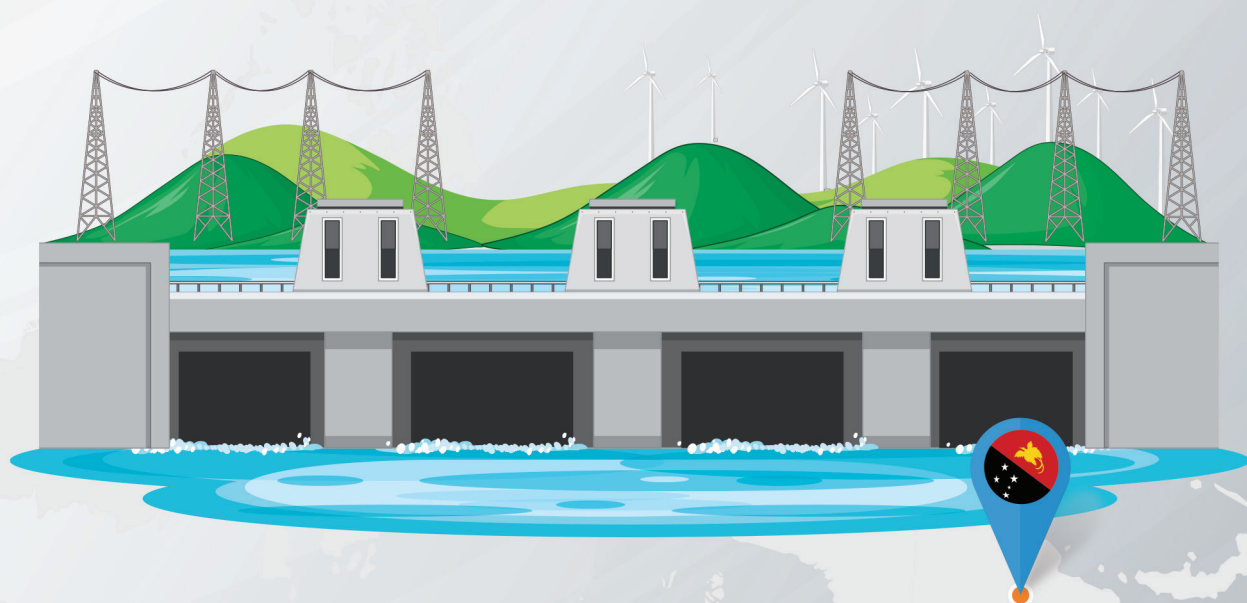




RAMU2 HYDROELECTRICITY PROJECT

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PAPUA NEW GUINEA



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Introduction

Electricity access remains an important issue in Papua New Guinea (PNG). Current estimates indicate that less than 15 percent of the country's estimated 9.1 million people have access to the electrical grid.^{1,2} An estimated 3.7 percent of people living in rural areas had access to electricity in 2010.³ Access in urban areas, home to only 13 percent of the population, stood disproportionately higher at 83.2 percent.⁴ PNG experienced one of the world's highest number of blackouts per month in 2015, averaging 40 per month.⁵ Furthermore, what electricity is available is expensive, as PNG has some of the highest electricity costs in the world, with average residential rates at USD 39 cents per kWh between 2010 and 2015.⁶ The mining industry, one of the main drivers of PNG's economy, largely depends on captive power stations for their operations, leaving fewer energy resources available for domestic use.⁷ According to Kumul Consolidated Holdings, "current mining and industrial demand not met from grid supplied power in the Momase region alone is already around 250MW and set to increase."⁸ The PNG Strategic Development Plan 2010-2030 (PNGSDP) projected a sharp increase in electrical demand with peak demand reaching 700MW by 2021 and increasing to over 1,400MW by 2030, while installed capacity was only 580MW in 2018.⁹ Increased industrial capacity would further strain PNG's limited electrical grids, indicating the need for investment in electricity generation throughout the country.

PNG has abundant, untapped hydropower resources. The 2016-2020 National Energy Policy estimates a potential of 15,000MW from large-hydropower projects (with capacity of 10 KW+) together with small plants, while assessments by the World Bank going back to 1994 estimate the gross potential of large-scale hydro as roughly 20,000 MW.¹⁰ To date, the country has harnessed less than 250MW in

¹ "Facilitating Renewable Energy and Energy Efficiency Project," UNDP, August 17, 2020, https://www.pg.undp.org/content/papua_new_guinea/en/home/projects/facilitating-renewable-energy-and-energy-efficiency-project.html; "Total Population by Sex (Thousands)," United Nations, accessed January 25, 2022 <https://population.un.org/wpp/DataQuery/>.

² Updated PNG census data is unavailable, with the deferral of the 2020 National Census. Estimates of the population are disputed: the UN Population Fund estimated 9.1 million in 2021, using an estimated 2 percent growth rate from 2015-2020, while PNG's National Statistical Office estimates a population of 9.9 million using a 3.1 percent annual population growth rate. UNFPA, "World Population Dashboard – Papua New Guinea," Accessed February 24, 2022 <https://www.unfpa.org/data/world-population/PNG>; National Statistical Office, "Population," Accessed February 24, 2022 <https://www.nso.gov.pg/statistics/population/>.

³ "Papua New Guinea Medium Term Development Plan, 2011-2015," Papua New Guinea Department of National Planning and Monitoring, October 2015, <http://extwprlegs1.fao.org/docs/pdf/png176393.pdf>.

⁴ "Access to Electricity, Urban (% of Urban Population) – Papua New Guinea," World Bank, Accessed January 7, 2022. <https://data.worldbank.org/indicator/EG.ELC.ACCS.UR.ZS?locations=PG>; "Urban Population (% of total population) – Papua New Guinea," World Bank, 2018 <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?locations=PG>.

⁵ Michael Kabuni, Kingtau Mambon, and Stephen Howes, "The Crisis of Governance in PNG's Power Sector," *DevPolicy Blog*, July 14, 2021, <https://devpolicy.org/the-crisis-of-governance-in-pngs-power-sector-20210714/>.

⁶ Michael Kabuni, Kingtau Mambon, and Stephen Howes, "The Crisis of Governance in PNG's Power Sector," *DevPolicy Blog*, July 14, 2021, <https://devpolicy.org/the-crisis-of-governance-in-pngs-power-sector-20210714/>.

⁷ "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, <https://www.adb.org/sites/default/files/linked-documents/CAPE-PNG-6-Energy-Sector-Assessment.pdf>.

⁸ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>.

⁹ "Papua New Guinea Development Strategic Plan 2010 -2030," Department of Planning and Monitoring, March 2010, <http://extwprlegs1.fao.org/docs/pdf/png176435.pdf>.

¹⁰ "National Energy Policy 2016-2020," Department of Public Enterprises and Department of Petroleum and Energy, 2015 (the policy specifies that the figure is quoted from an ADB Report of 2009, TA 4932-PNG Final Report: "PNG Power Sector Development Plan"); "Country Profile: Papua New Guinea," International Hydropower Association, <https://www.hydropower.org/country-profiles/papua-new-guinea>; "Renewable energy opportunities and challenges in the Pacific Islands region Papua New Guinea," IRENA – International Renewable Energy Agency, August 2013.

PNG Energy Profile 2018, IRENA, https://www.irena.org/IRENADocuments/Statistical_Profiles/Oceania/Papua%20New%20Guinea_Oceania_RE_SP.pdf; "Renewable energy opportunities and challenges in the Pacific Islands region – Papua New Guinea," International Renewable Energy Agency (IRENA), August 2013.

hydropower, representing 39.7 percent of the country's 580MW in installed generation capacity.^{11,12} Hydro-based generation will play a significant role in bridging this gap in PNG's energy needs.¹³

In 2011, the National Executive Council (the PNG Cabinet) decided to harness the potential of hydropower in PNG to meet increasing demand for electricity by developing the Ramu 2 Hydroelectricity project. The Ramu 2 project, a national-level building endeavor, will supply base load energy to the Wafi-Golpu and Ramu Nickel mines as well as people living within the Ramu system, one of PNG Power's three major power grids.¹⁴ The project is valued at about K3 billion (US\$ 939 million). According to Public Enterprise and State Investment Minister William Duma, the project is key to meeting the government's goal of providing "long-term least-cost power to the country."¹⁵ Shenzhen Energy Group President Pingyang Wang, the implementer of the project, claimed it would "increase the energy supply of PNG [and] technology for the business and energy sector... plus reliable, cheaper and renewable energy supply in PNG."¹⁶

The Ramu 2 project reflects the PNG government's intention to diversify the economy away from extractive sectors focused on the exploitation of mineral wealth towards broader growth, employment, and service delivery, a mission outlined in their "Vision 2050" plan.¹⁷ In addition, increased energy production is a key aspect of PNG's Medium Term Development Plan (MTDP), which aims for 70 percent of households to have access to the electrical grid by 2030 and outlines the beneficial effects of improved electrical infrastructure on potential GDP growth.¹⁸ The project meets goals identified in the National Strategy for Responsible Sustainable Development for Papua New Guinea (STaRS), which prioritizes green energy, economic diversification, and sustainable economic and livelihood activities.¹⁹

The project also matches with the move toward hydro (including mini-hydro) under the National Energy Policy 2016-2020 under the auspices of Kumul Power Limited (KPL) but may conflict with the policy's focus on off-grid development to accelerate rural electrification. PNG needs significant improvements in energy capacity to reach this level of demand while implementing broad access to electricity, and the proposed Ramu 2 hydropower project could play a key role in meeting these goals.

¹¹ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, accessed January 7, 2022, <https://businessdocbox.com/Government/84509753-Ramu-2-hydroelectric-power-project-expression-of-interest.html>; Mary Jane Maxwell, "A Case for Low-Cost, Renewable Green Energy to Power Up Papua New Guinea," Washington Business Dynamics, accessed January 7, 2022 <https://www.wbdynamics.com/a-case-for-low-cost-renewable-green-energy-to-power-up-papua-new-guinea-2/>.

¹² This was prior to the installation of the Edevu hydropower plant and two small gas-fired power plants in Port Moresby.

¹³ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

¹⁴ Peter Esila, "K3bil Power Plan," *The National*, September 21, 2018, <https://www.thenational.com.pg/k3bil-power-plan/>.

¹⁵ Peter Esila, "K3bil Power Plan," *The National*, September 21, 2018 <https://www.thenational.com.pg/k3bil-power-plan/>.

