Attachment 1

USAID-PNG Electrification Partnership Activity

I. Background

A. Introduction/Context

In November 2018, at the APEC Summit, Papua New Guinea invited Australia, Japan, New Zealand and the United States to work together to support its goal of connecting 70% of its population to electricity by 2030. The Papua New Guinea Electrification Partnership (PEP) recognizes that access to electricity is fundamental to economic growth and is foundational for the development of the private sector and industries. Papua New Guinea has one of the lowest electricity access rates in the region with only 15% of households having access to reliable electricity. To achieve the 70% household electrification target by 2030, PNG will rely on increased collaboration between its government institutions, the private sector and development partners.

To inform planned activities and coordination of the PEP, a multi-agency mission from Australia, Japan, New Zealand and the U.S. participated in the Trilateral Partnership for Infrastructure Investment Meeting which was held from April 9-10 in Port Moresby, Papua New Guinea. From this technical scoping trip, targeted areas for partnership have been identified considering the multitude of projects that are either planned or ongoing by other development organizations.

The proposed set of interventions supports the Indo-Pacific Strategy, particularly the Asia Enhancing Development and Growth through Energy (EDGE) Initiative which supports market-based energy policy and reforms, modernization of energy infrastructure and expanded access to affordable, secure and reliable energy supplies.

B. Power Situation

The current generation capacity of the country's two main grids, Port Moresby (POM) and Ramu is very low at around 320 MW, 50 MW of which are supplied by independent power producers. About 63% of the generation capacity is sourced from hydro, gas and geothermal while 37% from diesel power thermal sources. PNG has established transmission and distribution networks in the urban centers of Port Moresby, Ramu Valley (Lae, Madang and Highlands area) and Gazelle Peninsula as well as 19 isolated independent power grids servicing provincial centers. Of these three major grids, Ramu power system is connected to 9 provinces. Moreover, it is estimated that 280 megawatts of power is being generated by mining companies for their own consumption.[1] The National Energy Rollout Plan (NEROP) estimates that electricity demand will grow by 300 MW by 2030 through expanded connections and future demand from the mining and gas industry. The current national electricity tariff is very high at 30 cents per kilowatt hour. One of the reasons for the high tariff is the reliance on expensive imported thermal resources which accounts for 37% of total generation. PNG is endowed with generous indigenous resources such as hydro, natural gas, oil, geothermal resources and other renewable energy such as wind and solar. By reducing these costs through cheaper domestic resources, PNG can reduce their very high generation costs. The World Bank's recently completed study, *Delivering Affordable, Sustainable and Reliable Power to PNG*, identifies hydro and gas as the least cost generation options moving forward. The study also identifies new opportunities for solar and wind integration for the POM grid as well as in off-grid locations.

PNG has a fragile power system given its topography and aging power infrastructure. In a study conducted by the World Bank, PNG ranked fifth in terms of the countries with the greatest number of power outages averaging 42

[1] ADB 2018 Pacific Energy Update

each month.[2] System losses, both technical and non-technical were consistently high from 2015 to 2017, averaging almost 25%,[3] about 20% of which were due to unmetered consumption. In a survey of energy consumers in the industrial city of Lae, 80% of the customers were very dissatisfied with the supply of electricity to their home/establishments. Major complaints included affordability of the electricity tariffs, efficiency of power delivery, resolution of complaints, sustainability of power options being considered by the country, adequacy of regulations and enforcement and current available energy options.[4]

With support from the World Bank, the Government of PNG (GPNG) developed the NEROP which is the blueprint for implementing the electrification program with the target of reaching 70% by 2030. Given the geography and settlement patterns of PNG's population, it is estimated that grid electrification is the least-cost option for providing access to approximately 75% of the nation's future population; while off-grid systems are recommended for the other 25%.[5] The table[6] below summarizes current level of grid access and options for grid and off-grid electrification through 2030.

