

**Myanmar's Hydropower Development to Meet
National Electric Power
Demand : From Mega Hydropower Projects
Perspective**

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1. Introduction

- Energy is a basic requirement for development of Myanmar
- Energy from renewable sources- - Solar, Wind, Hydro, Geothermal, Tidal
- Energy from consumable sources-- Coal, Natural Gas, Biomass, Nuclear
- Currently the main sources of energy in Myanmar- - Hydro, Natural Gas

2. Potentials of Energy resources of Myanmar

- Water resources potential of Myanmar's four prominent river basins, namely Ayeyarwady, Chindwin, Sittaung and Thanlwin, the annual inflow of water resources is 1,081.3 cubic kilometers (km³) and current percentage of annual usage of water for cultivation is 6%.

- The hydropower potential of the four main river basins is estimated to be more than 100,000 megawatts (MW).

- Upon identified potential 46099 MW, the current hydropower production is about 6%.

- According to the World Energy Council, in 2007, Myanmar had coal resources estimated at around 2 million tons.

- According to the new Energy Architecture : Myanmar, June 2013, Myanmar's proven natural gas result is 7.8 trillion cubic feet.

3. Hydropower development in the World and Myanmar

- The first ever in the World - 12.5 kilowatts (KW) on Fox River, Appleton, Wisconsin, USA in 1882.
- The first ever in Myanmar in 1898. - 460 KW on Yeni River, Mogok, Myanmar
- The first Hydropower Station- Supply power into Grid System - 84 MW, Baluchaung No. 2 (first stage), Kayah State in 1961.

4. Hydropower component in Myanmar's Energy Sector

4.1 Identified Potential of Hydropower

Myanmar has identified 92 potential large hydropower projects with a total installed capacity of 46,099 MW.

December, 2009

The Hydropower Potential of Myanmar by region

Region (State & Division)	No. of Sites	Potential (MW)
Kachin	19	18,744.5
Kayah	5	954
Kayin	9	7,064
Sagaing	6	2,830
Tanintharyi	6	711
Bago	8	538
Magwe	5	359
Mandalay	9	1,555
Mon	2	290
Rakhine	6	764.5
Shan	17	12,289.3
Total	92	46,099.3

4.2 Implementation of Hydropower projects in Myanmar

4.2.1 Completed Project Sites

Among identified 92 hydropower projects, 22 sites have been completed.

No.	Power Plant	Location	InstalledCapacity (MW)	April,2014
				Annual Energy (GWh)
1	Baluchaung (1)	Loikaw	28	200
2	Baluchaung (2)	“	168	1,254
3	Kinda	Myittha	56	165
4	Sedawgyi	Maddaya	25	134
5	Zawgyi (1)	Yatsauk	18	35
6	Zawgyi (2)	“	12	32
7	Zaungtu	Bago	20	76
8	Thapanzeik	Kyunhla	30	117
9	Mone	Setuktra	75	330
10	Paunglaung	Pyinmana	280	991
11	Yenwe	Kyauktaga	25	123
12	Kabaung	Oktwin	30	120
13	Shweli (1)	Namkham	600	4,022
14	Kyaingtaung	Mo-ne	54	378
15	Yeywa	Mandalay	790	3,550
16	Shwekyin	Shwekyin	75	262
17	Tapein (1)	Bhamo	240	1,065
18	Kunchaung	Pyu	60	190
19	Kyi-on Kyi-wa	Setuktra	74	330
20	Thaukyegat (2)	Taungoo	120	604
21	Nancho	Pyinmana	40	152
22	Chipwenge	Chipwe	99	599
	Total		2,919	14,729

4.2.2 Ongoing Project Sites

- Among identified 92 hydropower projects, implementation of 13 project sites is now under way.

				April, 2014
No.	Power Plant	Location	Installed Capacity (MW)	Annual Energy(GWh)
1	UpperPaunglaung	Pyinmana	140	454
2	Shweli(3)	Momeik	1,050	3,330
3	Pyu	Pyu	40	120
4	Upper Yeywa	Kyaukme	280	1,330
5	Thuhtay	Thandwe	111	386
6	UpperKyaingTaung	KyaingTaung	51	267
7	Baluchaung(3)	Loikaw	52	334
8	UpperBaluchaung	NyaungShwe	30.4	124
9	Kanyin	MyanAung	5	18
10	Myogyi	Yengan	30	135.7
11	Kyaing Khan	Yatsauk	6	20
12	Myittha	Gangaw	40	170
13	Yazagyo	Kalay	4	21
Total			1,839.4	6,709