¹⁶ Peter Esila, "K3bil Power Plan," *The National*, September 21, 2018 <https://www.thenational.com.pg/k3bil-power-plan/>.

¹⁷ "Papua New Guinea Vision 2050," Department of Treasury, modified February 11, 2022 <https://png-data.sprep.org/dataset/papua-new-guinea-vision-2050>

¹⁸ Columbia University Sustainable Engineering Lab and Economic Consulting Associates, "Preparation of the National Rollout Plan and Financing Prospectus: Final Report," April 11, 2017, <http://upngcore.org/wp-content/uploads/2019/10/PNG-NEROP-FinalReport-2017-04-11.pdf>

¹⁹ "National Strategy for Responsible Sustainable Development for Papua New Guinea," Papua New Guinea Climate Change and Development Authority, January 2014 <https://www.cdda.gov.pg/document/national-strategy-responsible-sustainable-development-papua-new-guinea#:~:text=World%20Expo%202020-.National%20Strategy%20for%20Responsible%20Sustainable%20Development%20for%20Papua%20New%20Guinea.middle%20income%20country%20by%202030.>

Project Background

Connection to the Belt and Road Initiative

While Chinese and PNG officials do not appear to have directly linked Ramu 2 to the Belt and Road Initiative (BRI), the hydropower project clearly falls within the initiative's focus on energy projects, which accounted for 44 percent of BRI construction in 2019. Shenzhen Energy, the major contractor for the project, describes itself as "[actively] responding to the Belt and Road Initiative," including through the Ramu 2 project. The PNG government officially joined the BRI in June 2018 and announced that Shenzhen and Sinohydro had won the project bid in September 2018.

The Current Electricity Environment in Papua New Guinea

PNG Power Ltd (PPL) currently operates three major grids with a combined capacity of roughly 340 MW: the Port Moresby system (234 MW), the Ramu system (87 MW), and the Gazelle Peninsula system (19 MW).²² The transmission grid covers only some of the major urban and industrial centers and a large part of the country remains vastly underserved in its electricity needs. Nineteen isolated independent power grids serve 26 provincial centers not covered by these three major utility grids and primarily rely on high-cost diesel generation.²³

The Port Moresby system, which supplies the National Capital District (NCD) and parts of the Central province, has roughly 234 MW of installed capacity: 61 MW of installed capacity from four Rouna hydro stations along the Laloki river and the controlled water storage in the Sirinumu dam, a 30 MW from a diesel based system at Motukea intended to provide back up in peak hours, the aging 24 MW capacity oil-based plant operated by an independent power producer (IPP) at Kanudi, plus 103 MW capacity from two newly-installed gas-fired power plants outside the NCD.²⁴ The Ramu System, which serves the economic and industrial load centers in the Morobe region and the Highlands, has roughly 87 MW of capacity: 75 MW from Ramu Hydropower station (using the Yonki dam) and 12 MW from the Pauanda river hydropower station in the Western Highlands Province.²⁵ Outages and peaks demand are met (often inadequately and unreliably) by small hydropower-based IPPs and diesel plants in Madang, Lae, Kainantu, Goroka, Kundiawa, Mt Hagen, Mendi, and Wabag. The Gazelle Peninsula system, which supplies East New Britain Province, has 19 MW of capacity: 10 MW from the Warangoi hydropower station and 9 MW from two smaller diesel power plants (Ulagunan and Kerevat).²⁶

²⁰ Jane Nakano, "Greening or Greenwashing the Belt and Road Initiative?" Center for Strategic and International Studies, May 1, 2019, <https://www.csis.org/analysis/greening-or-greenwashing-belt-and-road-initiative>.

²¹ "PNG Reaps Benefits from Hosting APEC Summit," *Papua New Guinea Post-Courier*, December 17, 2018 <https://postcourier.com.pg/png-reaps-benefits-hosting-apec-summit/>.

²² "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, <https://www.adb.org/sites/default/files/linked-documents/CAPE-PNG-6-Energy-Sector-Assessment.pdf>

²³ "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, <https://www.adb.org/sites/default/files/linked-documents/CAPE-PNG-6-Energy-Sector-Assessment.pdf>

²⁴ "Papua New Guinea: Power Sector Development Plan," Asian Development Bank, April 2009 <https://www.adb.org/sites/default/files/project-document/67187/40174-png-tacr.pdf>; "Papua New Guinea makes progress in renewables but hydrocarbons projects remain the focus," Oxford Business Group, Accessed January 7, 2022 <https://oxfordbusinessgroup.com/overview/balance-power-while-steady-progress-made-renewables-focus-remains-hydrocarbons-projects>.

²⁵ "Papua New Guinea makes progress in renewables but hydrocarbons projects remain the focus," Oxford Business Group, Accessed January 7, 2022 <https://oxfordbusinessgroup.com/overview/balance-power-while-steady-progress-made-renewables-focus-remains-hydrocarbons-projects>

²⁶ "Papua New Guinea makes progress in renewables but hydrocarbons projects remain the focus," Oxford Business Group, Accessed January 7, 2022 <https://oxfordbusinessgroup.com/overview/balance-power-while-steady-progress-made-renewables-focus-remains-hydrocarbons-projects>

Due to gradual deterioration, the three grid systems require rehabilitations to improve the reliability of electrical services and avoid technical losses. While demand for electricity has increased with economic growth and a rising population, a lack of funding for upgrades and repairs have hampered PNG's electrical grid, although there have been some local rehabilitation and upgrade projects.²⁷ An independent assessment undertaken in the mid-2010s by the PNG energy sector and the ADB, found that the "sector in PNG is characterized by very low access, unreliable and expensive service, and infrastructure that is in need of rehabilitation."²⁸ Therefore, the country needs large scale investments to develop the electricity system to avoid further deterioration and to provide reliable and affordable electricity for the increasing population within both urban and rural areas.²⁹ During the 2018 APEC Summit in Port Moresby, Australia, the United States, Japan, and New Zealand announced a "Papua New Guinea Electrification Partnership" to fund energy infrastructure across PNG.³⁰ The partners recognized that a large portion of this supply would need to come from off-grid systems owing to geographic barriers that increase the cost of grid-based energy distribution. However, various PNG politicians and other public sector leaders favored major power projects and grid distribution, despite the high costs involved and potential non-viability and challenge of sustaining such costly infrastructure.³¹ The MTDP, a five-year rolling development plan for the country, outlines a broad plan for a national grid with an electricity transmission super corridor, which will require significant resources.³²

The lack of funding for maintenance, restoration, and upgrades of the existing system stems from three main issues: unpaid government debt owed to the PPL, high levels of electricity theft, and funding shortfalls. As a major user of the utility, government debts "[impact] the financial position of PPL to effectively sustain its operations," according to a source who spoke anonymously with PNG paper *The National*.³³

Government debts to the utility were an estimated K460 million (about USD \$130 million) in 2021.³⁴ Illegal connections by households cost K25 million (about USD \$7 million) per month in 2021. Funding shortfalls mean that PPL struggles to pay private electricity providers and upgrade its aging infrastructure. In 2020, after PPL failed to repay a K60 million debt to PASOE International Power Ltd, the IPP cut electricity to Lae due to PPL's failure to maintain the agreed repayment schedule.³⁵

²⁷ "Port Moresby Power Grid Development Project," Asian Development Bank, updated February 2022 https://www.adb.org/projects/43197-013/main?fbclid=IwAR3SVHHapt8-Tz3ABGeaSeRjauVitLgljtmYI_LTjmyrYMciuP5fzRTzmYM; "East New Britain Powers Up," *The National*, November 26, 2021 <https://www.thenational.com.pg/east-new-britain-powers-up/>.

²⁸ "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, <https://png-data.sprep.org/resource/energy-sector-assessment>

²⁹ "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, I

³⁰ "70% of PNG to have Electricity," *Post Courier*, November 18, 2018, <https://postcourier.com.pg/290694-2/>; Prime Minister of Australia, "Joint Statement to mark the announcement of a new multi-country Papua New Guinea Electrification Partnership," *Office of the Prime Minister of Australia*, November 18, 2018 <https://www.pm.gov.au/media/papua-new-guinea-electrification-partnership>.

³¹ Discussion with various officials.

³² Columbia University Sustainable Engineering Lab and Economic Consulting Associates, "Preparation of the National Rollout Plan and Financing Prospectus: Final Report," April 11, 2017, <http://upngcore.org/wp-content/uploads/2019/10/PNG-NEROP-FinalReport-2017-04-11.pdf>

³³ Michael Kambuni, Kingtom Mambon, and Stephen Howes, "The crisis of governance in PNG's power sector," July 14, 2021 <https://devpolicy.org/the-crisis-of-governance-in-pngs-power-sector-20210714/>

³⁴ Michael Kambuni, Kingtom Mambon, and Stephen Howes, "The crisis of governance in PNG's power sector," July 14, 2021 <https://devpolicy.org/the-crisis-of-governance-in-pngs-power-sector-20210714/>

³⁵ Janet Kari, "State's Failure to Settle Debt Plagues Lae with Blackouts," *Papua New Guinea Post-Courier*, May 5, 2021 <https://postcourier.com.pg/states-failure-to-settle-debt-plagues-lae-with-blackouts/>

However, PPL's power sector problem lies deeper than funding shortfalls and the country's widely-dispersed rural population. An ADB-funded assessment specified poor crisis governance and a failure to establish strong electricity institutions as key underlying problems.³⁶ The key energy sector institutions that govern the operations of the energy sector include the following: Department of Petroleum and Energy, Kumul Consolidated Holdings (KCH), Independent Consumer and Competition Commission (ICCC), PNG Power Limited (PPL), and the Western Province Power Limited, although some long planned institutional changes applied in 2021 removed PPL's regulatory powers.

