Bankability challenges for the construction of micro hydro power plants utilizing state-owned dams (case study: Pandanduri dam, West Nusa Tenggara-Indonesia)

Suksmo Satriyo Pangarso[1*], *Bryan* Alexando[2], and *Jaka* Aminata[3]

[1,3] Doctoral Programs of Economics, Faculty of Economics & Business, Universitas Diponegoro, Semarang, Indonesia
[1,2] PT Sarana Multi Infrastruktur (Persero), Jakarta, Indonesia

Abstract. Power supply business plan (RUPTL) of PT. PLN (Persero) year 2021-2030 states that there is an electric potential of 337.1 MW that can be generated from 60 dams owned by the Government of the Republic of Indonesia through the Ministry of Public Works and Public Housing. The tender process for several locations has already been implemented. One of them is the Pandanduri micro hydro power plant which utilizes the outlet of the Pandanduri Dam, West Nusa Tenggara. The purpose of this study is to analyze the challenges of the Pandanduri microhydro project in obtaining funding from financial institutions. Assessment of aspects of bankability (character, capacity, capital, collateral, condition of economy) with regard the construction of Pandanduri microhydro shows that the role of sponsors is very significant in providing equity portion, providing guarantees and to mitigate the potential risk of cost overrun, delay in commercial operation date and cash deficiency.

1 Introduction

Power supply business plan of PT. PLN (Persero) year 2021-2030 ("RUPTL") states that there are around 337.1 MW that can be generated from 60 dams owned by the Government of the Republic of Indonesia through the Ministry of Public Works and Public Housing (PWPH) [1]. Pandanduri dam is the one of existing dams which is planned for micro hydro powerplant. Meanwhile, the potential capacity of its dam according to RUPTL is relatively higher when compared to other data. The research which conducted by Widyastuti et al [2] informed that Pandanduri dam has a potential of only 0.9 MW, much smaller than the data in RUPTL, which is 2.84 MW.

The cooperation scheme was developed is the public-private partnership (PPP). The government (through the Ministry of PWPH) builds the dam and the business entity will build the power plant.

1. The definition of a microhydro power plant ("micro hydro") , is a power plant that utilizes power from streams/ waterfalls, reservoirs /dams, or irrigation canals (multipurpose canals) with a capacity of less than 1 MW (one Megawatt)[3].
2. Procedures for the selection of business entities refer to Regulation of Minister of PWPH No. 09/PRT/M/2017 on procedures for the selection of business entities as partners for the utilization of state property in the context of providing hydropower and solar photovoltaic [*]power plant infrastructure with a rental mechanism. [3].
3. Rental rates refer to the Regulation of the Minister of Finance No. 115/PMK.06/2020 on the utilization of state's properties. [4].
4. The procedure for purchasing electricity generated by the power plant refers to Minister of Energy and Mineral Resources (MEMR)'s Regulation Number 50 of 2017 on the utilization of renewable energy sources for Electricity Supply and Presidential Regulation of the Republic of Indonesia number 112 of 2022 on accelerating the development of renewable energy for electricity supply[5].

The tender process for several locations has already been implemented. One of them is the construction of micro hydro power plant at Pandanduri Dam. PT Brantas Energi was established as a business entity for micro hydro infrastructure providers through a rental mechanism at Pandanduri Dam. [6]. The micro hydro's capacity to be built is 2 x 0.9 MW with an investment value of IDR 21,946,830,057.

This paper will provide an overview of the bankability of the Pandanduri micro hydro project (eligible to obtain financing from financial institutions) based on the agreed conditions.

[*] Corresponding author : satriyo@ptsmi.co.id

2 Project overview

Pandanduri micro hydro power plan project is planned to be built on the Pandanduri Dam which located on the Palung River. The project is located in Pandanduri Village, Terara and Sakra sub-districts, East Lombok regency. The location can be reached by car from the city of Mataram as far as 46 km to Terara by via main street Mataram city-Labuhan Lombok, then passing through to the village of Pandanduri, and then pass through the entrance to the site of the Pandanduri dam.

