Public Disclosure Authorized

Project Information Document/ Integrated Safeguards Data Sheet (PID/ISDS)

Concept Stage | Date Prepared/Updated: 10-Nov-2017 | Report No: PIDISDSC22969

BASIC INFORMATION

A. Basic Project Data

Country	Project ID	Parent Project ID (if any)	Project Name
Myanmar	P162151		Power System Energy Efficiency Improvement Project (P162151)
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
EAST ASIA AND PACIFIC	Feb 26, 2018	Dec 12, 2018	Energy & Extractives
Financing Instrument	**Borrower(s)**	**Implementing Agency**	
Investment Project Financing	Ministry of Finance	Electric Power Generation Enterprise,Ministry of Electricity and Energy	

Proposed Development Objective(s)

The development objective of the proposed project is to increase capacity and efficiency of generation and transmission system in the project area.

Financing (in USD Million)

Financing Source	Amount
Borrowing Agency	10.00
International Development Association (IDA)	160.00
Total Project Cost	**330.00**

Environmental Assessment Category	Concept Review Decision
B-Partial Assessment	Track II-The review did authorize the preparation to continue

Other Decision (as needed)

B. Introduction and Context

Country Context

Myanmar is one of the least developed countries in Southeast Asia, with an estimated GDP per capita of $1,275 for 2016. Poverty in Myanmar is concentrated in rural areas, where poor people rely on agricultural and casual employment for their livelihoods. Many live near the poverty line and are sensitive to economy-wide shocks. Although GDP growth has remained strong, it has begun to moderate more recently from 8 percent in 2014/15 to 7.3 percent in 2015/16, and is projected to slow further to 6.5 percent in 2016/17. This is partly related to floods in 2015, which severely affected the agricultural productivity, as well as a drop-in commodity prices. Since 2015/16, however, the government has faced significant fiscal pressures, linked to some of the external shocks discussed above. Gas receipts, which account for 10-15 percent of general government revenue, declined by an estimated 0.5 percentage points of GDP between 2014/15 and 2015/16. The weakening of the Kyat on the other hand increased operational costs in the power sector, requiring an estimated 0.7 percent of GDP in additional subsidies. These pressures were exacerbated by growing losses of other state economic enterprises outside of the power sector.

Over the medium-term, the services sector (banking, distribution, information technology, communications and logistics) is expected to remain the big driver of growth. Improvements in these sectors are essential inputs for the productivity and expansion of the agriculture and industrial sectors. Therefore, investment in basic infrastructure and economic services (e.g. power sector, agriculture, transportation) will play an important role in growth.

Myanmar is five years into a significant political and economic transition. Following 50 years of isolation under military rule, the country opened under a new administration that took office in 2011. By-elections in 2012 brought in opposition parties to a newly established Parliament. In November 2015, national elections delivered a landslide victory for the National League for Democracy led by Daw Aung San Suu Kyi.

The government released its economic policy priorities at the end of July 2016. The policy objectives include: (i) national reconciliation and unity around a federal and democratic system of government; (ii) equitable development across States and Regions; (iii) creation of economic opportunities for the youth of the nation; and (iv) sustainable and inclusive growth through innovation and people-centered development. Within these policy priorities, the government recognizes the need to improve basic infrastructure in the country, particularly in the transport and electricity sectors[1].

Sectoral and Institutional Context

Institutional Set-up: Myanmar's power sector is organized under the Ministry of Energy and Electricity (MoEE), which oversees all operational functions of the generation and transmission sub-sectors, in addition to policy making and regulatory functions. Distribution has been organized in three separate entities, one each for Yangon and Mandalay regions (which are the two largest load centers) and remaining areas under the Electric Supply Enterprise. These entities also function under the supervision of MoEE.