National Energy Authority: A National Energy Authority Act was passed in April 2021 to establish the National Energy Authority, which will take steers of energy policy development and regulation, including assuming the regulatory functions previously provided by PPL.³⁷ The National Energy Authority was officially established on July 6, 2021.³⁸

Department of Petroleum and Energy (DPE): DPE was the agency responsible for technical regulation of the electricity sector and overall energy sector policy and planning until the National Energy Authority was established in legislation and gazette in July 2021. However, its capacity was limited by understaffing issues.³⁹

Kumul Consolidated Holdings (KCH): KCH (formerly IPBC, the Independent Public Business Corporation) is a holding company with ownership of all non-extractive national state-owned enterprises, including PPL. KCH participates in monthly review meetings in the energy sector; maintains management oversight of the companies, and may also take operational actions in companies that require support.⁴⁰

Independent Consumer and Competition Commission (ICCC): ICCC was the regulator for electricity tariffs until the establishment of the National Energy Authority, which is being established and taking on the staff of the former energy division of the Department of Petroleum and Energy, following the passage of the National Energy Authority Act 2021, which was passed in April 2021 and gazetted in July 2021. ICCC faced difficulty carrying out its mandate owing to limited capacity. In theory, ICCC employed revenue cap regulation (limiting the amount that firms can earn). As the sole retail service provider in the country, PPL is presently the only regulated entity.⁴¹ The ICCC also issued generation and distribution licenses to IPPs and mining companies.⁴²

PNG Power Limited (PPL): PPL is a "state-owned vertically-integrated electricity utility" that "is responsible for generation, transmission, distribution, and retail services in most grid-connected urban

³⁶ "CAPE PNG, Linked Document 6. ENERGY SECTOR ASSESSMENT," Asian Development Bank, <https://png-data.sprep.org/resource/energy-sector-assessment>.

³⁷ Columbia University Sustainable Engineering Lab and Economic Consulting Associates, "Preparation of the National Rollout Plan and Financing Prospectus: Final Report," April 11, 2017, <http://upngcore.org/wp-content/uploads/2019/10/PNG-NEROP-FinalReport-2017-04-11.pdf>; "Public Private Partnership Monitor: Papua New Guinea," Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>.

³⁸ Sarah Kuman and Gideon Pogla, "New PNG Energy Laws Commence," Allens, July 20, 2021 <https://www.allens.com.au/insights-news/insights/2021/07/new-png-energy-laws-commence/>.

³⁹ Columbia University Sustainable Engineering Lab and Economic Consulting Associates, "Preparation of the National Rollout Plan and Financing Prospectus: Final Report," April 11, 2017, 60, <http://upngcore.org/wp-content/uploads/2019/10/PNG-NEROP-FinalReport-2017-04-11.pdf>.

⁴⁰ "Public Private Partnership Monitor: Papua New Guinea," Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>.

⁴¹ "Our Portfolio: PNG Power Limited," Kumul Consolidated Holdings, accessed January 25, 2022, <https://www.kch.com.pg/what-we-do/our-portfolio/png-power-limited/>.

⁴² "Public Private Partnership Monitor: Papua New Guinea," Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>.

areas.”⁴³ In the past, the PPL also regulated electricity generation, effectively performing as both a near-monopoly power provider and regulator of prospective new entrants, although the regulatory powers had been transferred to the ICCC and the Department of Petroleum and Energy and now to the national Energy authority.⁴⁴

Western Province Power Limited: Western Province Power Limited is a wholly-owned subsidiary of PNG Sustainable Development Program Limited and provides generation, distribution, and retail electricity services in the Western Province, principally through small-scale power projects.⁴⁵

Project Profile and location

The Project is a proposed 180MW hydropower station on the Ramu River. The development of the Ramu 2 project is aimed at optimizing the utilization of water resources within the Yonki reservoir to meet increasing load demands and displace high-cost diesel generation.⁴⁶ Project management expects that Ramu 2 will increase Papua New Guinea’s electricity capacity by 36 percent.⁴⁷

The Ramu regional distribution grid, which includes the Yonki complex, services an area with approximately 4 million inhabitants, including the load centres of Lae and Madang in the Momase region; and Kainantu, Goroka, Kundiawa, Hagen, Tari, Mendi, and Wabag in the Highlands region. Electricity demand presently exceeds available generation capacity, resulting in frequent power outages in some centers.⁴⁸

Ramu 2 is located downstream of the existing Yonki hydroelectric complex in the Eastern Highlands Province of Papua New Guinea. The Yonki complex currently consists of two hydro facilities fed from the Yonki dam and reservoir: the 75MW Ramu 1 power station and the 18MW Yonki Toe of Dam hydropower station.⁴⁹

⁴³. “Public Private Partnership Monitor: Papua New Guinea,” Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>. ⁴⁴. Columbia University Sustainable Engineering Lab and Economic Consulting Associates, “Preparation of the National Rollout Plan and Financing Prospectus: Final Report,” April 11, 2017, <http://upngcore.org/wp-content/uploads/2019/10/PNG-NEROP-FinalReport-2017-04-11.pdf>; “Public Private Partnership Monitor: Papua New Guinea,” Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>.

⁴⁵. “Public Private Partnership Monitor: Papua New Guinea,” Asian Development Bank, December 2020, <https://www.adb.org/publications/public-private-partnership-monitor-png>.

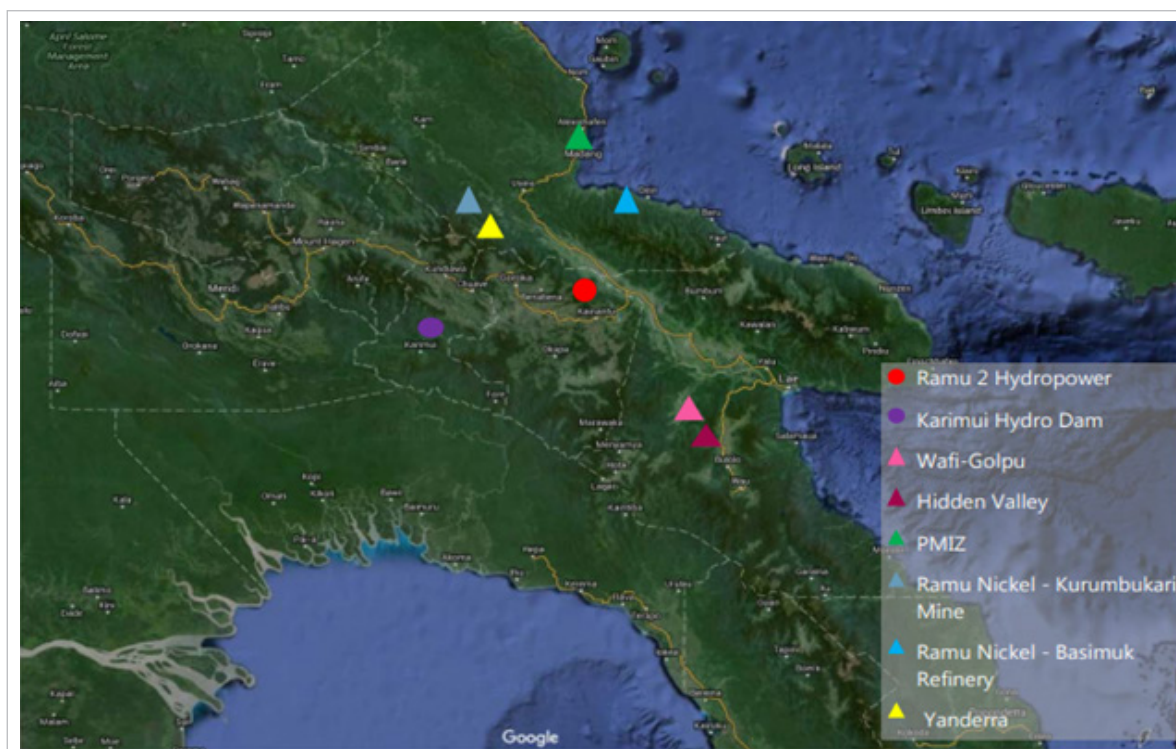
⁴⁶. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>.

⁴⁷. “Ramu 2 hydropower one of five renewable power projects to boost Papua New Guinea power generation,” *Business Advantage PNG*, December 17, 2015, <https://www.businessadvantagepng.com/ramu-2-hydropower-one-of-five-renewable-power-projects-to-boost-papua-new-guinea-power-generation/>.

⁴⁸. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>.

⁴⁹. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>.

Figure 1: PROJECT Location and Arrangements



Source: "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

The Ramu 2 project will develop the final 570 m head of water in the Ramu gorge between Ramu 1 tailrace Tunnel and the Ramu valley. The project is planned to meet the future power demands of local mines and associated processing plants, as well as household, commercial, and industrial demand between Lae and through the Highlands provinces, by way of the Ramu grid. According to reporting by *The National*, the project blueprint includes "the construction of a weir and storage facility, an eight-kilometer underground tunnel, a power station, a permanent camp facility, 34 kilometers of access roads, and 12 kilometers of 132kV transmission line to the nearest PNG Power Limited sub-station."⁵⁰ According to current projections, the Ramu 2 will boost the capacity of the Yonki complex by 194 percent, from 93 MW to 273 MW.⁵¹

According to KCH's Expression of Interest (EOI) document, the project includes "a new 471,000 m³ storage facility; three 60MW turbo-generators;" "30 km of new project access roads; a 7 km underground headrace tunnel; power station; 12 km of new 132kv transmission lines and various other temporary works."⁵² The EOI contains a detailed list of all the requirements for the project, including infrastructure requirements, power station infrastructure, transmission infrastructure, road infrastructure, and other miscellaneous infrastructure, including the permanent camp and temporary infrastructure needed for construction.⁵³

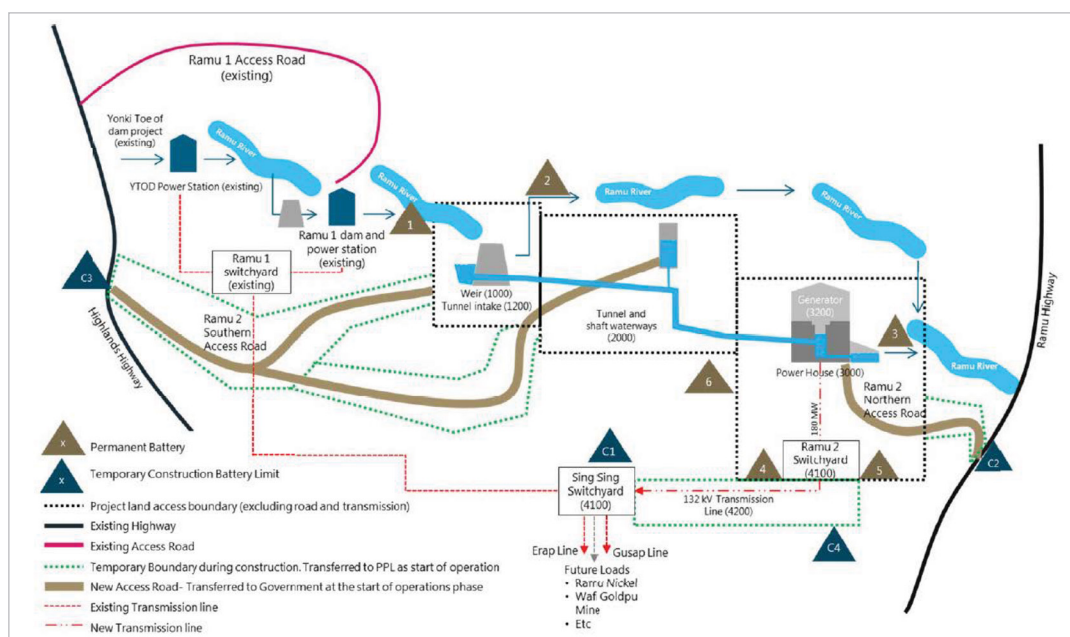
⁵⁰ "Hydro-power Project Under Review," *The National*, July 6, 2020, <https://www.thenational.com.pg/hydro-power-project-under-review/>.

