Hydropower in Myanmar

Shwe Myat Myo Oo

Introduction: Myanmar

2nd largest nation in southeast Asia

65% of population works in agriculture

Many waterways, Ayeyarwaddy most significant

Geopolitically strategic location

1948

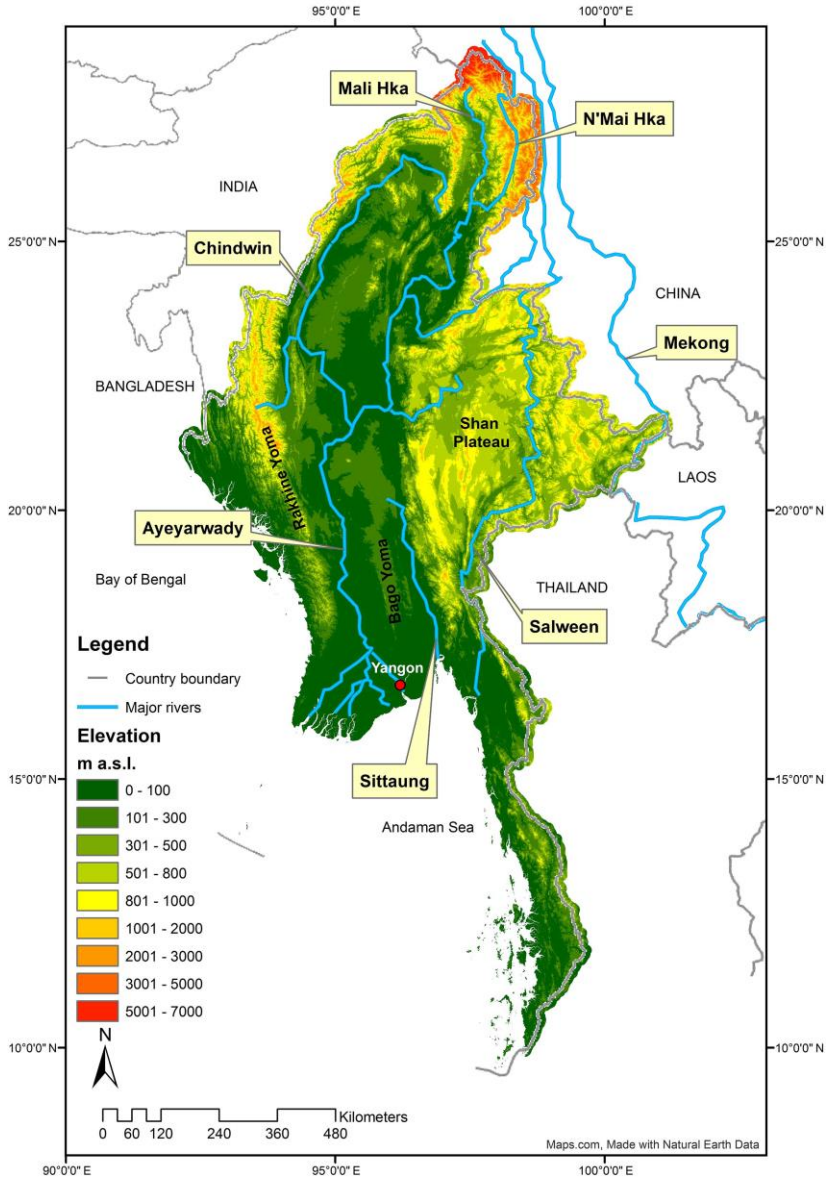
Independence gained from UK.

1962

Military dictatorship begins.

2011

Transfer of power to quasi-democracy after 2010 elections.



Myanmar Energy Overview

Known Energy Resources

- Non-renewable:
  - Coal (543.75 million metric tons)
  - Crude oil (105.78 million barrels)
  - Natural gas (6.6 trillion cubic feet)
- Renewable: biomass, PV, wind, hydropower

