

## The Electrification of Myanmar

*Thurain Win*



Myanmar has the lowest electrification rate among the ASEAN countries with less than 30 percent of the population having access to electricity. Upgrading its electricity infrastructure and updating legislation governing the electricity sector is central to Myanmar's economic development and for alleviating rural poverty. In particular, Myanmar is seeking to utilize its rich hydropower resources, which have been estimated at over 100,000 MW. In this paper the author provides an overview of Myanmar's electricity sector and power generation potential in addition to outlining some of the challenges the country faces.

In a speech delivered on May 20, 2011, at the National Level Workshop on Rural Development and Poverty Alleviation, President Thein Sein emphasized that: "In Myanmar, rural people who make up about 70% of the population are the main working force, and the majority of them engage in agricultural and livestock farming. Therefore, boosting production of goods and economic development of rural areas is the engine of national economic development. Only with economic development of rural areas, will there be alleviation of poverty."<sup>1</sup>

Economic development is accordingly a priority for Myanmar. As part of its development, efforts are needed to upgrade the country's basic infrastructure, including roads, bridges, communication systems, and the electrical grid. In particular, boosting electrification is a key driver for the economic development and industrialization of Myanmar. Currently Myanmar is faced with uneven electricity supply and chronic electricity shortages. Furthermore, Myanmar is an

agricultural-based economy with around two-thirds of the population living in rural areas with no access to electricity. If the population is to be lifted out of poverty and economic development is to proceed, Myanmar therefore needs to not only harness its energy resources—in particular exploiting its rich hydropower potential—but also make the necessary reforms to its electricity sector, which has hitherto been regulated by outdated laws.

### Myanmar's Low Electrification Rate

While the Myanmar government has recognized that development of the energy sector is fundamental for meeting the basic needs of the populace and for the country's overall development strategy, Myanmar's

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electrification rate continues to be the lowest among the ASEAN countries. The table below illustrates the contrast between Myanmar and Thailand—two countries with similar-sized populations—in terms of the electrification rate, per-capita consumption, and installed capacity per population.

**Table 1. Electrification Rates of Myanmar and Thailand**

	Myanmar	Thailand
<b>Population</b>	60 million	67 million
<b>Electrification rate</b>	26%	99.4%
<b>Per capita consumption</b>	104 kwh	2045 kwh
<b>Installed capacity</b>	3.5 gw	32 gw

At present the national electricity grid covers only about 30 percent of the country—that is, the population living in the central basin of Myanmar. Many parts of the country, especially in the south and north, are not connected to the grid. Furthermore, the national grid has no direct connection to other grids of neighboring countries. The current network (see Figure 1 opposite) is comprised of transmission lines of 230 kV with a total length of 1979 km, 132 kV with a total length of 2334 km, 66 kV with a total length of 3929 km, and 33 kV with a total length of 27 km. Current electricity supply, dominated by hydropower followed by gas and coal-fired thermal power, is some 30 percent below demand.

## Myanmar's Rich Power Potential

Belying the country's low electrification rate (both in terms of per capita consumption and installed capacity) is the fact that Myanmar has a rich energy potential for power generation, which includes substantial coal deposits, oil and natural gas, bio-fuel, as well as wind and solar energy (see Table 2). Of particular significance is Myanmar's hydropower potential. With its territory encompassing four main river basins—the Ayeyarwaddy, Chindwin, Thanlwin (Salween), and Sittaung—its hydropower resources are estimated at more than 100,000 MW. In spite of this, less than 10 percent is currently being harnessed. As a result of these shortfalls, there are many new power plant pro-