⁵¹ Freddy Mou, "Revamped Yonki to Give Nation's Power Big Boost," *The National*, December 9, 2015, <https://www.looppng.com/content/revamped-yonki-give-nation%E2%80%99s-power-big-boost>.

⁵² "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

⁵³ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

Figure 2: PROJECT Location and Arrangements



Source: "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019
<https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

Project History

PB Power and URS conducted a pre-feasibility study on the project in September 2005 and an interim feasibility study in November 2006.⁵⁴ These projects do not appear to be publicly available. According to an evaluation of the studies in a joint JICA-PPL Master Plan for the Ramu System, these studies indicate "the project is technically feasible" and "accurate power and energy estimates are possible using long-term data."⁵⁵ No further action seems to have been taken until the National Executive Council (NEC) approved the project on 8th December 2011 (NEC Decision NG137/2011) and envisaged as a partnership between the Government's Independent Public Business Corporation (IPBC – later to become KCH) and PNG Energy Development Ltd, a company jointly owned by PNG Sustainable Development Ltd (PNGSDP) and Australia's Origin Energy Ltd.⁵⁶ This followed the presentation and approval of the PNG Development Plans and Development Strategies of the Government in Parliament as part of the 2010 Annual budget.⁵⁷ The NEC appointed IPBC as the manager of the project, with the Corporation actively seeking private investors to join them in developing the project.⁵⁸

However, the initial development and planning for the project remains unclear. Despite the approval of the NEC, there is a lack of publicly available information on how the project was initiated and brought before the NEC. There was no project concept note published for Budget Approval, and it is not shown in the budget papers. Furthermore, there is no available information regarding who identified the project site, how it was identified, who initiated and/or commissioned the project, or who submitted the

⁵⁴ "The Project for Formulation of Ramu System Power Development Master Plan and Lae Area Distribution Network Improvement Plan: Final Report: Part A: Power Development Master Plan of Ramu Power System," Japan International Cooperation Agency and Papua New Guinea Department of Petroleum and Energy, September 2016 https://openjicareport.jica.go.jp/pdf/12266508_01.pdf.

⁵⁵ Ibid.

⁵⁶ "Govt okays 2 gas-fired power plants," *The National*, December 9, 2011, <https://www.thenational.com.pg/govt-okays-2-gas-fired-power-plants/>.

⁵⁷ Kumul Consolidated Holdings, "Ramu 2: Full power ahead," *The IPBC Review*, July 2015.

⁵⁸ Kumul Consolidated Holdings, "Ramu 2: Full power ahead," *The IPBC Review*, July 2015; "Businesses invited to upgrade Ramu," *The National*, September 12, 2012, <https://www.thenational.com.pg/businesses-invited-to-upgrade-ramu/>.

project to the NEC for approval. In 2020, the Minister for State Enterprises revealed in Parliament that the Project “is one of the many unsolicited projects that come to PNG Power.”⁵⁹

Following the NEC approval and the appointment of IPBC as the manager of the project, IPBC published an expression of Interest (EOI) to the public for a contract to carry out a feasibility study for the proposed project. Project officials selected WPS | Parsons Brinckerhoff as the lead consultant in a joint submission with MWH Global & Kramer Ausenco following a tender evaluation process involving an expression of Interest (EOI) process issued to suitably qualifying respondents and subsequent Request for Tenders (RFT) process. IPBC issued an invitation to lodge a Commercial Consultancy proposal to the selected respondents on November 16, 2012 with a closing date for submission of January 25, 2013 which was subsequently extended to February 1, 2013.⁶⁰

On June 3, 2013, IPBC (now KCH) appointed U.S.-based engineering and design firm WPS to undertake a feasibility study of the Project. WPS in turn engaged Australia-based engineering company Douglas Partners (who had been involved in Ramu since 1967 when a Douglas Partners Principal was part of the original geological investigation team for a hydroelectric scheme) to carry out a pre-feasibility study and then a full-field investigation for a feasibility study carried out from 2013 to 2014.⁶¹ According to Douglas Partners, the study included: “geological mapping of the weir and power station sites and 8.25km headrace tunnel route...; seismic refraction traversing; soil and rock laboratory testing; [and] seismic risk assessment.”⁶²

IPBC received the results of the pre-feasibility study and the feasibility study on January 28, 2015.⁶³ The study “identified and confirmed the technical viability of the project and determined that there was no minimal technical risk associated with its construction; the preferred layout of the scheme; the topographical footprint; the preliminary dimensions; and the design of the project components.”⁶⁴ ThKCH received the studies’ results towards the 3rd quarter of 2015 and then presented them to the NEC, which approved the project to go ahead.⁶⁵

Following NEC approval, then-Minister for State Enterprises Ben Micah launched the project at Kainantu, Eastern Highlands Province on December 9, 2015. Conducted in collaboration with the office of the Governor for Eastern Highlands and the office of the Governor of Morobe Province, the launch was attended by local landholders and other provincial governors in addition to local businesses and the ambassadors from China, the United States, South Korea, and New Zealand.⁶⁶

Procurement Process and Timelines

Following the project launch, KCH started the procurement process using its own procurement guidelines. The process consisted of three phases: Phase 1: expression of interest, Phase 2: request for proposals, Phase 3: financial close. Environmental and land management advisors Golder and Tanorama ran lease and land access negotiations in parallel to the procurement process. The KCH EOI stated that

⁵⁹ Isaac Nicholas, “Extreme Caution on Ramu 2 Power Deal,” *Post Courier*, August 27, 2020, <https://postcourier.com.pg/extreme-caution-on-ramu-2-power-deal/>.

⁶⁰ Kumul Consolidated Holdings. Port Moresby. “Ramu 2: Full power ahead” The IPBC Review. July, 2015

⁶¹ Kumul Consolidated Holdings. Port Moresby. “Ramu 2: Full power ahead” The IPBC Review. July, 2015

⁶² Douglas Partners, “Ramu 2 Hydro Electric Scheme, PNG,” accessed January 7, 2022 <https://www.douglaspartners.com.au/assets/downloads/PNG-Ramu-2-Hydro-Electric-Scheme.pdf>

⁶³ Kumul Consolidated Holdings. Port Moresby. “Ramu 2: Full power ahead” The IPBC Review. July, 2015

⁶⁴ Ibid

⁶⁵ Ibid

⁶⁶ Ibid

negotiations were to be finalized over the course of 2016.⁶⁷ However, in 2018 Minister Duma stated negotiations were not yet completed but that “consultations have been done already.”⁶⁸

Phase 1: Expression of Interest

Phase I commenced on February 29, 2016, when KCH issued an Expression of Interest (EOI) for the Project on its website. This step required the preparation and submission of a response by suitably qualified and experienced Proponents with the capability, capacity, and commitment to provide the services and deliver the works. KCH scheduled the closing date for all submissions for March 28, 2016 and also advertised in major newspapers in Papua New Guinea and the region. KCH set April 25, 2016 as the date for the selection of the successful proponent who would be advised by Letter from KCH.⁶⁹

Within 3 days of publishing the EOI, 65 proponents responded to the EOI. According to KCH, they provided these proponents with access to the virtual data room. The EOI process closed on March 2, 2016, 26 days before the scheduled date of March 28, 2016.⁷⁰

At the close of the EOI, the seven submissions were assessed by KCH, Advisian (a global consulting firm that was appointed as the manager of the project transaction), and Norton Rose Fulbright (the project’s legal advisers).⁷¹ The assessment process identified the top three proponents (in order of ranking): 1) A consortium of Posco Daewoo, Korea Western Power, Daelim Energy, and Hyundai; 2) Sinohydro Corporation Limited; and 3) Shenzhen Energy Group Co. Ltd.⁷²

Minister for State Enterprises William Duma announced the results of the EOI assessment to the public. He said, “Kumul Consolidated Holdings is following a process of **‘full transparency and due diligence’**. For a project of this size such processes, while time consuming and thorough, are mandatory. Inevitably we will be in a position to give the National Executive Council a detailed, thorough and informed recommendation regarding the Ramu 2 Project.”⁷³ Following the announcement of the EOI assessment, the next steps were: a Request for Proposal (RFP) issued on May 6, 2016 and scheduled to close October 28, 2016; announcement of the preferred development proponent scheduled for December 16, 2016; close of financial arrangements scheduled for March 2017.⁷⁴

Phase 2: Request for Proposals

The RFP included draft documentations, such as a power purchase agreement (PPA) and an implementation agreement. The RFP required offers to be fully costed and binding. During Phase 2, shortlisted proponents were required to “engage in interactive sessions with KCH and its advisors,”

⁶⁷ Kumul Consolidated Holdings, “Ramu 2 Hydroelectric Power Project – Expression of Interest,” March 2019, Ramu 2: EOI Document / February 2016 - Kumul Consolidated Holdings (kch.com.pg)

⁶⁸ “Moronbe Shares in Ramu 2 Blessings,” *The National*, September 27, 2018 <https://www.thenational.com.pg/morobe-shares-in-ramu-2-blessings/>

⁶⁹ “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019, 15, <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

⁷⁰ “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

⁷¹ “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

⁷² “Ramu 2 Progress Update,” Kumul Consolidated Holdings, accessed January 26, 2022 <https://www.kch.com.pg/ramu-2-progress-update/>

⁷³ “Ramu 2 Progress Update,” Kumul Consolidated Holdings, accessed January 26, 2022 <https://www.kch.com.pg/ramu-2-progress-update/>

