



Project Information Document (PID)

Concept Stage | Date Prepared/Updated: 26-May-2020 | Report No: PIDC29343

**BASIC INFORMATION****A. Basic Project Data**

Country Philippines	Project ID P173728	Parent Project ID (if any)	Project Name Agus-Pulangi Hydropower Complex Rehabilitation Project (P173728)
Region EAST ASIA AND PACIFIC	Estimated Appraisal Date Apr 19, 2021	Estimated Board Date Jun 25, 2021	Practice Area (Lead) Energy & Extractives
Financing Instrument Investment Project Financing	Borrower(s) The Republic of the Philippines	Implementing Agency National Power Corporation, Power Sector Assets and Liabilities Management Corporation	

Proposed Development Objective(s)

To enhance the reliability of clean energy generation in Mindanao by rehabilitating the Agus-Pulangi Hydropower Complex.

PROJECT FINANCING DATA (US\$, Millions)**SUMMARY**

Total Project Cost	300.00
Total Financing	300.00
of which IBRD/IDA	300.00
Financing Gap	0.00

DETAILS**World Bank Group Financing**

International Bank for Reconstruction and Development (IBRD)	300.00
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Environmental and Social Risk Classification

Concept Review Decision



Substantial

Track II-The review did authorize the preparation to continue

Other Decision (as needed)

B. Introduction and Context

Country Context

1. **The Philippines experienced high economic growth in recent years and its medium-term growth outlook is positive.** The Philippines is a middle income, archipelagic nation in Southeast Asia with a population of about 105 million with strong economic growth of over 6 percent in recent years. It is increasingly characterized by robust inclusive economic growth, healthy current account surplus, adequate international reserves, and a sustainable fiscal position. As a result, it earned an investment grade credit rating, and is poised to cross the threshold from lower-middle income country (LMIC) status to upper-MIC status within the next three years. The economy is expected to continue to grow at solid rates. Investment is expected to be the key driver of growth, which is expected to rise on the back of public investment and the timely implementation of the government's infrastructure and human capital investments. However, the impacts of COVID-19 could batter the economic growth momentum. Direct impacts of COVID-19 outbreak disruptions may include weakened domestic investment, consumption of goods and retail and transport services from Enhanced Community Quarantine, unemployment, and low foreign remittances.

2. **Philippines exposed to the highest level of climate change and natural disaster hazard risk in the world is also prone to conflict hazards, particularly in Mindanao** according to the INFORM Global Risk Index. The country is exposed to high risks of typhoons, earthquakes and landslides, volcano and wildfires, water scarcity, tsunami, as well as urban, coastal and river flooding hazards¹. This exposure poses a principal threat to economic growth and inclusion. The ongoing conflict threats have stifled development and poverty reduction in parts of Mindanao, where the Project is located. It is reported that roughly two-fifths of the country's poor live in Mindanao, and over 50 percent of the population in the former-Autonomous Region in Muslim Mindanao (ARMM) are poor. While Mindanao as a whole has been experiencing development owing to the strong growth in Davao, the conflict-affected areas of Mindanao have been left behind. In February 2019, after many years of peace talks, the historic ratification of the Bangsamoro Organic Law (BOL) led to the establishment of the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) which replaced ARMM. There is extremely high expectation for tangible and visible improvements to the lives of the Bangsamoro people in the provinces of BARMM during the three-year transition period.

Sectoral and Institutional Context

3. **The power sector in the Philippines is mostly privately owned and operated.** Power generation has become highly competitive and new investments are made exclusively by the private sector as independent power producers (IPPs). GoP continues to own some older oil-fired power plants and some key hydropower assets, especially in Mindanao. The competitive Wholesale Electricity Spot Market (WESM) has been operating for more than a decade in Luzon and the Visayas. However, the WESM accounts for only 10 percent of all traded power. Transmission remains state-owned, but

