National Water Resources Committee
Thematic Working Group (1)

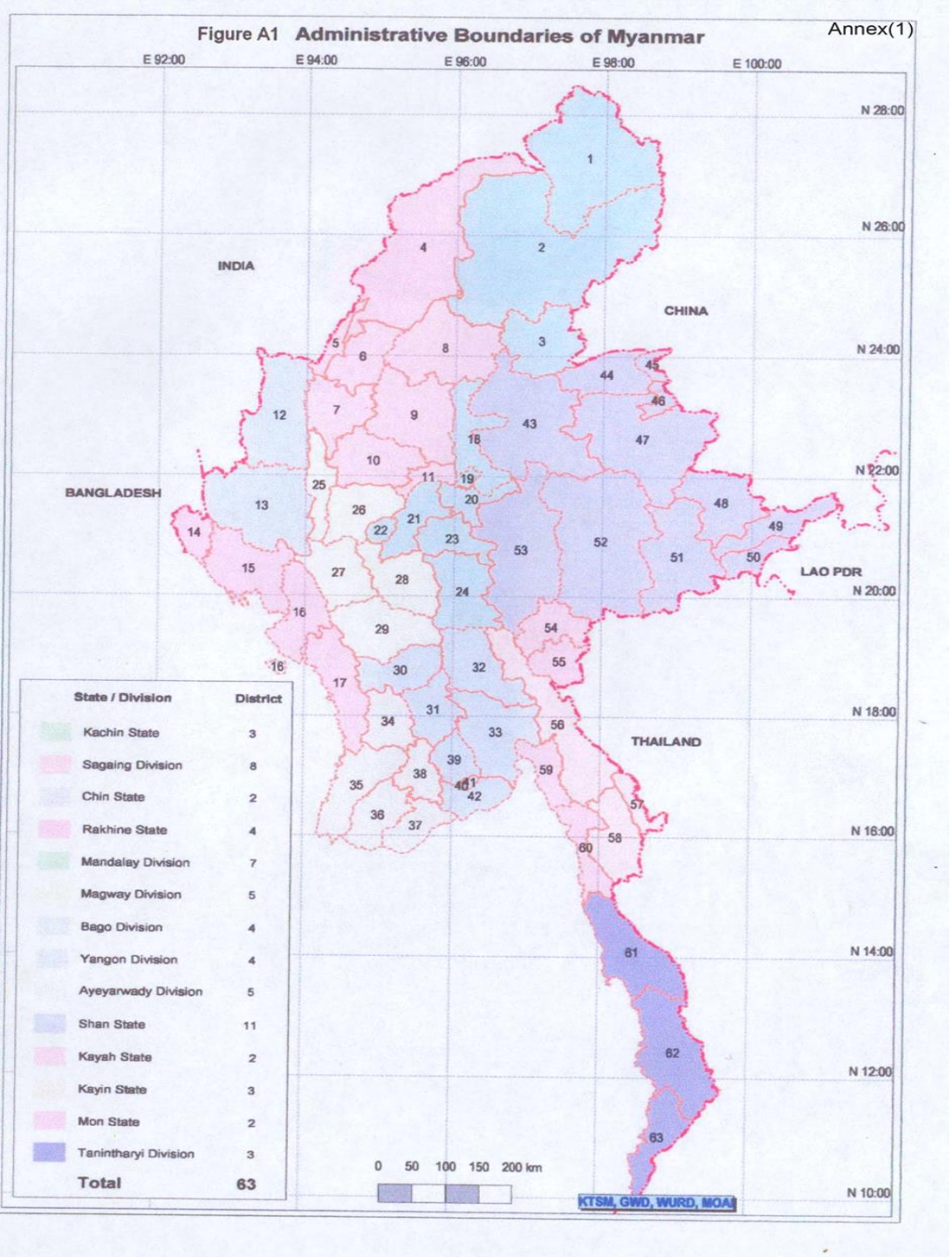
Water and Energy

21st , October, 2014

Nay Pyi Taw

National Overview

• Location of the country	-	Lat 9°55’ and 28° 15’W
	-	Long 92° 10’ and 101° 10’ E
• Area	-	676577 Sq.km
• Administrative Regions	-	(7) States and (7) Regions
• Population	-	51.419 million
• Growth Rate	-	1.47% (1983-2014)
• Rural Population	-	70.4%
• G.D.P	-	10.1% (2008-2009)
• Labour Force	-	61.2 %