Pandanduri dam was built in 2011 and operational in 2014. In accordance with the purpose of construction, the main building consists of a main dam, diversion, spillway building and irrigation outlet. The dam has an inundation area of 315.7 ha, with a total capacity of 27 million m^3 and an overflow width of 37.5 m. This dam has an irrigation function covering an area of 5168 ha, providing raw water, in addition to having fishing and tourism benefits [7].

The construction of a microhydro power plant at the Pandanduri dam is expected to increase participation in greenhouse gas reduction activities.[8]

3 Research methodology

The research methodology which be used is to conduct due diligence on documents related to the object of research based on 5C in credit (character, capacity, capital, collateral, condition of economy) and convert them to a financial modelling.

3.1 Literatures review

In layman's parlance, "**feasible** is **worthy of effort**, whereas" **bankable** is **worthy of credit**". So if the bank wants to provide financing, it can be interpreted that the project is "bankable". To obtain such confidence, before granting credit, banks must conduct a careful assessment of the **character**, **capacity** (capacity), **capital** (capital), **collateral** (collateral), and business prospect funds from the debtor (**condition of economy**) in accordance with Law No. 10 of 1998 on amendments to Law No. 7 of 1992 on Banking [9] and Financial Services Authority Regulation No. 42 / POJK.03/2017 on the obligation to prepare and implement credit or bank financing policies for commercial banks [10].

A common assessment in Indonesia of the character of prospective debtors is carried out using the BI Checking method or the Debtor Information System (SID) has switched from Bank Indonesia to the Financial Services Authority (OJK) and changed its name to the Financial Information Service System (SLIK) [11].

The ability (capacity) of the debtor to repay the loan is linked to the feasibility study of the project to be financed. Financial assumptions [12] and non-financial (e.g. capacity factor) are required in creating cash-flow from the project. Based on the existing cash-flow, the ability to pay loans and interest can be known [13].

ICED-USAID said that funding for PLTM from financial institutions generally ranges from 65% to 75% of the total investment cost. The rest is the equity portion (capital portion) [13]. The ability to provide capital from sponsors or project initiators is used as one of the assessment objects in the process of analyzing bank financing. This is because the project is not yet operational, and the sponsor must provide initial capital and bear the risks of the project (eg project cost overruns).

The Center for Energy Studies of Gajah Mada University (PSE-UGM) said that the definition of **guarantee** is everything that is used as a substitute if the debtor at the due date cannot carry out the obligation (default) [14]. Credit guarantee for microhydro project is the project itself. In a long-term loan, the bank will ask for a mortgage guarantee on all the facilities, land, and other related fixed assets [15].

The debtor's business prospects (condition of economy) can be assessed from business growth potential, market conditions and the debtor's position in competition, quality of management and labor issues and support from business groups and affiliates [16].

3.2 Data

The Data used in this study are primary data and secondary data. Primary data are obtained from observations during site visits and secondary data obtained from journals, reports, papers and press releases from relevant agencies. Some assumptions are also used, if the author can not obtain the required data.

Based on the site visit, we got information that the microhydro does not need to build weirs and waterways. The condition will reduce the investment cost and shorten the project's duration. The installed capacity will be 2 x 0.29 MW which refere to Refer to the procurement result of Ministry of PWPH [6].

The investment cost (included tax) is assumed IDR 21.9 billiion. The construction cost is the biggest portion of capital expenditur (Capex) [6],[17]. Operating and maintenance costs are estimated which consisted of personnel costs, maintenance and maintenance costs for civil buildings, steel and hydromechanical equipment, and generating equipment. In general, the cost of operation and maintenance of microhydro has ranges from 1-4% of *capex* [13].

The taxes charged for this project are water tax and income tax. [18],[19],[20]. The general tax rate on corporate income tax is 28% since 2009. The rate has been reduced to 25% since the 2010 tax year [21]. Consumer Price Index inflation (headline inflation) or commonly referred to as CPI inflation is an increase in CPI from time to time calculated and published by the Central Statistics Agency (BPS). Annual inflation in 2022-2024 is assumed to be 3%.[22].