Power generation mix: Hydro and gas-based electricity accounted for about 55% and 45%, respectively, of the total 17,737 GWh generated in fiscal year 2016-17. The only coal plant with 120 MW installed capacity did not generate any power in 2016-17. In terms of installed capacity, there is 2801 MW of gas-fired generation and 1967 MW of

[1] 'Only if transport and electricity is better will foreign investors be interested in investing in the country. The government will help the public to have the acquisition of better transport and electricity, and the parallel creation of jobs' (Daw Aung San Suu Kyi, State Counselor, April 26, 2017).

hydropower. A few hydropower plants have been developed to serve mainly export (to China) market, with a smaller share for the domestic use. About 46,000 MW of technically feasible hydropower generation potential has been identified in the country.

Electricity access and meeting the sustainable development goals: Even though Myanmar has abundant hydropower and natural gas resources, two-thirds of Myanmar's population have no access to electricity. In terms of access to modern energy, most of the rural households use biomass to cook. The lack of electricity has been identified as a major bottleneck by existing and new industries and commercial enterprises. The one-third with grid access face problems of unreliable and poor quality of power supply. High dependence on seasonal hydropower poses a special concern for energy security during the dry season, when low electricity production causes electricity shortages in Myanmar when power demand is highest.

Sector development plan: The Government has committed to provide universal access to reliable, affordable and sustainable energy for all by 2030, in line with United Nations Sustainable Development Goal 7. The Bank financed a national electrification plan in 2014, and JICA is helping MoEE update it power sector master plan for generation and transmission to meet this target. To meet the national priority goal of universal access to electricity by 2030, Myanmar would need to add about 20,000 MW to its power generation capacity and complementary transmission and distribution investment to meet the new demand, equivalent to nearly four times the current level. It would entail significant investments (around US$ 20 billion over next 10 years) with half of it for power generation assets, both greenfield and brownfield. The generation capacity required to fulfill the unmet demand needs to come from a judicious mix of hydro power, gas, renewable and imports. It is noted that the JICA master plan does envisage significant contribution from coal, except in the high gas utilization scenario.

Financial viability of power sector: The financial health of the sector is quite poor. It is estimated that the revenue would need to be increased by over 60 percent to cover cost of services as per 2015-16 financial information. This gap is expected to widen with more share of gas based generation and higher investment. The budget support has already reached $1.15 billion (1.5% of GDP) annually for 2017-18. Residential tariffs are currently the lowest in East Asia, below US$ 0.03/kWh. Actions to improve the financial health of the sector are urgently required to support the Government's ambitious universal access goal, which would need significant private investments given the limited public funding available. The steps to increase revenue, including through tariff increases, will need to be supplemented with the measures to address high costs. Generations costs are the largest contributor to the overall cost structure, with state owned plants costing the highest, followed by IPPs and rental plants. Interestingly, the average cost of rental projects in 2016-17 is at a similar level compared to IPPs, despite shorter PPA terms, underlining the gap in commercial arrangements for the earlier IPPs. Significant savings can also be achieved through better system operation and planning.

The World Bank has helped under the ongoing Electric Power Project (Cr.5306-MM) to prepare a financial viability plan for the sector and, through the first Macroeconomic Stability and Fiscal Resilience Development Policy Operation (DPO), has agreed with GoM measures to improve this situation. The issue of financial viability of the power sector is expected to remain the focus of future DPOs also.

Problem with declining gas and the medium-term gas challenge: Large proven gas reserves[2] have made Myanmar one of the region's major energy exporters. In FY2015-2016, Myanmar exported around 80% of the total natural gas it produced and used the remainder for domestic consumption. Most gas exploration contracts were export linked as

[2] As per latest BP Statistics, Myanmar has 1.2 trillion cubic meters of gas reserves by 2016.