Myanmar

2017 primary energy data in quadrillion Btu

Total Energy: **Production** 0.839 **Consumption** 0.52

Coal

Production
0.012

Consumption
0.008

Dry natural gas

Production
0.685

Consumption
0.168

Petroleum & other liquids

Production
0.027

Consumption
0.234

Nuclear, renewables, & other

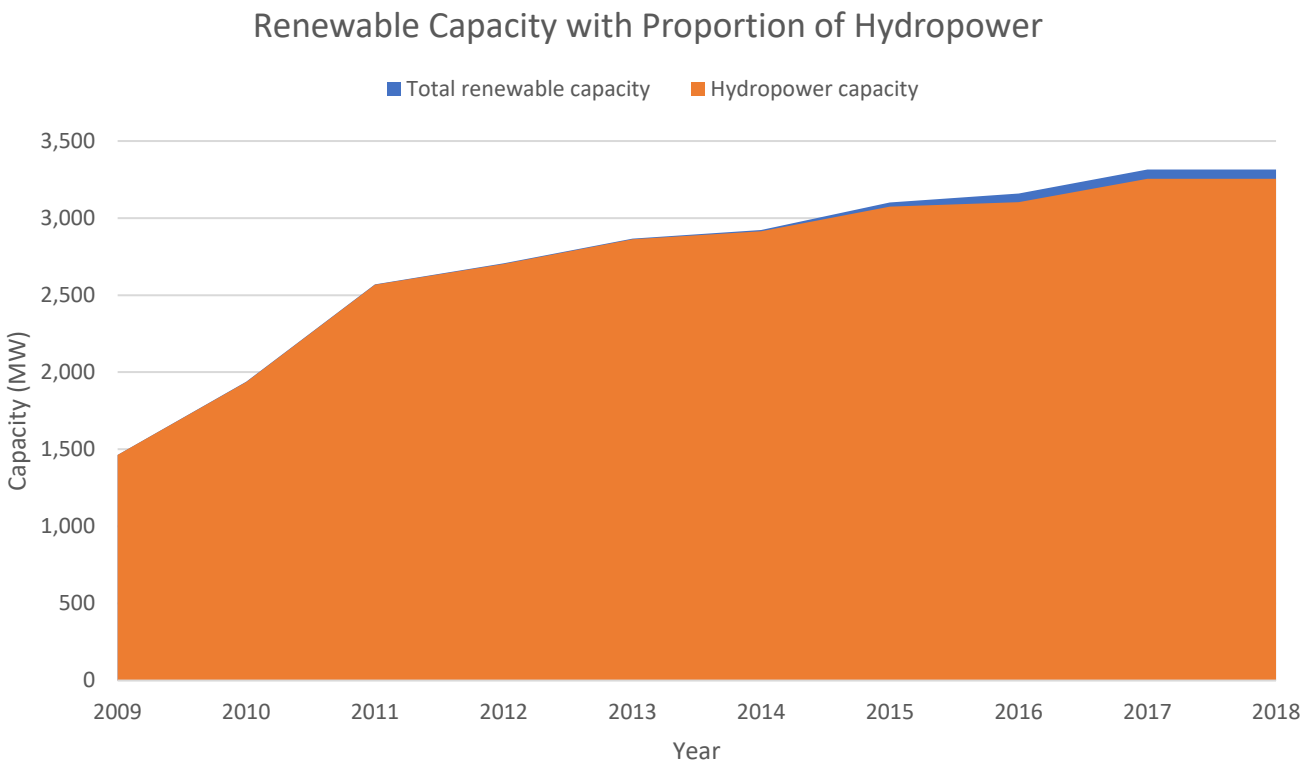
Production
0.116

Consumption
0.111

#54 Rank
1 billion kilowatthours
Electricity exports 2017

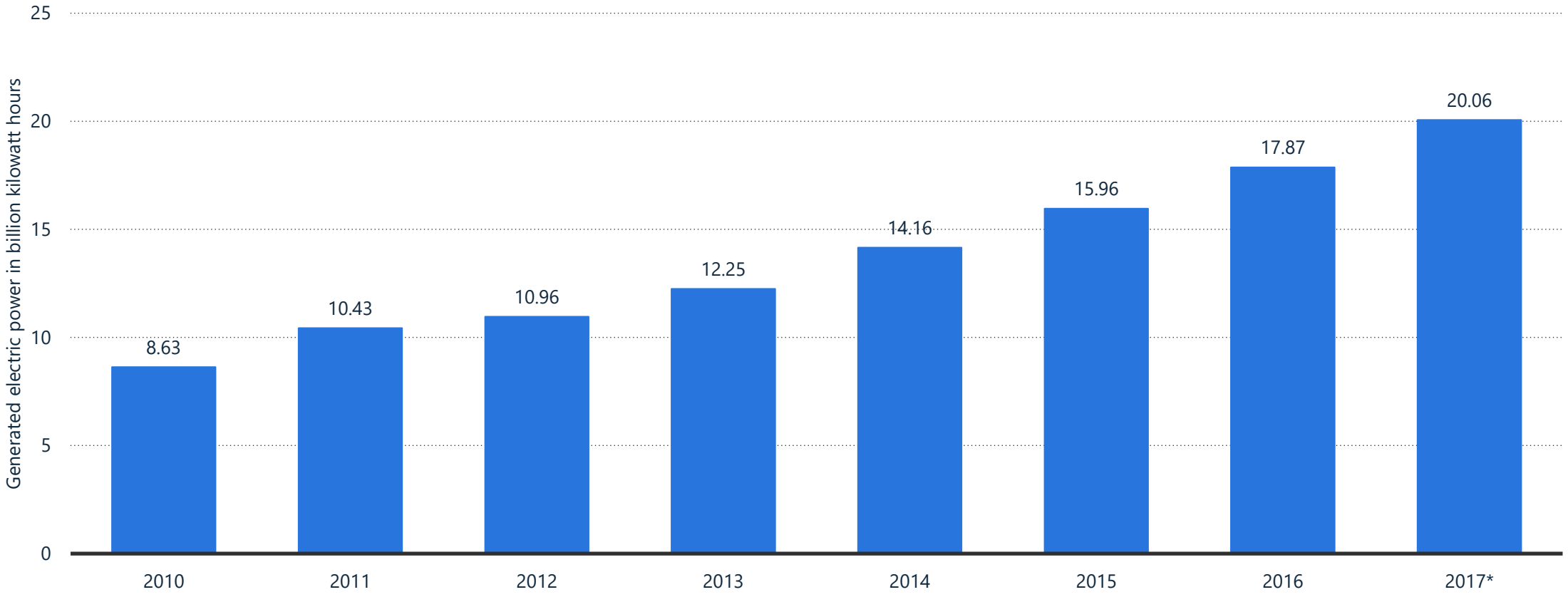
#55 Rank
1 quadrillion Btu
Primary energy production 2017