The Grace period is assumed for 6 months. This is because most civil buildings (weir, waterway and sand trap do not need to be built). The interest assumption using the average basic credit interest rate during January-March 2022 listed on the Central Statistics Agency (BPS) website is added to the estimated risk premium component, the amount of which depends on the bank's assessment of the risk of each debtor or group of debtors.[23]. The equity portion is

assumpted for 30%. Depreciation is assumed for 25 years, corresponding to the useful life of the equipment [24]. The loan tenor is assumpted for 10 years.

It is assumed that this project has not signed an PPA with PT PLN (Persero). Electricity tariff refers to the agreement between the developer and PT PLN (Persero) as the buyer. For comparison, the cost of generation (BPP) in 2020 for Lombok, West Nusa Tenggara province is IDR1,715.65 / kWh higher than the National BPP of IDR 1.027,70/ kWh, which refers to [25]. Electricity tariff is assumed to be the same as the National BPP.

4 Result and discussion

4.1 Character

The first process to assess the bankability of the Pandanduri microhydro project is to assess the character of the micro hydro power plant developer. Character assessment of micro hydro developers through a series of knowing your customer/KYC processes starting from determining credit payment history (willingness to pay and capacity to pay) or commonly referred to as collectibility. Regulation of the Financial Services Authority number 40 / POJK.03/2019 on asset quality assessment of commercial banks provides a reference for assessing credit quality in the categories of collectability 1/col 1 or **pass,** col 2 or **special attention,** col 3 or **substandard,** col 4 or **doubtful** and col 5 or **loss**. [16].

PT Brantas Energi as an infrastructure provider business entity selected to develop the Pandanduri microhydro is a holding company under PT Brantas Abipraya (Persero) [26]. PT Brantas Energi will form a new Special Purpose Company (SPC) to develop the Pandanduri micro hydro power plant. In accordance with the 2020 Annual Report of PT Brantas Abipraya (Persero) as the sponsor company and considering that the SPC has just been formed, **there have been no debt transactions**, so the SPC has a collectability of 1.

4.2 Capacity

To measure the capacity or ability of developers to fulfill their obligations, an assessment of capacity is carried out. Assessment of capacity aspects by studying current sources of revenue, future projection and liabilities. Pandanduri micro hydro power plant is planned to use water from the outlet of Pandanduri Dam. Financial institutions will usually calculate the DSCR (Debt Service Coverage Ratio) or the level of ability of project to pay all loan obligations that will mature in the current year. [27].

Table 1 shows the author's calculations that the average DSCR of the Pandanduri micro hydro power plant project is 0,88 x. DSCR< 1 means that EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) or earnings before interest, taxes, depreciation, and amortization minus tax from the project cannot cover the total loan.

One of the solutions is the sponsor has to provide additional equity. The previous assumption for equity portion is 30%. The sponsor should provide > 30% investment cost as equity portion. At least, the equity portion will be 40%.

Table 1 : DSCR.

Year	Equity 30%	Equity 40%
CFADS	21,37	21,01
Service	24,40	20,85
DSCR	**0,88**	**1,01**

Another solution is looking for low-interest funding or grant funding to improve the bankability of the project.

PT Brantas Energi which have experience in mini hydro power plants, should work hard to increase production and as much as possible improve the efficiency of power plant to reduce the operation and maintenance cost.

In the other hand, the company should notice the technical risk that may occur related to the aspect of capacity are as follows :

1. The target capacity factor will not be reached. The actual condition of the water discharge coming out of the Pandanduri Dam outlet (Table 2). The average discharge Data released from the Pandanduri Dam based on data obtained from the Nusa Tenggara River Basin Center I (BWS NT I) averaged only 1.83 m3/sec, smaller than the research data [28]. This causes the possibility of a lack of ability to pay loan installments (cash deficiency).

Table 2 : Outlet discharge of Pandanduri dam.

Month	Average Discharge (m^3/s)
January	3,03
February	2,69
March	2,04
April	2,19
May	2,83
June	2,41
July	1,47
August	1,02
September	0,72
October	0,47
November	0,6
December	2,54
Average	1,83

2. The potential for cost overrun in this project is relatively large. The construction component of the micro hydro project will account for the largest portion of capital expenditures (capex)[17]. Table 3 informs the investment cost of Pandanduri MHPP project.