Results of spatial query	Current Grid Access (2016)			Program for 100% Electricity Access (Grid & Off-Grid) by 2030				
	Access Categories	Population (Households)	Percent	Recommended Type of Access and Investments	Population (Households)	Per-cent	Capex per HH	Total Capex (M)
Within range of LV connection: <1 km	Customers: grid access with PPL account	460,000	6% 19%	EasyPay meters for existing customers	460,000	4%	$260	$22
		90,000			90,000			
	Consumers: grid access w/o PPL account	460,000	6%	Improved connections + EasyPay meters for consumers	460,000	4%	$450	$39
		90,000			90,000			
	No grid access (calculated by difference)	540,000	7%	Grid Intensification (LV line + connection)	1,680,000	14%	$990	$272
		100,000			280,000			
Beyond range of LV connection: > 1km	Requires new access (grid or off-grid determined by geospatial model)	6,030,000	81%	Grid extension (MV, LV, connection)	6,790,000	55%	$1,680	$2,200
		1,160,000			1,320,000			
				Off-grid / Mini-Grid	2,950,000	24%	$1,160	$660
					570,000			
	Population	7,630,000	100%	Population	12,330,000	100%	$1,370	$3,200
	(Households)	1,440,000		(Households)	2,330,000			

Table 1. Summary of grid level access and options for electrification

C. State of PPL

Founded in 1963, PNG Power Limited (PPL), formerly known as the Papua New Guinea Electricity Commission (ELCOM), is a fully integrated authority responsible for the generation, transmission, distribution and retailing of electricity servicing almost 112,000 customers throughout the country. Under the Electricity Industry Act of 2002, PPL took over all of ELCOM's assets, liabilities, rights, titles and personnel. PPL is a State Owned Entity under the oversight of the Ministry of State Owned Enterprises (MSOE). Kumul Consolidated Holdings Limited (KHCL) is mandated to hold the shares for corporatized state entities like PPL. A Board was created by the Ministry of State Owned Enterprises (MSOE) through which, PPL provides annual financial and operational reports and a five-year business plan to KHCL.

[2] World Bank, 2017
[3] Delivering Affordable, Sustainable and Reliable Power to Papua New Guineans, World Bank, July 2018, p. 52
[4] An Appraisal of PNG National Energy Policy 2018-2028, Papua New Guinea University of Technology, pp 7-8
[5] Delivering Affordable, Sustainable and Reliable Power to Papua New Guineans, World Bank, July 2018, p. 49
[6] World Bank Report_PNG ELectrification, May 2017, p. 5

PPL has numerous challenges with the foremost being aging infrastructure, high non-technical losses (non-payment for electricity), oversized workforce, and political interference. An assessment of PPL's financial and operational performance from 2015 to 2017 revealed that the entity has been in financial distress affecting its capacity to fund planned investments, therefore constraining PPL to provide reliable services to its customers. Electricity is very costly in PNG with PPL's average tariffs for 2017 registered at $0.279/kWh[7]. Despite its comparatively high weighted tariffs, PPL has limited funds to cover its debt service and capital expenditure requirements. Further, the operating costs and expenses of $250 million are considered oversized for a company with 100,000 customers and $270 million of revenues.[8] Major operational costs include staff and overhead costs and fuel which represent 34% and 26%, respectively, of its total revenues. Since 2013, tariff rates have not been adjusted to allow PPL to reflect the true cost of service and allow for a reasonable rate of return.

D. Electricity Regulation

The Independent Consumer and Competition Commission (ICCC) has broad responsibilities across the economy regulating transport, insurance, fuel and energy sectors. Consistent with the Independent Consumer and Competition Act of 2000, the Electricity Industry Act of 2002 established the Electricity Commission mandating the body to exercise economic regulation by overseeing the conduct of the generation, transmission, distribution and sale of electricity. The Commission consists of three Commissioners which are appointed by the Prime Minister and serve on such terms and conditions as determined by the Parliament.

Specifically, the Commission is tasked to plan and to coordinate the supply of electricity throughout the country, set electricity tariffs, develop and implement regulatory standards for electricity service including reliability indices, lay the groundwork to allow third party access arrangements in the electricity industry and promote consumer protection.