Administrative Boundaries of Myanmar

For (7) States and (7) Regions and also for (63) districts

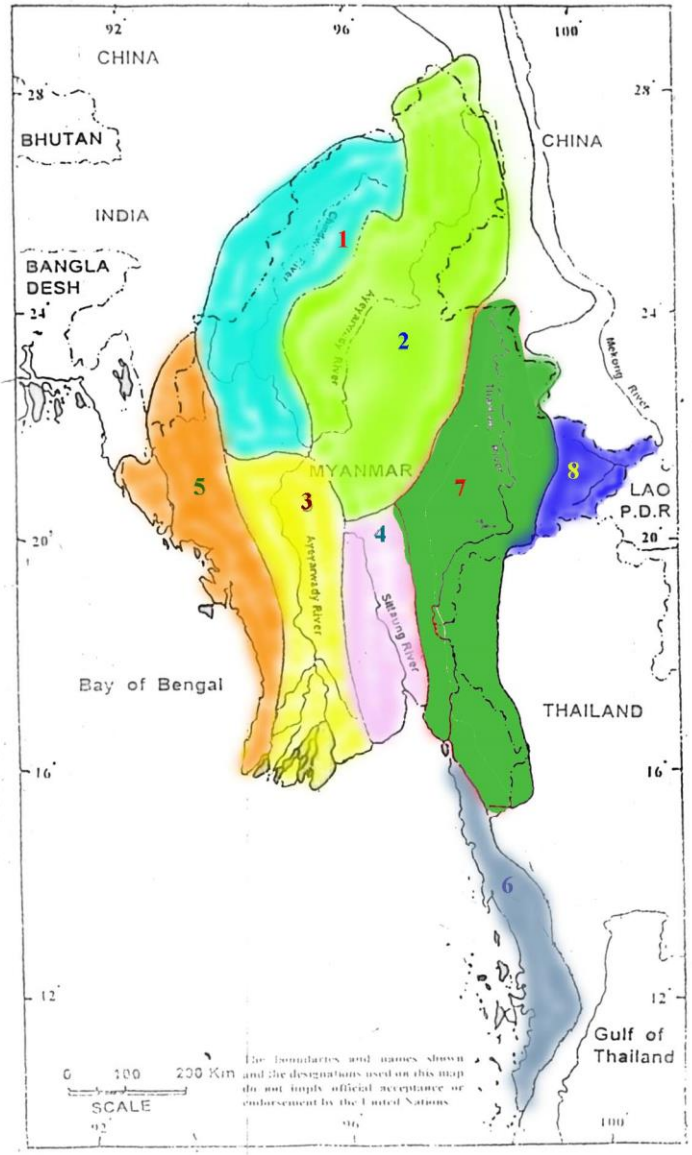
Rainfall Isohyets Map

5000 mm in coastal strips

2000-3000 mm in the delta area

1200-3000 mm in the north and hilly regions

760 mm in central Myanmar

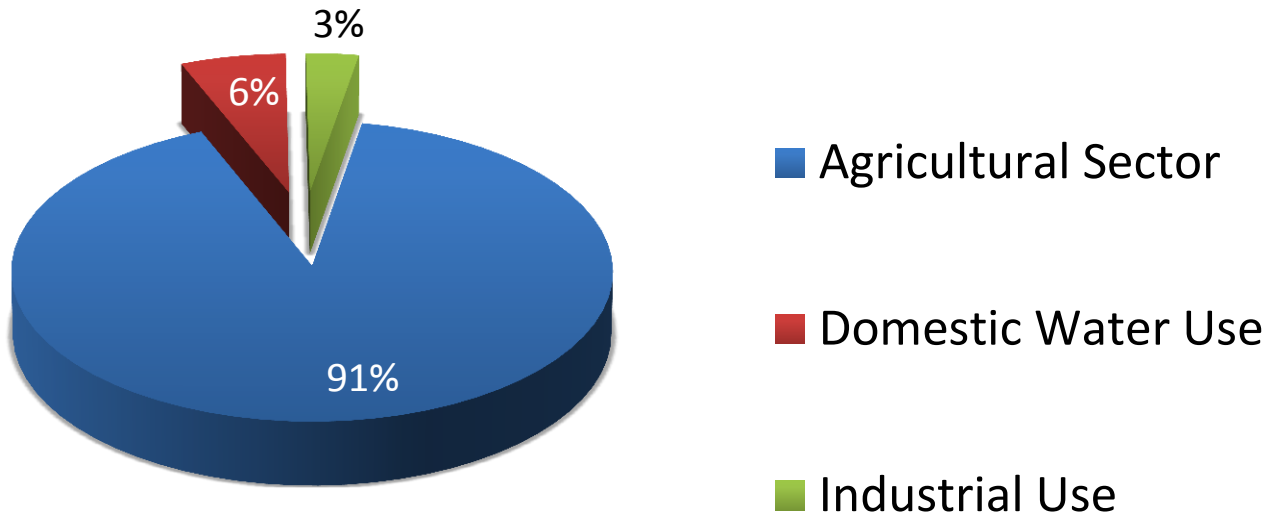


Map showing river basin of Myanmar

Potential Water Resources in Myanmar

River Basin Number	Name of the River Basin	Drainage area (1000 * km^2)	Surface water (km^3)	Ground water (km^3)
I	Chindwin	115.3	141.293	57.578
II	Upper Ayeyarwady	193.3	227.920	92.599
III	Lower Ayeyarwady	95.6	85.800	153.249
IV	Sittoung	48.1	81.148	28.402
V	Rakhine State	58.3	139.245	41.774
VI	Taninthari Division	40.6	130.927	39.278
VII	Thanlwin	158.0	257.918	74.779
VIII	Mekong	28.6	17.634	7.054
	Total	737.8	1081.885	494.713

Present water use situation



The total utilization of nation's water at present is about 56 km³ and that is only 5% of total potential.