¹ Global Facility for Disaster Reduction and Recovery (2020). ThinkHazard: Philippines. See: <http://thinkhazard.org/en/report/196-philippines>



new investments and operations have been assigned to a private concessionaire on a long-term basis. The Power Sector Assets and Liabilities Management Corporation (PSALM) holds the remaining government assets in the sector including the transmission assets, which has been concessioned to a consortium of private investors, and hydropower facilities which have not yet been privatized. The National Power Corporation (NPC) used to own all the generation and transmission assets, but its responsibility has been reduced after the Electric Power Industry Reform Act (EPIRA) of 2001 to managing the hydropower facilities that are yet to be privatized and assisting rural electrification. The Luzon and Visayas grids are interconnected and the undersea interconnection to the Mindanao grid is under construction. A spot market for Mindanao was launched in June 2017 but has not been operationalized.

4. **The Philippines has made great strides in achieving a highly liberalized energy market, but it also has one of the highest electricity prices in the region** – almost twice the rates in Indonesia (US\$8.06/kWh) and 40 percent more than those in Thailand (US\$10.17/kWh). In 2018, average retail tariff in the Philippines was over US\$14.07/kWh². As many supply companies are subsidiaries of distribution utilities, cross-ownership gives distribution firms the incentive to purchase power from its affiliated generation firms, resulting in higher prices than a competitive market would yield. In addition, IPPs are typically built with long-term “take-or-pay” under which the IPPs are guaranteed to be paid a set price over many years.

5. **The Philippines has a rapidly growing electricity sector with coal-fired power plants dominating power generation capacity addition in recent years and expected to play a major role in the future.** The installed power generation capacity increased from 15.7 gigawatts (GW) to 22.7 GW while electricity consumption went up from 49.2 terawatt-hours (TWh) to 77.8 TWh in the past decade. Coal-fired installed capacity increased from nearly 6 GW to above 8 GW between 2015 and 2017 owing to government’s ‘technology neutral’ and cost-sensitive approach to meet growing power demand. In recent years, coal power generation capacity accounted for about 35 percent out of the total installed capacity, coal power plants generated 46.8 TWh, or nearly 50 percent of electricity produced in the Philippines in 2017. The DOE pursues to develop a technology-neutral power sector in line with the so-called “70-20-10” generation proportion, which aims at achieving: (i) 70 percent baseload capacity from coal, geothermal, big hydropower, natural gas, nuclear and biomass; (ii) 20 percent mid-merit capacities from natural gas; and (iii) 10 percent peaking capacities from oil-based plants and variable renewable energy (VRE) such as solar photovoltaic (during daytime) and wind. According to the Philippine Energy Plan (PEP) 2017-2040, some 43.7 GW of power capacity will need to be added by 2040 to support continued electrification, increases in consumption by households as a result of higher income levels, and economic growth.

6. **Mindanao power system grew from about 1.7 GW in 2003 to nearly 3.6 GW in 2017 but yet, with 74 percent electrification rate, electricity access is a priority** -particularly if compared to approximately 94 percent in Luzon and Visayas. Between 2003 and 2017, coal-fired power plants accounted for about 70 percent of the capacity additions, with the bulk of coal capacity being added in the past three years. While the existing total installed capacity of nearly 3.6 GW is largely sufficient to supply the current demand in Mindanao, the least-cost expansion plan calls for additional 3 GW of capacity by 2030 to serve the projected rapid demand growth at around 7 percent per annum from 9.5 TWh in 2017 to 48.3 TWh in 2040³. A number of factors contribute to the projected rapid rise in demand: (i) continued electrification, (ii) increase in consumption as a result of higher income levels and economic growth, and (iii) the planned submarine cable interconnection of the Mindanao grid to the Luzon-Visayas grid and potential integration of the Mindanao WESM into the Luzon-Visayas WESM.

² Based on Meralco’s 2018 IEC study (Regional/Global Comparison of Retail Electricity Tariffs). See: https://meralcomain.s3.amazonaws.com/images/ckeditor-documents/2018_IEC_Study_Updated.pdf?null

³ Source: Mindanao Energy Plan 2018-2040. DOE in partnership with Mindanao Development Authority.