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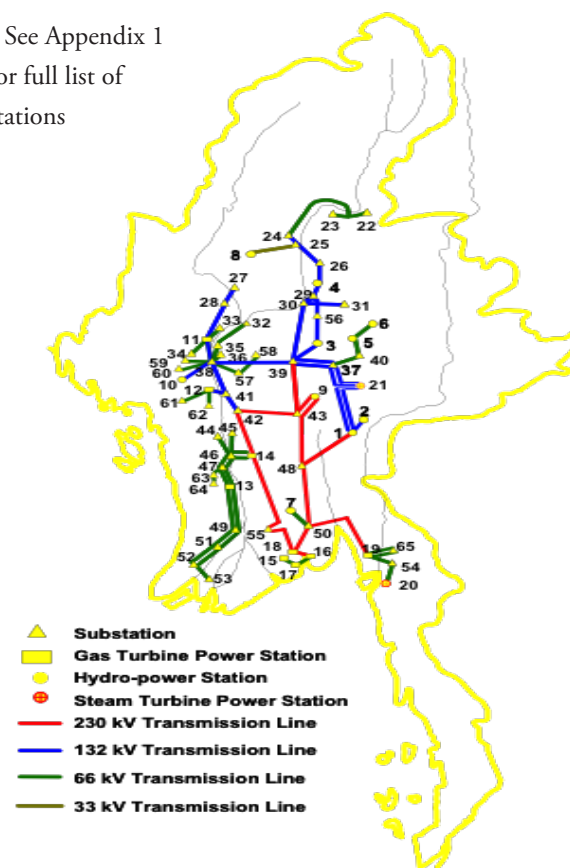
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jects currently under construction (see Appendix 2 for list of projects between 2013-2016).

**Figure 1. Myanmar's Electrical Power National Grid**

\* See Appendix 1 for full list of stations



**Table 2. Myanmar's Energy Resources**

Crude oil (offshore and onshore ) ( proven and probable )	648.59 MMBBL (Million barrel )
Natural gas (off shore and on-shore) (proven and probable)	122.5391 TSCF (Trillion Std. Cubic Feet)
Hydropower	108,000 MW (Mega Watt )
Coal	711 Million Metric Tons
Biomass	Potential available annual yield of wood-fuel up to 58.36 million cubic tons  18.56 million acres of lands could generate residues, by products or direct feed stocks for biomass energy  209 million livestock could generate animal waste for biogas
Wind	365.1 TWH per year (Terra Watt Hour/year)
Solar power	51,973.8 TWH per year (Terra Watt Hour / year)

Source: Ministry of Energy

According to the 2012 Asian Development Bank Energy Sector Initial Assessment,<sup>2</sup> Myanmar has 92 potential large hydropower projects with a total installed capacity of 46,101 MW. There are 36 hydropower projects that have been identified for future implementation, with a total installed capacity of 36,524 MW. As of the end of 2011, however, only 753 MW of hydropower power had been commissioned. Myanmar Electric Power Enterprise has so far identified more than 200 locations suitable for hydropower development, with a combined potential capacity of about 40,000 MW. The table opposite illustrates Myanmar's hydropower potential by state.

**Table 3. Hydropower Resources in Myanmar by State and Capacity**

State/Region	No. of Potentials		Capacity (MW)	
	≤50 MW	>50 MW		
Kachin State	5	14	18,744.5	
Kayah State	2	3	954.0	
Kayin State	1	8	7,064.0	
Sagaing Region	2	4	2,830.0	
Tanintharyi Region	5	1	711.0	
Bago Region	4	4	538.0	
Magway Region	2	3	359.0	
Mandalay Region	3	6	1,555.0	
Mon State	1	1	290.0	
Rakhine State	3	3	764.5	
Shan States				
East	1	3	719.8	
South	3	5	7,569.5	
North	-	5	4,000.0	
	>10 MW	32	60	46,099.30
	<10MW	210		231.25
Total		302		46330.55

