Indonesia: PT. Supreme Energy Muara Laboh – Muara Laboh Geothermal Power Project

Performance Evaluation Report
Performance Evaluation Report
February 2024

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### NOTES

(i) The fiscal year of PT. Supreme Energy Muara Laboh begins on 1 January and ends on 31 December.

(ii) In this report, “$” refers to United States dollars.

<table>
<thead>
<tr>
<th>Director General</th>
<th>Emmanuel Jimenez, Independent Evaluation Department (IED)</th>
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<tr>
<td>Deputy Director General</td>
<td>Sona Shrestha, IED</td>
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<td>Nathan Subramaniam, Sector and Project Division, IED</td>
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<td>Arjun Guha, Evaluation Specialist, IED</td>
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<td>Team members</td>
<td>Mark Leander Mendoza, Evaluation Officer, IED</td>
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<td></td>
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In preparing any evaluation report, or by making any designation of or reference to a particular territory or geographic area in this document, the Independent Evaluation Department (IED) does not intend to make any judgments as to the legal or other status of any territory or area.

The guidelines formally adopted by IED on avoiding conflict of interest in its independent evaluations were observed in the preparation of this report. To the knowledge of the management of IED, there were no conflicts of interest of the persons preparing, reviewing, or approving this report.
Abbreviations

ADB – Asian Development Bank
AWL – average weighted life
CO₂ – carbon dioxide
COD – commercial operation date
CTF – Clean Technology Fund
DFI – development finance institution
DMC – developing member country
E&S – environmental and social
EIRR – economic internal rate of return
Engie – Engie Global Development B.V.
FIRR – financial internal rate of return
GDP – gross domestic product
GW – gigawatt
GWh – gigawatt-hour
JBIC – Japan Bank for International Cooperation
kWh – kilowatt-hour
LEAP – Leading Asia’s Private Sector Infrastructure Fund
MEMR – Ministry of Energy and Mineral Resources
MW – megawatt
O&M – operation and maintenance
OCR – ordinary capital resources
ORM – Office of Risk Management
PLN – PT. Perusahaan Listrik Negara (national power utility)
PPA – power purchase agreement
RRP – report and recommendation of the President
SEML – PT. Supreme Energy Muara Laboh
Supreme Energy – PT. Supreme Energy Sumatera
WAC – waiver, amendment, and consent request
WACC – weighted average cost of capital

Currency Equivalents

Currency unit – rupiah (Rp)

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<th>At Appraisal (31 October 2017)</th>
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<td>Rp1.00 = $0.000077</td>
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<td>$1.00 = Rp13,050</td>
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Acknowledgment

A team of staff and consultants from the Independent Evaluation Department (IED) contributed to the analysis, desk reviews, interviews, and research that produced this evaluation. The core team included Arjun Guha (team leader), Mark Leander Mendoza, Irene Garganta, and Alzeus Alzate. Michael David Allen and Fitri Oktaviani were the consultants.

The report benefited from the guidance of Emmanuel Jimenez, Director General, IED, and Nathan Subramaniam, Director, Sector and Project Division, IED.

The team would like to thank ADB staff and management of the Private Sector Operations Department, as well as peer reviewers Sherine Ibrahim, Principal Evaluation Specialist, IED, and Priyantha Wijayatunga, Senior Director, Energy, Sectors Group, who provided valuable project information and support for the evaluation report.
# Basic Data

## ADB Loan 3487-INO

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<th>Key Project Data</th>
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<td>Project performance evaluation</td>
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ADB = Asian Development Bank, LEAP = Leading Asia’s Private Sector Infrastructure Fund, INO = Indonesia, NEXI = Nippon Export and Investment Insurance, RRP = report and recommendation of the President.

Lenders covered by NEXI are Bank of Tokyo-Mitsubishi UFJ, Ltd.; Mizuho Bank, Ltd.; and Sumitomo Mitsui Banking Corporation.