7. **The Agus-Pulangi Hydropower Complex (APHC) has been the backbone of the power generation system in Mindanao for decades and the GoP has requested the Bank to support its rehabilitation.** Most of the APHC plants have been in operation for more than three decades and badly require rehabilitation to extend their operational life, recover capacity and energy output, and enhance safety of dams and reliability of supply⁴. APHC is still owned by PSALM and operated by NPC due to the fragility and conflict in Mindanao. The APHC is slated for rehabilitation in the Mindanao Energy Plan 2018-2040 and in the GoP's *Build, Build, Build* program. In the immediate future, increases in power capacity in Mindanao, likely dominated by coal-fired generation, will further increase base load capacity of the system and will need to be accompanied by adequate regulating (hydropower) capacity to provide load-following and other ancillary services. In the medium term, increased energy generated from APHC will reduce the need to rely on further development of coal-fired power plants. To achieve this, APHC needs to be rehabilitated to enhance its reliability by restoring the rated capacity of the plants, extending their operating life and ensuring the safety of the power complex.

Relationship to CPF

8. **The Project is fully aligned to the Country Partnership Support (CPF) for the period 2019-2023.** The CPF's overarching objective is to reduce core constraints to inclusive growth and poverty reduction in relation to people, competition and key vulnerabilities. Specifically, the rehabilitation of APHC is highlighted in the CPF as a project that contributes to *CPF Objective #6: Improve efficiency of infrastructure services in selected areas under CPF Focus Area #2: Competitiveness and Economic Opportunity for Job Creation*. As described in the CPF, the Project will generate greener, more affordable power and enhanced system reliability in Mindanao and eventual implementation of public-private partnership (PPP), in accordance with legislation that has mandated privatization of power generation assets in the country.

9. **The Project also contributes to CPF Objective #8: Increased availability of services in conflict-affected areas.** The CPF underscores the importance to resolve the nexus between poverty and vulnerability particularly in Mindanao, which is home to a quarter of the country's population representing nearly 40 percent of the poor. As the World Bank Group seeks to deepen its engagement on Mindanao peace and development during the CPF period, the Bank's footprint in BARMM through the Project is expected to have a positive impact.

C. Proposed Development Objective(s)

To enhance the reliability of clean energy generation in Mindanao by rehabilitating the Agus-Pulangi Hydropower Complex.

Key Results (From PCN)

10. The PDO indicators defined to measure the project outcomes are the following:

1. Total number of unplanned power outages due to deficiency of APHC (Number)
2. Generation capacity of hydropower rehabilitated under the project (MW)

⁴ Prominent issues requiring attention include the need to rewind the old windings of the generators, replace outdated auxiliary equipment, fix water leakages and oil leakages, and improve the management of sediment accumulation in the reservoirs.



3. Dam safety against hydrological and geological risks (improved/not improved)⁵

D. Concept Description

11. **The APHC consists of seven run-of-river hydropower plants (HPP) with a total installed capacity of about 1,000 MW.** Six of the plants (Agus I, II, IV, V, VI and VII HPPs) are located on the Agus River that flows for 36.5 km from Lanao Lake to Iligan Bay. Agus I and II HPPs are located in Lanao del Sur, one of the BARMM provinces. In fact, Agus I HPP is located in the city of Marawi, where the five-month-long siege took place in 2017⁶. The seventh (Pulangi IV HPP) is the first of five plants envisaged on the Pulangi River, which is the longest river in the province of Bukidnon with 320 kilometers length. Out of the 1,000 MW of nameplate installed capacity, only 600-700 MW is currently available, partly due to limitations of the ageing equipment. The major technical shortcomings that reduce reliability are problems in the cooling systems, increased vibration of turbine-generators' shafting and varying degrees of modernization of mechanical and electrical auxiliary equipment, as well as control and protection systems. Without rehabilitation, the HPPs are expected to deteriorate further until they soon become obsolete. The proposed Project will finance the rehabilitation of some or all of the plants, based on their conditions, needs of Mindanao power system, and economic and financial viability. Since the six Agus HPPs are developed in a cascade, it is necessary to assess the priority, grouping and sequencing of rehabilitation and optimize their operation.