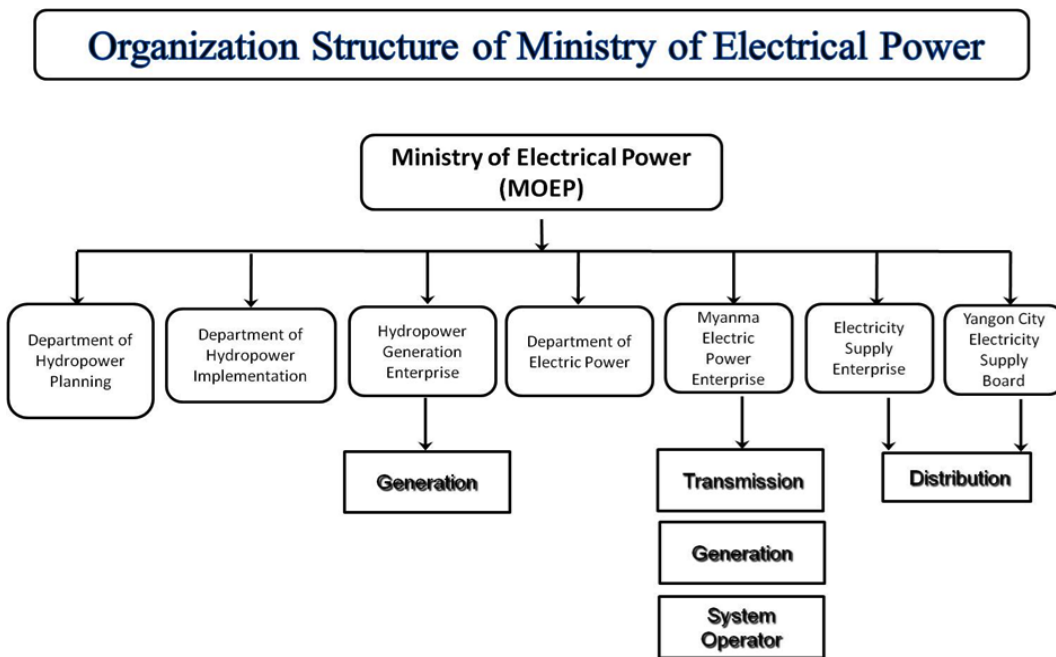
## Myanmar's Electricity Sector

The Ministry of Electrical Power is the main body for the electricity sector in Myanmar with the Ministry of Energy having responsibility for overall energy policy and coordination. The Ministry of Electrical Power is mainly concerned with the gas and hydropower sector including power distribution. It consists of seven departments with its structure outlined in Figure Two overleaf.

The current policy<sup>3</sup> of the Ministry of Electrical Power is outlined as follows:

- To employ the available energy resources in power generation to ensure the sufficient supply of electricity;
- To promote the effective and efficient use of electricity for future energy sufficiency, reserves, and sustainability in Myanmar;

Figure 2. MOEP Organogram



- To safely ensure the reliable supply of energy;
- To enhance the electricity distribution system to be developed in accordance with advanced technologies;
- To adopt environment-friendly ways in electricity generation, transmission, and distribution;
- To encourage the expansion of power transmission and distribution throughout the country and public-private participation in each sector;
- In addition to constructing thermal power plants, construct more hydropower plants as a form of clean and renewable energy whilst taking heed of Environmental and Social Impact Assessments.

The Myanmar Electric Power Enterprise (MEPE), a state-owned enterprise under the Ministry of Electrical Power, is responsible for transmission, distributing electricity generated by the country's major hydropower and gas turbine stations. MEPE's objectives for the country's development are as follows:

- Developing hydropower for base load and gas turbines for peak load;
- Optimizing the use of natural gas in gas turbines by implementing combined cycle power plants.
- Expanding the national grid;

- Studying the alternative production of electricity by using waste products, for example rice husks, and firing boilers to generate electricity to meet local requirements instead of utilizing power from the national grid;

- To reduce loss of electricity incurred from transmission and distribution;

tion;

- In remote areas where electricity from hydropower through the national grid cannot be utilized, the generation and distribution of electricity will be performed by diesel generating sets and wind and solar energy.