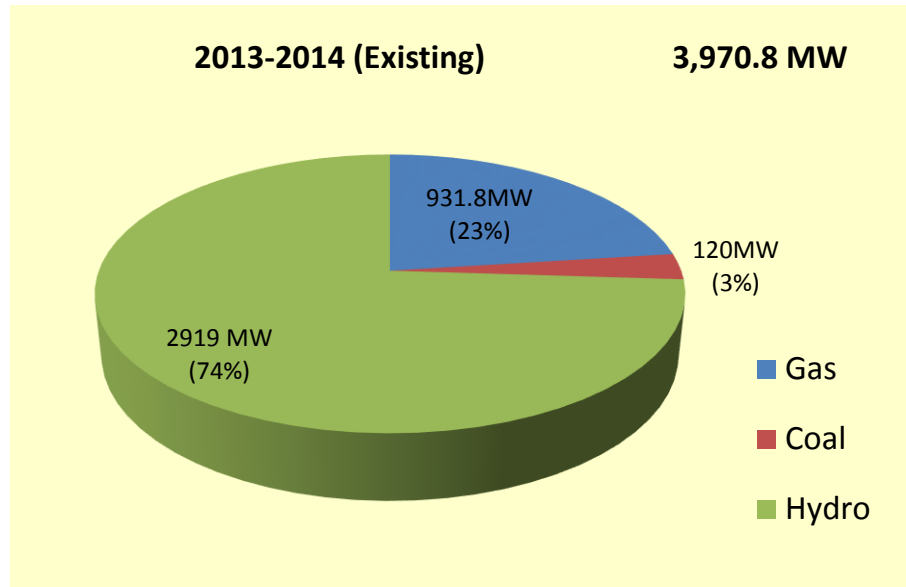
4.2.3 Planned Project sites

- Among 92 identified hydropower projects, 50 projects have been planned to implement and the remaining 7 Projects have not been considered yet.

No.	Power Plant	Location	Installed Capacity(MW)	Remarks
				April, 2014
1	Deedoke	Mandalay	66	Department
2	Middle Paunglaung	Pyinmana	100	"
3	Middle Yeywa	Naungcho	320	"
4	Tanintharyi	Myeik	600	"
5	Bawgada	Kyaukgyi	160	"
6	Ngokechaung	Southern Shan State	16.6	B.O.T/MOU Agreement
7	AyeyarwadyMyitsone	Kachin State	6,000	JV/B.O.T, Suspended
8	Chipwi	"	3,400	"
9	Laza	"	1,900	"
10	Wutsok	"	1,800	Agreement of MOA
11	Kaunglanphu	"	1,700	"
12	Renam	"	1,200	"
13	Hpizaw	"	2,000	"
14	Gawlan	"	100	"
15	Khankan	"	160	"
16	Laungdin	"	600	"
17	Htonshingyaung	"	340	"
18	UpperThanlwin(kunlon)	Nothern Shan State	1,400	"
19	HatgyiKayin State		1,360	"
20	Shweli (2)	Nothern Shan State	520	"
21	Laymyo (1)	Rakhine State	600	MOA Annulment
22	Laymyo (2)	"	90	"
23	Ywathit	Kayah State	4,000	Agreementof MOA

24	Nantabet	“	180	“
25	HtuKyan	Southern Shan state/Kayah State	105	“
26	Han Na	“	45	“
27	ThaKwa	“	150	“
28	Palaung	“	105	“
29	Bawlakhe	“	180	“
30	Saingdin	Rakhine State	76.5	MOA Annulment
31	NaungPha	Nothern Shan State	1,200	Agreement of MOU
32	ManTaung	“	225	“
33	Tapein (2)	Kachin State	168	“
34	Tamanthi	Sagaing Division	1,200	Suspended
35	Shwesaye	“	660	“
36	UpperThanlwin(Maing Ton)	Eastern Shan State	7,110	Agreement of MOU
37	Kyaing Ton	“	128	“
38	Wantaping	“	33	“
39	Si Lu	“	160	“
40	Kyaing Yam	“	40	“
41	Hi Ku	“	100	“
42	MaingWa	“	50	“
43	NamHka	“	200	“
44	Namtabet	Kachin State	200	“
45	Manipura	Sagaing Division	380	MOU Annulment
46	NamtuNothern	Shan State	100	Assessment of MOU
47	MaingYaung	Eastern Shan State	45	“
48	Dun Bang	Kachin State	130	“
49	Nam Li	“	165	“
50	NamHkok	Eastern Shan State	50	“
Total			4,1618.1	