Executive Summary

In 2016, the Board of Directors of the Asian Development Bank (ADB) approved a private sector loan of $70 million to support an initial 80-megawatt (MW) phase of geothermal power production at Muara Laboh in the province of West Sumatra, Indonesia. The Muara Laboh Geothermal Power Project involved the construction of an 80 MW geothermal power generation plant and associated facilities. The project was estimated to cost $590.9 million and, in addition to ADB’s loan, the financing package included $19.2 million from the Clean Technology Fund and $20.0 million from Leading Asia’s Private Infrastructure Fund, both administered by ADB.

The project was implemented under a 30-year, take-or-pay power purchase agreement (PPA) with the national power utility, PT. Perusahaan Listrik Negara (PLN). During the initial feasibility studies of the Muara Laboh project in 2011 and 2012, the PPA was negotiated based on limited surface explorations. The size of the project had been estimated at 220 MW of power capacity, but in 2014, upon completion of a detailed resource exploration program, the resource estimates were revised, leading to a downscaling of the project to 80 MW. Based on the prevailing regulations at the time, the PPA with PLN was renegotiated to a higher tariff to ensure project feasibility.

Overall, the evaluation team rates the project *successful*, with certain caveats.

The project contributed to clean energy supply in a less developed part of Indonesia. The project largely achieved the intended objectives—80 MW of geothermal energy capacity implemented and operating at satisfactory levels—and thus contributes to clean energy supply in a relatively underdeveloped part of Indonesia. It also met targets for carbon dioxide emissions avoided and jobs provided on time. ADB administered funds from the Clean Technology Fund and Leading Asia’s Private Sector Infrastructure Fund in addition to its ordinary capital resources, and the project attracted financing from an international financial institution as well as commercial cofinanciers. The anticipated environmental and social impacts are being addressed by the borrower. The loan is profitable to ADB, and the borrower is making timely repayments on schedule.

The project’s feasibility was helped by ADB’s long-tenor loan and blend of concessional capital. The financial arrangements helped improve the project’s risk perceptions, mobilize additional investment, and catalyze private capital needed to fill the financing gap. Nonetheless, ADB and other multilateral development banks’ respective experiences with direct transactions and resource risk mitigation for geothermal energy development can be leveraged further for collaborative learning; for example, in helping de-risk the exploration and drilling stage to attract commercial financing for projects with similar resource risks and for those deploying relatively early-stage technologies. As such, ADB should leverage concessional finance at earlier stages of project development to advance emerging energy transition technologies.
CHAPTER 1
The Project

A. Project Background

1. Between 2004 and 2014, the economy of Indonesia experienced consistent growth as its gross domestic product (GDP) expanded at an average rate of 5.7% per annum.\(^1\) In 2014, Indonesia had the largest GDP in Southeast Asia, estimated at $888.5 billion.\(^2\) Despite this economic growth, Indonesia still had a lower electrification rate than countries with similar income levels. About 84% of Indonesia’s population had access to electricity in 2014, compared with less than 68% in 2010, according to national power utility PT. Perusahaan Listrik Negara (PLN).\(^3\) At the time of project approval, the country’s Ministry of Energy and Mineral Resources (MEMR) estimated that power demand would increase by 8.5% per annum in 2015–2019, resulting in a shortage of about 35 gigawatts (GW) before 2020 (footnote 2). A brief overview of Indonesia’s energy sector is provided in Appendix 1.

2. To address the anticipated electricity shortage and reduce dependence on fossil fuels,\(^4\) the Government of Indonesia launched a program to provide an additional 35 GW of power capacity by 2019.\(^5\) The largest share of generation was expected to come from fossil fuels such as coal and gas, but the government also encouraged an increase in energy supplied from renewable sources. MEMR estimated that the country had more than 29 GW of geothermal energy capacity reserves (equivalent to 40% of the global resource) but only 1.3 GW of that had been developed by October 2015 (footnote 3). This contributed about 3% to Indonesia’s total electricity generation capacity in 2015. To support the government’s capacity expansion plan, the Muara Laboh geothermal energy project was conceptualized on the island of Sumatra by a consortium of private parties led by PT. Supreme Energy Sumatera (Supreme Energy). Supreme Energy is one of the sponsors of PT. Supreme Energy Muara Laboh (SEML), the borrower.

