Energy and Economic Growth
Applied Research Programme

Developing a programme of research on the electricity sector for Myanmar

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Introduction

Myanmar is a sovereign state in Southeast Asia, bordered by India and Bangladesh to the west, Thailand and Laos to the east, and China to the north and northeast. The former British colony has spent much of its independent years in civil war and under the command of a military dictatorship, and while the country is taking steps toward a more liberal future – with free elections held in 2015 – tensions between ethnic communities and the army remain.

After decades of political and economic turmoil, Myanmar is now one of the poorest nations in the region and has one of the widest income gaps seen anywhere in the world. Universal access to electricity is seen as critical to its socio-economic growth, but there are many challenges within the country's electricity sector that need to be overcome if this is to become a reality.

The Energy and Economic Growth programme (EEG) produces cutting-edge research to inform policy makers about how electricity sector reforms and new technologies can deliver equitable and sustainable energy systems for all. Myanmar has been identified as a possible location for a country research programme. To identify potential research questions that would be of interest to policymakers in Myanmar, opinions were gathered from government and industry experts about where further research is needed to provide valuable insights for planning and further policy development. This paper lays out the key issues identified during this scoping exercise.

Institutional structure of the power sector

The main government body responsible for the energy sector in Myanmar is the Ministry of Energy and Electricity (MOEE). Myanmar's electricity sector has been partly de-bundled. However, the majority of operations remain in public hands. Sixty percent of generation remains state owned, however, the portion coming from the private sector is increasing.

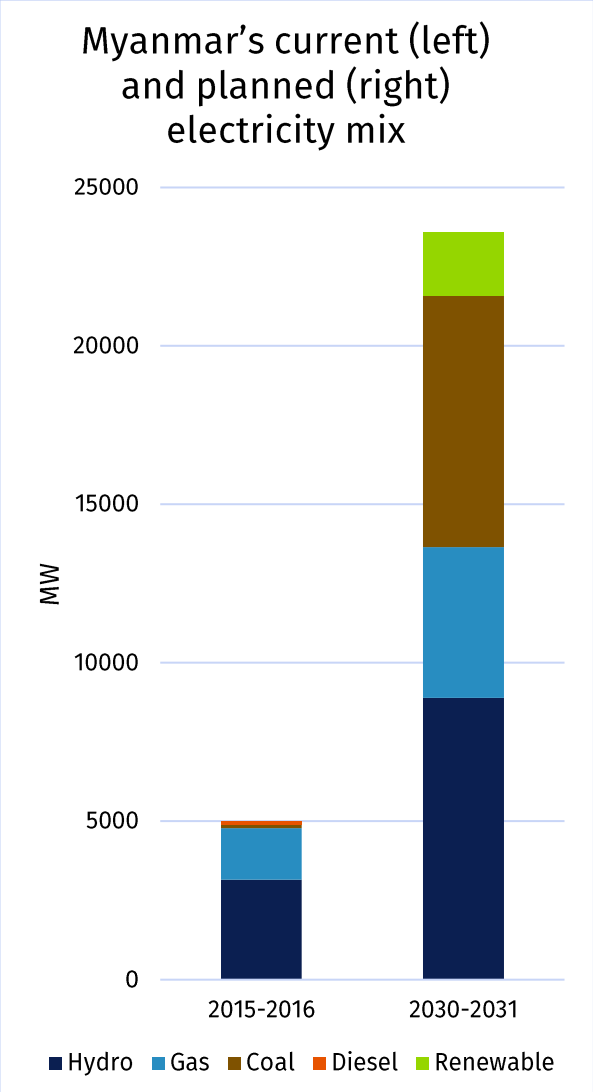
Regardless of the supply, all electricity is aggregated by the publically-owned and managed Electric Power Generation Enterprise, which transfers it to the Department of Electric Power Transmission & System Control (DEPTSC) for transmission to distribution companies.

Key issues facing the sector

Myanmar must rapidly scale up its generation capacity to keep up with increasing demand.

Since 2010/11, total electricity consumption has more than doubled from 6.5 to 15.4 terawatt-hours (TWh). Peak demand has also nearly doubled, growing from 1600 MW in 2011 to over 3000 MW in 2017.

In Myanmar's high demand forecast scenario, developed with the support of Japanese International Cooperation Agency (JICA), it is projected to grow almost five-fold between 2017 and 2030, to 14,542 MW. Generation capacity will need to scale up rapidly to keep up. The figure on the right of this page outlines how Myanmar's electricity mix will evolve between now and 2030, based on MOEE's National Electricity Plan



Source: Power Development Opportunities in Myanmar, MOEE

Myanmar's existing power generation is highly seasonal, inefficiently used and poorly contracted.