In order to support the reform of the sector the government recently established the National Energy Management Committee.<sup>4</sup> Similarly, a committee on the Rural Electrification and Water Supply has also been established and is chaired by the Union Minister of Livestock, Fisheries, and Rural Development.<sup>5</sup>

### Outdated Electricity Law and Other Challenges

In spite of Myanmar's power potential and ambitious objectives outlined above, the country faces a number of obstacles. One of the challenges that Myanmar has faced is pursuing a proper development policy. Not only does the country suffer from a scarcity of qualified personnel, but also its legislative framework governing electricity laws is outdated. The framework of existing law is mainly contained in the 1984 Electricity Law and the accompanying 1985 Electricity Rules.

This law is undermined by the fact that it is silent on the responsibilities of public institutions as well as the licensing and approval process for investments in the electricity sector. There has accordingly been a lack of concern attached to supporting exploration and extending electrification to the rest of the country, with the result that there has been a failure to implement rural electrification programs or establish an electricity regulator with internationally recognized best practices. The Government of Norway has subsequently provided a technical assistance grant to the Asian Development Bank to help Myanmar to update its Electricity Law, including implementing rules and regulations by the Ministry of Electrical Power, in conjunction with other stakeholders. This process is expected to take around 18 months with the completion target being June 2014.<sup>6</sup>

Another challenge is the well-rooted legacy of bureaucracy that serves to impede reforms. Electricity distribution and electrification also lack guidelines and frameworks for cohesive socio-economic development, in particular relating to sustainable development and assuaging social conflict. It is clear too that the environmental implications of large-scale hydropower projects must also be taken into account. The Myitsonne Dam project is an obvious example of the lack of attention paid to conducting proper Environmental and Social Impact Assessments. This is similarly hampered by a lack of competition in the tendering processes of large infrastructure projects in the energy sector. Myanmar's energy sector is largely influenced by Chinese investment with a large amount of current hydropower drawn from Chinese-backed dams (see Appendix 3 for current dam projects).

## Conclusion and Recommendations

The electricity sector and electrification has been placed as a high priority on the Myanmar development agenda. The government in particular prioritizes the development of hydropower projects to increase the installed capacity by utilizing its hydro resources as much as possible.

Harnessing its power potential to generate electricity and judiciously reforming Myanmar's electricity sector is therefore key to the country's economic development. In so doing, the Myanmar government should undertake as follows:

### KEY POINTS

- Myanmar has the lowest electrification rate (26%) among the countries of ASEAN. Increasing power generation is central to Myanmar's economic development and to alleviate rural poverty.
- The existing national electrical power grid is mainly confined to the central basin of the country with the south and north of the country in particular not connected to the grid.
- Myanmar has rich energy potential. Of particular significance are its hydropower resources which are estimated at over 100,000 MW, of which less than 10 percent is currently being harnessed.
- The Myanmar Electrical Power Enterprise has identified more than 200 locations suitable for hydropower development. Kachin State in the north of the country is site of the largest potential with nearly 19,000 MW. However, dams could also incite tensions with ethnic minorities if not sustainably implemented.
- Modernizing Myanmar's electricity sector is impeded by a legacy of bureaucracy, a lack of proper guidelines and frameworks, and a scarcity of qualified personnel. These are in urgent need of addressing if Myanmar is to effectively harness its power generation potential.

- Implement a new Electricity Law for generation, transmission, and distribution;
- Seek best practices for electricity efficiency at the regional government level;
- Extend electrification via the national grid and ensure integration with local electricity generation with equitable contribution of resources by the central and regional governments;
- Create a good investment climate for investment in the electricity sector;
- Enhance the capacity of public service personnel and also rural communities through vocational

training programs;

- Ensure comprehensive and inclusive development promoting sustainable development and social harmony;
- Promote off-grid electrification through renewable energy technologies for rural electrification;
- Promote and make incentives for small and medium-size electricity generation by local people.