#73 Rank
127 thousand barrels per day
Petroleum and other liquids consumption 2017



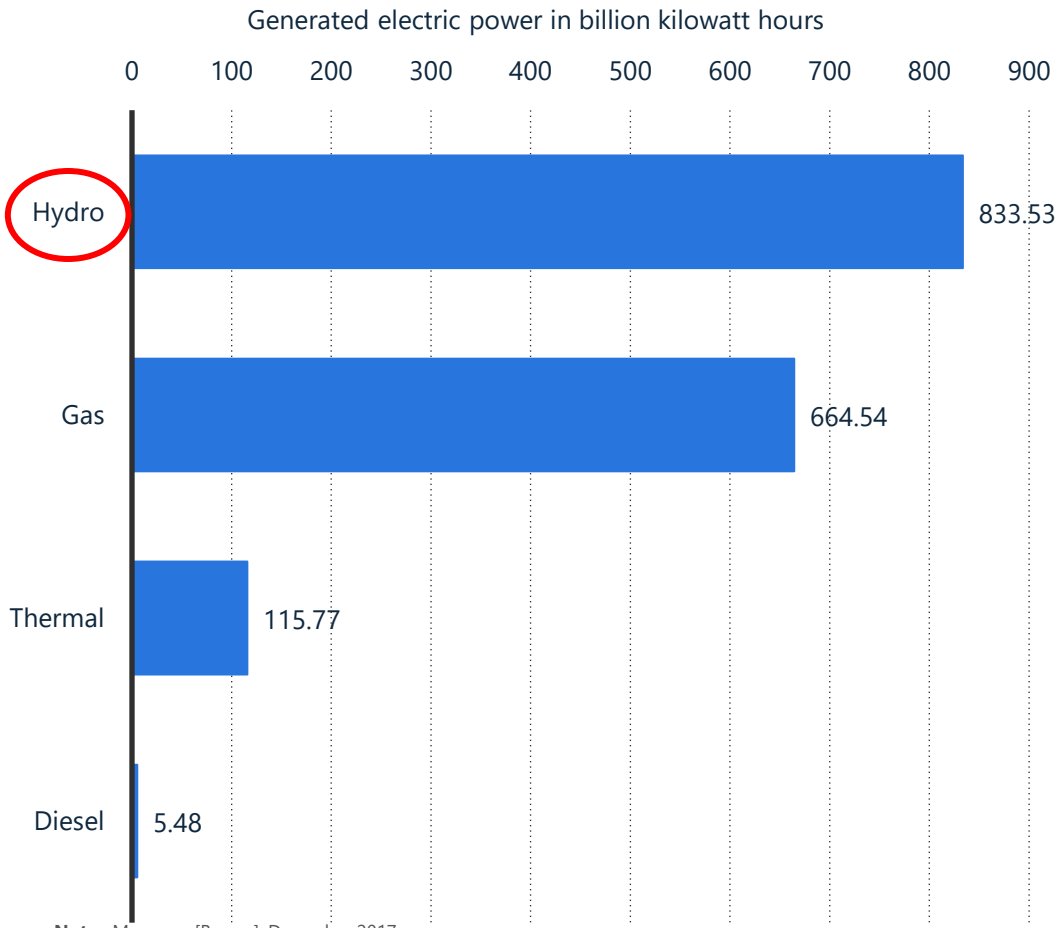
Nos.	Name of stations	Number of machine	Type of machine	Installed capacity	Name of river	Type of hydropower plant
1	Zawgyi no (1)	3	Francis	18	Zawgyi	Runoff river
2	Keng Tawng	3	Francis	54	Nantein	Runoff river
3	Kinda	2	Francis	56	Panlaung	Rock fill
4	Sedawgyi	2	Kaplan	25	Chaungmagyi	Rock fill
5	Zawgyi no (2)	2	Francis	12	Zawgyi	Arch
6	Thaphanseik	3	Kaplan	30	Mue	Earth fill
7	Mone Chaung	3	Francis	75	Mone	Rock fill
8	Kyeeohn Kyeewa	2	Kaplan	74	Mone	Earth fill
9	Baluchaung no (1)	2	Francis	28	Baluchaung	Runoff river + dam
10	Baluchaung no (2)	6	Pelton	168	Baluchaung	Runoff river + dam
11	Zaungtu	2	Kaplan	20	Bago	Earth fill
12	Paung Laung	4	Francis	280	Paung Laung	Rock fill
13	Yenwe	2	Francis	25	Yenwe	Earth fill
14	Kabaung	2	Francis	30	Kabaung	Earth fill
15	Yeywa	4	Francis	790	Myitnge	Roller compacted concrete
16	Shwe Gyin	4	Francis	75	Shwegyin	Rock fill
17	Kun Chaung	3	Francis	60	Kun	Rock fill
18	Shweli no (1)	6	Francis	600	Shweli	Runoff river
19	Dapein no (1)	4	Francis	240	Dapein	Runoff river
20	Thaukyekhat no (2)	3	Francis	120	Thaukyekhat	Concrete faced rock fill
21	Nancho	2	Francis	40	Nan Cho	Runoff river
22	Phyu Chaung	2	Francis	40	Phyu Chaung	Rock fill
23	Upper Paung Laung	2	Francis	140	Paung Laung	Roller Compacted Concrete
24	Myo Gyi	2	Francis	30	Zaw Gyi	Earth fill
25	Myittha	2	Kaplan	40	Myitta	Earth fill
26	Baluchaung (3)	2	Francis	52	Baluchaung	Runoff River + Dam
27	Chipwe Nge	3	Pelton	99	Chipwe	Runoff river