12. **The design of the Project will consider hydrological constraints whereby the Balo-i Floodplains situated midstream of Agus River is prone to flooding.** This low-lying area between Agus II HPP and Agus IV HPP is another factor hampering the Agus HPPs to operate at full capacity. The Agus HPPs were developed expecting flood protection dikes to be built to allow the rated design discharge to be used for generation. However, the dikes reportedly could not be built due to the volatile security situation. Therefore, the operation of Agus II HPP, with a rated design discharge of 210 m³/s, is capped at plant discharge of 120 m³/s, thereby reducing its output from 180 MW to about 100 MW⁷. This also limits the flows to the downstream cascade, thereby also reducing energy generated by Agus IV, V, VI and VII HPPs. This constraint is expected to be removed in the near future since the Asian Development Bank (ADB) is assisting the Department of Public Works and Highways (DPWH), responsible to develop the dikes, to prepare a flood risk management master plan with a planning horizon up to 2050. Removing this constraint would allow a significant increase in the generation output provided from the existing HPPs along the Agus cascade and the possibility to further increase generated energy from the HPPs. ADB advised that it expects to obtain approval for a project to finance the construction of dikes along the Agus River by December 2021.

13. **The APHC Rehabilitation Project uses an Investment Project Financing instrument** and will potentially be implemented in a multiphase programmatic approach⁸. It will be structured in the following three components:

⁵ The baseline and target of this indicator will be further described with text as the technical studies further determine the specific work to be accomplish in each HPP to improve their safety.

⁶ While the plant was not damaged, the cost to reconstruct the decimated city and the lives of the people is estimated to be in the order of US\$1 billion.

⁷ Department of Environment and Natural Resources issued an Environmental Compliance Certificate in 1992, after most Agus HPPs had been commissioned, for NPC to develop and operate the HPP cascade subject to operating conditions, including: (i) Agus II HPP is not operated at full capacity to prevent flooding of the Balo-i Plains, and (ii) NPC to build dikes downstream of Agus II HPP to prevent flooding, amongst other conditions.

⁸ The CPF envisages a phased approach to rehabilitation. While a multiphase programmatic approach is likely given that the Project may involve up to seven HPPs with differing rehabilitation needs, the specific modality, including Series of Projects, will be considered through the studies.



Component 1. Rehabilitation of APHC power units and infrastructure (Indicative estimate: US\$290 million)

- This component will finance rehabilitation works and equipment to enhance the reliability of APHC by restoring the rated capacity of the plants, extending their operating life and ensuring the safety of the power complex. This could cover addressing, through repairs or replacements, equipment issues that currently constrain production and availability, efficiency improvements of the generating units, upgrading the plant auxiliary systems and the supervisory control and data acquisition (SCADA) systems with the latest digital technology, addressing dam safety issues and/or restoring effective instrumentation. If dikes are built to remove (or reduce) the discharge flow constraints from Lake Lanao, this component could even finance an expansion of the existing installed capacity through increased water availability as potential flooding in the Balo-i flood plain would be mitigated⁹. The specific rehabilitation works will be defined through the preparation of technical studies currently underway. Technical findings of key rehabilitation works and measures to be considered under this component are as follows: (i) rehabilitation or repairs of main generation equipment (including major rehabilitation work on some of them), (ii) replacement of auxiliary equipment and control systems by state-of-the-art technologies to help improve plant operational efficiency and reliability, real-time control and dispatch, protection, and scheduling of maintenance, (iii) careful inspection of civil structures, (iv) effective remedial action of sedimentation issues at Pulangi IV HPP¹⁰, (iv) inspection of penstocks to assess their rehabilitation requirements., and (v) safety aspects to bring the plants in line with good international industry practices.