Regulation of the electricity industry was further defined under the 2009 Electricity Industry Policy of Papua New Guinea which states that while the ICCC is the overall regulator, the technical regulation has been delegated to PPL. As a technical regulator, PPL is responsible for ensuring compliance to standards in generation and network assets and enforcement of codes and guidelines for electrical installations.[9] PPL exercising technical regulation is something that the entity does not welcome as it is an additional burden both administratively and financially. It is envisioned that the technical regulation of the electricity industry will eventually be transferred to the Department of Petroleum and Energy (which is now the Department of Information, Communication and Technology and Energy.) Enforcement of environmental and safety regulations will also be undertaken in close coordination with the Department of Environment and Conservation.[10]

Another aspect of the regulatory environment is the Organic Law on Provincial Government and Local Level Government of 1995 which granted authority to 19 provincial and 299 local governments to regulate their respective electricity services[11].

E. Off-grid Electrification

Off-grid areas can receive electricity either through PPL, if it falls within the 10-kilometer radius from its existing distribution network or through a third-party service provider for more remote areas. Competition for loads that are less than 10 megawatts are also encouraged regardless of the service provider's coverage areas. Under the State's Community Service Obligation (CSO) policy, service providers for off-grid areas may be funded by the State

[7] Delivering Affordable, Sustainable and Reliable Power to Papua New Guineans, World Bank, July 2018, p. 49
[8] Ibid.
[9] Electricity Industry Policy, August 2009, p. 13
[10] Electricity Industry Policy, August 2009, p. 13
[11] PNG's Energy Sector and Estimation of Renewable Energy Resources in Morobe Province, Papua New Guinea: Solar and Wind Power for New Umi Township. p. 41

through a competitive tender. Currently, PPL is also providing electricity to off-grid areas through the National Budget allocation and reduced dividends to the State. This arrangement, however, has not been sufficient to expand rural electrification.[12] The implementation framework for the CSO policy is also yet to be defined.

F. Domestic Gas Utilization

PNG's proven and probable natural gas reserves is estimated at 8 trillion cubic feet (tcf) while estimated additional 30 tcf of underdeveloped recoverable resources remain untapped.[13] The ExxonMobil LNG project which was completed in 2014 was the first of its kind and became the top-revenue export product in the same year. In 2017, the gas production and processing facilities produced 8.3 million tonnes of LNG, an increase of 20% from the original design specification of 6.9 million tonnes per annum (MTA).[14]

With the country's huge natural gas reserves, the World Bank's study to determine least-cost options for power generation revealed that natural gas is the fuel of choice for grid-based generation, particularly in the Highlands in Port Moresby where abundant domestic gas is available. This would drive down the cost of power generation compared to more expensive liquid fuel and more capital-intensive hydropower and geothermal.[15] Recently, the government prioritized the use of natural gas for domestic energy requirements and the planned development of a gas master plan is essential to enable encourage private sector investments in the entire value chain.

II. Problem Statement

Access to affordable and reliable electricity is integral to achieve PNG's economic and social development objectives. PNG is rich in energy resources with abundant renewable energy as well as natural gas resources but the country currently has one of the lowest electrification rates in the Asia Pacific Region. The PEP targets an ambitious goal of 70% electrification by 2030 from the current level of 13%. Over the five years of activity implementation, The USAID PNG Electrification Partnership Activity aims to achieve intermediate progress toward this goal through the strengthening of key energy sector institutions, support for off-grid electrification and increased private investment. Therefore, the development hypothesis of this activity is that **if** technical, financial and organization capacities of key energy sector institutions improve, **then** institutions will have greater ability to invest in electrification expansion and partner with the private sector to meet PEP targets.

The PEP target of 70% electrification by 2030 requires the country to add 70,000 connections annually, which is estimated to cost more than $100 million per annum. In recent years, PPL has added approximately 10,000 connections annually. In 2019, PPL is increasing their new connections to 32,000. This is, however, way below the target of annual connections to meet the PEP goal. Given this huge undertaking, the PEP presents a strategic opportunity for partners to contribute resources and work together to reach the desired electrification level.

PPL is the main government counterpart for the PEP. Over the last 14 months, PPL has started a reform program which includes the hiring of a new Managing Director. PPL has also established a new senior management team and created focused divisions on their core business of generation, transmission/distribution and commercial retail. These divisions previously did not exist. Advancing PPL reforms and supporting the utility's sustainability and financial viability is crucial to enable future investment to meet PEP's electrification targets, and ultimately achieve self-reliance in the energy sector.