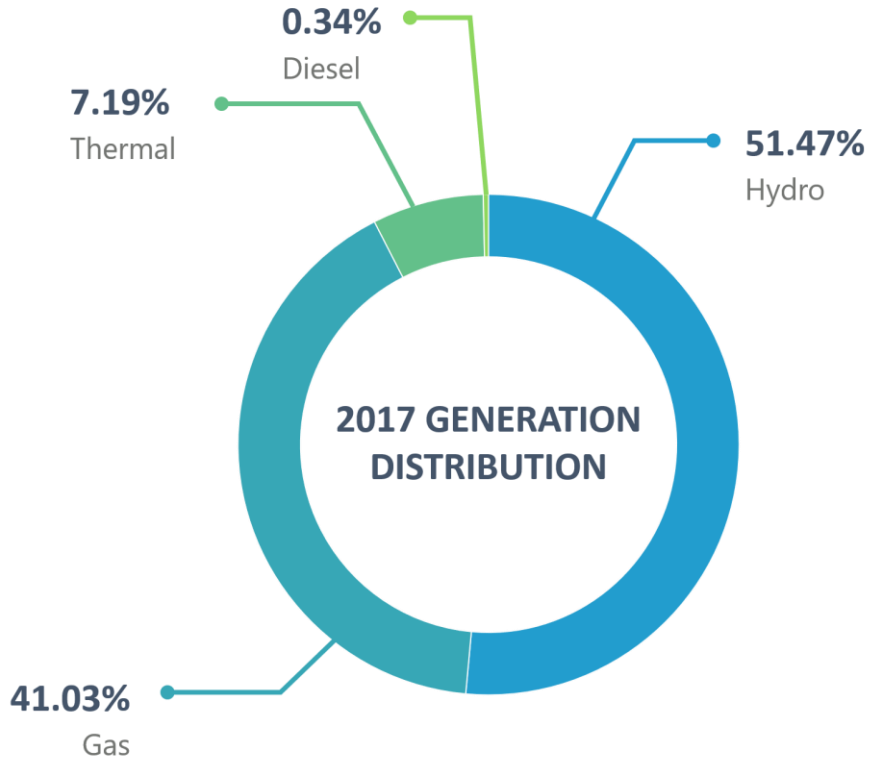
Annual Electricity Generation 2010-2017



Note: Myanmar [Burma]; 2010 to 2017
Source(s): MMSIS; MOEE (Myanmar) (Department of Electric Power Planning); ID 1059861