⁷⁴ “Ramu 2 Progress Update,” Kumul Consolidated Holdings, accessed January 26, 2022 <https://www.kch.com.pg/ramu-2-progress-update/>

including workshops conducted by KCH where proponents could discuss aspects of their design and seek clarification on project details and requirements.⁷⁵ Proponents were also required “to provide mark-ups and commentary on the documentation package.” At the end of Phase 2, proponents submitted proposals and KCH selected a final proponent.⁷⁶

Phase 3: Financial Close

KCH and its advisors selected the SinoHydro and Shenzhen Energy Group consortium after their assessment.⁷⁷ In January 2017, following the conclusion of negotiations and financial closure of the project, KCH recommended that the National Executive Council (NEC) approve SinoHydro and the Shenzhen Consortium to finance and construct the Ramu2 hydropower project.⁷⁸ Minister Duma publicly announced that SinoHydro and Shenzhen Energy had won the contract for the Ramu 2 Hydroelectricity project in September 2018.⁷⁹

The parties signed a commercial agreement following the NEC approval, and the next step was for the consortium to work closely with PNG and related financial institutions to complete the financing arrangements and start construction.⁸⁰

Delays affected the consortium’s plans to start construction in early 2017, with reports citing either the change in government or doubts regarding the estimated demand for the project.⁸¹ Despite projections indicating that new mining projects would consume much of the power generated by Ramu 2, (Wafi-Golpu), the project had not secured necessary investment, suggesting that projections overstated the market for power generated by the Ramu 2 Project. Different interests implemented various interim measures and alternative power sources to ensure more reliable power supply for Lae, including a contentious gas turbine bought from Israel that never worked, a controversial coal-fired power station, and two more sustainable initiatives by the energy company Oil Search, a 30 MW biomass powered plant and a 10 MW solar plant.⁸²

In May 2017, PPL stated that negotiations were ongoing. PPL Chairman Andrew Ogil noted “This is an important project that we’re taking time to look at so it’s fair for Papua New Guineans and

⁷⁵. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

⁷⁶. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>

⁷⁷. “Ramu 2 set to flood the country with Energy,” *Post Courier*, September 26, 2018, <https://postcourier.com.pg/ramu-2-set-flood-country-energy/>; “K3.31bil Hydro Project to Start,” *The National*, August 8, 2019, <https://www.thenational.com.pg/k3-31bil-hydro-project-to-start/>

⁷⁸. “Ramu 2 set to flood the country with Energy,” *Post Courier*, September 26, 2018, <https://postcourier.com.pg/ramu-2-set-flood-country-energy/>; Xinhua, “Chinese Enterprise Contracts PNG Ramu 2 Hydro Electricity Project,” March 4, 2021 <https://en.imsilkroad.com/p/320071.html#:~:text=In%20January%20of%202017%2C%20a%20consortium%20formed%20by%20hard%20work%2C%20a%20commercial%20agreement%20was%20finally%20signed>

⁷⁹. “Ramu 2 set to flood the country with Energy,” *Post Courier*, September 26, 2018, <https://postcourier.com.pg/ramu-2-set-flood-country-energy/>

⁸⁰. “Energy,” Kumul Consolidated Holdings, <https://www.kch.com.pg/ramu-2-progress-update/>

⁸¹. “US\$2b Ramu 2 Hydro Power Project Stalled,” *Post Courier*, August 1, 2019, <https://postcourier.com.pg/us2b-ramu-2-hydro-power-project-stalled/>; “The Coal Agenda: Mayur Resources and the Push to Start a Coal Industry in PNG,” *CELCOR and Jubilee Australia*, September 2020, <https://png-data.sprep.org/system/files/The-Coal-Agenda-Full-Report-WEB.pdf>

⁸². “The Coal Agenda: Mayur Resources and the Push to Start a Coal Industry in PNG,” *CELCOR and Jubilee Australia*, September 2020, <https://png-data.sprep.org/system/files/The-Coal-Agenda-Full-Report-WEB.pdf>; “PNG Biomass green power project under threat in Papua New Guinea,” *Business Advantage PNG*, May 2021, <https://www.businessadvantagepng.com/png-biomass-green-power-project-under-threat-in-papua-new-guinea/>

fair on the contractors.”⁸³ Despite PPL’s comments, construction of the project continued to face delays. The NEC only approved the PPA and Implementation Agreement in January 2019.⁸⁴

In May 2019, Prime Minister Peter O’Neill’s government was ousted in a vote of No Confidence motion in Parliament and James Marape became the new Prime Minister.⁸⁵ After the change in government Sasindran Muthavel replaced William Duma as the Minister for State Enterprises.⁸⁶ In August 2019, Shenzhen Group executive members told the *Post Courier* that “the delay in kick starting the project which was originally planned to begin construction on the project in 2017 was now taking its toll.”⁸⁷

In August 2020, the *Post Courier* reported that Eastern Highlands Governor Peter Numu had asked Minister Muthavel why he was not consulted about the project’s negotiations. Minister Muthavel replied that, while the Governor should have been consulted, the sheer scale of the Ramu 2 project has forced the government to exercise “extreme caution.”⁸⁸ According to Minister Muthavel, the project’s projected value of K3.5 billion dwarfed PPL’s valuation of K1 billion, leading the national government to prioritize protecting PPL’s “in terms of its operation and in terms of its reliability,” while also emphasizing Ramu 2’s potential benefits for the people and provincial governments of Eastern Highlands and Morobe.⁸⁹

On October 21, 2020, the Minister for Mining and member for Kainantu claimed the hold-up in the Project construction was due to PPL’s delay in endorsing the PPA (one of the major requirements in the project Agreement) and that the mines might by-pass PPL in securing their own power, suggesting a clear lack of coordination between the Ministers and the relevant Agents and stakeholders of the project.⁹⁰

On February 24, 2021, Minister Duma said that PPL had signed a conditional PPA with Shenzhen Energy and “as soon as they organize their financing, we will start.”⁹¹ The Minister described it as a “regional legacy nation-building project” which has been carefully considered by the Government for many years, and “long outliving the Wafi-Golpu mine”, while refuting claims in the Australian media that it would increase PPL’s debt level.⁹²

On March 29, 2021, Mr. Flagon Bekker (briefly the Managing Director for PPL, which had eight Managing Directors over six years) said PPL had “signed a conditional PPA with a consortium” (meaning Shenzhen Group and SinoHydro) and was “looking at financial close in the next three to four months, then

⁸³. Cedric Patjole, “Ramu 2 Hydro Contract Negotiations on going,” *Loop PNG*, May 8, 2017, <https://www.looppng.com/business/ramu-2-hydro-contract-negotiations-going-58449>.

⁸⁴. “K3.31bil Hydro Project to Start,” *The National*, August 8, 2019, <https://www.thenational.com.pg/k3-31bil-hydro-project-to-start/>.

⁸⁵. Michael Kabuni, “PNG’s Fluid Politics: Winners and Losers from O’Neill to Marape,” *Devpolicy Blog*, June 19, 2019, <https://devpolicy.org/pngs-fluid-politics-winners-and-losers-from-oneill-to-marape-20190619/>.

⁸⁶. Jerome Ikuavi, “Muthavel Takes Office,” *Post Courier*, June 18, 2019 <https://postcourier.com.pg/muthavel-takes-office/>.

⁸⁷. “US\$2b Ramu 2 Hydro Power Project Stalled,” *Post Courier*, August 1, 2019, <https://postcourier.com.pg/us2b-ramu-2-hydro-power-project-stalled/>.

⁸⁸. Isaac Nicholas, “Extreme Caution on Ramu2 Power Deal,” *Post Courier*, August 27, 2020 <https://postcourier.com.pg/extreme-caution-on-ramu-2-power-deal/>.

⁸⁹. *Ibid.*

⁹⁰. “The Ramu 2 Hydro Power Project is one of the Biggest Projects To Date, Says Tuke,” *PNG Business News*, October 21, 2020 <https://www.pngbusinessnews.com/articles/2020/10/the-ramu-2-hydro-power-project-is-one-of-the-biggest-projects-to-date-says-tuke> ; “Ramu 2 project vital, says Tuke,” *Post Courier*, October 19, 2020, <https://postcourier.com.pg/ramu-2-project-vital-says-tuke/> <https://postcourier.com.pg/ramu-2-project-vital-says-tuke/>.

⁹¹. Helen Tarawa, “Government Signs K3.3bil Power Deal,” *The National*, February 24, 2021 <https://www.thenational.com.pg/government-signs-k3-3bil-power-deal/>.

⁹². “Ramu a legacy project, says Duma,” *Post Courier*, February 25, 2021 <https://postcourier.com.pg/ramu-a-legacy-project-says-duma/>.

construction will be starting fairly early on the ground.”⁹³ However, even as the PPL moved toward financial close, Bekker noted the success of the project “depends on our private sector resources... We need offtakers.”⁹⁴ This suggests that PPL did not have a market for power from the project without the private sector entities like the Wapu Golpu, Ramu Nickel, and K92 mines.

Project Stakeholders

Shenzhen Energy Group is the ‘Operating Entity’ for the project. Based in Guangdong, China, Shenzhen Energy is “principally engaged in the development, generation, purchase, and distribution of various types of traditional and new energy.”⁹⁵ The major shareholder of Shenzhen Energy (43.91 percent of shares) is the Shenzhen State-Owned Assets Supervision and Administration. Huaneng Power International, whose ultimate parent company (Huaneng Group) is one of the largest state-owned energy enterprises in China, holds another 25.02 percent of shares.⁹⁶ Shenzhen Energy also describes itself as “[actively] responding to the Belt and Road Initiative” including through the Ramu 2 project.⁹⁷

Project Cost & Financing

Widely quoted estimates projected the cost of the project at US\$902 million (about K3.5 billion) in 2015.⁹⁸ The source of this figure is supposedly from the feasibility studies carried out in 2013-2014, but this cannot be confirmed as both the pre-feasibility and the feasibility studies have not been published by the PNG Government, KCH, or any of the public stakeholders on any of their websites. The websites of WPS Brinkerhoff also do not have the studies available. By 2018, this estimated cost had increased to USD \$939 million.⁹⁹

The project is structured as an Independent Power Producer (IPP) basis and will be arranged as a Build, Own, Operate, Transfer (BOOT) model under a Public Private Partnership (PPP) arrangement.¹⁰⁰ The project life is estimated to be 100 years. Under the (BOOT) arrangement, Shenzhen Energy will build the facility and operate it for 25 years after completion of construction to recoup their expenses.¹⁰¹ During the 25 years that Shenzhen Energy will operate and own the facility, Shenzhen Energy will pay an annual lease payment of K350,000 per annum to the Landowner Companies.¹⁰² After 25 years, the claimed duration of the PPA, Shenzhen Energy will hand over the facility to the Asset Entity (KCH, traditional landowners, and provincial governments) without any associated debt.¹⁰³ The Asset Entity

⁹³. Ibid.

