Ministry of Electric Power with review and implementing towards establishment of IPP and PPP programs

(b) Work Program

(i) Ministry of Livestock, Fishery and Rural Development will implement in collaboration with other relevant ministries in order to improve energy supply situation in the rural area

(ii) Implement program for construction of energy infrastructure to contribute economic and social development region where energy resources are developed

(iii) Restructuring of state organizations under MOE and MOEP will be initiated with review and to continue to emerge IPPs and PPPs of mainly national and international companies incorporating international banking loan programs such as World Bank, ADB etc….

Policy(5): To implement programs on a wider scale, utilizing renewable energy resources such as wind, solar, hydro, geothermal and bioenergy for the sustainable energy development in Myanmar

1. The following are objectives and work programs of policy (5):

(a) **Objective**

(i) To implement responsible investment with minimum impact on natural environment and social environment in the energy development program in order to sustainably supply energy required for the increasing population of future economic development

(ii) To promote capacity building program necessary for the energy sector development

(iii) To promote utilization of renewable energy

(iv) To implement strategic reserve program in order to support the state energy security and economic stability

(v) To promote increased utilization of renewable energy to meet the energy requirement of industrial and commercial activity

(vi) To encourage research program and awareness campaign program on the importance of renewable energy sources

(b) **Work Program**

(i) National Energy Management Committee and other relevant working committees are in place as of 9 January 2013 to implement policy, objectives and work programs pertaining to energy sector

(ii) Laws, rules and regulations corresponding to State Policy and embracing different energy sectors are to be in place in order to

contribute to successful implementation of policy, objectives and work programs in energy sector

(iii) Ways and means to supply required energy and required volume for implementation of the project are to be studied and coordinate to fulfill the requirement

(iv) Collaboration work with local and external organizations will be done in order to have access to technology and for reduction of environmental pollution

(v) Investment and assistance will be invited by local and oversea to promote renewable energy sector

(vi) EIA /SIA studies will be conducted in the energy production and construction of energy infrastructures (including electric power) to minimize the impact on natural environment and social environment

(vii) Will arrange to send the technicians to attend training program and workshop in order to upgrade knowledge and performance

(viii) Training schools will be established in collaboration with internal and external private sector in order to produce skilled technicians

(ix) Rural energy supply program of the MOLFRD will be expedited in collaboration with other relevant ministries to improve energy supply to rural areas

(x) Capacity building program are to be implemented in collaboration with experienced oversea organizations and using modern technology

(xi) Standardization and specification programs relevant to ASEAN and international standards are to be implemented in collaboration with relevant ministries

(xii) Storage facility for petroleum reserve of 30 days use are to be implement in strategic location

(xiii) Similarly for private organizations who are importing petroleum products in Myanmar will be required to maintain the storage of reserve for 30 days use

Policy (6): To promote Energy Efficiency and Energy Conservation

1. The following are objectives and work programs of policy (6):

(a) Objective

(i) To implement on a priority basis the energy efficiency and conservation program in accordance with ASEAN targets

(b) Work Program

(i) Institute relevant laws, rules, and regulations (legal framework) required for implementation of energy efficiency and conservation program

(ii) Institute a dedicated department responsible for implementation of energy efficiency and conservation programs

(iii) Capacity building programs and awareness raising campaign are to be conducted to promote energy efficiency and conservation work

(iv) To reduce diesel consumption, the Solar Photo Voltaics (SPV) Hybrid system are to be integrated into the existing diesel generating systems.

(v) To implement energy efficiency and conservation (EE & C) programs in industrial, commercial and house hold energy and electrification systems.

Policy(7) : To establish Research, Development, Design, and Dissemination, Institution in order to keep abreast with international practices in energy resources exploration and development works and to produce international quality products in order to manufacture quality products and in order to conduct energy resources exploration works in accordance with international standard

1. The following are objectives and work programs of policy (7):

(a) **Objective**

(i) To employ state of art technology and equipment in the exploration for different kinds of energy resources

(ii) In inspection of petroleum and biofuels products with are produced locally, the standards and specifications must be according to international norms and standards.