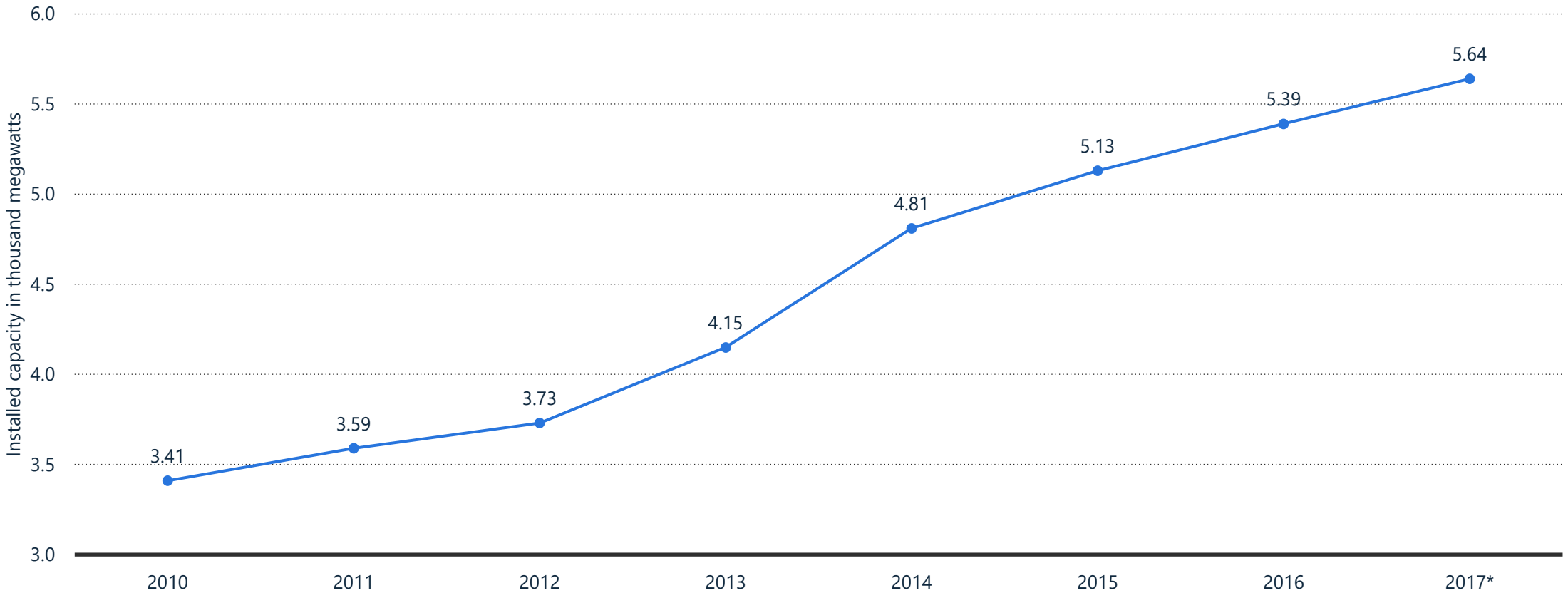
Electricity Generation (December 2017)





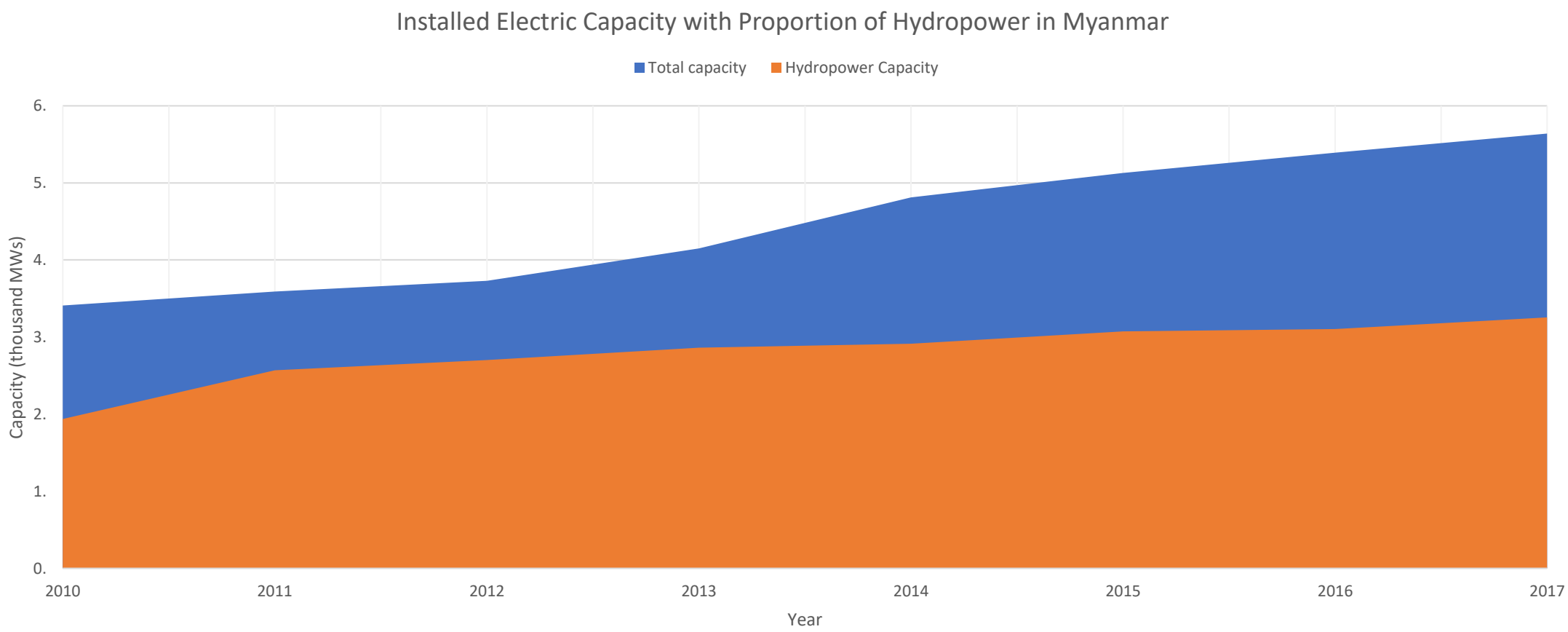
Note: Myanmar [Burma]; December 2017
Source(s): MMSIS; MOEE (Myanmar) (Department of Electric Power Planning); ID 1059896