Myanmar did not have adequate financial standing to de-risk the exploration based only on domestic usage. The power sector accounts for around 80% of its domestic gas consumption, which helps it to generate 1914 MW of power, while the rest is consumed by industries, petrol stations and refineries.
However, the availability of indigenous gas supply for the domestic market is decreasing, as production from both onshore and offshore fields is predicted to drop from 2020-21 onwards. New gas fields exploration is ongoing, but their contribution is expected only after several years. In view of declining gas production, MoEE is worried about ensuring gas supply to IPPs, as it would have to pay the cost of unused IPP capacity in case of any shortages. This is one reason for a large share of rental power plants with short term PPAs. In parallel, MoEE is evaluating options, with advice from the WBG, for LNG import infrastructure to meet the shortfall in gas until new discoveries can replace the gas shortages.

Developing optimized hydro plants and other renewables: The development of new hydro power has slowed down due to pressure on environment and social safeguard issues. IFC Advisory is carrying out a high level Strategic Environment Assessment for the major basins which would help in identifying sites with low environmental and social footprints and selecting sites which can be developed on a priority basis. The WBG team is also planning to engage with MoEE to develop an operating regime for all projects in a sub-cascade to bring synergy in their operation to align their output with the system demand. The current practice of developing project specific transmission system, instead a common transmission system for all projects in a sub-cascade is also sub-optimal and identified as another support area by WBG. IDA support could be considered through guarantees and other means for supporting development of large hydro power IPPs.

In view of the large unmet demand, there is no reserve margins in grid operation – which would be necessary for the grid to absorb variable generation, such as solar and wind. Moreover, two PPAs signed for large solar plants development, cumulatively 520 MW at around 13 cents/kWh, have been a hurdle in systematic introduction of scalable renewable generation in Myanmar. With under developed transmission system, it is difficult to absorb all renewable power without backing down of existing generation. WBG is planning to help MoEE identify hydro power sites, which could potentially help in supporting the variable renewable power, with the same transmission system and when run in conjunction to each other also help the variability of generation. Gas powered plants could also compensate the seasonality of hydropower and the variability of solar power.

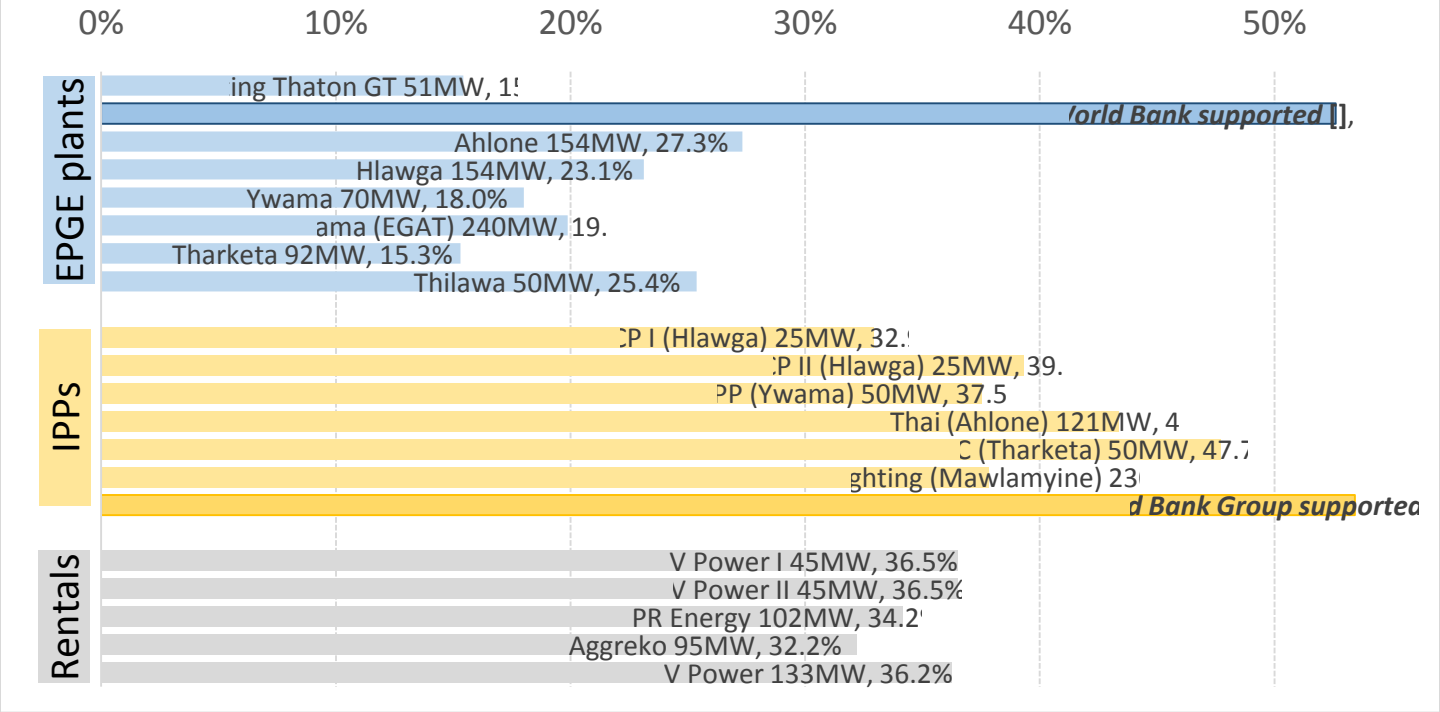
System operation constraints: Insufficient investment in transmission system has resulted in no redundancy and is a cause for frequent operational problems leading to power breakdowns. There is also mismatch in generation resources and load demand. While most hydro power and some gas plants generation are located in central or north western part of the country, the major load center is in Yangon region (the southern part of the country) which consumes 46% of electricity produced in 2016-17. In terms of generation availability, Yangon region has installed capacity of only 1,032 MW (761 MW state-owned and 271 MW IPPs). The actual generation of state owned gas power plants in January 2017 was 255 MW (34 % of the installed capacity), thus necessitating large power movement from Central or North western region. Outage of any plant in Yangon Region runs the risk of cascading failure of transmission lines and consequently black-outs in the country. System studies indicate that reduction of 170 MW of generation in Yangon Region would increase system losses of 50 MW, besides overloading of few critical links. The situation is likely to improve after the under construction 500 kV transmission link between Central Myanmar and Yangon Region which is expected to be completed in 2021. Many sub-stations have load demand far exceeding the transformer capacity, and demand is met by local curtailment.