## References

<sup>1</sup> President's Office of the Republic of the Union of Myanmar, <http://www.president-office.gov.mm/en/?q=briefing-room/speeches-and-remarks/2011/05/20/id-203>

<sup>2</sup> Asian Development Bank, Myanmar Energy Sector Assessment, <http://www.adb.org/sites/default/files/myanmar-energy-sector-assessment.pdf>

<sup>3</sup> Ministry of Electricity, Presentation on "Present and Future Power Sector Development in Myanmar", [https://www.uschamber.com/sites/default/files/international/files/ministry\\_electric\\_power\\_myanmar\\_2\\_27\\_13.ppt&ei=zKOYUvWzOuSGywO2oIHQBQ&usg=AFQjCNE3bkpAWSifr4Go4fn3y09MDJOgIQ&sig2=I3sSoiyq77L07yTkKRjMvg&bvm=bv.57155469,d.bGQ&cad=rja](https://www.uschamber.com/sites/default/files/international/files/ministry_electric_power_myanmar_2_27_13.ppt&ei=zKOYUvWzOuSGywO2oIHQBQ&usg=AFQjCNE3bkpAWSifr4Go4fn3y09MDJOgIQ&sig2=I3sSoiyq77L07yTkKRjMvg&bvm=bv.57155469,d.bGQ&cad=rja) (accessed in November 25, 2013)

<sup>4</sup> Members of the committee include the Ministry of Energy, Ministry of Electricity, Ministry of Agriculture and Irrigation, Ministry of Environmental Conservation and Forestry, Ministry of Industry, Ministry of Mining, Ministry of National Planning and Economic Development, and Ministry of Science and Technology accompanied by two NGOs - Myanmar Engineer Society, Myanmar Renewable Energy Association.

<sup>5</sup> This Committee includes members from the Ministry of Livestock, Fisheries and Rural Development, Ministry of Cooperatives, Ministry of Agriculture and Irrigation, Ministry of Environmental Conservation and Forestry, Ministry of Electricity, Ministry of Industry and Ministry of Construction.

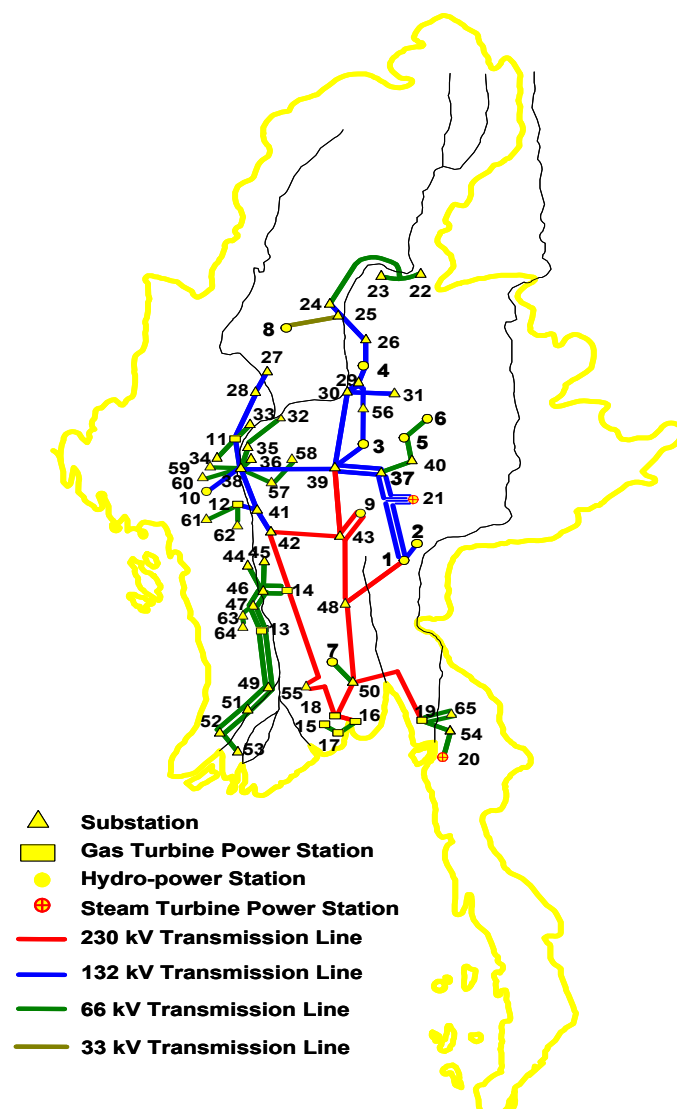
<sup>6</sup> Editor's note: this text was written prior to the expected completion target.