⁹⁴. “Ramu 2 hydro will be a gamechanger for Papua New Guinea, says PNG Power MD,” *PNG Business News*, December 14, 2021, <https://www.businessadvantagepng.com/ramu-2-will-be-a-nation-building-project-says-png-power-md/>.

⁹⁵. “Shenzhen Energy Group Co., Ltd.,” *Reuters*, accessed January 16, 2022, <https://www.reuters.com/companies/000027.SZ>.

⁹⁶. “Company Introduction 公司介绍,” Shenzhen Energy, accessed January 6, 2022, <https://www.sec.com.cn/abouts.do>.

⁹⁷. “Company Introduction 公司介绍,” Shenzhen Energy, accessed January 6, 2022, <https://www.sec.com.cn/abouts.do>.

⁹⁸. “Ramu 2 hydro will be a gamechanger for Papua New Guinea, says PNG Power MD,” *Business Advantage PNG* <https://www.businessadvantagepng.com/ramu-2-will-be-a-nation-building-project-says-png-power-md/>.

⁹⁹. “A Year in Review: 2018,” Kumul Consolidated Holdings, accessed January 26, 2022, <https://www.kch.com.pg/wp-content/uploads/2020/06/KCH-Annual-Review-2018.pdf>

¹⁰⁰. “Ramu 2 Hydroelectric Power Project – Expression of Interest,” Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>.

¹⁰¹. “Morobe Shares in Ramu 2 Blessings,” *The National*, September 27, 2018, <https://www.thenational.com.pg/morobe-shares-in-ramu-2-blessings/>.

¹⁰². Joe Gurina, “Landowners to Benefit from Ramu 2 Hydropower Project,” *PNG Bulletin*, February 23, 2021, <https://thepngbulletin.com/lifestyle/technology/landowners-to-benefit-from-ramu-2-hydropower-project/#:~:text=Minister%20Duma%20said%20under%20the,the%20State%20retains%2060%20percent>.

¹⁰³. “Energy,” Kumul Consolidated Holdings, accessed January 26, 2022, <https://www.kch.com.pg/key-impact-projects/energy/>.

will then own the Facility and operate it for 75 years. According to KCH, this agreement represents the first time traditional landowners will assume equity in a power project.¹⁰⁴ In February 2021, Minister Duma said the share for the provincial governments of Eastern Highlands and Morobe and traditional landowners is 10 percent each.¹⁰⁵

The financing arrangements for the project cannot be mapped out as the RFP report and the Commercial Agreement (including the PPA and the implementation Agreements) are not published publicly. The only publicly available document is the KCH EOI which is published on the KCH website. In the absence of information from the implementation agreement, as well as the PPA, determining and mapping out the main contractors and key entities in the project and their relationships remains difficult.

The structure shown in Figure 3 is derived from the KCH EOI Document and shows the primary shareholders and operators in the project.¹⁰⁶ It is difficult to ascertain the financing Structure and the Project structure due to lack of information available publicly.

PPL will pay to take up the power from the 'Operating Entity' for the duration of the PPA agreement.¹⁰⁷ INA is assuming the PPA is for 25 years as indicated by the BOOT arrangement under the PPP model adopted for the project. According to the KCH EOI document, the PPA follows the form used by PPL for other projects in PNG as adapted for the Project. It covers aspects including: supply period (in years); commencement date; capacity; contract price (which may incorporate both a capacity payment and energy payment); metering; billing and payment; interconnection obligations and responsibilities; testing and commissioning regime; operating and maintenance obligations; force majeure; change in law; default and termination events; governing law (which will be the laws of PNG); dispute resolution; and usual lender protection provisions/direct agreement.¹⁰⁸

The project has not been implemented to date. According to the KCH EOI, the Implementation Agreement may include: "obligations of the selected proponent, including those relating to provision of development bonds, finance, construction, operation and maintenance; access arrangements and site risk; required approvals, authorizations and insurance and any Government concessions; the sub-lease (or equivalent arrangement) between the Asset Entity and the Operating [Company]; and... retention of ownership provisions."¹⁰⁹

¹⁰⁴. "Ramu 2 Progress Update," Kumul Consolidated Holdings, accessed January 26, 2022 <https://www.kch.com.pg/ramu-2-progress-update/>.

¹⁰⁵. Joe Gurina, "Landowners to Benefit from Ramu 2 Hydropower Project," *PNG Bulletin*, February 23, 2021, <https://thepngbulletin.com/lifestyle/technology/landowners-to-benefit-from-ramu-2-hydropower-project/#:~:text=Minister%20Duma%20said%20under%20the,the%20State%20retains%2060%20percent>.

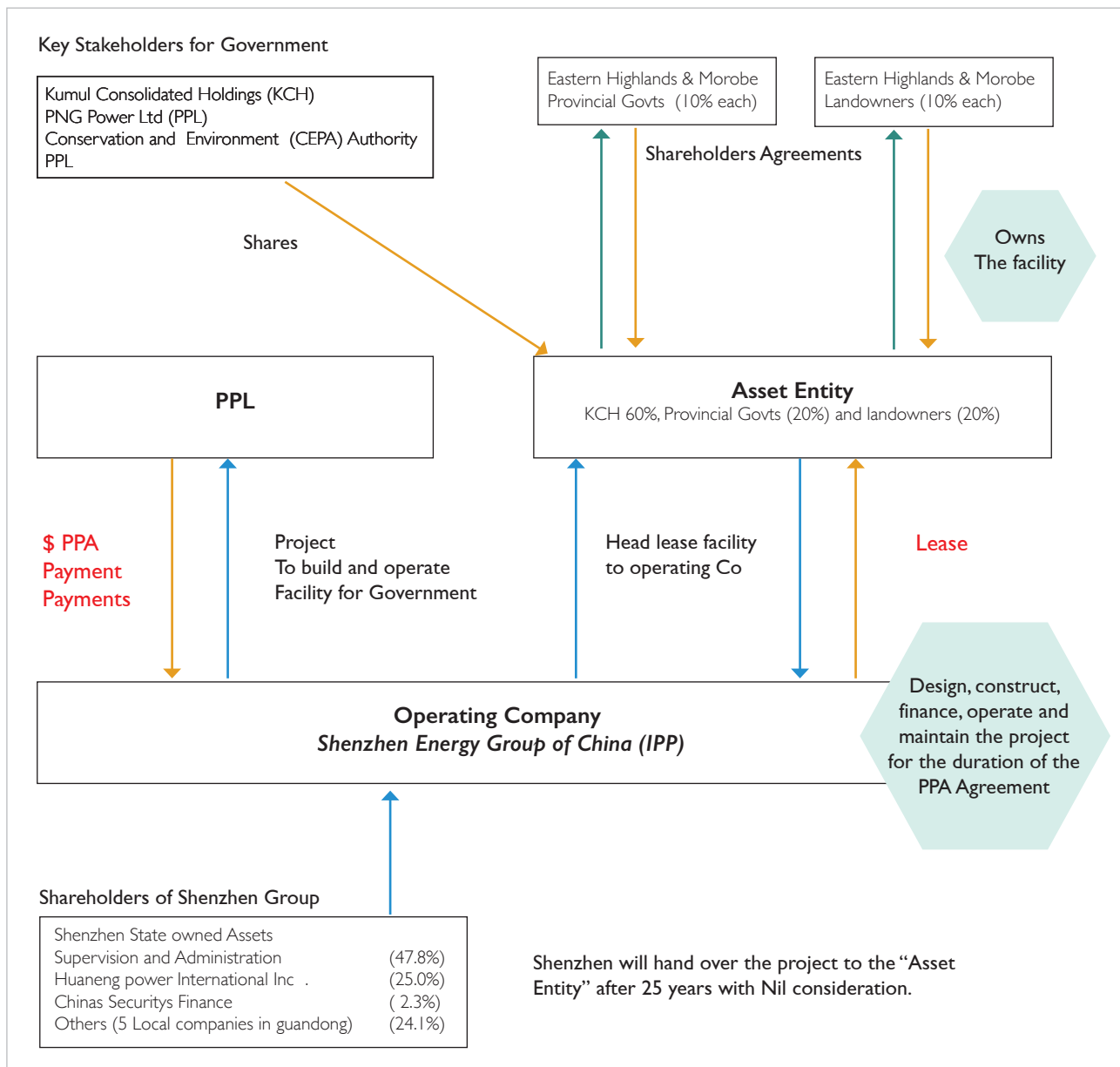
¹⁰⁶. "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

¹⁰⁷. "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>, March 2019, 11,

¹⁰⁸. "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

¹⁰⁹. "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

Figure 3: Shareholder Structure and Relationships

Source: Various¹¹⁰

¹¹⁰ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Documents.pdf>

Governance Gaps

Project Transparency

According to Transparency International, hydroelectric projects in developing countries face increased risk to corruption due to their high cost, generating opportunities for bribes and kickbacks.¹¹¹ Key decisions in the strategic planning phase, including site selection, exhibit vulnerabilities to political influence and collusion.¹¹² The lack of available documentation and apparent confidentiality clauses raise concerns that the Ramu 2 project has faced these exact issues. The Ramu 2 project was an unsolicited project. There was no project concept paper submitted for Budget Approval and NEC Approval, and there was no public involvement or opinion in the project, but the project will have significant economic and environmental effects. Furthermore, it appears that project officials did not consult with the Provincial Governments during the planning process.

As noted earlier, there is also a severe lack of publicly available information and documents regarding the Ramu 2 project. Unavailable or missing documents include the Submission to the NEC on Project Identification and Project Site, the pre-feasibility and feasibility studies, environmental impact assessments, RFP, financial and project agreements, PPA, and lease agreements. To date, the only document disclosed publicly is the Expression of Interest released by KCH.