3. In December 2016, the Asian Development Bank (ADB) Board of Directors approved a 20-year nonsovereign loan of $70.0 million from ADB’s ordinary capital resources (OCR) to PT. Supreme Energy Muara Laboh for the development and construction of the Muara Laboh Geothermal Power Project. ADB had prior experience in leading the financing of a geothermal project in Indonesia and was therefore well placed to support Muara Laboh.\(^6\)

B. Key Project Features

4. The Muara Laboh project involved the construction of an 80-megawatt (MW) power generation plant and associated facilities in the province of West Sumatra. It was estimated to cost $590.9 million and, in addition to ADB, the financing package included $19.2 million from the Clean Technology Fund.

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\(^4\) In 2015, fossil fuels powered most of the electricity generation in Indonesia (88%), while renewable energy sources, primarily in the form of hydropower and geothermal resources, accounted for the remainder.


(CTF) and $20.0 million from Leading Asia's Private Infrastructure Fund (LEAP), both administered by ADB.\(^\text{7}\)

5. [CONFIDENTIAL INFORMATION DELETED]

C. Progress Highlights

6. The facility agreement between SEML and ADB was signed on 26 January 2017. The first drawdown was made on 16 February 2017, the last one on 26 June 2020. The actual project cost was lower than budgeted due to savings in drilling. Payments from PLN have been on schedule since the COD. PLN is currently rated BBB/stable by Standard & Poor’s (July 2022), BBB/stable by Fitch Ratings (September 2022), and Baa2/stable by Moody’s Investors Service.

7. The project’s performance has been better than expected. The overall strong performance of SEML was attributed to a good underlying resource, high availability, and limited forced outages.

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8. In accordance with the guidelines of the ADB Independent Evaluation Department for preparing a project performance evaluation report for nonsovereign operations, the performance of the project was evaluated for (i) its development results, (ii) ADB additionality, (iii) ADB investment profitability, and (iv) ADB work quality.

A. Project Rationale and Objectives

9. While Indonesia has an assessed 29 GW of potential geothermal resources, it was able to develop only 1.3 GW of geothermal power generation as of October 2015 (footnote 3). The perceived high risks associated with the exploration phase and uncertainty regarding the potential for a tariff renegotiation by PLN stalled many early-stage geothermal developments. Given ADB’s experience in leading the financing of the Sarulla project (2013) and the exploration finance investment in the Rantau Dedap project (2014) (footnote 6), ADB was in a position to translate its resource risk management experience into commercially viable geothermal projects, and to demonstrate financial structuring solutions tailored to the unique risks of geothermal development.

10. The project’s expected impacts were to (i) contribute to the government’s goal of increasing the share of renewable energy in the country’s energy supply and (ii) reduce greenhouse gas emissions. The expected outcome was to expand geothermal power generation in West Sumatra. The project’s expected outputs by the end of 2019 were (i) the construction and commissioning of one geothermal power plant with 80 MW total capacity, and (ii) the provision of up to 1,400 jobs during construction.

B. Development Results

11. The project’s development results were assessed according to four criteria: (i) contribution to private sector development and ADB’s strategic development objectives; (ii) economic performance; (iii) environmental, social, health, and safety performance; and (iv) business success.

1. Contribution to Private Sector Development and ADB Strategic Development Objectives

12. Envisioned outcome and outputs of the project largely achieved. The project-level outcome and outputs in the design and monitoring framework were met, except for one development output indicator. The target of $95 million in total payments to the government provided during construction and operation was not achieved because this was deemed an erroneous (i.e., too high) target, as discussed and concurred by the borrower. Given that SEML was projected to have taxable income only by 2033, no payments for corporate taxes were estimated to be made to the government prior to 2033, so it would be difficult to achieve the target of $95 million in total payments to the government by 2019. The targets

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9 Per the going-in financial model, the borrower would not pay corporate taxes until 2032 because the company was projected to have zero taxable income until 2032. The reason being the recognition of a larger amount of depreciation for tax purposes as compared to the depreciation for book purposes during the early operating years of the project.
of at least 80 MW of total plant capacity; 471,240 tons of carbon dioxide (CO₂) emissions avoided annually; and 190 jobs created during operations were achieved on time.

