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Myanmar's Quest to (Em)Power its Citizens

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As Myanmar emerges from nearly [six decades of economic stagnation and isolation](#) ^[1], perhaps no issue is as pressing to its development as the need to [upgrade the country's antiquated power sector](#) ^[2]. It is believed that the national power grid currently [connects less than a third of Myanmar's 51 million people](#) ^[3]. More than half the wiring in the country, which is roughly the size of Texas, is estimated to be at least 70 years old. Without adequate power, Myanmar will never see a [transition toward a brighter future](#) ^[4]; without power, advances in education, health care, industry, and regional development, it is simply not possible.

But electrification is also a political issue. Myanmar's grid is [concentrated primarily in urban areas](#) ^[5], leaving those who live in rural environments—approximately 70 percent of the population—largely without grid access. Some rural citizens report paying anywhere from 10 to 20 times what government-subsidized grid power costs, and they rely on alternative sources, often powered by [diesel-powered mini-grids](#) ^[6]. [Myanmar's economic opening](#) ^[7] has led many to expect improved living standards from the government. And within the government's attempt to build a more representative democracy is a push to win the political support of traditionally remote populations, some of which have been affected by ongoing ethnic conflict and social tensions. [Rural electrification](#) ^[8], in addition to helping these regions and the country as a whole develop, is one means of building support for a more inclusive Myanmar.

Revamping the nation's electrification system, however, will not be easy. [Myanmar's installed electric capacity](#) ^[9]—approximately 4,500 megawatts (MW), according to government figures—is a fraction of what it should be for a country of its size. Thailand, by comparison, has a comparable land mass and population, but its installed capacity is roughly [ten times larger than that of Myanmar](#) ^[10]. Adding to the problem, about 27 percent of electricity generated in Myanmar is lost in transmission due to the system's antiquated nature. [Seasonal fluctuations in hydropower](#) ^[11]—Myanmar's largest source of electricity—places additional strain on the system, which has led to blackouts, deficient power supply for commercial users, and protests.

POWERING THE ECONOMY

Myanmar has ambitious growth plans [12]. Officials in Naypyidaw have forecast a national growth rate of 9.3 percent for the 2015–16 fiscal year through a combination of job creation and activity in tourism, telecommunications, agriculture, and other sectors. Inadequate power proves particularly troublesome for the manufacturing sector. In Mandalay, one foundry prices its production of pumps differently depending on whether they are produced during rainy season, when hydroelectric and grid power is available at lower prices, or during the dry season, when the company must supplement supply through diesel-powered backup generators. Making matters worse, the nation's use of subsidized tariffs means that the government provides power to citizens at a loss. Several years ago, it was estimated these subsidies created an annual deficit of over \$275 million. Under past regimes [13], when economic development and domestic energy use were less of a priority, revenue gained from oil, gas, and other resource exports was used to finance the country's survival in the face of a harsh sanctions regime. These programs largely benefited a small group of elites and select institutions and are now unpopular, even though the capital and expertise that is derived could potentially fund power sector development.

According to the World Bank, universal electrification should be both "achievable and affordable" in Myanmar by the year 2030 [14]. To this end, the organization has committed \$1 billion in financial support [15] to expand electricity generation, transmission, and distribution for the national grid as well as off-grid development. The funds will be utilized to support a National Electrification Plan [16], which the government has developed in cooperation with the World Bank over the past few years. An initial \$400 million loan was recently approved by Myanmar's National Assembly as well as by the World Bank Board of Directors. Coordination meetings between donors, interested private firms, and other parties are now under way, with an anticipated program launch for the first phase before the end of the year.

Extending the national grid to rural populations is viewed as the most efficient strategy for electrifying Myanmar, both economically and technically speaking. The grid is easier to scale than other systems, reducing the generation cost per unit with the ability to draw, and integrate, distribution from a range of energy sources. It is also the favored strategy among the population due to the low, subsidized rates and 24-hour availability. Nonetheless, grid extension is an enormous task. According to Columbia University's Earth Institute, which supported development of the World Bank's National Electrification Plan, a total of 7.2 million households will need to be brought onto the grid [17] over the next 16 years in order to achieve universal electrification in Myanmar by 2030.

Grid extension also requires massive investment to meet Myanmar's needs as a whole. For rural populations who generally possess lower incomes than those in urban areas, hooking up to the grid will be difficult. According to our fieldwork, government responsibility for grid extension has traditionally extended to the township level, after which it is usually up to households to connect on a village level. The cost per household for villages located close to the grid is about \$250, more than double the average monthly income in Myanmar.

Aside from cost considerations, Myanmar lacks the skilled human resource pool [18], institutional capacity, and management expertise needed to address the challenges of national electrification. Government decision-making on energy and electrification is divided among eight or more ministries, including the Ministry of Electric Power, charged with transmission and distribution; the

Ministry of Energy, which handles supply; and the Ministry of Livestock, Fisheries, and Rural Development, which manages off-grid and rural electrification. Myanmar has also found it difficult to collect and maintain sufficient data on its existing energy framework.