Table 3 : Investment cost.

Item	(IDR Billion)
Engineering (Feasibility study)	1.8
Mechanical & electrical	12.75
Hidromechanical (piping & valve)	0.18
Instalation	1.8
Power house	1.23
Testing & commissioning	0.175
Contigency	1.75
Sub-total	19.765
VAT 11%	2.174
Total After-tax	21.939

4.2.1 Capital

PT Brantas Energi a the sponsor of Pandanduri micro hydro power plant will be responsible for the equity fulfillment of the project. The loan profile of Pandanduri micro hydro power plant project is informed in Table 4. At the scenario, PT Brantas Energi should bear 40% of investment cost or IDR 8,78 billion. Based on The Annual Report 2021, PT Brantas Energi will be able absorb equity portion [29]. The other scenario to maintain DSCR >1.00x is extending the loan tenor from 10 years to 13 years

Table 4 : Loan profile.

Loan Profile	Asmp	Asmp	Unit
Tenor	10 yrs	13 yrs	
Project value	21,9	21,9	bn Rp
Loan portion	60%	70%	%
Loan value	13,16	15,36	bn Rp
Interest During Construction (IDC)	60%	70%	
IDC portion	0,242	0,329	bn Rp
Loan portion	13,41	15,69	bn Rp
Equity portion	40%	30%	%
Equity value	8,8	6,6	bn Rp
Rate	10.5%	10.5%	%
Tenor Repayment	9.50	12,50	year
Tenor Grace Period	0.50	0,50	year
Total Tenor	10.00	13,00	year
CFADS	21,01	27,64	
Service	20,85	27,46	
DSCR	1.01	1.01	

4.3 Collateral

The guarantees that can be provided for the financing of the Pandanduri micro hydro are mentioned in Table 4. Because the SPC is not yet operational, the sponsor must provide these guarantees.

4.3.1 Liability rights

In accordance with Article 33 (Government Regulation of the Republic of Indonesia number 28 of 2020 concerning amendments to Government Regulation Number 27 of 2014 concerning the Management of State/Regional Property, mentions that state property cannot be mortgaged/used as credit security.[30]. In this project, the sponsor can not provide this collateral.

4.3.2 Fiduciary security and fiduciary security of insurance claim

Fiduciary security is a written agreement by which debtor transfers to the lender its rights of ownership in the transferred assets (the project machinery or equipment including compensation for the results of termination of project documents). The construction all risk dan third parties liabilities have to mention the lender as banker's clauses. The sponsor can provide the security.

4.3.3 Pledge share and pledge of bank account

All shareholders must pledge their shares to the lender. And the debtor must pledge the Collection Account, Debt Service Payment Account, Debt Service Reserve Account dan Excess Account of SPC. The sponsor can provide the security.

4.3.4 Letter of undertaking

Letter of undertaking is a guarantee from the sponsor company to provide additional funds if there is cost over run or cash deficiency.

4.4 Condition of economy

The developer's business prospects are shown in the condition of the absorption of electricity production from the Pandanduri microhydro. Based on the interconnection study, the entry of Pandanduri microhydro into the local electricity subsystem did not cause a negative impact on the PLN distribution system. The electricity production of Pandanduri micro hydro power plant is expected to be absorbed 100% in accordance with current conditions.[31].

5 Conclusion

Assessment of the bankability aspect (5C) in the construction of the Pandanduri micro hydro power plant project shows that the role of the sponsor (PT Brantas Energi) is very significant in providing equity portion, providing guarantees and to mitigate the potential risk of cost overrun, delay of construction and cash defficiency.

In accordance with Presidential Regulation Number 112/2022, the purchase of electricity from hydro power plants that utilize hydro power from reservoirs/dams or irrigation canals (multipurpose canals) can be carried out by direct appointment. Therefore, the process of appointing the developer of the power plant must be done carefully. Especially the capacity of sponsor should be highlighted. This is to facilitate the process of obtaining funding from financial institutions.