13. [CONFIDENTIAL INFORMATION DELETED].

14. The project was aligned with ADB’s strategies, particularly (i) pillar 2 of ADB’s country partnership strategy, 2012–2014 for Indonesia, which focuses on environmental sustainability with climate change mitigation and adaptation by promoting renewable energy; 10 (ii) ADB’s country operations business plan, 2015–2017 for Indonesia, which prioritizes renewable energy financing by the private sector; 11 (iii) ADB’s Energy Policy 2009, which focuses on renewable energy projects; 12 and (iv) ADB’s Midterm Review of Strategy 2020, which underlines its support for clean energy. 13 The project contributed strongly to ADB’s strategic objective of environmental sustainability by promoting renewable energy and reducing greenhouse gas emissions. The 80 MW geothermal power plant was built as planned and has been able to achieve its annual emission reduction target. In sum, the project’s contribution to private sector development and ADB’s strategic development objectives is rated satisfactory.

2. Economic Performance

15. Contributing to clean energy supply in a less developed region. Apart from helping provide clean energy in a relatively underdeveloped region, the project also benefits Indonesia as a baseload clean energy technology and by establishing proof of concept for using the more efficient dual-flash technology for geothermal energy. 14 The project’s economic internal rate of return (EIRR) is highly sensitive to the assumptions on the avoided resource cost of coal-fired generation and the avoided social cost of CO₂ emissions, which is currently a globally debated topic. 15 Both assumptions are conservative, taking into account the historically low energy pricing in Indonesia and the absence of a global consensus on the social cost of emissions. For reference, the World Bank in 2017 and the European Bank for Reconstruction and Development in 2019 stipulated a social cost of $40–$80 per ton of CO₂ (2020 prices) for the economic analysis of their respective projects. 16

16. The economic performance is rated satisfactory. The real EIRR of the project was recalculated and is above the threshold required for a satisfactory rating, i.e., an EIRR greater than the larger of 1.2 times the real weighted average cost of capital (WACC).

3. Environmental, Social, Health, and Safety Performance

17. Effective measures taken to mitigate potential adverse impacts. The potential environmental and social impacts of the project were identified by conducting the following studies commensurate with category A for environmental risks and impacts: (i) audit of existing facilities and development of a corrective action plan, (ii) environmental and social impact assessment, (iii) environmental and social management plan, and (iv) biodiversity action plan. Effective measures to avoid, minimize, mitigate, and compensate for any adverse impacts of the project were incorporated in the environmental and social management plan (integrating various requirements from the environmental impact assessment, the biodiversity action plan, and environmental and social safeguards, as well as other adopted standards).

The project operates in compliance with applicable laws and regulations and meets the requirements of ADB’s Safeguard Policy Statement (2009). No significant issues arose from the review of key environmental aspects, such as generation of effluents, air quality, water demand, noise, heat and vibration, solid and hazardous waste management practices, impacts on ecology, occupational and community health and safety, and socioeconomic impact. The management system and compliance reference frameworks reflect company standards and are in line with Indonesian standards, the Safeguard Policy Statement, international standards, and other applicable legislation and codes of practice, and are commensurate with the actual risks and impacts of the project.

18. SEML prepares a safeguard environmental and social (E&S) monitoring report every 6 months in compliance with the reporting requirements agreed with ADB. In addition to the semiannual reporting, monthly progress reports are submitted to summarize the activities underway on site and to document progress with the project’s E&S action plan, and social compliance audit report actions. An external firm also undertook semiannual E&S reviews and monthly E&S progress reporting throughout the construction phase, followed by annual E&S reviews during operations. A stakeholder engagement plan and a grievance redress mechanism are in place, and associated activities are being undertaken and reported on regularly. No issues appear to have arisen with labor management, including compliance with labor laws and core labor standards. The project’s environmental, social, health, and safety performance is rated satisfactory.