High inefficiencies in generation: There is a tremendous potential for energy and economic savings in Myanmar, by improving conversion efficiencies of gas to power (thermal efficiency). Most state-owned gas power stations, which are old and obsolete, have thermal efficiency between 15-27 percent, versus efficiency of more than 52 percent available

for modern combined cycle gas turbine plants. IPPs and rental plants, though relatively new, also have much lower efficiency, ranging between 33-48% for IPPs and 32-37% for rental plants. The 119 MW Thaton project which is under construction with IDA funding and the 235 MW Myingyan IPP with IFC/MIGA support will set a much-improved standard of designed thermal efficiency near 53 percent. The Thaton combined cycle gas turbine (CCGT) plant is expected to almost triple the electricity generation from the existing 260 GWh to 770 GWh per year, reduce the plant's CO_2 emissions by 400 g CO_2/kWh and save around 9,300 MJ of fuel over the projected lifetime. Upgrading only state owned gas plants to international level of efficiency have been estimated to save more than US$ 150 million per year in operating costs.

Figure 1 below provides more details on gas-to-electricity conversion efficiencies of existing gas-based power plants in Myanmar.

Figure 1. Thermal efficiency of gas-fired power plants in Myanmar, grouped by ownership structure
Source: World Bank staff estimates based on EPGE data as of January 2017



On the distribution side, the IDA-financed National Electrification Project (Cr.5727-MM for $400 million) is helping both grid and off-grid based access expansion. It is also supported by Lighting Myanmar Program of IFC.