Power Product Type

Power Projects are relatively easy to develop in Myanmar since the resources are available;

- Hydro Power Project
- Gas-fired Power Project
- Coal Power Project
- Renewable Energy Project

Estimate resources of Hydropower is about 100,000 MW

Link of Water and Energy

- Without water and energy- cannot satisfy basic human needs, produce food for a rapidly growing population and achieve economic growth
- Water for energy- for cooling, storage, bio-fuel, hydropower, thermal power etc.
- Energy for water- for pumping, treat, and desalt
- Our economics are entirely dependent on both water and energy

Water and **Energy**

- The increase demand for energy as well as water is expected to grow by some 55% by 2050.
- In 2010, water withdrawals for energy production were estimated at 583 billion cubic meters (bcm), from which 66 bcm were consumed. This demand is predicted to increase by 20% by 2035, with consumption increasing by 85% due to population growth and climate change. (IEA, 2012)
- Water is vital for the production of energy and energy is indispensable for water provision.
- Main water users are agriculture, energy, and manufacturing

Main Theme

- Water cooperation for the year 2013
- Water and energy for the year 2014 (Also one of the main themes for 7th World Water Forum 2015)

History of Electricity and Hydropower Development in Myanmar

- 1898 Constructed 460 KV Hydropower station on Yeni river in Mogok township and Electric power generation started in 1908 at ruby mine in Mogok.
- Yangon and Mandalay consumed Direct Current (D.C) distribution system in 1910.
- Alternative Current system (A.C) started in 1922
- 1961 Connected to national grid from 84 MW Hydropower station of Balu Chaung No. 2 as 1st stage of project

Electrification Ratio in Myanmar

- Population 51.419 million
- Number of Households 10.889 million
- Electrified Households 3.01 million (2014)
- Electrified Percentage 28% (28.86% as previous estimation)

Source, 2nd Myanmar Power Summit, MOEP

For the worldwide

People without access to safe drinking water 783 million

People without access to sanitation 2.5 billion

Source, WHO/UNICEF, 2012

People still lack access to electricity over 1.3 billion

(most of them in Africa and East-Asia)

Source, IEA

Rural Electrification in Myanmar

- Rural Electrification Access

No. of inhabited villages:	62218
Electrified villages (on-grid):	2765
Electrified villages (off-grid):	14195
Un-electrified villages:	45258

- Five Year Plan by MOEP

2013-14	2014-15	2015-16
3575	4116	4793 (villages)
188	370	1491 (Completed)

Source : Ministry of Electric Power, 2013

Village Hydro-electric power establishment for Village Electrification

Photo Credit: Renewable Energy Association of Myanmar

Hydropower Potential in Myanmar

Sr. No	State/Region	Numbers of Potentials	Capacity (MW)
1	Kachin State	19	18,744.5
2	Kayah State	5	954.0
3	Kayin State	9	7,064.0
4	Sagaing Region	6	2,830.0
5	Tanintharyi Region	6	711.0
6	Bago Region	8	538.0
7	Magway Region	5	359.0
8	Mandalay Region	9	1,555.0
9	Mon State	2	290.0
10	Rakhine State	6	764.5
11	Shan States		
	East	4	719.8
	South	8	7,569.5
	North	5	4,000.0
	Total	**92**	**46,099.3**