[12] Electricity Industry Policy, August 2009, p. 10
[13] Delivering Affordable, Sustainable and Reliable Power to Papua New Guineans, World Bank, July 2018, p. xiv
[14] ExxonMobil PNG LNG website
[15] Delivering Affordable, Sustainable and Reliable Power to Papua New Guineans, World Bank, July 2018, p. 94

Improving regulatory quality is likewise critical to ensure reliable and cost-effective service delivery and consumer protection. For a sector that is positioned to allow greater private sector participation, regulatory oversight is key to sustaining market stability and competitiveness.

III. Objectives

The goal of the USAID PNG Electrification Partnership Activity is to contribute significantly to achieving the goal of 70% electrictrification by 2030. The activity plans to support the following objectives.

Objective 1. ***Strengthen PNG Power Limited's financial viability and operational efficiency.*** PNG Power Limited (PPL) transforms itself into a strong partner, which is able to provide reliable energy, better serve customers, expand electricity connections and improve overall financial viability to undertake capital investments and partner with the private sector.

Objective 2. ***Develop Viable Off-Grid Electrification Models.*** Develop viable off-grid electrification models that catalyzes investment to provide electricity to provincial centers, island communities and other remote populations to meet PEP electrification targets, reduce high supply costs, and bolster economic activities.

Objective 3.*Enhance PNG's Energy Regulator.* Strengthen PNG's energy regulator to enable a vibrant energy sector that expands connections, increases generation capacity, promotes competition and follows a rules based system that ensures PNG's self-reliance is not affected by predatory partners and non-economically viable investments.

Objective 4. ***Catalyze Private Investment for Energy Projects*** PPL's financial status improves allowing them to be a credible off-taker for new electricity generation projects including proposed gas to power projects.

IV. Key Considerations

The PEP Activity will work with key national government entities such as PPL, ICCC, DPE, select local government units or District Development Authorities, the private sector, universities and other development partners/donors and non-government organizations that contribute to the PEP goals.

Activity implementation must take into account the following considerations in designing its implementation approach:

- ***Consideration of PNG's demography and ethnic diversity.*** With a population of more than 8 million in 2017, 60% of which are 25 years old and below, Papua New Guinea has one of the most diverse cultures with more than 1,000 ethnic groups and 800 local languages spoken. These tribal communities are highly decentralized and community members have strong allegiance to cultural practices and beliefs, hence interaction with members of these tribal communities should consider these sensitivities. About 80% of the population lives in rural areas and rely on natural resources for its daily subsistence. The activity will design strategic approaches for implementing community-based energy systems, capacity building support and technical assistance by recognizing local practices, diversity and livelihoods.

- ***Advanced coordination with other donors.*** Several donors are already working to assist the PNG government in pursuing its electrification goals. Convergence and coordination with other donor-funded projects is key to leverage other resources, scale up development impacts, and better meet the needs of the PNG Government. Development partners under the PEP have agreed to sustain dialogues through participation in future Trilateral coordination platforms and the planned PEP Governance Committee. A list of other donors and their ongoing activities can be found in Annex 1. The Activity will work with other donors and the PNG government to ensure

close strategic planning and implementation.

- ***Synergies with other USAID activities.*** The Activity will coordinate, cooperate and communicate with the Pacific-American Climate Fund (PACAM) and an upcoming biodiversity project called, "Lukautim Graun" (look after the environment) and find synergies in order to optimize resources and enhanced results. Lukautim Graun will work both at the national and local levels to strengthen governance of natural resources for biodiversity conservation. At the site level, the project intends to work in the Bismark Forest Corridor across four provinces: Madang, Chimbu, Eastern Highlands, and Jiwaka to conserve biodiversity in priority places by demonstrating and replicating conservation actions that reduce the key threats to biodiversity. Potential partnership with other on-going USAID energy activities managed in Washington, DC such as Energy Regulatory Partnership Program, the Sector Reform and Utility Commercialization activity among others.

- ***Human and Institutional Capacity Development (HICD).*** The activity will develop HICD programs for select PNG government agencies and other related energy sector entities, and follow the guidelines developed by USAID (Reference, Human and Institutional Capacity Development Handbook, October 2010, http://pdf.usaid.gov/pdf_docs/pnadt442.pdf). The Offeror may present similar HICD programs for better results and monitoring features.