Total Installed Capacity

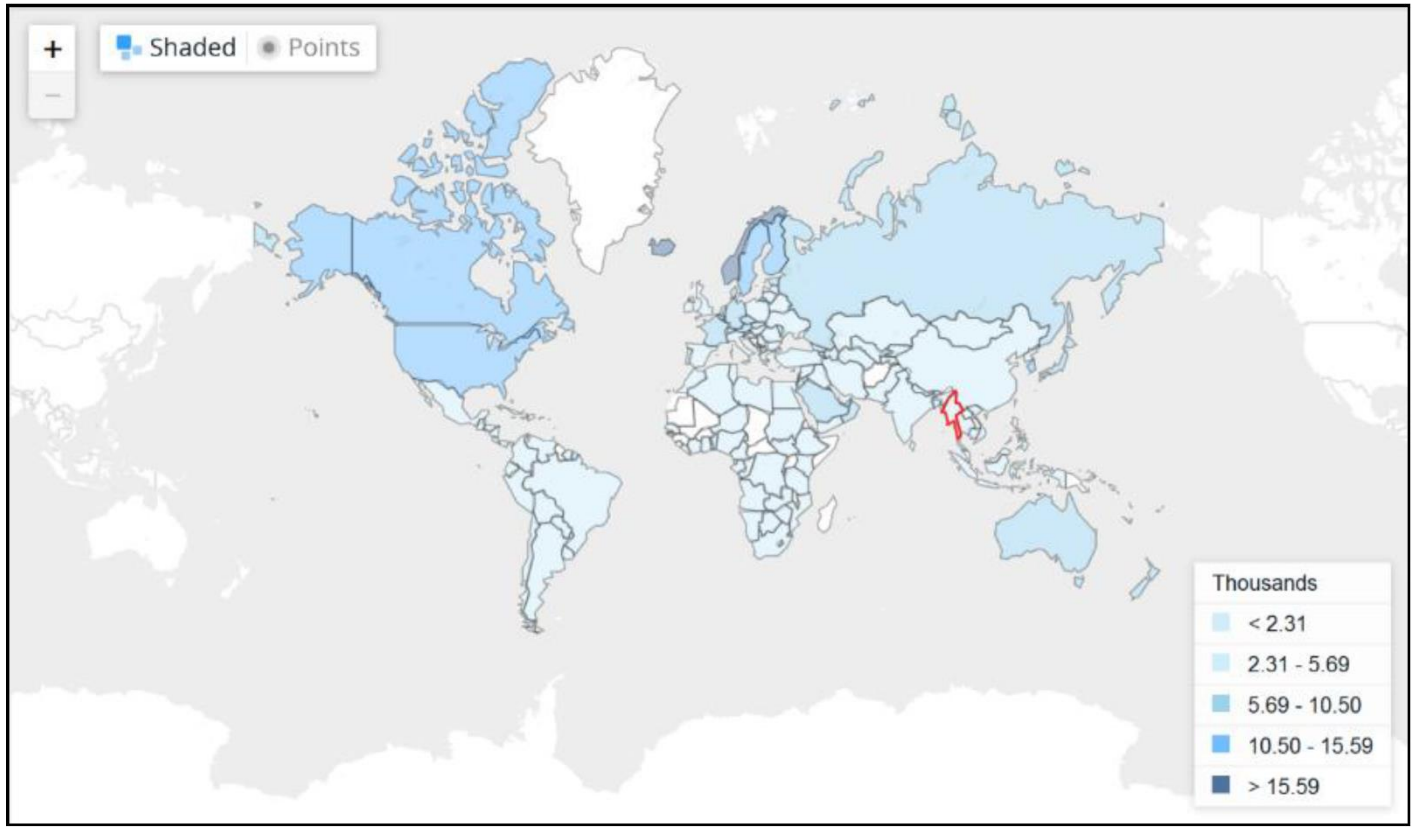


Note: Myanmar [Burma]; 2010 to 2017
Source(s): MMSIS; MOEE (Myanmar) (Department of Electric Power Planning); ID 1059839