(iii) The petroleum products and biofuels in local market must be according to specifications which must be standardized and the measurements and volumes must be correct according to set standards and specifications.

(iv) In energy related organizations of government and private sector, various energy quality / standards must be accredited and to nurture to get qualified technicians and laboratories.

(b) **Work Program**

(i) To install and use state of the art technology and equipment in the oil and natural gas exploration programs and in the electric power plant

(ii) To set up international level qualified laboratories to control and regulate qualities and standards of petroleum products and other biofuels and conventional and renewable energy products.

(iii) To inspect and control the petroleum and biofuels products regularly and periodically by authorized and competent organizations.

(iv) Access to expertise and technology pertaining to energy product control are to be achieve by sending

(v) technicians to local overseas workshop and discussion

(vi) Collaboration with local and external organizations would be made to open up training school pertaining to energy products quality control

Policy(8): To promote international collaboration in energy matters

1. The following are objectives and work programs of policy (8):

(a) Objective

(i) To exchange experience and to have continuous access to current technology

(ii) To study current energy and geopolitical information that has been emerging on real time basis all over the world

(iii) To increase cooperation with other ASEAN countries and other friendly nations during the process of ASEAN Economic Community (AEC) in 2015 on energy and renewable energy matters.

(b) Work Program

(i) International and regional conferences are to be organized and collaboration with international and regional organizations such as BIMSTEC, ASEAN and other relevant regions

(ii) Ministry of Energy to establish the core unit to study and report the energy and geopolitical situation

(iii) In energy sector international cooperation, it is to implement the National Energy Policy provided that Ministry of Energy and Ministry of Mines on fossil fuels, Ministry of Electric Power on electricity, to be newly set up directorate on Renewable Energy, to be newly set up directorate on Energy Efficiency and Conservation, to be newly set up organization on Energy and Power regulatory matters in cooperation with international governments, organizations and private companies.

Policy (9): To formulate appropriate policy for energy product pricing meeting economic security of energy producers and energy consumers

1. The following are objectives and work programs of policy (9):

(a) Objective

(i) To set energy price at the affordable level, and the pricing not to subject to frequent drastic change and to keep abreast with level not too far different from neighboring countries

(b) Work Program

(i) Energy Pricing Committee will be established to set energy price at the appropriate level on the basis of international market and cost of production

(ii) To control and regulate Myanmar Energy and Power Sector such as tariff and pricing, an independent institution named as Myanmar Energy and Power Regulatory Authority (MEPRA) will be formed up.

Appendix(a)

Duties and functions of National Energy Management Committee

1. To formulate National Energy Policy based on energy demand & supply and fulfillment of energy requirement on energy matters of the State.
2. To formulate Energy Regulation for ensuring implementation of energy development of the State in accordance with National Energy Policy
3. To supervise the facts and figures on energy for ensuring qualified and accurate statistics
4. To coordinate with Privatization Commission and Myanmar Investment Commission for changing the ratio between state-owned and private-owned sectors through privatization
5. For development of electrical sector, to fulfill the current requirements by laying down short-term plans
6. To lay down long-term plans based on sustainable development of industrial sector of the State and GDP to be able to meet the increased demand for electricity
7. To generate electricity with the use of coal as in many other countries as there has been greater demand for electricity and to use Clean Coal Technology (CCT) aimed at placing emphasis on environmental conservation
8. To strive for generating electricity depending on regions and topographical situation with the use of solar power, hydro power, wind power, geothermal, bio mass and bio fuel to be able to meet the public demand for electricity
9. To formulate necessary measures for adequate supply of energy for development of industrial sector
10. To take systematic measures in laying down development plans to be able to cover three sectors as energy, industrial and electrical sectors are mutually dependent