- ***Robust public and community participation.*** The activity will hold public outreach activities, multi-stakeholder consultations and other public fora in partnership with relevant local organizations, media groups and other development partners that will directly contribute to achieving the rural electrification goals and reforms in the power sector.

- ***Procurement of smart technologies.*** The activity will propose for USAID approval, utility performance improvement procurements that may include, but are not limited to information technologies/architecture that support the meter-to-cash process, mobile billing and collection and data management and analytics; and integrated energy modeling software. These technologies must be factored into the design to improve utility reliability, efficiency and maintenance. Prior to proposing the procurement of these technologies, the activity must leverage private sector resources that are willing to partner with USAID to implement these technologies.

- **Gender.** In February 2019, the Women's Global Development and Prosperity (W-GDP) Initiative was signed through the Presidential National Security Memorandum. This whole-of-government initiative aims to promote women's economic empowerment globally to benefit 50 million women by 2025. In the energy sector, USAID's Engendering Utilities Program works to promote gender equity. Specifically, it focuses on enhancing gender equity through global best practices in the employee life cycle of electric utility operations with the goal of improving core business outcomes for the utility. At PPL, the role of women in decision making has been observed to take prominence. The Offeror is highly encouraged to design interventions that would highlight women's role in reforming and improving PPL's operations considering the experience of USAID's W-GDP Initiative, Empowering Entrepreneur Training and Engendering Utilities Program.

- **Private sector engagement:** The Asia EDGE Initiative is anchored on engaging the private sector. As the economy grows, demand for energy will increase, thus, the country requires huge financial investments including from the private sector. USAID's private sector engagement is a strategic approach to planning and programming through which USAID consults, strategizes, aligns, collaborates, and implements with the private sector for greater scale, sustainability, and effectiveness of development outcomes across all sectors. The activity must clearly identify the role of the private sector in each of the Tasks and qualify the private sector's resources that will contribute to achieving the goals of the PEP, including in the implementation of smart technologies and IT infrastructure enhancements. Due diligence is expected to be performed by USAID of the private sector partners..

ANNEX 1: Related Development Partner Activities

PEP Partners

Australia: The primary vehicle for their support is the, the Environmental and Social Infrastructure Facility, which provides financing for infrastructure projects in the energy, telecommunications and water sectors. Through this mechanism, Australia is supporting an expansion of new connections as well as upgrading to the existing Ramu Hydro Power Station. DFAT has also initiated a technical assistance Utility to Utility partnership with Tasmania Hydro, which is Australia's largest hydro producer. DFAT is also hiring a new expatriate Chief Financial/Operations Officer for PPL who will oversee the proposed Project Management Unit.

New Zealand: New Zealand has substantial experience in the sector having supported energy programs in PNG for the last eight years. New Zealand has a technical advisor in PPL who also oversees their projects focused on connections in the central region. These investments are implemented in partnership with ADB who funds transmission lines and NZ supports the connections. Through a partnership with Australia, New Zealand is also implementing transmission and distribution extensions to the Tsak Valley in Enga Province, which will connect 30,000 households to the grid. New Zealand is also implementing off-grid programs, the most notable being a 3 MW hydro project in Bougainville.Finally, NZ also supports a technical assistance program with PPL to train power linesmen.

Japan: Japan's contribution to the PEP is the $82 million Ramu transmission project which includes high voltage transmission lines and a new substation. This project is funded through a concession loan and was approved in February 2018 by the GPNG. The project will be completed in 27 months. Training on grid operation and power distribution will also be provided to the PPL technical staff as part of the assistance.

Multilateral Banks

World Bank: The World Bank is formulating a new energy project which may include the following focus areas 1) Rehabilitation of PPL facilities, 2) Support for Least Cost Generation Options, 3) Establishment of MIS (management information system) and 4) Technical Assistance to PPL.

Asian Development Bank: ADB will soon start a new 10 Year program, Power Sector Investment Development Program with focus activities on increasing the grid penetration from 12% to approximately 19% by 2028 and replacing diesel generation with renewable energy sources in provincial centers. The investment program will also enhance operational efficiency of PPL and address institutional capacities, policy framework and facilitate private sector mobilization in off-grid areas.

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