4.3 Current Application of Hydropower in Myanmar



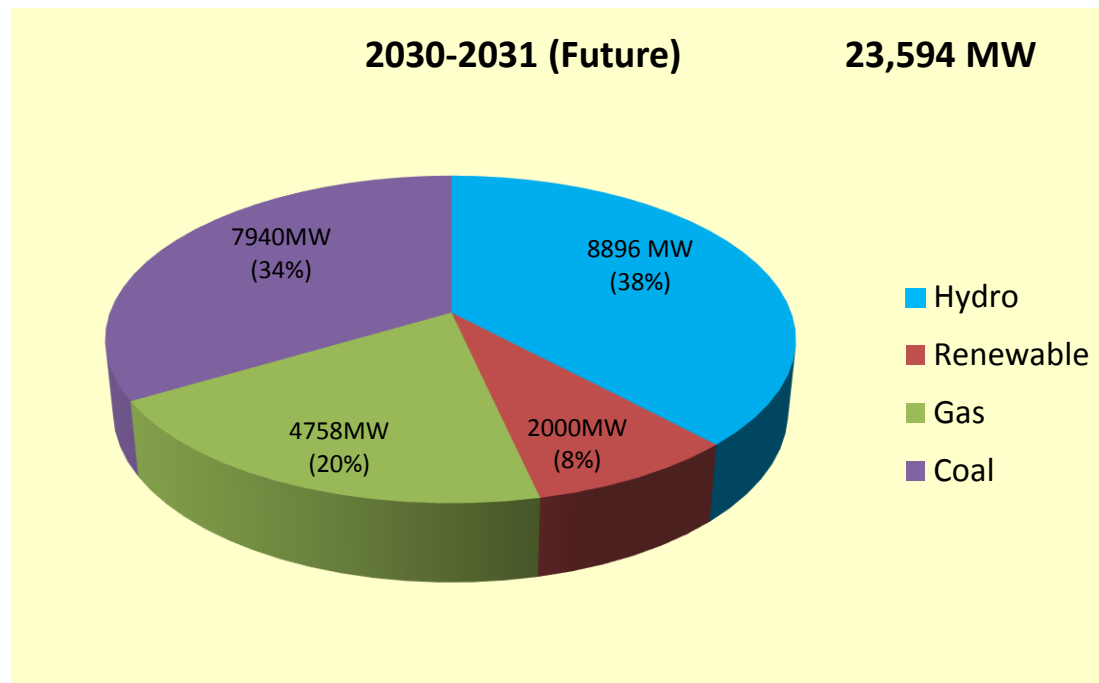
- Because of unbalance generation mix, insufficient power supply occur in dry period.
- Hydropower is in excess to demand in wet season, an indicator of inefficiency in current power system against supply.
- Due to its flexibility, hydropower is only applicable to variable loads and more adaptable to peak loads.
- High proportion in Generation Mix.