The Papua New Guinea Institute of National Affairs (INA) made several requests for interviews with KCH officials to obtain information on the procurement process, project structure, financing, and project implementation structure, but KCH denied these requests. A KCH legal officer, Mr. Erastus Kamburi, responded with the following statement via email: "The Agreement ... severely limits the purpose for which KCH may disclose any information and disclosure in the nature you have requested for may render KCH susceptible to been in breach of the Project Agreement. That as it may, I regret to advise that we may be of little assistance to you."

The INA did arrange an interview with Martine Teine, First Assistant Secretary, Investment Divisions of the Department of Treasury. However, Mr. Teine could not disclose any information on the project due to confidentiality clauses in the Agreement between KCH and Shenzhen Group.

Environmental Impacts

Environmental and land management advisors Golder Associates and Tanorama conducted the Environmental and Social Impact Assessment (ESIA) and the Environmental & Social Management Plans (ESMP) in parallel with the procurement process.¹¹³ These two processes were conducted in parallel to meet the timelines in the Government's development strategies and the planned financial close of the project in 2017, and more importantly to match the start-up of new mining projects in the Region targeted to be off-takers for Ramu 2 (the Wafi Golpu project and the Ramu Nickel project).

According to the IPBC quarterly review of 2015, an environmental impact assessment (EIA) was conducted as part of the feasibility study in 2013. The EIA, like the feasibility study report, is not readily

¹¹¹ Victoria Jennett, "Corruption in the Hydropower sector," U4, August 1, 2007, 2, <https://www.u4.no/publications/corruption-in-the-hydropower-sector.pdf>.

¹¹² Jennett 3.

¹¹³ "Ramu 2 Hydroelectric Power Project – Expression of Interest," Kumul Consolidated Holdings, March 2019 <https://www.kch.com.pg/wp-content/uploads/2019/03/Ramu-2-EOI-Document.pdf>.

available. However, the 2016 JICA-PPL Master Plan notes that “foreseeable environmental impact seems to be small because the dam is low in height and has a regulated poundage and long tunnel.”¹¹⁴ The Quarterly Review 2015 says that “the ESIA work reviewed available background information; the laws, standards, and guidelines (PNG and international) that the project will need to comply with when developing the project. The likely environmental and social issues that may prevent the development of the project. Site visits were undertaken to understand the project area better and identify the vegetation types present and the people who lived in the project area. The environmental and social team worked closely with the project design engineers enabling environmental and social conditions on site to be integrated into the projects preliminary design.”¹¹⁵

Golder’s website indicates positive social and economic outcomes for local communities but stated that “a proposed 180 MW run-of-river hydroelectric power station in the Eastern Highlands presented complex environmental and social challenges, which needed careful consideration for permitting and project design... we identified possible changes in the aquatic ecosystem of the Ramu River due to the construction and operation of the weir, intake structure and outfall.” Golder states they implemented “thoughtful and appropriate management and mitigation measures, including design changes to facilitate fish passage past the weir, and a long-term water quality management plan for early detection of exceedances of guideline values.”¹¹⁶

INA tried several times to arrange an interview with the Conservation, Environment Protection Authority (CEPA)¹¹⁷ to confirm these reports and determine the extent of the ESIA studies conducted for the project and whether due process was followed. CEPA did not respond.

Project Feasibility

The assessment on the economic and financial benefits of Ramu 2, which was conducted in 2015 according to a joint JICA-PPL Master Plan for Ramu System Power Development, is not publicly available.¹¹⁸ The Australian government has raised concerns that costs associated with Ramu 2 could cripple PPL and leave PNG beholden to the Chinese government. According to Australian estimates, the project could cost as much as USD \$2 billion, making it one of the most expensive hydroelectric projects in the world.¹¹⁹ Costs of power from the project may also exceed national averages. According to Minister Duma, the generation tariff for the project is 11.79 U.S. cents/kWh, while the World Bank

¹¹⁴ “The Project for Formulation of Ramu System Power Development Master Plan and Lae Area Distribution Network Improvement Plan: Final Report: Part A: Power Development Master Plan of Ramu Power System,” Japan International Cooperation Agency and Papua New Guinea Department of Petroleum and Energy, September 2016 https://openjicareport.jica.go.jp/pdf/12266508_01.pdf.

¹¹⁵ Kumul Consolidated Holdings, “Quarterly Review 2015”

¹¹⁶ “Assessing the Environmental and Social Impacts of a Hydropower Station in Papua New Guinea,” Golder, accessed January 15, 2022 <https://www.golder.com/project/assessing-the-environmental-and-social-impacts-of-a-hydropower-station-in-papua-new-guinea/>.

¹¹⁷ The Conservation and Environment Protection Authority (CEPA), previously the Department of Environment and Conservation (DEC), was established in 1985. Its mission (approved by the National Executive Council on 22 August 1989) is to “ensure natural and physical resources are managed to sustain environmental quality and human well-being.” “PNG Conservation and Environment Protection Authority,” Papua New Guinea Environmental Data Portal, accessed January 27, 2022, <https://png-data.sprep.org/group/1>.

¹¹⁸ “The Project for Formulation of Ramu System Power Development Master Plan and Lae Area Distribution Network Improvement Plan: Final Report: Part A: Power Development Master Plan of Ramu Power System,” Japan International Cooperation Agency and Papua New Guinea Department of Petroleum and Energy, September 2016 https://openjicareport.jica.go.jp/pdf/12266508_01.pdf.

¹¹⁹ Ben Packham, “Warning Over PNG’s Chinese Hydro Project,” *The Australian*, February 12, 2021, <https://www.theaustralian.com.au/world/warnings-over-pngs-chinese-hydro-project/news-story/7dbbfdb37e0edc6e2dd5d7c0fdfe117>.

calculated the levelized cost of energy (LCOE) of hydropower in PNG at 6.5 U.S. cents/kWh.¹²⁰ Based on the JICA-PPL Master Plan, previous assessments of the project's feasibility seem to have been based on an energy cost of 4 U.S. cents/kWh, nearly a third of the current cost.¹²¹

As noted throughout the development of Ramu 2, the project depends upon private actors such as the Ramu Nickel and Wafi-Golpu mines to serve as offtakers.¹²² However, statements by local private sector associations suggest that there is insufficient demand for power produced by the project. The President of the Lae Chamber of Commerce and Industry, Mr John Bryne (who represents the private sector in the province) said that there was a "lack of proper planning for the project. Two aspects of the project that were poorly planned were (i) the timing and (ii) allocation of regular and adequate funding for maintenance of existing power infrastructure in Lae." He emphasized that "Lae currently has enough power supply to meet the current power demands of its consumers. The issue is not so much the amount of power supplied, but the efficiency of the service that is currently provided."¹²³

This is particularly concerning because, according to Mr. Teine, KCH requested that Treasury give a "guarantee for the Project to pay for any shortfalls in PPLs (scheduled) payments to the operating company under the BOOT arrangement," a claim that was also reported in Australian media.¹²⁴ There was no consultation and agreement with Treasury before the PPA was signed. According to Mr. Teine, KCH, the appointed managers of the Ramu 2 project, usually bypass the Department of Treasury and reported directly to the NEC due to the KCH Act, The KCH Act, formerly known as the IPBC Act Amendment of 2007, allows KCH extensive financial autonomy from the Treasury, including the ability to borrow as a private company.

Project Management and Oversight

The PPP Policy and PPP Act outline the legal and institutional framework for PPP procurement. The PPP Policy, prepared with considerable support from the ADB, was already in place when the NEC appointed KCH (IPBC) to manage the project. Parliament passed the PPP Act (unopposed) in 2014 and the Act came into force; it was established to both encourage major PPP investment and partnerships, such as the power sector, which had seen deficient and uncompetitive investment and partnerships in the past, and to ensure that the process was conducted in a transparent manner in future, leading to improved service provision and lower costs in 2018. However, this PPP Act is yet to be implemented and still requires amendments to strengthen it, which have yet to be released for public comment.¹²⁵ In 2018, PPL management approved the "Independent Power Producer and Major Infrastructure Policy" which stresses the importance of solicited projects and avoiding undue political influence in the project

¹²⁰ William Duma, "Press Statement: Signing Ceremony of Ramu 2 Project Implementation Agreement Between the Independent State of Papua New Guinea and Shenzhen Energy Co.," February 23, 2021 <https://twitter.com/ShaneMcLeod/status/1364362555276230659>; "Delivering Affordable, Sustainable, and Reliable Power to Papua New Guineans," World Bank, July 2018, <https://documents1.worldbank.org/curated/en/100651574343960624/pdf/Delivering-Affordable-Sustainable-and-Reliable-Power-to-Papua-New-Guineans-Key-Challenges-and-Opportunities-in-the-Power-and-Domestic-Gas-Sectors.pdf>.

¹²¹ "The Project for Formulation of Ramu System Power Development Master Plan and Lae Area Distribution Network Improvement Plan: Final Report: Part A: Power Development Master Plan of Ramu Power System," Japan International Cooperation Agency and Papua New Guinea Department of Petroleum and Energy, September 2016 https://openjicareport.jica.go.jp/pdf/12266508_01.pdf.

¹²² Peter Esila, "K3bil Power Plan," *The National*, September 21, 2018, <https://www.thenational.com.pg/k3bil-power-plan/>.

¹²³ Dialogue with John Byrne, President, Lae Chamber of Commerce and Industry, November 7, 2021.

¹²⁴ Ben Packham, "Warning Over PNG's Chinese Hydro Project," *The Australian*, February 12, 2021, <https://www.theaustralian.com.au/world/warnings-over-pngs-chinese-hydro-project/news-story/7dbbfdb37e0edc6e2dd5d7c0fdfe117>.

¹²⁵ "Public-Private Partnership Monitor: Papua New Guinea," Asian Development Bank, December 2020, <https://www.adb.org/sites/default/files/publication/687846/public-private-partnership-monitor-png.pdf>.

process.¹²⁶ It is unclear whether these principles were applied to the Ramu 2 project. Generally, KCH followed its own legislation (IPBC Act, as amended in 2015) and its own procurement policies and manual for this project (see Figure 4) because the IPBC (KCH) Act gives them the power to undertake projects using their own policies and procurement guidelines. In doing so KCH has bypassed other policies and legislations, including the PPP Policy, PPP Act, and PPL's "Independent Power Producer and Major Infrastructure Policy."