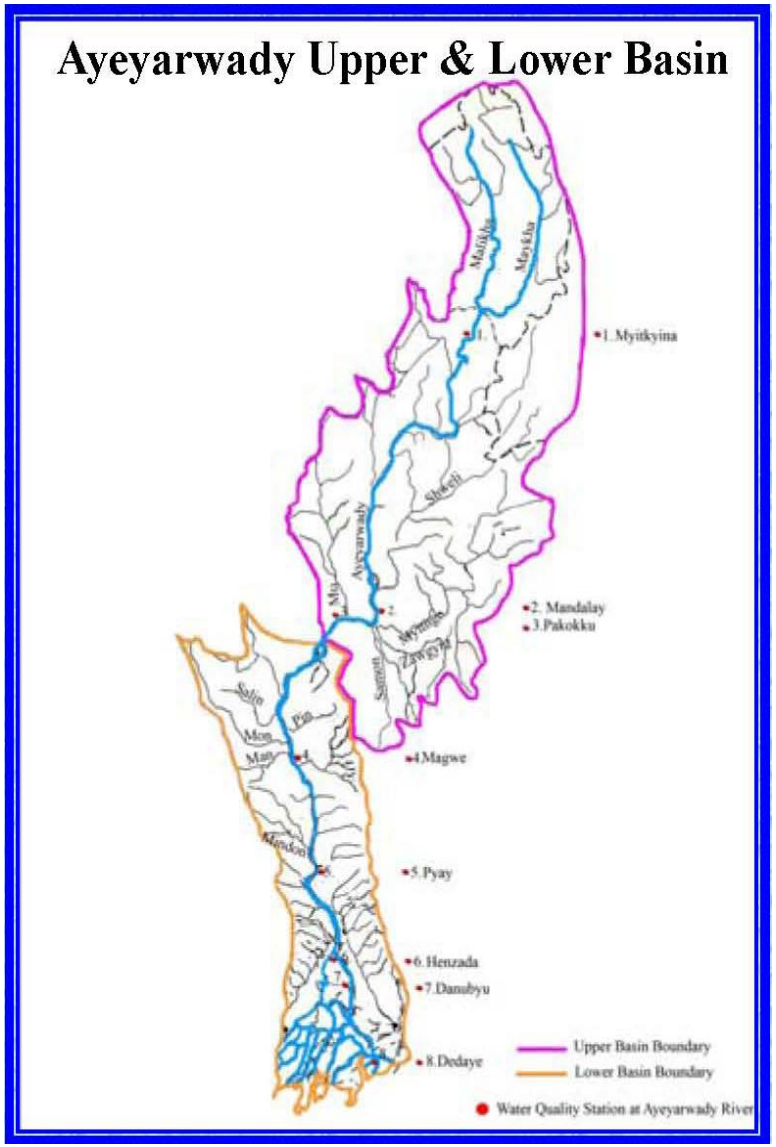
Source: Ministry of Electric Power

The present status of Hydropower generation in Myanmar

Potential	**92 no**	**46099 MW**
Completed	**25 no**	**3013 MW**
On going projects	**13 no**	**1839 MW**
Under Planning	**50 no**	**41618 MW**