4. Business Success

[CONFIDENTIAL INFORMATION DELETED].

C. ADB Additionality

19. The evaluation team assessed ADB’s additionality as the extent to which ADB financing was a necessary condition for the timely realization of the project’s objectives. It did so by assessing how the Muara Laboh project would have proceeded without ADB support. It considered (i) financial additionality in providing funding not available from the commercial market or in catalyzing other funding, and (ii) nonfinancial additionality in improving the project’s risk profile, design, capacity, ability to raise standards, and development impact.

1. Financial Additionality

20. ADB’s constructive role in attracting commercial lenders. Positive perceptions of ADB’s due diligence, its preferred creditor status, and its provision of concessional capital gave confidence to commercial lenders to finance the geothermal power project. Blending the ADB OCR with a low-cost CTF loan added value to the project by lowering SEML’s cost of capital. If the CTF component had been priced like the ADB OCR loan (a proxy for the “without CTF” scenario), SEML’s real WACC would have increased. ADB’s stand-alone OCR financing was the most expensive source of funds, compared with the other lenders, but weighting in the LEAP component and the CTF loan lowered ADB’s blended package pricing. ADB’s debt package for the project was ultimately priced competitively because ADB blended the low-cost CTF without crowding out the commercial lenders. The CTF blending improved the project’s liquidity situation because this concessional component could be drawn down upfront upon financial closure to cushion the sponsors’ prior investments in reserve drilling activities.

2. Nonfinancial Additionality

17 The commercial banks are the Bank of Tokyo-Mitsubishi Ufj, Ltd.; Mizuho Bank, Ltd.; and Sumitomo Mitsui Banking Corporation.

21. **Limited nonfinancial contribution by ADB.** Muara Laboh was a greenfield geothermal venture in a previously underdeveloped region and faced many uncertainties and risks, such as resource, drilling, construction, technology, offtaker counterparty, legal, and regulatory risks. This was compounded by the limited understanding of these risks by commercial financial institutions. ADB was already engaged with SEML through one earlier transaction and helped bridge the knowledge gap of the other lenders. SEML noted ADB’s contribution to the project’s financial structuring, E&S framework, and commercial preparation. However, the evaluation team is reasonably convinced that these were likely achieved by the engagement on the earlier loan, leaving limited scope for added contribution in this loan.

22. Despite ADB’s involvement, the commercial cofinancers secured their exposure against political risk (100%) and commercial risk (90%). This indicates that ADB’s presence as a multilateral lender provided some comfort to the cofinancers but may not have fundamentally influenced their credit decisions. ADB could have considered arranging such political risk insurance from in-house resources. In addition, the offtaker’s tariff renegotiations are a powerful indication to the market that ADB’s presence may not necessarily protect them from such risks. In sum, ADB’s nonfinancial additionality to this project appears modest and would have merited a more thorough consideration at appraisal.

3. **Overall Additionality Rating**

23. **Overall additionality of ADB’s assistance rated satisfactory.** ADB’s presence, and its administration of the LEAP and CTF funds encouraged commercial banks to provide financing to the project. ADB matched the other lenders with a long loan tenor and lowered SEML’s cost of capital by blending the OCR loan with a low-cost CTF loan. The blended finance package helped cushion the financials of the project, which was fraught with very high risks and uncertainties. The client’s view was that ADB’s reputation for due diligence, preferred creditor status, and its efficiency with loan processing accelerated the successful financial closure of the project. However, it is understood that SEML was negotiating with other development finance institutions (DFIs) that also could have financed the project with CTF blending, and that ADB concluded its loan processing earlier than others. This indicates that the project could possibly have gone ahead without ADB participation, but perhaps with higher financing costs or delays.