5 Current Application of Coal and Natural Gas in Myanmar

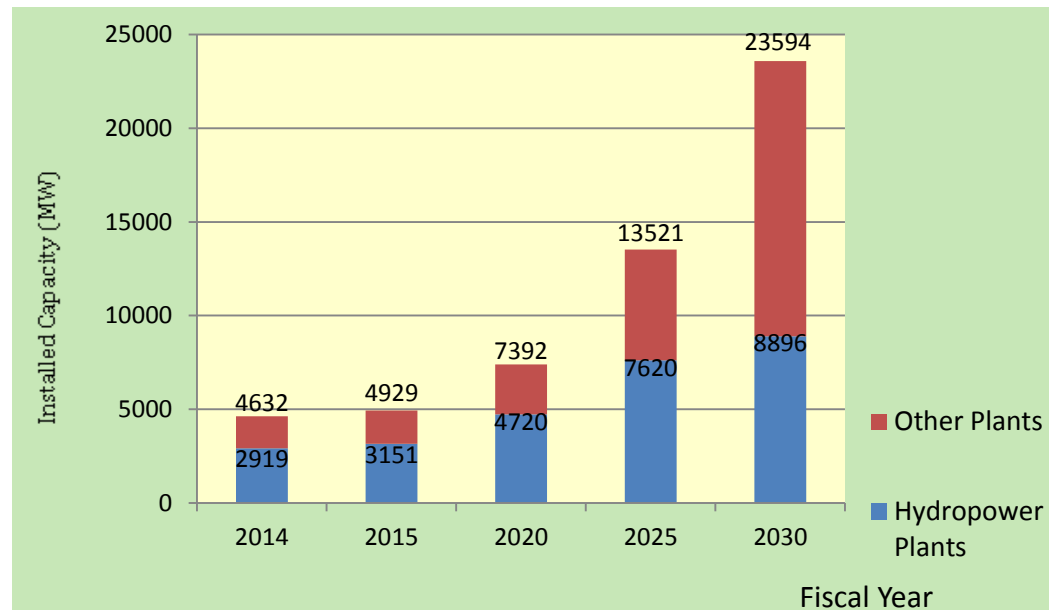
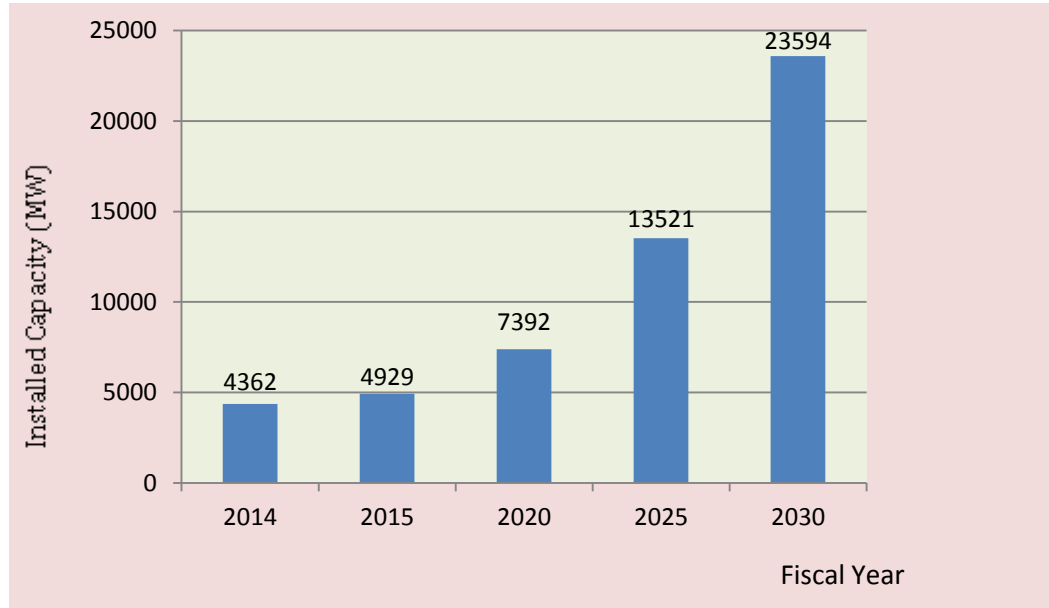
- Coal fire plant, 120 MW, in Tigyt, Southern Shan State.
- Natural gas plants in Yangon and elsewhere in Myanmar, altogether 931.8 MW in total.
- Coal and natural gas plants are suitable for base loads.
- Low proportion in Generation Mix.

6 Future Power Demand in Myanmar

- The expected rate of demand is increasing 13% annually.
- 1000 MW installed capacity has to increase annually.
- Electricity Master Plan is prepared by JICA support for long-term, in 2030-2031.
- 50% of power from Joint Venture power plants.



6.1 The Expected Installed Capacity in Electricity Master Plan



7 Conclusion

- Use of Natural Gas for base loads is essential and solely green energy cannot be expected.
- Coal is one of the choices for base loads, but it must be complied with clean coal technology.
- Though investment cost is high, renewable energy such as Solar and Wind must be exploited as a supplementary energy.
- Environmental Impact Assessment and Social Impact Assessment must be subjected properly to all projects.
- Implementation of all projects must be in a sustainable development.
- Try to ensure to achieve the target of the long-term plan 2030-2031 Generation Mix.
- Transmission and distribution of electricity, especially National Grid must be improved in parallel with the development of all power sources, including mega hydropower.
- For development of Myanmar, choice of mega hydropower projects is indispensable.
- International financial agencies such as IMF, World Bank, Asian Development Bank, etc., must be involved in the development of mega hydropower projects in Myanmar.
- Public Private Partnership, PPP, must be applied in implementation of mega hydropower projects, 50% share by public and 50% investment by government. (loans from International financial agencies to the government)
- Joint Venture is also practiced in development of mega hydropower projects but lesser concession period is preferable.
- The prospect of 10% free power and 10% - 15% free investment cannot enhance significantly to the development of Myanmar. In case of power requirement, purchase of power from Joint Venture power plants should be according to the Power Purchase Agreement, PPA.
- Ultimately explore the potential of the mega hydropower project site.

Thank You for Your Attention.