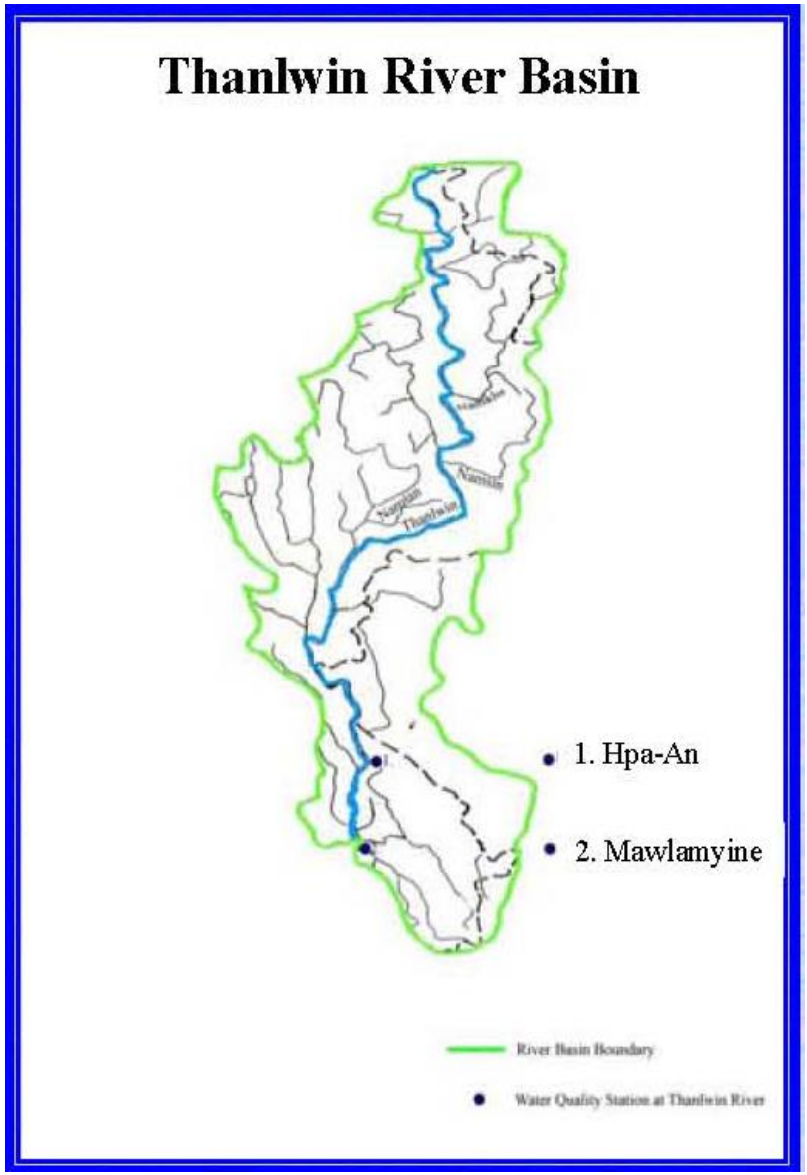
Remark- 521 MW export to China

Existing Hydropower Station in Ayeyarwady Basin



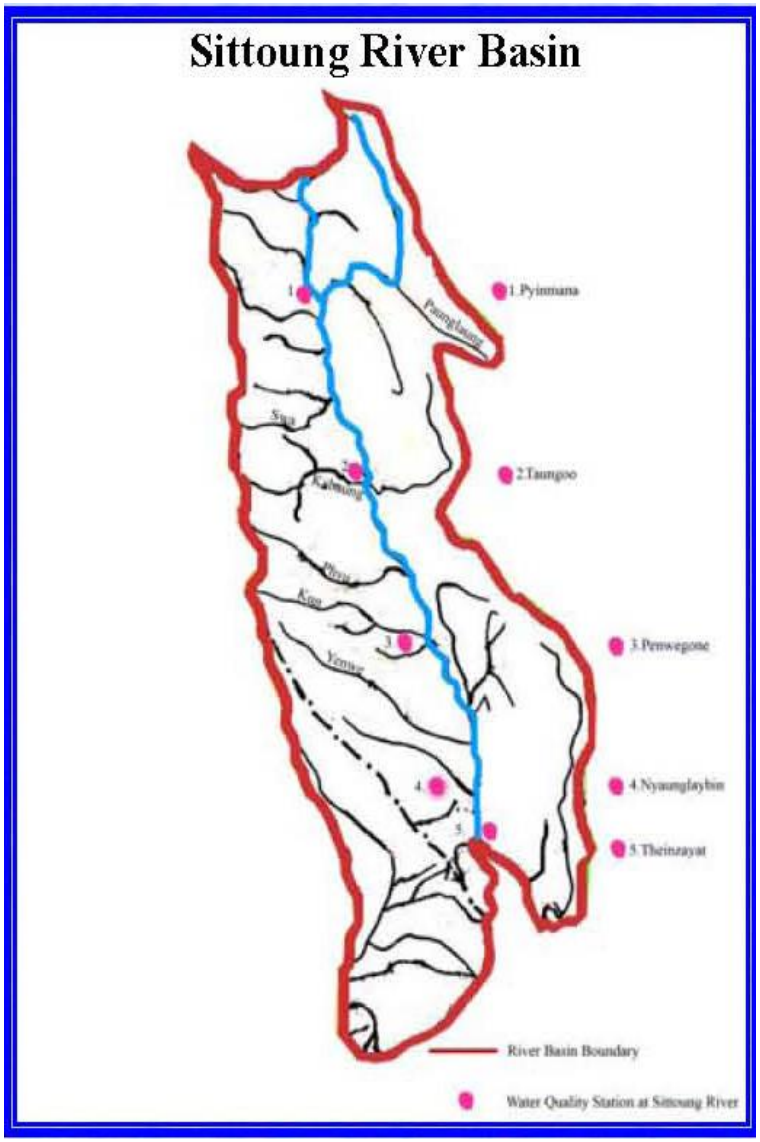
Sr No	Name of Power Station	Installed Capacity (MW)	River
1	Chipwe Nge	99	Chipwe Chaung
2	Dapein (I)	240	Dapin
3	Shweli (I)	600	Shweli
4	Thaphanzeik	30	Mu
5	Yeywa	790	Myit Nge
6	Zawgyi (I)	18	Zawgyi
7	Zawgyi (II)	12	Zawgyi
8	Sedawgyi	25	Chaungmagy
9	Kindar	56	Pantha Chaung
10	Mone	75	Mone Chaung
11	Kyee Own – Kyee Wa	74	Mone Chaung
Total		**2019 MW**	

Existing Hydropower Station in Thanlwin Basin



Sr No	Name of Power Station	Installed Capacity (MW)	River
1	Lawpita (I)	28	Namtein River
2	Lawpita (II)	168	Namtein River
3	Lawpita (III)	52	Namtein River
4	Kengtawng	54	Namtein River
Total		**302 MW**	

Existing Hydropower Station in Sittoung Basin



Sr No	Name of Power Station	Installed Capacity (MW)	River
1	Nancho	40	Nancho Chaung
2	Paunglaung	280	Paunglaung River
3	Pathi	2	Pathi Chaung
4	Kabaung	30	Kabaung Chaung
5	Phyu	40	Phyu Chaung
6	Kun	60	Kun Chaung
7	Yenwe	25	Yenwe Chaung
8	Shwegyin	75	Shwegyin Chaung
9	Zaungtu	20	Zaungtu Chaung
10	Thaukyegat	120	Thaukyegat Chaung
Total		**692 MW**	

Comparison of Generation Mix During Last Decade

	Year 2001	Year 2013 (From JICA)
Total installed power	1171 MW	3970.6 MW
Hydropower	360 MW	2919 MW
Gas	746 MW	931.6 MW
Other	65 MW	120 MW

Hydropower Increased (8) times during last decade

Installed Power as of May 2014 is 4362.5 MW (22-7-2014 The Mirror)

Some Potential Hydropower Project in Myanmar

Proposed sites on Thanlwin River

(1) Kunlon (Kokant Area, Northern Shan State)	1400 MW
(2) Naunghpa (Wa region, Southern Shan State)	1000 MW
(3) Mington (Southern Shan State)	7000 MW
(4) Ywathit (Kayah State)	1400-4500 MW
(5) Hatgyi (Kayin State)	1360 MW
Total	**15260 MW**

Proposed Site on Chindwin River

(1) Htamanthi (Upper Sagaing Region)	1200 MW
Total	**1200 MW**

Hydro Energy

- The Government targets for hydropower sector are as follow:
  - To reduce the gap between demand and supply
  - To have more input in terms of financial resources, equipment, machineries and facilities
  - To improve technology and management systems
  - To promote private participation
  - To have more conducive terms and conditions to attract more foreign direct investment
  - To formulate appropriate pricing mechanism

(Kyaw et al., 2011)