Around 65% of Myanmar's electricity capacity comes from hydropower, which is highly seasonal. During the dry season, when increased demand for cooling is at its peak, and hydropower production is lowest, scheduled load shedding is required.

Many of Myanmar's hydropower dams are now near obsolete and slow to react to increased demand from the grid. Outdated technology, coupled with poor dispatch practices, cause Myanmar to utilise its generation capacity inefficiently. Thermal power plants are over-utilised, while water is spilled from hydro dams unnecessarily, creating missed opportunities to generate lower cost hydro-electricity.

To compound matters, many of the country's hydro and gas plants were procured through poorly structured contracts, including 80:20 contracts with Thai or Chinese investors, which stipulate that 80% of the electricity produced is exported to Thailand or China and only 20% is used domestically.

Myanmar's north-south transmission lines are currently overloaded.

A majority of Myanmar's electricity is generated by hydropower in the north of the country and transmitted south to the more populated areas. Myanmar is currently upgrading its main north-south transmission line from 230 KV to 500 KV line, which will be the first of a kind in the country.

High system losses mean that over a quarter of the power produced does not reach end users

Due to outdated infrastructure and poor management of the power network – as well as other mitigating factors such as theft – an estimated 27% of the electricity generated is lost during T&D. In neighbouring Thailand, the equivalent figure is under 10%.[1] Only 4% of losses occur during transmission. Most losses occur on distribution lines with 66 KV or less.

Large hydro projects risk inflaming internal conflicts

Myanmar has very large untapped hydro resources, with estimates of total potential amounting to roughly 100 GW. These resources are primarily located in the northern mountains. The environmental and social impacts caused by harnessing these untapped resources would be felt most acutely by ethnic minorities.

While there are a large number of hydro projects proposed, there is strong opposition. Pushing big hydro projects through risks exacerbating the pressures underlying the internal conflicts. The 6 GW Myitsone dam project in Kachin state, backed by the Chinese Power Investment Corporation, offers a case-in-point. The project would dam the Irrawaddy River, the country's most important water resource, and create a reservoir submerging 63 villages. It has been stalled since 2011, after the Kachin Independence Army bombed the dam site, breaking a 17 year ceasefire.[2] The Kachin believe that the resettlement and relocation plans under the dam development serve the government's interest to control the Kachin military forces.[3]

Given the political opposition to hydropower, the MOEE favours small to medium size hydro projects in the near term. Nonetheless, by 2030, it still aims to increase hydro capacity from 3.2 to 8.9 GW.

Natural gas resources are smaller than anticipated, so MOEE is turning to imported gas and coal

After initial optimism about the Myanmar's off-shore gas resources, it now appears that the resources are not as large as anticipated. The drop in projections creates a fiscal challenge for the government, as in 2015/16, 66% of revenues in 2015/16 came from gas industry. It also creates a challenge for MOEE, which anticipated relying on domestic electricity generation in the future. Between 2016 and 2030, MOEE aims to increase its gas-fired capacity from 1.6 GW to 4.8 GW.

To meet the shortfall in anticipated domestic supply, MOEE is now planning to import gas. With World Bank support, it has built a floating gas terminal. The MOEE is also looking to rapidly increase coal-fired generation. Currently, the country only has one 120 MW installed coal plant,

[1] Dobermann, T. 2016. Energy in Myanmar. International Growth Centre

[2] Kirchherr, J. 2017. Dams on Myanmar's Irrawaddy river could fuel more conflicts in the country, The Conversation

[3] International Rivers. 2011. The Myitsone Dam on the Irrawaddy River: A Briefing

representing 3% of generation. Given the local and global environmental impacts of coal-fired generation, there is substantial public opposition to its development, both domestically and internationally. Nonetheless, by 2030, MOEE aims to increase coal capacity to 7.9 GW, or 33% of total generation.

Renewables offer an alternative, but are politically unpopular

MOEE has conservative attitudes towards renewable energy, and only aims to add 2000 MW capacity from non-hydro renewables by 2030, up from 120 MW currently existing.

Myanmar's solar resources are substantial, particularly around Mandalay. Six projects are currently in the pipeline. Three projects have reached financial close, with signed power purchase agreements, totalling 470 MW. The International Finance Corporation, the UK Department for International Development, and AusAID are also supporting three floating solar projects implemented by independent power producers, each totalling 30 MW capacity.