Relationship to CPF

The objective of the proposed project is consistent with the key priorities laid out in the current Country Partnership Framework FY15-FY17. Myanmar's CPF focuses on three main areas: (i) reducing rural poverty; (ii) investing in people and effective institutions for people; and (iii) supporting a dynamic private sector to create jobs. The proposed project supports directly the areas (ii) and (iii). The proposed project will improve the power supply for industries and commercial enterprises in Yangon Region and therefore boost private sector investment and lead to increased job opportunities. The capacity building support of the project will help build more effective institutions in the electricity

sector and strengthen implementation capacities in Myanmar. By increasing power supply for Yangon Region, the Project will also help meet the demand from new consumers, many from rural areas, to be connected to the grid under the National Electrification Project and indirectly support the reduction of rural poverty.

C. Proposed Development Objective(s)

The development objective of the proposed project is to increase capacity and efficiency of generation and transmission system in the project area.

Key Results (From PCN)

The following project indicators are proposed to capture the development objectives:

1. Projected life time fuel savings (MJ);
2. Increase in power transfer capacity in transmission grid (MW/year).
3. Increase in generation capacity (MW);

D. Concept Description

The large need for generation capacity addition needs to come from various resources: hydro power, gas power, and renewables, such as solar, as well as imports. The World Bank Group is helping Myanmar in optimal and sustainable development of these resources. As mentioned earlier, the mismatch in available generation capacity and demand in Yangon region is contributing to several operational challenges, such as higher system losses, system instability and other operation constraints, in addition to contributing to the high cost of generation due to low efficiencies of gas power plants in Yangon Region. There are five gas based power plants in the Yangon Region. A recent technical assessment has indicated that at all locations, except Ywama, the plant capacity could be significantly increased to around 400 MW plus. Ywama, in addition to having a space constraint, contains three separate EPGE gas-based power plants in operation (2*120 MW Mitsubishi gas turbines; 2*18.45 MW John Brown make and 1*24 MW Hitachi make gas turbines; and 9.4 MW steam turbine). A 50 MW IPP power plant is located next to the existing EPGE plants. The plant produces around 90-110 MW of output, mostly contributed by Mitsubishi gas turbine. The Mitsubishi turbine also contributes the highest MW share among all the Yangon plants. Upgrading of Ywama, while ensuring that its generation contribution remains at the current level, would require flexible engineering approach, to find solution for any issue coming up at site. The indication is that with some good engineering design, it could accommodate around 250 MW capacity plant. Given these challenges, Ywama plant upgradation has been selected for Public sector financing.

With this background, the proposed project would encompass the following components.

Component A (US$ 280 million):

A.1 Upgrading of existing Ywama Gas Power Project:

It is proposed to replace the existing small gas and steam turbines at the Ywama plant with highly efficient combined cycle gas turbine (CCGT), with approximate capacity of 250 MW, using the existing gas allocation. To avoid reduction of much needed supply during the interim period, the existing 2*120 MW gas turbines will operate until the renovated plant starts generating power. These units would also be available in the future and could be used for peaking power, when gas supply shortages are eliminated. Additional generation capacity, over the current power output at Ywama after renovation, will provide security of energy supply in Yangon region to meet power capacity loss when the other two outdated gas plants at Yangon on the same gas pipe line will need to be shut down for replacement. Given the

large savings available by upgrading to higher efficiency levels, as part of the project, a strategy will be developed with MoEE to progressively upgrade all Yangon gas based projects with most of funding coming from the private sector through options such as public-private partnerships.
Additionally, the power generation development plan, being updated by JICA to meet the 2030 demand, indicates a significant role of coal generation in three out of the four power development scenarios being considered, except for the scenario where reliance on gas utilization is the maximum. The proposed project will lead to support the most climate friendly scenario with lowest coal generation additions (less than 1% of total installed power generation forecasted capacity by 2030), by laying the foundation of adding substantial gas based capacity in Yangon region without increasing the gas requirement for the proposed project.