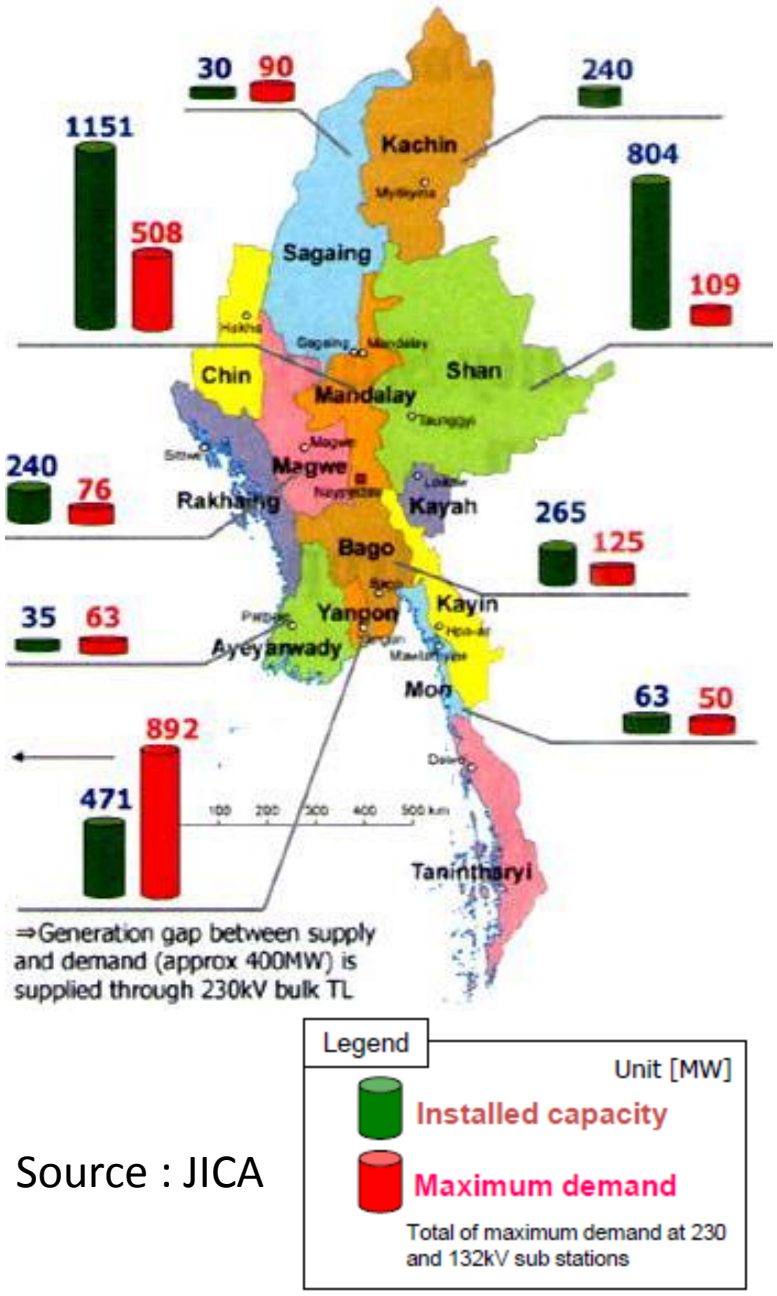
Hydro Power Projects :

Advantage -

It has big enough resources.

Disadvantages -

- not available for base loads because production is seasonally varied
- difficulty for its transmission



Source : JICA

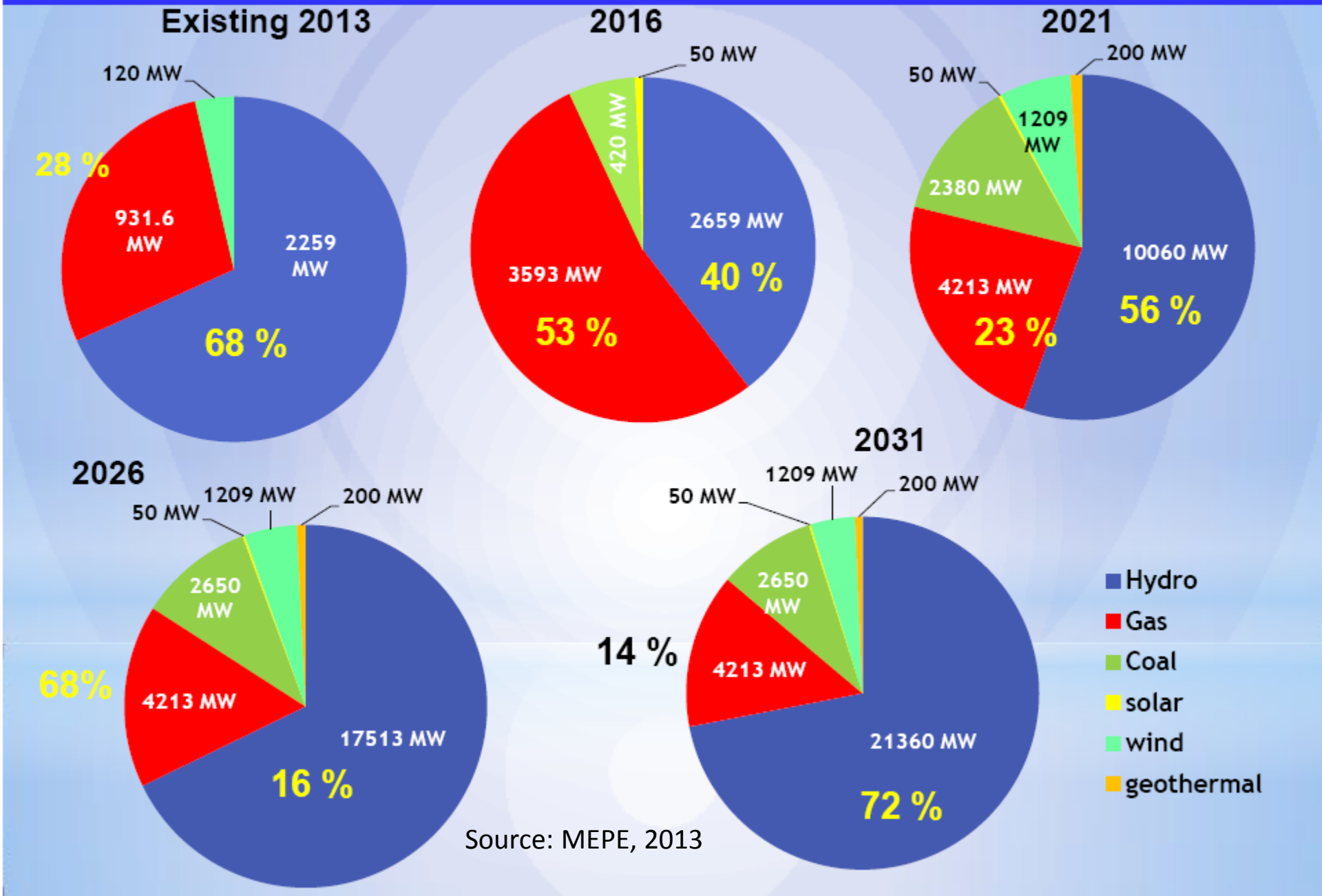
General Energy Plan in Myanmar 20013-2031