D. **ADB Investment Profitability**

24. **Project profitable to ADB.** Profitability was assessed in terms of whether (i) market pricing was achieved, (ii) the ADB pricing model was cleared, and (iii) the loan was or is expected to be paid as scheduled. The loan’s applicable interest rate was higher than the cost recovery pricing. t.

25. SEML has been making principal and interest payments on schedule. Based on the updated financial model, the borrower is expected to service debt on time until final maturity. Further, the offshore debt service reserve account is appropriately funded and maintained with an offshore agent bank (footnote 7). In view of the preceding, ADB’s investment profitability is rated satisfactory.

E. **ADB Work Quality**

1. **Screening, Appraisal, and Structuring**

26. [CONFIDENTIAL INFORMATION DELETED].

2. **Monitoring and Supervision**
27. **Diligent monitoring, prompt processing.** ADB diligently monitored the project and was prompt in processing SEML’s WACs. The supervision reports, specifically the annual monitoring reports, were complete and of satisfactory quality. Moreover, the deal team closely monitored SEML’s operating and financial performance through regular communication and follow-up on the timely submission of reports, financial statements, and annual operating plans and budgets. SEML complied with all reporting requirements in a timely manner. ADB was prompt in approving WACs on existing agreements, subject to thorough review. ADB’s performance in monitoring and supervision is rated *satisfactory*.

28. Based on the component ratings for screening, appraisal, and structuring and the satisfactory rating for monitoring and supervision, ADB’s overall work quality is rated *less than satisfactory* with important lessons to be learned from this project.

F. **Overall Evaluation**

29. The project is rated *successful overall*. 


30. Based on this evaluation and on interviews with country stakeholders, the project yielded valuable insights and lessons that ADB can use to improve the design and implementation of future geothermal power projects.

A. Issues
31. [CONFIDENTIAL INFORMATION DELETED].

32. **Energy transition needs. Indonesia’s energy transition requires stronger coordination between state-owned enterprises and coherence among development finance institutions (DFIs).** The evaluation team found that most of the high-quality fields of geothermal resources in Indonesia have already been developed, leaving numerous dispersed and remote pockets with a lower-quality resource to make up the country’s total geothermal energy potential. Moreover, the tariff-setting process is not well defined, leaving geothermal developers prone to non-bankable PPAs. The bankability of PPAs is further undercut by historically lower energy pricing in Indonesia. It also seems that local communities have become more averse to the entry of geothermal developers, prompted by material concerns over water and air pollution, involuntary displacement, and loss of livelihoods.

33. Presidential Regulation No. 112 of 2022 on renewable energy development in Indonesia is being hailed as a necessary boost to the industry, providing more clarity on policies and regulations to help accelerate the country’s energy transition. ADB and other DFIs have an opportunity to support the government more coherently in helping create policy frameworks that allow renewable energy and energy transition ventures to thrive. The Just Energy Transition Partnership (JETP) and Energy Transition Mechanism (ETM) platforms can serve as avenues for policymakers and regulators to inform, incentivize, and facilitate the transition. However, it remains to be seen if they can positively influence the enabling framework for Indonesia’s energy transition.

B. Lessons
34. **Use blended finance as a de-risking tool.** Blended finance can help de-risk energy transition projects and enhance market confidence. ADB’s support to the Muara Laboh project came in at a later stage of the client’s financing plan. ADB’s stand-alone OCR financing was the most expensive source of funds compared with other lenders—but weighting in the LEAP component and the CTF loan lowered ADB’s blended package. ADB’s financing support of OCR blended with low-cost CTF provided a financial cushion to a project that was susceptible to severe risks at all stages of development, and helped boost the developer’s confidence to move ahead. In parallel, the World Bank has been deploying the Geothermal Resource Risk Mitigation (GREM) program with contingent grants and a risk-sharing facility for geothermal resource exploration in Indonesia. Given ADB’s expertise from its involvement in three geothermal energy projects in Indonesia, there is an opportunity to consolidate the insights and lessons and deploy blended finance at an earlier stage of project development in a calculated risk-taking approach.
35. **Leverage detailed resource assessments.** Negotiating contracts after detailed resource assessments can provide a better basis for tariff setting. During the feasibility studies of the Muara Laboh project, several assumptions were established through limited surface explorations, and the PPA was negotiated on these assumptions. Upon more detailed assessments through drilling and well testing, many of these assumptions were revised, leading SEML to renegotiate a higher tariff to keep the project feasible. Since 2017, major regulatory changes have happened wherein PLN negotiates the PPA and pricing after the geothermal resource potential has been better defined, leading to lower risks and uncertainties. However, in such cases, the developers may hesitate to inject capital into drilling and testing without a preliminary power purchase commitment. The World Bank’s GREM program aims to alleviate such techno-commercial tensions to some extent with risk capital to share the costs of exploration drilling, allowing better quantification of resources and providing a better basis for power purchase negotiations. ADB and the World Bank’s respective experiences with direct transactions and resource risk mitigation in geothermal energy development can be leveraged for collaborative learning.