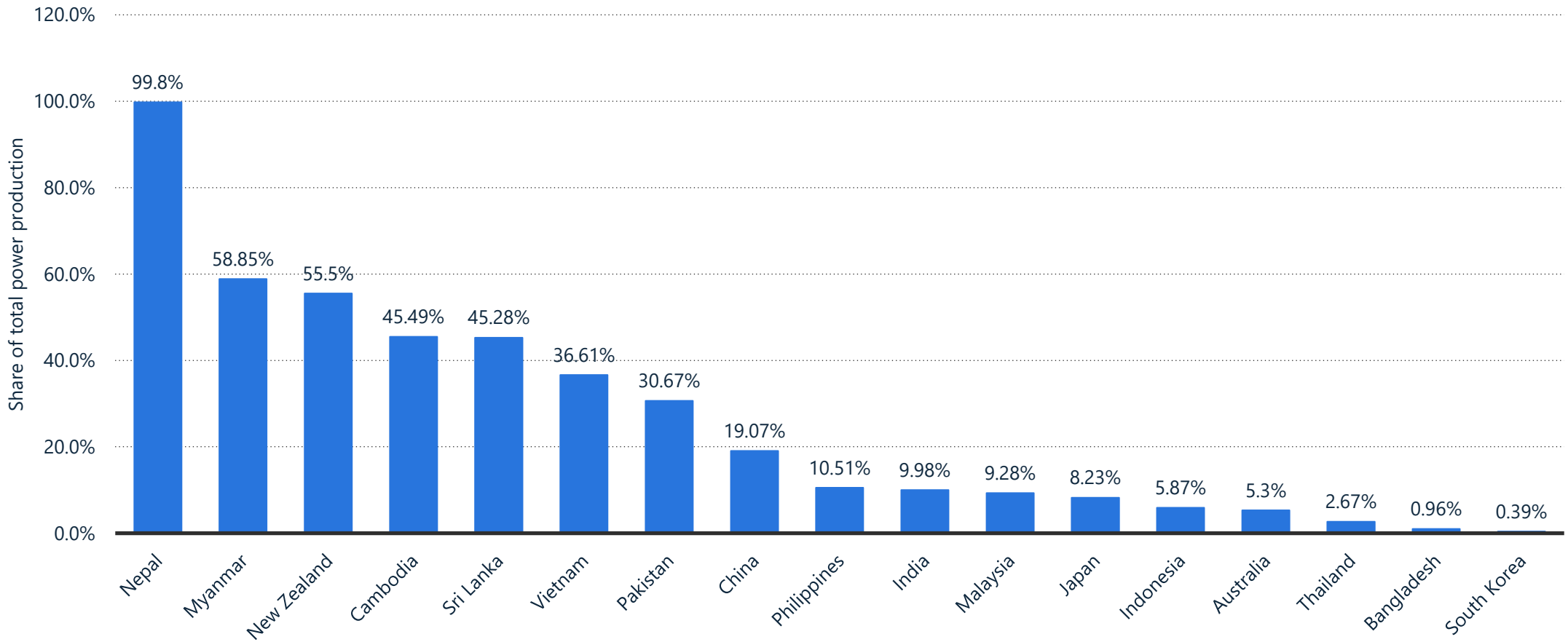
Installed Capacity with Portion of Hydro



Hydroelectricity Potential Comparison



Electric power consumption (kWh per capita)


120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Share of total power production
99.8%
58.85%
55.5%
45.49%
45.28%
36.61%
30.67%
19.07%
10.51%
9.98%
9.28%
8.23%
5.87%
5.3%
2.67%
0.96%
0.39%
Nepal
Myanmar
New Zealand
Cambodia
Sri Lanka
Vietnam
Pakistan
China
Philippines
India
Malaysia
Japan
Indonesia
Australia
Thailand
Bangladesh
South Korea

Beneficial Technical and Economic Parameters for Hydropower

Technical

- Influx of foreign expertise
- High head, high flow water resources
- Geographical elevation gradient in favor of hydropower

Economic

- High recent GDP growth
- Foreign investments and joint ventures

Major Obstacles in Hydropower Development

Economic

- Project financing/budgetary concerns
- Land ownership issues
- Corruption

Technical







Source: Renewable Energy Association Myanmar

Other Obstacles

- Civil war/internal unrest/conflict zones
- Habitat destruction/environmental concerns
- Forced displacement of villages
- Climate change
- Presence of archeological sites and protected nature reserves