Wind potential in Myanmar is relatively low, averaging only 6 m per second. Four wind projects are in the pipeline that have not yet reached financial close.

MOEE's aversion to renewables is partly due to uncertainties around the fragility of the electricity grid, and its ability to absorb variable supply. A recent study showed that the added capacity would actually benefit the stability of the grid, because unlike Myanmar's hydropower, it would be primarily located in the south, closer to demand centres, reducing strain on transmission.[4]

Electricity trade with neighbouring states offers a potentially large source of additional supply

The Myanmar Government is particularly interested in trade with China and Laos in the northeast and Thailand in the southeast. The opportunity to import from Yunnan, China is particularly large. However, transmission constraints create a bottleneck. Opportunities to import electricity from Bangladesh and India may also exist.

Half of the population remains without electricity; both grid and off-grid solutions are needed

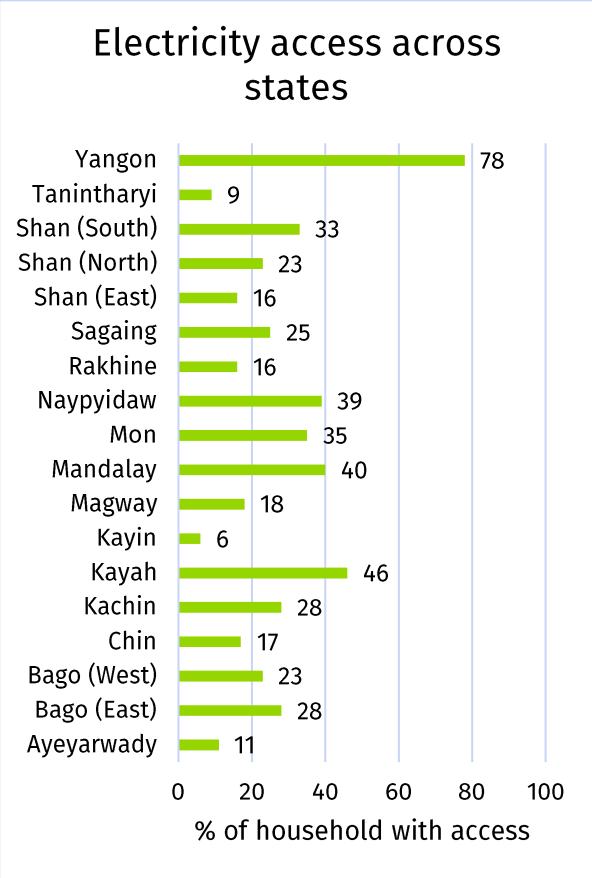
The MOEE has launched a National Electrification Plan to achieve universal access to electricity by 2030. To achieve this, its plan must include solutions to target rural communities – which make up approximately two-thirds of the country's population – as this is where grid expansion is more expensive. In rural areas, an average of just 16% of homes currently have access to electricity, compared to 80% of the homes in built-up areas like Yangon (see figure).

The World Bank has led a geospatial modelling exercise to determine the most cost-effective supply option in each area. The plan aims to connect 7.2m households to the national grid, up from 200,000 existing customers.[5]

Small-scale renewable energy and off-/mini-grid development will be essential to providing isolated rural communities with an electricity supply. The roll out of off-/mini-grid projects is under the remit of the Department for Rural Development in the Ministry of Agriculture, Livestock and Irrigation, rather than the MOEE.

[4] Burma: Energy Project Development and Technology Advisory Services, Delphos

[5] Dobermann, T. 2016. Energy in Myanmar. International Growth Centre



Source: Dobermann, T. 2016. Energy in Myanmar. International Growth Centre

Myanmar's heavily subsidised electricity tariffs are regressive and undermine the electrification plan

Myanmar households pay one of the lowest tariffs in the world for electricity, at 35 kyat per KWh (2.6 cents), compared to a regional average of 11.2 cents (see figure below). A lifeline tariff exists for the first 100 KWh per month to make electricity more affordable, but an IGC study showed that 60% of the benefit goes to the richest 20%.[6] With tariffs below the cost-recovery rate, the government will run a loss of 378 billion kyat (US$278 mn) in the electricity sector in fiscal year 2017/18 alone.[7]

These subsidies are unequally distributed geographically and across income levels, given the country's low and varying levels of electricity access. Most of the subsidies go to better off households. The vast majority benefit households in Yangon and Mandalay.