A.2 Implementation and Associated Support:

This sub-component will include financing (i) technical supervision and safeguard consultants to oversee the implementation of the Ywama CCGT project upgradation work, including the sequencing of the dismantling and new construction activities; and (ii) advisors to MoEE to help prepare a plan to expeditiously realize new generation projects, including by attracting private sector, to meet the goal of universal access by 2030; (ii) support government activities in furthering the power sector reforms. This would include preparation of a financing plan for the selected priority projects, preparation of detailed techno economic feasibility studies; safeguards assessment; land acquisition due diligence, if needed; environment and other statutory clearances; recommendation of measures to reduce risks and enable attract private investments (e.g. foreign exchange risk exposure management, payment assurance, etc.)

Component B: (Estimated cost: US$ 50 million)

B.1 Transmission Equipment/ Installation services:

This component will support identified works to remove constraints in the existing grid to increase its transmission capacity by using measures with quick results, such as, replacement of worn out and low rating switchgears, providing additional power transformers at existing sub-stations; replacement of damaged insulators in the transmission lines, capacitors/ reactive compensation to help improve the power transfer capacity of the grid and/or reduce losses. Any transmission upgrade, if identified for power evacuation from Ywama station in the feasibility study, would also be included under this component.

B.2 Implementation Support:

This sub-component will include technical supervisions and safeguard consultants to oversee the implementation of the transmission project; assess possible improvement in dispatching to support more renewable generation; feasibility and design of SCADA system etc.

Component C: Contingent Emergency Response

The objective of the contingent emergency response component, with a provisional zero allocation, is to allow for the reallocation of financing in accordance with the IDA Immediate Response Mechanism.

SAFEGUARDS

A. Project location and salient physical characteristics relevant to the safeguard analysis (if known)

For component A, the rehabilitation / upgrading of the gas turbines at Ywama, the location is the Ywama power plant site in the industrial and residential area of Yangon. The site is an active industrial facility on the left bank of the Yangon River with controlled access. It is surrounded by residential buildings (for power plant staff) and adjacent industrial facilities, and accessible by barge from the river and by vehicles from the access road. The rehabilitation and upgrading works will take place 'inside the fence', within the existing site. Potential social impacts that will be screened for include potential for land acquisition under linked activities (transmission lines etc.) and potential negative social impacts to surrounding communities during construction (increased traffic, noise etc.).

The plans and studies that are envisioned to be funded under Component A2 are not determined at this stage.

They could support the completion of technical outputs in preparation for construction of physical infrastructure for power projects (e.g. feasibility studies for a transmission or generation project). No such activity has been identified as yet. Any such studies would consider new projects with alternatives to avoid, minimize or mitigate potential social and environmental impact. Proposed activities would be screened using the ESMF and required safeguards instruments prepared and implemented based on the screening.

For component B, the transmission equipment installation, the locations are various sub-stations and other parts of the national transmission system yet to be identified through technical studies supported by the project (during the project). Generally, it is expected that the works will take place within the existing facilities (sub-stations, switchyards, etc.). Social impacts are expected to be minor and limited to potential negative impacts to communities during construction.

Under this component, the need for upgrading the existing transmission line evacuating power from Ywama will be considered together with the need for the Bank support for such potential upgrading. Upgrading the transmission line will have social impacts, such as minor land acquisition, right of way easements and temporary land use.

B. Borrower's Institutional Capacity for Safeguard Policies

Borrower's institutional capacity for safeguards, environmental and social, is very low. Starting from a low base of near complete absence of a safeguards system a few years ago, experience is fast emerging from implementation of Bank and other development partners financed power sector projects, and through targeted technical assistance and capacity building activities (e.g. supported by Norway, IFC, WASP, etc.) However, generally the capacity is low and expected to be provided through significant engagement of internationally procured safeguards consultants (as is the case now in a similar Bank financed gas turbine upgrading at Thaton).