36. [CONFIDENTIAL INFORMATION DELETED].

C. **Recommended Follow-Up Actions**

37. **Deploy early-stage blended finance to advance energy transition technologies.** The evaluation team found that ADB, with its access to the CTF, played a role in cushioning the financials of the Muara Laboh project, but it emphasizes the need for ADB to come in at earlier stages of project development. In the case of Muara Laboh, the blended CTF helped bring down the cost of capital at a later stage of project development (i.e., after the greatest portion of resource risks had been mitigated). Having gained this experience, in addition to a few earlier transactions in geothermal energy, ADB should consider deploying earlier-stage blended capital\(^\text{20}\) to de-risk similarly nascent yet high-potential energy transition technologies in DMCs.

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\(^\text{20}\) According to the October 2017 DFI Working Group in Blended Concessional Finance for Private Sector Projects report prepared by a group of development finance institutions that includes ADB ([DFI Working Group on Blended Concessional Finance for Private Sector Projects: Summary Report (adb.org)]), the DFI working group developed a set of guidelines for each of the five principles for providing blended concessional finance. These five principles are additionality; crowding-in and minimum concessionality; commercial sustainability; reinforcing markets; and promoting high standards.
Appendixes
APPENDIX 1: POWER SECTOR OVERVIEW AND GEOTHERMAL CONTEXT

A. Overview

1. Indonesia, a country with a rapidly growing population and a surging economy, is facing significant challenges in meeting the increasing demand for electricity while reducing its reliance on fossil fuels. The energy sector holds the key to driving sustainable development in the country, and Indonesia's abundant geothermal resources position geothermal energy as a pivotal solution for achieving clean, reliable, and affordable electricity.

2. To address climate change concerns, Indonesia has set ambitious targets for a reduction in greenhouse gas emissions, aligning with its commitment to the 2022 United Nations Climate Change Conference (COP 27). The country aims to reduce emissions by 31.89% in its own right and by 43.20% with international support.¹ Achieving these targets requires a fundamental transformation of the energy sector and electricity generation, and a shift toward renewable energy sources.

3. Currently, Indonesia relies heavily on fossil fuels, particularly coal, for electricity generation. However, recognizing the need for diversification and cleaner alternatives, the country is making strides in incorporating renewable energy sources into its energy mix. The new and renewable energy (NRE) target for 2025 aims to achieve a 23% share of renewable energy in the national primary energy mix,² and the use of natural gas and hydroelectric, geothermal, solar, and wind power is gaining momentum. With a population of more than 270 million and a rapidly expanding middle class, Indonesia's energy demand is projected to surge in the coming years. To sustain economic growth and provide electricity access to all citizens, the country requires substantial power capacity expansion and diversification with a focus on sustainable energy solutions.