At the same time, the country does have abundant energy resources ^[19]—consisting of vast potential in oil, natural gas, biomass, hydroelectricity, and alternative fuels, including geothermal—and Myanmar’s citizenry has pushed for the nation to use them for the public good. In September 2011, public opposition led Myanmar’s president, Thein Sein, to suspend construction of the Myitsone Dam ^[20], a \$3.6 billion project along the Thanlwin River, which, upon completion, would have exported the majority of its 6,000 MW capacity to China’s Yunnan Province. In January 2012, the Myanmar government announced the cancellation of a 4,000 MW coal-fired power plant in Dawei ^[21] on the site of a special economic zone, citing environmental concerns. More recently, however, plans for large-scale projects have been revived. In late 2014, the Japanese trading house Marubeni announced plans to partner with Thai utilities to build a low-carbon coal-burning power plant that could generate as much as 2,000 MW. This would include the construction of transmission lines from the plant in southern Myanmar to central Thailand.

Despite a reluctance to export power, however, Myanmar’s citizens are also unlikely to support the substantial increases in electricity rates that are needed to cover generation costs. Parliament recently managed to raise tariffs for large-scale electricity users, but public outcry halted plans to implement a residential rate increase in 2013. This makes it difficult to develop any kind of pricing system that would generate the revenue needed to extend and maintain the grid and to ensure the sustainability of Myanmar’s sociopolitical and economic growth.

Financing is also not easy to come by in Myanmar, where loans—when available—generally have a term of one year ^[22]. Private investors are also likely to choose urban centers, industrial zones, and other areas where demand is high and incomes sufficient to allow positive returns on a commercial basis, leaving marginal areas in the dark.

SHORT-TERM SOLUTIONS

There is no one-size-fits-all solution to electrification in Myanmar, and cost is but one factor affecting the feasibility of various strategies. Towns and villages have already begun to protest their lack of connectivity as they watch other areas connect to a grid that provides 24-hour power at affordable rates. As efforts to extend the grid are accelerated, social dislocation is bound to increase and tensions are sure to rise.

In Kyaukpyu, a town within Rakhine State that hosts a planned special economic zone, the government installed a mini-grid ^[23] that allows households along 15 miles of the town’s main road, as well as homes within just under a mile of the main line, to access power at government-subsidized rates. This has allowed local businesses to expand their operations and lower production costs. Given geographic limitations, however, a number of nearby households have not been able to connect to the mini-grid, which has created issues of inequality close to home. The resulting impact that electricity has on living standards is now visible in Kyaukpyu on a home-by-home basis.

Areas that are left behind by grid expansion initiatives, if even temporarily so, must continue to rely on off-grid systems and self-help approaches to gain access to electricity. Interim solutions, however, such as home-unit solar panels, micro-hydropower turbines, generators, and the traditional burning of biomass, can yield a step toward modernization. These solutions are a stopgap that does not necessarily detract resources and investment from grid extension initiatives in urban and industrial areas that are poised to drive Myanmar's economic development. At the same time, larger-scale renewable and off-grid projects are difficult to develop and finance without tariffs, rural electrification acts, and other measures that would facilitate convergence with a national grid.

Diesel generators, typically purchased and managed through a village electrification committee or a local entrepreneur, are perhaps the most common source of rural electrification. These generators provide power for several hours in the evening for \$2 to \$5 per month per household. Solar home systems, hydro turbines, and gasification powered by rice husks—a resource that is abundantly available in Myanmar's Ayeyarwady Delta—are also used to meet their energy needs. These off-grid technologies, even on a micro level, have allowed income-generating activities to take place in many households.

Solar power, which consists primarily of single home-units in Myanmar, has high up-front costs and is difficult to scale. This makes it ideal for small isolated villages and areas that lack the cohesion needed to manage and finance larger installations, but proves less than optimal in areas with high demand or growing industries. Gasifiers, which use biomass for fuel, have proved economically viable but at a high cost to the environment. Environmentally friendly gasifiers are available to Myanmar, but would add up to 50 percent to the cost of the equipment, making it out of reach for many rural citizens.

Mini hydroelectric power, for the most part, is feasible only for households located near an adequate water supply. The seasonal nature of water supply in Myanmar, which is highly dependent upon monsoon weather, makes the technology unreliable in many places for half of the year. Large-scale facilities also require speculative funding for studies and advanced engineering projects. Should these projects ultimately prove feasible, the government would then need to consider the resulting environmental and social impact of their construction. Investment can prove large and, if the facility is not primarily dedicated to supplying the national grid, hard to finance and manage among disconnected local areas

THE POLITICS OF POWER

Cross-border cooperation can help power Myanmar's outlying regions, as well as bring in essential capital, technology, and other goods and services from the nation's more developed neighbors. There is vast potential for hydroelectric power along Myanmar's borders with China and Thailand, for example. Finding a balance that provides adequate domestic supply while also exporting excess resources will be a crucial balancing act. Inequitable distribution and neglect for the needs of its citizens has tainted Myanmar's views on energy exports, but there is no reason it cannot benefit from selling certain resources abroad in order to invest in its national grid, as well as off-grid renewable electrification initiatives.