STRENGTHS

- High head, high flow water resources
- Geographical elevation gradient in favor of hydropower
- Recent high GDP growth

WEAKNESSES

- Project financing/budgetary concerns
- Land ownership issues
- Corruption
- Technical skill of workforce
- Heavy industry requirements

THREATS

- Climate change
- International environmental concerns

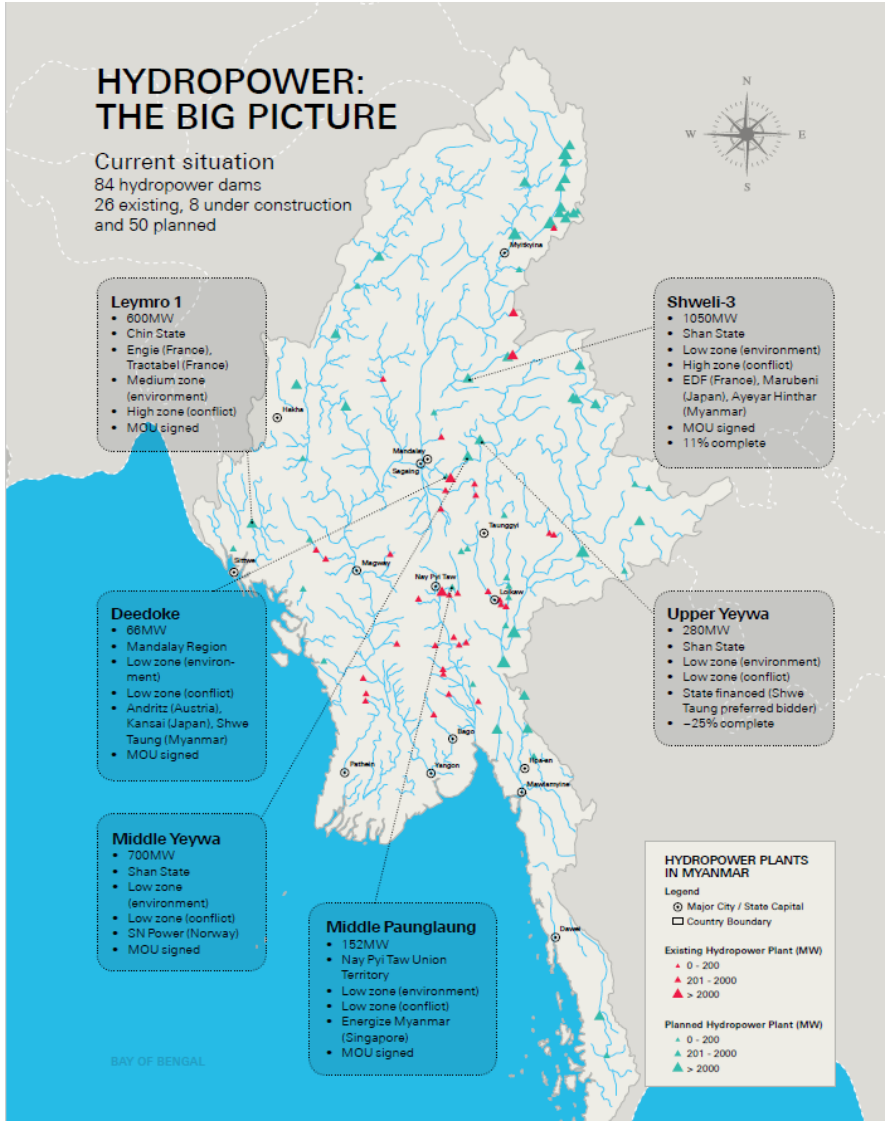
OPPORTUNITIES

- Influx of foreign expertise
- Foreign investments and joint ventures

Future Planned Developments

Planned Power Plants

- 30.4 MW plant at upper Baluchaung in southern Shan state
- 51 MW plant at Upper Kengtawn in southern Shan state
- 280 MW plant at Upper Yeywa in northern Shan state
- 1050 MW plant at Shweli-3 in northern Shan state
- 111 MW plant at Thahtay in Rakhine state
- 3.2 MW plant at Upper Nattrum in Kachin state
- 66 MW plant at Deedoke in Mandalay region
- 100 MW plant at Middle Paunglaung in Naypyitaw.



Picture source: Frontier Myanmar (2018)

Conclusions

- Hydropower has been integral to energy security in Myanmar and will continue to be
- Significant potential for hydroelectricity still remains
- Project financing and budget issues must be resolved in the long term
- Technical workforce training and a focus on heavy machinery will augment hydropower
- Corruption must be tackled along with improving conflict resolution at all levels
- Key stakeholders must collaborate closely to minimize negative externalities