<sup>7</sup> Ministry of Electrical Power, Presentation on "Present & Future Power Sector Development in Myanmar" on February 27, 2013.

<sup>8</sup> Ibid.

## Appendices

### Appendix 1. Current National Grid System<sup>7</sup>



#### Hydropower stations

1. Lawpita	168MW
2. BHP(1)	28 MW
3. Kinda	56 MW
4. Sedawgyi	25 MW
5. Zawgyi(1)	18 MW
6. Zawgyi(2)	12 MW
7. Zaungtu	20 MW
8. Thaphanseik	30 MW
9. Paunglaung	280 MW
10. Mone	75 MW

#### Gas Turbine stations

11. Kyunchaung	54.3MW
12. Mann	36.9 MW
13. Myanaung	34.7 MW
14. Shwedaung	55.3MW
15. Ywama	36.9 MW
16. Thaketa	57 MW
17. Ahlone	99 MW
18. Hlawga	99 MW
<b>Substations</b>	
Nos. 22-65	

## Appendix 2. Power Plants under Construction 2013-2016 (MW)<sup>8</sup>

Sr. No.	Project Name	Type	Installed Capacity	Completion Year
1	Thaukyekhat-2	Hydel	120	2013
2	Hlawga (Zeya Co.)	Gas Engine	50	2013
3	Ywama (MyanShwePyay Co.)	Gas Engine	50	2013
4	Thaketa (CIC Co.)	Gas Engine	50	2013
5	Ahlonge (Toyo Thai Co.)	Gas Turbine	120	2013
6	Phyu	Hydel	40	2014
7	Namcho	Hydel	40	2014
8	Ywama ( Transferred from Thailand)	Gas Turbine	240	2014
9	Thaketa (BKB Co., Korea)	Gas Turbine	500	2014
10	Hlawga ( Hydrolancang Co., China)	Gas Turbine	530	2014
11	Upper Paunglaung	Hydel	140	2015
12	Baluchaung No.(3)	Hydel	52	2015
13	Mawlmyaing (Myanmar Lighting Co.)	Gas Turbine	150	2015
14	Kyaukphyu	Gas Turbine	50	2015
15	Upper Baluchaung	Hydel	29	2016
16	Kyunchaung (Extension)	Gas Turbine	70	2016
17	Shwedaung (Extension)	Gas Turbine	80	2016
<b>Total</b>			<b>2311</b>	

## Appendix 3. 20 Large Chinese-Backed Dams in Myanmar

DAMS	RIVER	STATE / DIVISION
Myitsone	Ayeyarwady River	Kachin State
Chibwe, Pashin, Lakin, & Phizaw	N'Mai River	Kachin State
Laiza & Khaunglanphu	Mali River	Kachin State
Shweli 1, 2, & 3	Shweli River	Shan State
Tasang & Upper Thanlwin	Salween River	Shan State
Hatgyi, Weigyi, & Dagwin	Salween River	Karen State
Yeywa	Myitnge River	Mandalay Div.

Lower Paunglung	Paunglaung River	Mandalay Div.
Upper Paunglaung	Paunglaung River	Shan State
Dapein 1 & 2	Tarping River	Kachin State
<b>TOTAL MEGA-WATTS:</b>	<b>34,440</b>	

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