Component 2. Technical Assistance (Indicative estimate: US\$10 million)

14. This component will finance the cost of technical assistance to support NPC and PSALM in project management and implementation. Key consultancy contracts financed under this component will include the owner's engineer to support NPC in the implementation of Component 1. Activities for capacity building and technical assistance will also be covered under this component as needed. These activities will be identified during project preparation and potentially include advisory services on sustainable electricity pricing reform, power system planning, optimization of cascade operation, reinforced safety in HPP and to explore PPP investment opportunities in the sector. In addition, the Bank will also provide technical assistance to NPC during project preparation and implementation to address capacity constraints and facilitate the familiarization of the implementing agencies with the World Bank policies. Such activities will be coordinated with the Programmatic Advisory Services and Analytics (PASA) for the energy sector which is being prepared.

Component 3. Contingency Emergency Response (US\$0)

15. This Contingency Emergency Response Component (CERC) provides swift response in the event of an eligible crisis or emergency¹¹. The CERC component is included to minimize the time and effort needed to make available uncommitted funds under this project to finance urgent needs that might arise¹², particularly in view of the high exposure of the

⁹ This specific works are subject to DPWH and ADB's confirmation to build the dikes. In such case, various scenarios will be considered to determine the scope of the rehabilitation.

¹⁰ A study on sediment management is being conducted (P170148) for Pulangi IV financed by ESMAP. The key findings of this study will serve to inform the technical design of this project.

¹¹ For the purpose of the CERC, eligible crisis or disaster is defined as "an event that has caused, or is likely to imminently cause, a major adverse economic and/or social impact associated with natural or man-made crises or disasters."

¹² A CERC may finance works, goods, non-consulting and consulting services, training, and operating costs (the CERC does not finance humanitarian assistance or relief). For activation of the CERC, a state of emergency (or equivalent) must be declared by the competent national or subnational authority in accordance with GoP's emergency response laws and regulations (if existing).



Philippines to climate change and natural disasters, the recent COVID-19 outbreak and the uncertainty around its impacts and evolution in the short-term.

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Screening of Environmental and Social Risks and Impacts

The Project works will take place only within the existing hydropower complex footprint and will mainly consist of equipment replacement, repair and system improvements. The works might include engineering structures and their rehabilitation may have temporary and long-term impacts to be assessed and managed. Temporary risks and impacts are those associated with any potential civil work, emissions, water pollution, waste management, traffic safety and community health and safety. While not extensive, some influx of labor may pose moderate risks outside the project footprint (e.g. incursions into sensitive habitats or adjacent communities) and create sensitivities due to the fragile and conflict-affected setting. Long-term impacts could result from modifications in the operational regime through the cascade, which could be positive or negative. The risk of adverse hydrological changes leading to flooding of the Balo-i planes is low. This is due to: (i) DPWH plans to construct the dikes, (ii) the flexibility in project design to prioritize investments for increased efficiency, safety and restored capacity while avoiding those that may result in exceeding the operational discharge limits set for flooding control, and (iii) existing regulation for NPC not to exceed such limits while dikes, or other flooding prevention measures, are not in place. Land acquisition is not foreseen and the direct social impacts on land, access to resources and community health and safety are considered moderate. However, social risks are considered substantial due to: (i) the security situation, (ii) potential legacy issues, and (iii) the presence of indigenous communities in the area and complexities to ensure that these communities are properly consulted to inform Project design and environmental and social risk management measures. The application of GoP’s Indigenous Peoples Rights Act will therefore be investigated. Risks on these categories also relate to the unfamiliarity of NPC with World Bank’s ESF, which might lead to non-compliance. To mitigate this risk, the Bank team will provide extensive training to PMU staff on the Bank and regularly monitor compliance of the PMU-managed activities with the ESF. The risk classification will be revisited at appraisal stage based on final design and the findings of the environmental and social impact assessment (ESIA).

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