B. Overview of Geothermal Energy in Indonesia

4. Geothermal energy emerged as a promising solution to Indonesia's energy challenges. The country's unique geographic location along the Pacific Ring of Fire grants it abundant geothermal resources. It currently ranks among the top three global leaders in geothermal electricity generation, with an installed capacity of 2,373 megawatts (MW).³ Expansion plans for existing geothermal plants aim to add another 1,063 MW. However, considering the estimated total geothermal resource potential of about 23,060 MW (23.06 gigawatts), based on data from Indonesia's Geological Agency in 2020, there is still significant room for further capacity development.⁴

5. Geothermal energy offers several advantages for Indonesia's power industry and aligns with its sustainable development goals. It provides a clean, reliable, and continuous source of electricity with minimal greenhouse gas emissions. Additionally, geothermal power plants have a smaller land footprint than other renewable energy sources, ensuring efficient land use. Expanding geothermal projects can stimulate economic growth, create jobs, and enhance energy security by reducing reliance on imported fuels.

6. Indonesia's geothermal resources are widely dispersed. At present, it has 63 government-designated geothermal working areas and 16 PSPE (exploration priority) areas.⁵ PSPE is an assignment given by the government to business entities to conduct comprehensive geological, geochemical,

³ ThinkGeoEnergy Research 2022.
geophysical and/or evaluation surveys up to exploration well drilling. The objective is to gather crucial information about subsurface geological conditions and to estimate the geothermal reserves.

7. To enhance its competitiveness, geothermal energy in Indonesia can be leveraged not only for power generation but also for direct-use operations such as hydrogen production, emission trading, and mineral extraction. However, the current utilization of geothermal heat for direct use in Indonesia is relatively modest: only 2.3 thermal megawatts are being harnessed for this purpose. This signifies substantial untapped potential for the development of directly usable geothermal heat in commercial applications.

C. Geothermal Regulation in Indonesia

8. To expedite the development of geothermal energy, effective policy and regulatory frameworks are essential. The Government of Indonesia has implemented Geothermal Law No. 21/2014, which establishes the legal framework for geothermal activities in the country. This comprehensive legislation provides the legal foundation for the exploration, exploitation, and utilization of geothermal resources. It also addresses crucial aspects such as land acquisition, licensing, fiscal incentives, and involvement of local communities.

9. In addition, the issuance of Presidential Regulation No. 112 of 2022 on Acceleration of Renewable Energy Development for Power Supply (PR 112/2022) reflects the government’s commitment to increase investment in renewable energy operations. The regulation introduces a range of incentives, both fiscal and non-fiscal. It also emphasizes ministerial cooperation, the accelerated termination of coal-fired power plants, and other provisions that underscore the urgency to transition to renewable energy.

D. International Financing Support for Geothermal Development in Indonesia

10. Despite the potential of geothermal energy, its development in Indonesia has faced multiple challenges, including disruptions caused by coronavirus disease, temporary suspension of exploration projects, social resistance in several areas, longer periods of civil and drilling work, operational and health and safety issues, financing and partnership issues, and delays in the engineering, procurement, and construction process.

11. In light of these challenges, international financiers have stepped up their efforts to support geothermal development in Indonesia. ADB has provided financial assistance to the Muara Laboh Geothermal Power Project in West Sumatra, which has a capacity of 80 MW. ADB is also involved in the Geothermal Power Generation Project (Dieng 2 and Patuha 2) in Central and West Java, which is being implemented at present.

12. While ADB’s contributions are noteworthy, other international financiers have also made significant strides in supporting geothermal development in Indonesia. The World Bank, Japan International Cooperation Agency (JICA), and Germany’s KfW, for example, are contributing financing and providing technical assistance to geothermal projects across the country.

13. The Government of Indonesia has implemented programs and mechanisms to utilize the funds provided by international financiers. Once such program is the Geothermal Energy Upstream Development Project, which aims to accelerate geothermal exploration and development activities by reducing risks and uncertainties through financial support for exploration drilling, resource assessment, and surface studies. The government also introduced the Geothermal Resource Risk Mitigation (GREM) mechanism to minimize financial barriers by providing risk-sharing instruments such as guarantees and

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Reevaluation of the Return on Invested Capital and Weighted Average Cost of Capital

insurances, which enhance the bankability of geothermal projects and attract more investors and financial institutions.