11. To prioritize and supervise oil & gas and natural resources to be able to meet domestic demands

12. To carry out oil & gas production through local and foreign investments in accordance with international regulations

13. To sell out value-added petrochemical products rather than raw materials

14. To coordinate natural gas and electricity generation in order to meet Urea fertilizer demand of the agriculture sector by planning production target

15. To adopt convenient pricing policy for both consumers and investors depending on international prices

16. To explore environmental impact and social impact assessment of the region ahead of the implementation and to release information to the people who live in the project area

17. To enforce energy sufficiency ambition in industry, transport and household sectors and cut energy wastages

18. To invite foreign and local investments for the energy sector development and increase FDI in accordance with international norms

19. To conduct necessary assessment to participate in civil nuclear energy activities in ASEAN

20. To adopt National Energy Security Strategy that envisages the future generations, apart from the current energy issues

21. To make arrangement for drafting necessary law, rules and regulations to be able to implement in accordance with the National Energy Policy and National Energy Security Strategy

22. To invite the Union ministers for President Office (3) and President Office (5), representatives of Pyithu Hluttaw (Member of the Natural Resources and Environmental Conservation Committee) and Amyotha Hluttaw (Member of the Mineral and Natural Resources Affairs Committee).

Appendix(b)

Duties and functions of Energy Development Committee

1. To participate in laying down the energy development policy and plans of the National Energy Management Committee

2. To coordinate with authorities concerned for changing the ratio between state-owned and private-owned sector sectors through privatization

3. To systematically link the Energy Plan and Industrial Development Plan as the energy sector and industrial development, which are necessary for becoming an industrialized country, are depending each other

4. To adopt the reform plans to be able to upgrade the situation of selling raw materials of natural resources to producing and selling value-added products

5. To carry out check, recheck, counter check in the field trips as statistics, facts and figures are important for formulation of policy and decision making regarding the projects related to the energy sector; and to carry out feasibility study to be able to get the correct facts and figures and information

6. To seek advices and cooperation from the responsible personnel involved in the energy sector so as to get yearly approximate energy demand in terms of short-terms and long-terms

7. To lay down objectives and adopt rules and regulations for short-term and long-term implementation in line with the energy development policy which laid down by the National Energy Management Committee

8. To review the weak and strong points yearly, when implementing objectives in accordance with short-term and long-term rules and regulations, and to revise the rules and regulations if necessary

9. To lay down objectives and strategies after making assessment to opportunities and limitations regarding the tasks for energy development

10. To devise plan to improve and modernize the investment of the foreign and local companies, Union government, and Region/State government

11. To formulate environmental conservation laws and rules to regulate energy projects and to minimize environmental and social impacts

12. To recover losses urgently which is caused by unprecedented natural disasters and adopt energy reserve policy

13. To form pricing committee and formulate pricing policy for purchasing of energy product

14. To set work procedures for investment, if local entrepreneurs would like to cooperate with foreign investors or scrutinized companies and organizations

15. To lay down plans to attract foreign and local investor in renewable energy projects such as solar, wind, geothermal, biomass and bio fuel projects

16. To regulate energy development projects by foreign and domestic investors in accord with energy development rules and regulations

17. To seek technology and management assistances from experienced international organizations in cooperation with local experts, consultancies and to review and adopt management and technology standards and norms

18. To educate the staff and those from private sector through media or workshop with the support of foreign and domestic experts and send them to local and foreign technological trainings

19. To invest in energy development under the leadership of National Energy Management Committee, tapping utmost financial and technological assistances from international monetary institutions

20. To gather information for effective use of energy, set plans and projects for effective utilization of energy, and adopt yearly, short-term and long term objectives and rules and regulations for drafting the project

21. To coordinate with other energy sectors while implementation of the project and collect information and data for energy efficiency plans and effective utilization of energy for the projects

22. To seek ways and means to implement the civil nuclear energy program to generate electricity and cooperate with regional and international organizations

Appendix(c)

Institutional Framework