Due to the limited research time, the data used in this research is data that can be obtained from the internet (news, press releases, reports, journals etc.). This is to avoid the use of confidential data. Further research is expected to use actual data if it has obtained permission from the relevant parties, so as to obtain more precise research results.

Credit authorship contribution statement

Suksmo Satriyo Pangarso: Conceptualization, Data gathering & curation, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Visualization. **Bryan Alexando**: Conceptualization, Financial Modelling, Writing - review & editing. **Jaka Aminata**: Conceptualization, Methodology, Project administration, Writing - review & editing, Supervision.

We would like to thank PT Sarana Multi Infrastruktur (Persero) for the site visit arrangement.

References

1. PT. PLN (Persero). *The Electricity Bussines Plan of PT. PLN (Persero) 2021-2030*. PT PLN (Persero), Jakarta, (2021) https://web.pln.co.id/stakeholder/ruptl
2. Widyastuti S, Dalimi R. Analisa Potensi Daya Listrik pada Bendungan Eksisting di Indonesia untuk Pembangkit Listrik Tenaga Air (PLTA) Guna Mencapai Target Bauran Energi Sebesar 23%Tahun 2025. In: *Seminar Nasional Sains Dan Teknologi (SNAST)*, 1-11 (2021)
3. MPWPH. *MPWPH Regulation No. 09 / PRT/M / 2017 on Procedures for Selecting Business Entities as Partners for the Utilization of State Property in the Context of Providing Hydropower/Minihydro/Microhidro/PV Infrastructure with a Lease Mechanism*, (2017)
4. MoF. *Regulation of the Minister of Finance No. 115 / PMK.06/2020 on the Utilization of State Property*, (2020).
5. Indonesia P of R of. *Presidential Regulation of the Republic of Indonesia Number 112 of 2022 on Accelerating the Development of Renewable Energy for Electricity Supply*, (2022).
6. Directorate General of Water Resources. Announcement of the selection results of the selection of business entities as partners for the use of state property for PLTM through the rental mechanism at Pandanduri Dam. Published 2017. https://www.pu.go.id/source/pengumuman-hasil-seleksi-pemilihan-badan-usaha-penyediaan-infrastruktur-pltm-di-bendungan-pandanduri.pdf
7. BWS West Nusa Tenggara 1. Pandanduri Dam Profile. Website SDA PUPR. Published 2020. Accessed November 15, 2022. https://sda.pu.go.id/balai/bwsnt1/post/264/profil-bendungan-pandanduri
8. Bappenas. Study of Dam Asset Management and Implementation of Performance Based Contract In DOISP Dam Phase 2, **2** (2020)
9. Indonesia G of R of. *Law No. 10 of 1998 on Amendments to Law No. 7 of 1992 on Banking*. Lembaran Negara Republik Indonesia Tahun 1998 Nomor 182. Kementerian Sekretariat Negara RI. Jakarta, (1998)
10. Financial Services Authority. *Regulation of The Financial Services Authority No. 42 / POJK.03/2017 on the Obligation to Prepare and Implement Credit or Bank Financing Policies for Commercial Banks*, 1-1 (2017)
11. Financial Services Authority. *Regulation of The Financial Services Authority No.18 / POJK.03/2017 on Reporting and Requesting Debtor Information through Financial Information Service System*, (2017). http://www.ojk.go.id/id/kanal/perbankan/regulasi/peraturan-ojk/Documents/Pages/POJK-tentang-Pelaporan-dan-Permintaan-Informasi-Debitur-melalui-Sistem-Layanan-Informasi-Keuangan/SAL POJK SLIK.pdf
12. Windarta J, Saptadi S, Handoyo E, Machfudz L, Renaldo D, Saintekha MA. Economic Analysis of Planning for Utilization of Tabang Hydro Power Plant. *J Phys Conf Ser*. 2020;1524(1). doi:10.1088/1742-6596/1524/1/012091
13. USAID & OJK. *Pembiayaan Pembangkit Listrik Tenaga Minihidro*. ICED-USAID; 2016. https://www.iced.or.id/wp-content/uploads/2017/03/Modul-03-Pembiayaan-Pembangkit-Listrik-Tenaga-Mini-Hidro.pdf
14. UGM P. *PJBL ET, BOO Dan Isue Terkait Perjanjian Jaminan (Materi Presentasi Dalam Workshop Materi Transformasi Kerangka Kebijakan Dan Sistem Tata Kelola Energi Terbarukan Di Indonesia, 17 Juli 2020)*. Masyarakat Energi Terbarukan Indonesia. Jakarta, (2020)
15. USAID & OJK. *Clean Energy Handbook for Financial Services Institutions*. ICED-USAID, (2014) https://www.ojk.go.id/id/Documents/Pages/Keuangan-Berkelanjutan/buku-energi-bersih.pdf
16. Financial Services Authority. *Regulation of the Financial Services Authority Number 40 / POJK.03/2019 on Asset Quality Assessment of Commercial Banks*, (2019)
17. MoF. *Analysis of the Impact of Fiscal Incentives on Investment and the Selling Price of Renewable Energy Electricity*.; 2019. https://fiskal.kemenkeu.go.id/kajian/2019/03/15/121945424999089-analisis-dampak-insentif-fiskal-terhadap-investasi-dan-harga-jual-listrik-energi-terbarukan
18. Indonesia G of TR of. *Law No. 17 of 2019 on Water Resources*, 50 (2019) https://peraturan.bpk.go.id/Home/Details/122742/uu-no-17-tahun-2019