Instead of abandoning the energy export business, Myanmar should play a bigger role in regional energy integration. The nation's neighboring countries have benefitted from reliable and affordable energy, and so too can towns along its borders: in North Shan State, which is situated along Myanmar's border with China, off-grid populations were connected to China's grid, which has served as a core element of both urban and rural electrification strategies for the region. In addition, Tachileik, along the border of Thailand that is far from where Myanmar's grid currently ends, connected to the Thai grid in 1995. The area's population has since grown from about 20,000 people to a reported 100,000 or more, replete with small-scale factories and workshops. Despite such rapid growth, the electricity supplied by Thailand is reliable, with only about half the transmission loss seen within Myanmar's national grid. Although Thai electricity is significantly more expensive than Myanmar's grid power, due to lower domestic tariff rates the region has experienced significant growth and high incomes.

Similar arrangements exist along other parts of Myanmar's borders with both Thailand and China. Although Myanmar's regulations prohibit the purchase of power from foreign countries, such arrangements have been tacitly allowed and can be seen as a sound short- to medium-term solution until the Myanmar grid reaches outlying areas. Reliable power supply in border zones can attract foreign factories to develop along Myanmar's border areas, where international firms can take advantage of competitive wages. The Muse CBD project along Myanmar's main commercial border crossing into China is but one example. This strategy also helps alleviate strain on domestic electrification resources, allowing the government to focus on areas that have no such alternatives. Additionally, this system allows areas experiencing conflict to have a sustained, third-party energy source, removing the risk that energy projects, power plants, and distribution lines could be subject to attack and therefore leave regions in the dark. To address sovereign concerns about reliance on foreign providers in particular areas, Myanmar-derived energy flows could be supplemented by power sourced from neighboring countries into an expanded Myanmar national grid.

COMING TOGETHER

The good news for Myanmar is that there is broad agreement on the need to initiate a comprehensive energy and electrification development program, and that a range of entities are providing assistance.

The Asian Development Bank is helping Myanmar draft legislation that will replace statutes that have not been updated since 1984 and new legislation on rural electrification. Plans for technical assistance programs that will improve power transmission, distribution, and long-term energy planning are on the way as well. Assistance from the Japan Fund for Poverty Reduction has aided in the development of the long-term Energy Master Plan, Renewable Energy Development Strategy, and Energy Efficiency Policy for Myanmar. Roughly \$215 million has been invested in power distribution and transmission improvements, with many programs either under way or scheduled for completion in 2015.

In January 2013, the Myanmar government created the National Energy Management Committee and National Energy Development Committee, with the goal of achieving greater cooperation among Myanmar's energy-related ministries. This initiative is a major step forward,

but it can't be the end of things. Given Myanmar's size and political complexity, ongoing cooperation and discussion are needed across a wide range of stakeholders if the nation is to develop a functional electrification policy that is socially and politically acceptable.

For now, the nation's government, national assembly, energy companies, and general public are debating the scope and scale of national electrification and proposed agreements, and many of the laws needed to implement such projects have yet to be codified. Better data collection, capacity building, public engagement and education, communication, and information sharing are prerequisites for effective policy. Getting the necessary policy, regulatory, and business components in place properly will take time, but immediate needs can be addressed through the creation of an institution that brings together public and private stakeholders.

The formation of a Myanmar international energy center could help the country navigate a path drawn from the various plans proposed by donor agencies and other entities entrusted to advance, or to seek commercial involvement in, the energy sector. Such a center could also help promote successful energy and electrification policies by building awareness and cultivating dialogue among key stakeholders. A center could also advance discussion on important policy questions and other vital issues. It could monitor relevant news, transactions, events, and other information and share it with government officials, analysts, investors, and journalists. The center could also promote mechanisms for the construction of public-private partnerships, inter-ministerial cooperation, foreign alliances, and awareness of both Myanmar's needs and the opportunities presented by the country's opening to the world and its emerging power sector.

HARNESSING HUMAN POWER

Achieving inclusive, sufficient, and sustainable economic growth in Myanmar depends on resolving the country's electrification difficulties. There does not seem to be any shortage of resources, interest, or willing investors interested in Myanmar's power sector. The path forward appears to be more a question of raising capacity and building consensus about viable policies than of resolving any intractable technical or structural concerns. It is up to the wide range of domestic and international stakeholders to work with Myanmar's government to devise a plan that meets the country's long-term goals and short-term needs.

Many of the initiatives already under way—whether they be micro-grids, home electrification initiatives, cross-border energy solutions, or formation of a Myanmar international energy center—will help the nation meet the challenge of improving a woefully outdated power grid. Expanding electricity access will reduce the gap between Myanmar's urban wealth and its rural poverty, creating employment opportunities that can advance Myanmar along its developmental path. The end result is not just more reliable electricity for a larger number of citizens, it also creates a nation that is more inclusive and representative of the public will. Nowhere does good government come into play more fundamentally than in the need to create light out of darkness.

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