- 2013 3310.6 MW
- 2016 6722 MW
- 2021 18112 MW
- 2026 25835 MW
- 2031 29682 MW (JICA Master Plan 23594 MW)

- Including Hydropower, Gas, Coal thermal, Solar, Wind and Geothermal

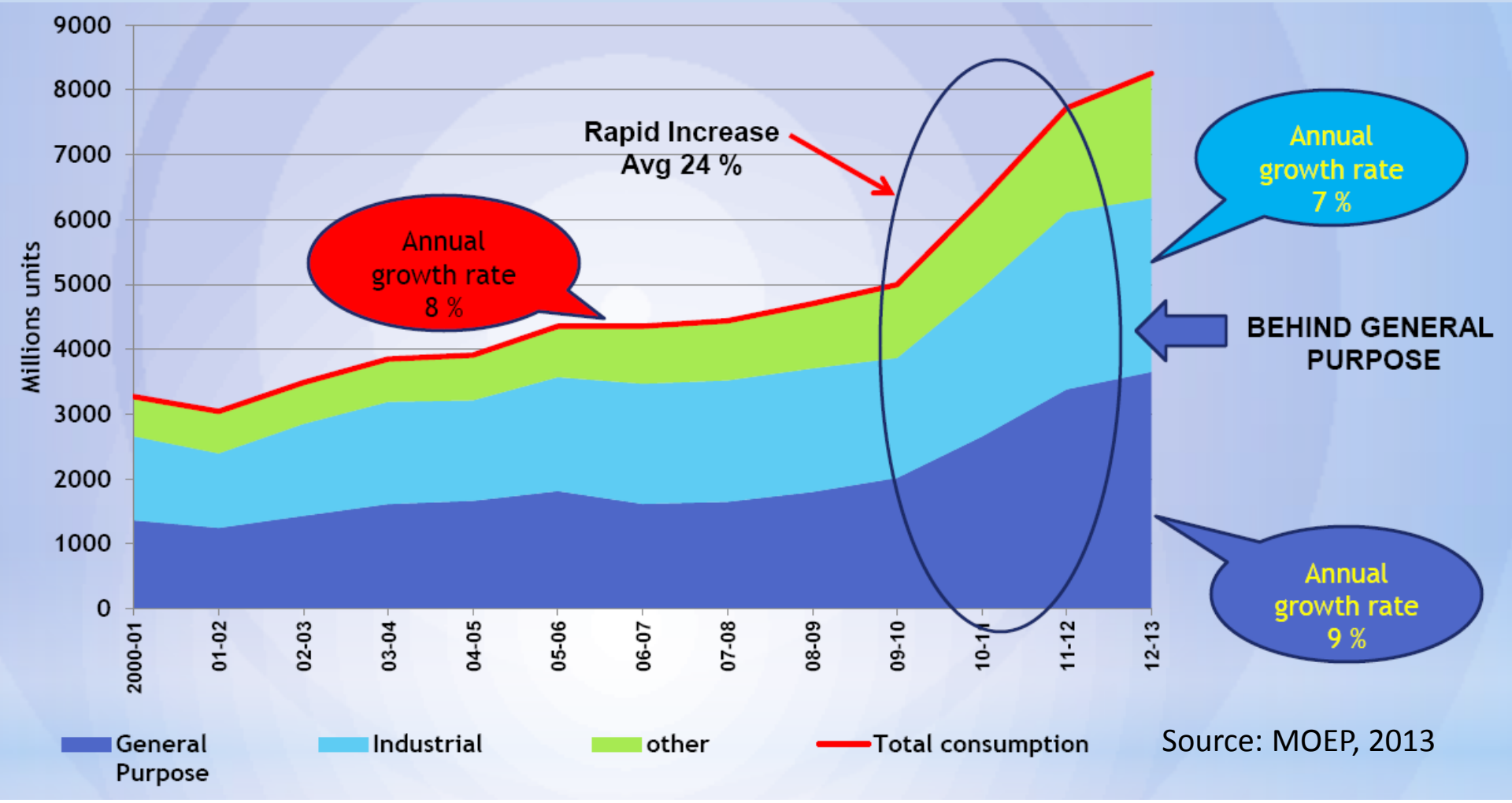
- **Hydropower potential in Myanmar is estimated as 46099 MW**