The government, its regulators and SOEs need to coordinate these Policies and Acts to eliminate such loopholes and clearly outline roles of relevant government actors. During the interview INA also enquired about status of the institutional arrangements under the PPP Act and the PPP Policy, in particular the establishment of the PPC Centre. Mr Teine said the Unit has not been established yet as the Minister for National Planning and Monitoring wants the Unit situated under the Department of Planning and Monitoring. Apparently, the Department of Planning and Monitoring is currently drafting recommendations to the NEC for amendments that would reflect this structure.

Other Issues

Project Delays

The Project has continued for more than 10 years since the NEC gave its approval for the project in 2011, more than 5 years after the launching of the project in 2015, and more than 4 years after Shenzhen Energy planned to begin construction in 2017. Over this time, costs have increased beyond the reported budget of US\$902 million (K3.5 billion) to \$939 million.¹²⁷

On November 8-11, 2021, INA staff members Doreen Philip and Tuari Gaudi travelled to Lae, Morobe Province and up the Markham valley to the vicinity of the project site in the adjoining Ramu valley. The purpose of the trip was to visit the project site to observe the project's status and to seek the views of the customary landowners, the Morobe Provincial Government, and the private sector on the project. The visit to the project site found no evidence of any construction work.

The team met with two landowner groups and President of the Lae Chamber of Commerce separately. According to the visit report, all three stakeholders agreed that they basically welcome the project because the country needs such investment to provide an increased and constant supply of power to households and businesses, thereby improving their lifestyle and operations respectively.¹²⁸ In addition, they indicated, that it would provide employment and spill over benefits to landowners and businesses operating in its vicinity.

¹²⁶ "Independent Power Producer and Major Infrastructure Policy," PNG Power Limited, 2018, https://www.pngpower.com.pg/images/misc/Policy_For_IPP_and_major_infrastructure_Projects.pdf.

¹²⁷ "A Year in Review: 2018," Kumul Consolidated Holdings, accessed January 26, 2022 <https://www.kch.com.pg/wp-content/uploads/2020/06/KCH-Annual-Review-2018.pdf>.

¹²⁸ Dialogue with John Byrne, President of the Lae Chamber of Commerce, November 8, 2021; Dialogue with Markham Landowner Group, November 9, 2021; Dialogue with Yonki Landowner Representative, November 9, 2021.

Conclusion

The paper has tried to outline the Ramu 2 project based on the available information, mainly accessed from media sources, the limited accessible official sources (such as annual Budget documents), the KCH EOI and the IPBC (now KCH) Quarterly review, 2015. Beyond these documents, there is a severe lack of available documentation and information from official sources.

The available information and documents reveal a severe lack of transparency and lack of coordination between the stakeholders. Opaque transactions and tight control of information under one organization and its Minister have hampered public oversight, significantly raising project risks. It is clear that, although a further upgrade or additional stage of the Ramu hydro is widely considered a logical option for meeting the growing demand for power in the Lae-Highlands to Madang electricity catchment, some stakeholders and power analysts have major concerns regarding the nature and cost of the Ramu 2 project as agreed by GoPNG. These concerns include the terms of power purchase agreement, the level of immediate demand for power generated by the project, and the obligation upon PPL to purchase the supply generated, regardless of commitment by major customers to buy that power from PPL. This structure could increase the cost of the project for PPL and endanger PPL's viability. Finally, the unit cost of power for the project's corporate and household consumers, already high by global standards, has sparked worries over Ramu 2's utility.

Civil society, the private sector, and international organizations should urge the PNG government to implement the new policies and legislation related to public-private partnerships, power generation, and the need to reduce the costs of generation and reticulation and therefore also user charges to business and household consumers. In addition, the government should strengthen, not undermine, PPL's long-term viability. Furthermore the PNG government must honor their own commitments to freedom of information and avoid the confidentiality agreements included in the Ramu 2 PPA and many of the other financing agreements and contracts between Chinese SOEs and PNG SOEs.

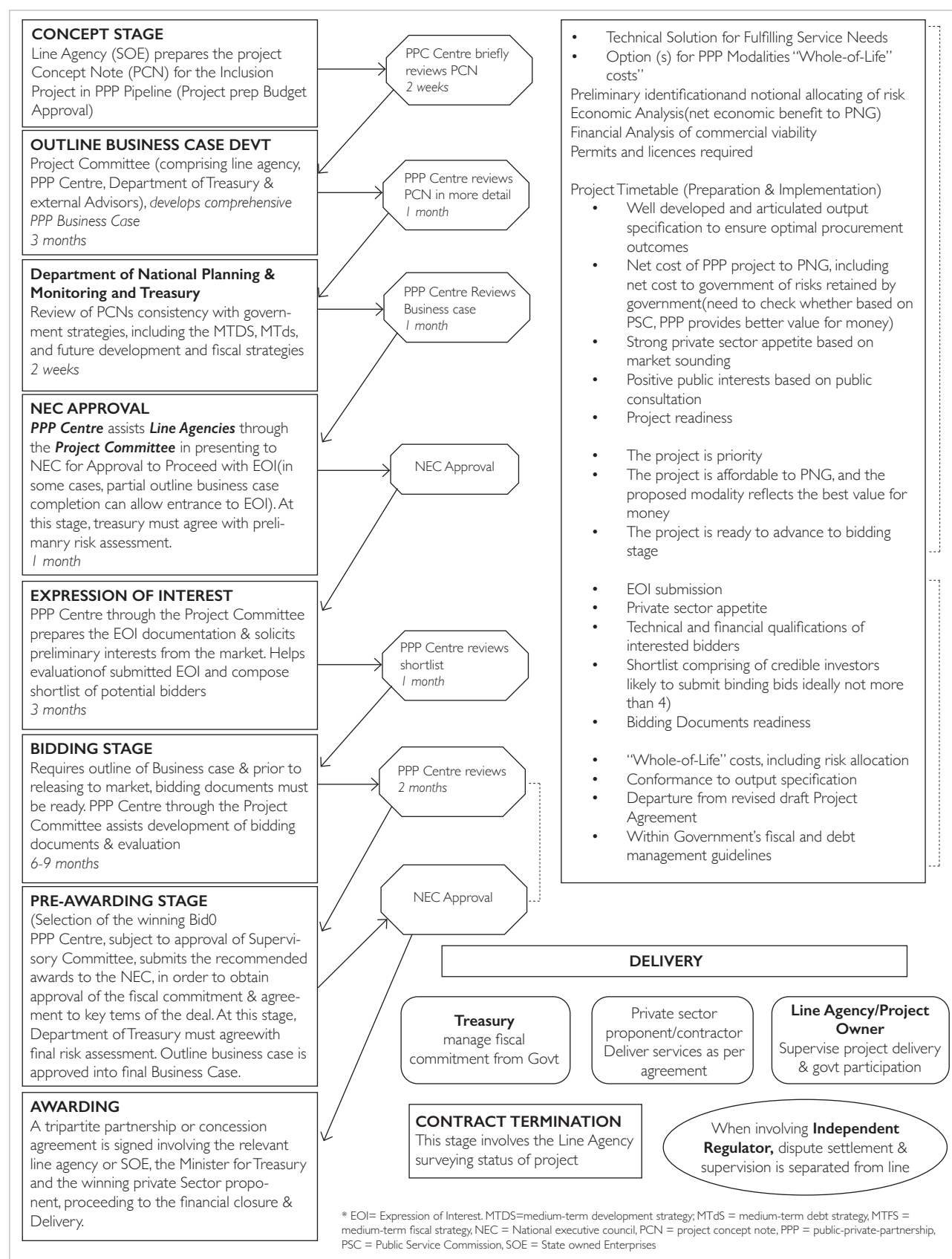
The Ramu 2 Project has been planned and subject to a process of decision-making, review, financing and contracting for over 10 years. Nevertheless, with major issues over cost, risks, energy demand and adherence to policies and laws raised, the Government and its respective SOEs and regulators, in dialogue with professional legal and technical advice, should promptly and transparently further review the project and the details, equitability, and implications of the PPA on the viability and sustainability of PPL, KCH and the Government, the risks and responsibility for the debt and the cost impact on current and prospective consumers, with a view to PPA revision, cessation, or other action to safeguard PNG's best interests.

The PNG government and project stakeholders need to learn from this experience, particularly the role and pressure seemingly applied by the Chinese Government, notably through the Embassy, to conclude an agreement with the participating Chinese corporations. This agreement has major cost and risk implications for PPL and the State; runs contrary to technical advice offered to GoPNG; and might not align with the best interests of the PNG government, its institutions, or the public.

As stated, the option of upgrading the Ramu hydro facility was long considered the logical next step for the provision of increased power for the Lae-Highlands market from renewable sources, so long as the option maintains viability and competitiveness in the medium to long term. Clearly, Chinese corporations have extensive experience in the construction of hydro-power plants in China and around the world, but others do also, and the cost and financing, and PPA arrangement needed compete with other hydro power contractors or PPP partners, while considering other energy options in the short term. The issue, as it stands, does not lie with the selection of a Chinese company. Rather, the selection

process itself lacked the necessary transparency and apparent competitiveness, leading to a contract that could jeopardize the potential viability for the PPL and potentially impose a major cost burden on the State and power consumers alike.

Figure 4: Shareholder Structure and Relationships



Source: Asian Development Bank. "Public-Private-Partnership Monitor". Papua New Guinea. 2020

<https://www.adb.org/publications/public-private-partnership-monitor-png>

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BRI Monitor is a collaborative effort by five civil society organizations in Southeast Asia and the Pacific: the Institute for Democracy and Economic Affairs (IDEAS) of Malaysia, Stratbase Albert Del Rosario Institute (ADRI) of the Philippines, Sandhi Governance Institute (SGI) of Myanmar, the Institute of National Affairs (INA) of Papua New Guinea and the Future Forum of Cambodia to promote transparency and accountability in major infrastructure projects funded through the Belt and Road Initiative (BRI) in the region.

These organizations have studied the regulatory environments governing these large infrastructure projects in respective countries, including public procurement, official development assistance, public private partnership (PPP), and more, to identify regulatory gaps. They have each researched a set of case studies to identify implementation gaps and governance gaps. Each case study assesses the level of transparency based on almost 40 data points, from basic project information to the tendering process to project completion. Last but not least, each organization maps out the structure of the projects in question in order to identify domestic and international entities involved in the project and to understand the degree of public financial exposure resulting from each project.

This website is intended to be a platform for the publication of our research outputs and as a knowledge repository. We also hope that the website can be used as a platform for knowledge sharing and a tool to advocate better governance of major infrastructure projects in the region.

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