19. MPWPH. *Regulation of the Minister of Public Works No. 8 / PRT/M/2014 on Guidelines for Calculating the Cost of Water Resources Management Services for Drinking Water Business Activities, Industrial Business Activities, Hydroelectric Business Activities and Agric*, (2014).
20. NusaTenggara G of W. *West Nusa Tenggara Governor Regulation Number 9 of 2018 on Procedures for Surface Water Tax Collection*, (2018).
21. Indonesia G of R of. *Law of the Republic of Indonesia No. 36 of 2008 on the Fourth Amendment to Law No. 7 of 1983 on Income Tax*, (2008).
22. MoF. *Regulation of the Minister of Finance No. 101 / PMK.010/2021 on Inflation Targets for 2022, 2023 and 2024*, (2021).
23. BPS. Rupiah Lending Rates By Bank Group 2021. Badan Pusat Statistik, (2021), Accessed May 24, 2022. https://www.bps.go.id/indicator/13/383/1/suku-bunga-kredit-rupiah-menurut-kelompok-bank.html
24. MoF. *Decree of the Minister of Finance Number: 295 / Km.6/2019 On The Table Of Benefits In The Form Of Depreciation In The Form Of Fixed Assets In Government Entities*, 1-19 (2019)
25. MEMR. *Minister of Energy and Mineral Resources Decree No. 169. K. HK. 02.MEM.M. 2021 on the Cost of Generation of PT PLN (Persero) in 2020*, 8 (2021) https://jdih.esdm.go.id/storage/document/Kepmen No. 169.K.HK.02.MEM.M.2021.pdf
26. PT Brantas Abipraya (Persero). *Annual Report 2021*, (2022).
27. Financing DG of PW and HI. *Dictionary of Terms Infrastructure Financing and PPP*. 1st ed, (2019)
28. Tyas EC. *Studi Perencanaan Pembangkit Listrik Tenaga Air Di Bendungan Pandanduri Swangi Lombok Timur Nusa Tenggara Barat*. Universitas Brawijaya, (2014)
29. PT Brantas Abipraya (Persero). *Annual Report 2020*, (2021). http://www.brantas-abipraya.co.id/id/laporan-tahunan/index
30. Indonesia G of R of. *Government Regulation of the Republic of Indonesia Number 28 of 2020 Concerning Amendments to Government Regulation Number 27 of 2014 Concerning the Management of State/Regional Property*, (2020)
31. PT Brantas Energi. *Study Report Connecting PLTM Pandanduri 2 x 029 MW to 20 KV Distribution System of PT PLN (Persero) UIW West Nusa Tenggara in Sakra District, West Nusa Tenggara*, (2020)