Role of Hydro power in Gen Plan



Source: MEPE, 2013

Power Consumption Situation



Source: MOEP, 2013

For Effective Economical operation and Rapid increase demand within short period , more large scale consumer is fundamental

Off Grid Electrification

- Diesel Generator Power Plants
- Small Hydro Power Plants

Ministry of Electric Power

- Biomass Gas Power Plants
- Micro & small Hydro Power Plants
- Diesel Generator Plants

Private or Local Schemes

Existing Small Hydro power Station in MOEP (Off Grid)

- 32 Stations , 33327 kW of installed capacity
- Largest Station is NantKhamKha (Kachin State)

  (Installed capacity is 1250 x 4 KW , Francis Turbine)

Tidal Energy

- Tidal energy, if utilized could enable sustainable electricity generation of rural costal and island regions of the developing countries by generating electricity and producing drinking water through desalination (IEA, 2010).
- The currently operating tidal energy project is situated in Kanbalar village, Ayeyarwaddy Division.

Tidal Energy

- Although Myanmar has more than 2,800 km of coastline (Kyaw et al., 2011), tidal energy in Myanmar is in premature stage and feasibility studies are still undergoing for the potential utilization of the tidal energy.
- Myanmar Engineering Society (MES) has been providing technical support and services for feasibility study, design and supervision especially to the rural areas, which are far away from the national grid.

Country Investment in Power Sector

Sources of Funds for implementation of hydropower projects

- Main source of funds is provided by GOM .
- Limited amount of loans received from some countries.
- Some projects are implement by B.O.T , J.V basis.
- NGOs, INGOs contributed funds for some small scale development works and renovation works .
- International organizations also contributed funds for small scale electrification works for rural community

Potential Financing Sources

- Private sector investment;

- Multi Development Banks (MDBs) such as ADB, WB, other bilateral donors, International financial institutions;

- Myanmar Government will work closely with all segment of the society – politicians, scholars, academia, civil society, media, and business leaders to undertake new energy development program, and to invest in energy efficiency improvement and conservation programs.

Myanmar

- **The Government's energy sector policy aims and objectives are as follows:**
- Ensure energy security for sustainable economic development;
- Provide affordable and reliable energy supply to all categories of consumers; especially to those without electricity in remote areas;
- Achieve government's overarching objective of poverty reduction;
- Increase foreign exchange earnings through energy exports after meeting the national demand;
- Expand community-based renewable energy projects, with women participation, that are based on fuel that is free and self-renewing: the sun, the wind, biomass, hydro, geothermal, and others;
- Gradually reduce fossil fuel based energy supply that continuously rises in price, is dirty, dangerous, causes global warming, and destroys the habitat of this planet.

Formation of National Energy Management Committee (NEMC)

The NEMC was formed by Presidential Notification No 12/ 2013 on 9 Jan 2013 headed by the Vice President and the minister of energy and minister of electric power as chairman and vice-chairman respectively

The duties of NEMC are as follows:

- formulate national energy policy and energy security strategy
- to draft necessary law, rules and regulations to implement the policy and strategy
- privatization of state owned energy sectors
- development of electricity sector in short and long term plans
- utilization of coal and CCT technologies for power generation
- generating electricity using renewable resources(for off grid rural electrification)

Formation of National Energy Management Committee (Cont,)

- providing adequate power for industries
- to prioritize oil and gas for domestic demands
- to promote foreign direct investment for energy development
- to adopt convenient pricing policy for consumers and investors
- to promote energy efficiency and conservation in industry, transport and household sectors
- to participate in ASEAN civilian nuclear power activities

Challenges

- How to develop and manage water and energy for the good of society and healthy ecosystems at local, regional and global levels avoiding unintended consequences of narrow sectoral approaches.

- Shift towards renewable energy striving towards a greener world.

Should be focused on

- Demography and economy driving water and energy demands.

- The balancing of societal uses of water and energy.

Conclusion

- The electric power sector plays a vital role for the development of the state and social affairs.
- Due to the geographic conditions, most of the hydropower resources are in the northern part of Myanmar, however, the areas where great electricity consumers reside, including Yangon region, are in the south. Therefore, 500 kVA high power transmission lines should be constructed so as to maintain the transmission of electric power by reducing unnecessary losses.
- Due to the Nature of Hydropower, Load shed has been rendered in dry seasons for the Hydropower stations have not been provided with sufficient water at that time . Accordingly, MOEP had planed to commercial implement the thermal power projects: coal-fired , gas turbine, geo-thermal and so on, so as to protect rendering. Load shed in dry season and also fulfill the electricity demands in near future.
- Coal-fired Thermal Power Plant and Gas Turbine Power Plant Projects assisted by high technologies causing low impact on environmental, social and health as well as short term construction periods, are to be established in the highest power demand areas to fulfill the present power demands.

Thank You For Your Attention