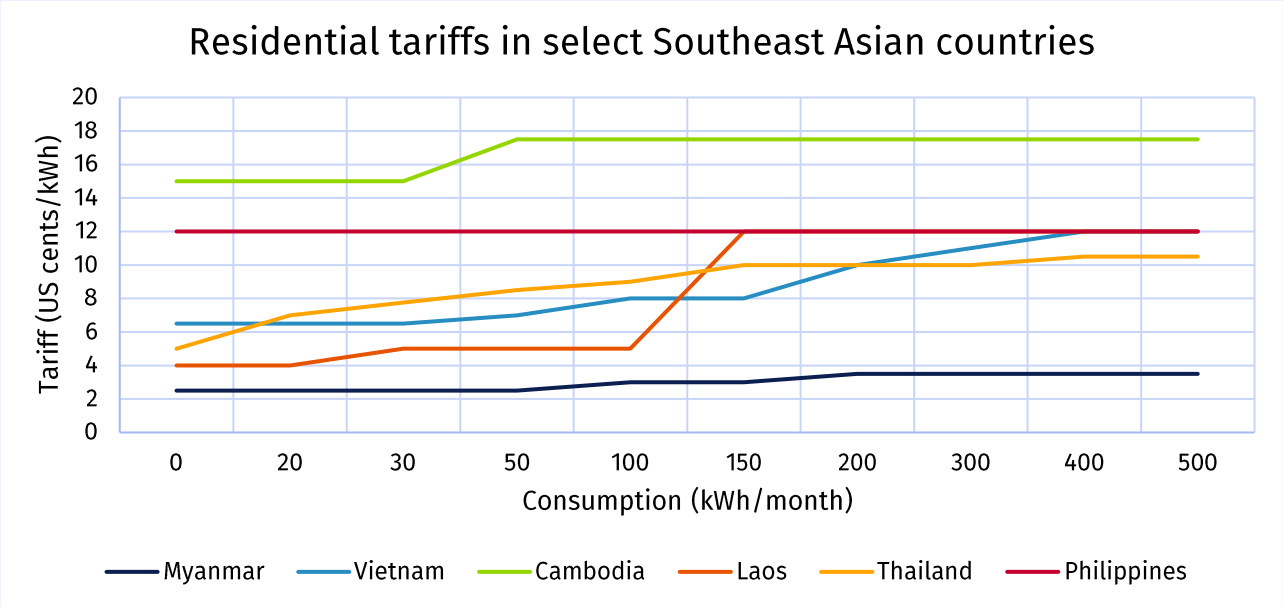
Without an increase in tariff, the MOEE faces a strong financial incentive to curb investment in electrification. In essence, each new household connected to the grid represents a greater financial loss to the government.

Conclusion

EEG is engaging with a wide range of stakeholders, including government officials, donors, academics and other entities overseeing and operating in Myanmar's electricity sector. In so doing, the following priority areas have been identified: tariff restructuring, dispatch optimisation, improving system reliability and reducing losses, incorporating variable renewable energy into the grid, and enabling productive uses of electricity in the garment and agro-processing sectors. EEG intends to develop a programme of research in these priority areas to support efforts to tackle the major challenges discussed in this report.

[6] Dobermann, T. 2016. Energy in Myanmar. International Growth Centre

[7] Htwe,CM. 2017. Government Subsidy of Electricity Bill Hindrance to Development of Sector. Myanmar Times, 14 Mar 2017



Source: Dobermann, T. 2016. Energy in Myanmar. International Growth Centre

About the Author

Ryan Hogarth works closely with researchers, policymakers and practitioners to help shape a demand-led research agenda on energy and economic growth. He helps coordinate EEG research activities to address pressing policy questions in Sub-Saharan Africa and South Asia's energy sectors.

Ryan is an OPM consultant, with expertise in energy access and renewable energy policy. His previous experience includes work for the Overseas Development Institute, and for Oxford University's Smith School of Enterprise and the Environment, where he helped the Government of Rwanda develop a National Green Growth and Climate Resilience Strategy.

Ryan holds a DPhil from the School of Geography and the Environment at the University of Oxford, and a MSc in Development Management from the London School of Economics and Political Science. He has researched and published on a wide variety of topics, including energy access, renewable energy policy, climate finance, low-carbon transitions and financing low-carbon infrastructure.

Front cover image: Eric Brown / Alamy