C. Environmental and Social Safeguards Specialists on the Team

Martin Fodor, Environmental Safeguards Specialist
Zeynep Durnev Darendeliler, Social Safeguards Specialist

D. Policies that might apply

Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	The proposed project has been classified as category 'B' because the adverse environmental and social impacts that may occur, primarily civil works related during construction or operation of the project investments are limited, site-specific and mitigation measures can be readily designed. Physical works are expected to take place within the existing brownfield locations, particularly at Ywama power plant and selected substations. The positive impact of the project will be increased efficiency of the power system. Environmental and Social Impact Assessment (ESIA) for Ywama power plant upgrade and an Environmental and Social Management Framework for potential activities at other locations (of power system) including for TA activities under component A2 will be prepared by an international consultant. The ESIA will include a comprehensive and complete assessment of potential social impacts and risks of the Ywama upgrade, including for neighboring communities in the project area.
Natural Habitats OP/BP 4.04	No	Project is not likely to have impacts on natural habitats since the only know site of Project activities is an active power plant in an industrial area of urban Yangon, and its potential locations are existing sub-stations and other elements of the existing distribution system infrastructure which are not expected to constitute or be located in a way affecting natural habitats.
Forests OP/BP 4.36	No	Project is not likely to have impacts on forests or forest management natural habitats or forests since the only know site of Project activities is an active powerplant in an industrial area of urban Yangon, and its potential locations are existing sub-stations and other elements of the existing distribution system infrastructure which are not expected to constitute or be located in a way affecting forests.

Pest Management OP 4.09	No	Project is not likely to finance or affect pesticide use.
Physical Cultural Resources OP/BP 4.11	No	Project locations and project activities are not likely to affect physical cultural resources; for the unlikely accidental finds, procedure will be included in the ESMF.
Indigenous Peoples OP/BP 4.10	TBD	Component A1 is located near Yangon, on the periphery of the city and is not expected to trigger the Indigenous People's Policy. The team will assess the need to the trigger the Indigenous People's policy for the remaining components during preparation. Component B1 may potentially be implemented in areas with ethnic minorities (or it may not be possible to rule out this possibility by appraisal if sub-projects are not identified until during project implementation) and component A2 is likely to have implications for ethnic minorities although it won't finance specific investments. Therefore, the policy will likely be triggered. An Indigenous Peoples Planning Framework will be included in the ESMF in this case.
Involuntary Resettlement OP/BP 4.12	TBD	Physical works for Component A will take place within the existing site footprint. The ESIA will confirm that all works for the Ywama upgrade will indeed take place on existing premises. For Component B, transmission equipment installation is expected to take place mostly in existing substations. There is a chance that some installation may exceed the existing footprint or that installations on existing footprints have temporary land use impacts during construction. The team will determine during preparation the likelihood of these impacts and ask the project management unit to prepare a RPF by Appraisal if necessary. For both components and their sub-components, ESMF will be prepared to screen for activities that may trigger OP4.12, require application of the RPF and preparation of site specific instruments for involuntary resettlement.
Safety of Dams OP/BP 4.37	No	Project is unlikely to involve dams.
Projects on International Waterways OP/BP 7.50	No	Project is unlikely to affect international waters.
Projects in Disputed Areas OP/BP 7.60	No	Project is unlikely to involve disputed areas.

E. Safeguard Preparation Plan

Tentative target date for preparing the Appraisal Stage PID/ISDS

Jan 08, 2018

Time frame for launching and completing the safeguard-related studies that may be needed. The specific studies and their timing should be specified in the Appraisal Stage PID/ISDS

Preliminary screening of environmental and social issues has been carried out by Fichtner, the safeguards consultant for the ongoing Bank financed Thaton gas power plant upgrading. Fichtner noted no particular safeguards issues or risks apart from the work within the constrained space of an existing facility and its residential surrounds. An ESIA and ESMP will be prepared for component A (Ywama) by internationally procured consultants as input in project appraisal.

For component B, where locations of activities are yet to be confirmed, a brief ESMF and, if necessary, a RPF and a IPPF will be prepared by appraisal to guide the screening of proposed activities and management of potential risks from safeguards perspective.

All the safeguards instruments will be disclosed and consulted on with appropriate stakeholders.

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