THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

FOR OFFICIAL USE ONLY

Report No: PAD2932

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A PROPOSED LOAN
IN THE AMOUNT OF US$150 MILLION AND

A PROPOSED LOAN IN THE AMOUNT OF US$40 MILLION
FROM THE CLEAN TECHNOLOGY FUND

TO THE
REPUBLIC OF INDONESIA

AND
A PROPOSED CONTINGENT RECOVERY GRANT
IN THE AMOUNT OF US$32.5 MILLION AND
A PROPOSED GRANT IN
THE AMOUNT OF US$2.5 MILLION
FROM THE CLEAN TECHNOLOGY FUND

TO
PT SARANA MULTI INFRASTRUKTUR (PT SMI)

FOR AN

INDONESIA GEOTHERMAL RESOURCE RISK MITIGATION PROJECT

UNDER THE MULTIPHASE PROGRAMMATIC APPROACH – Phase 1

WITH AN IBRD FINANCING ENVELOPE IN THE AMOUNT OF US$ 325 MILLION

August 30, 2019

Energy & Extractives Global Practice
East Asia And Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective July 31, 2019)

Currency Unit =	Indonesian Rupiah
IDR 1 =	US$ 0.000070
US$ 1 =	IDR 14,244

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Victoria Kwakwa
Country Director:	Rodrigo A. Chaves
Regional Practice Director:	Ranjit Lamech
Practice Manager:	Jie Tang
Task Team Leader(s):	Peter Johansen

ABBREVIATIONS AND ACRONYMS

BAU	Business-As-Usual
BCM	Business Continuity Management
BPP	Biaya Pokok Penyediaan (Average Cost of Generation)
CAGR	Compound annual growth rate
CO_2	Carbon dioxide
CPF	Country Partnership Framework
CTF	Clean Technology Fund
DA	Designated Account
DIPA	Daftar Isian Pelaksanaan Anggaran (Budget Implementation List)
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ESIA	Environmental and Social Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental Social Safeguard
FIRR	Financial Internal Rate of Return
FMA	Financial Management Assessment
FMV	Fair Market Value
FS	Feasibility study
FY	Fiscal Year
GAP	Gender Action Plan
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEUDP	Geothermal Energy Upstream Development Project
GHG	Greenhouse gas
GIF	Global Infrastructure Facility
GoI	Government of Indonesia
GREM	Geothermal Resource Risk Mitigation
GRS	Grievance Redress Service
GW	Gigawatt
GWh	Gigawatt hour
HoA	Head of Agreement
IA	Implementing Agency
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IDR	Indonesian Rupiah
IFC	International Finance Corporation
IFR	Interim Financial Report
IPB	Izin Panas Bumi (Geothermal Permit)
IPF	Investment Project Financing

IPP	Indigenous Peoples Plan
IPPF	Indigenous Peoples Planning Framework
IPPs	Independent Power Producers
KfW	Kreditanstalt fur Wiederaufbau
kWh	kilowatt hour
LARAP	Land Acquisition and Resettlement Action Plan
M&E	Monitoring and Evaluation
MEMR	Ministry of Energy and Mineral Resources
MFD	Maximizing Finance for Development
MoF	Ministry of Finance
$MtCO_2$	Metric tons of carbon dioxide
$MtCO_2e$	Metric tons of carbon dioxide equivalent
MW	Megawatt
NBFI	Non-Banking Financial Institution
NDC	Nationally Determined Contribution
NV	Notional Value
OJK	Otoritas Jasa Keuangan (Indonesia's Financial Services Authority)
OP/BP	Operational Policy / Bank Policy
PDO	Project Development Objective
PGE	Pertamina Geothermal Energy
PISP	Pembiayaan Infrastruktur Sektor Panas Bumi (Infrastructure Financing for Geothermal Sector)
PLN	PT Perusahaan Listrik Negara (State Electricity Company)
PMK	Peraturan Menteri Keuangan (Ministry of Finance Regulation)
PMU	Project Management Unit
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PPSD	Project Procurement Strategy for Development
PrDO	Program Development Objective
PSPE	Preliminary Survey plus Exploration
PT SMI	PT Sarana Multi Infrastruktur
RETF	Recipient Executed Trust Fund
RIDF	Regional Infrastructure Development Fund
ROA	Return on Assets
ROE	Return on Equity
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik (Electricity Supply Business Plan)
SAGS	Steamfield Above Ground Systems
SOE	State-Owned Enterprise
SPV	Special Purpose Vehicle
TA	Technical Assistance
WB	World Bank
WING	Women in Geothermal
WKP	Wilayah Kerja Panas Bumi (Geothermal Working Area)
3G	Geology, Geophysics and Geochemistry

TABLE OF CONTENTS

DATASHEET **1**

I. STRATEGIC CONTEXT **9**

A. Country Context 9

B. Sectoral and Institutional Context 10

C. Relevance to Higher Level Objectives 15

D. Multiphase Programmatic Approach 16

II. PROJECT DESCRIPTION **20**

A. Project Development Objective 20

B. Components 21

C. Beneficiaries 25

D. Rationale for Bank Involvement and Role of Partners 26

F. Lessons Learned and Reflected in the Project Design 26

III. IMPLEMENTATION ARRANGEMENTS **28**

A. Institutional and Implementation Arrangements 28

B. Results M&E Arrangements 30

C. Sustainability 30

IV. APPRAISAL SUMMARY **30**

A. Technical, Economic and Financial Analysis 30

B. Fiduciary 33

C. Environmental and Social 34

V. KEY RISKS **38**

VI. RESULTS FRAMEWORK AND MONITORING **42**

ANNEX 1: Implementation Arrangements and Support Plan **50**

ANNEX 2: Detailed Project Design **55**

ANNEX 3: Economic and Financial Analysis **65**

ANNEX 4: Assessment of Indonesia's Financial Sector and PT SMI as Financial Intermediary **70**

ANNEX 5: Financial Management **75**

ANNEX 6: Gender Analysis and Proposed Interventions **80**

ANNEX 7: Clean Technology Fund **83**

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Indonesia	Indonesia Geothermal Resource Risk Mitigation Project (GREM)	
Project ID	**Financing Instrument**	**Environmental Assessment Category**
P166071	Investment Project Financing	F-Financial Intermediary Assessment

Financing & Implementation Modalities

[✓] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[ ] Small State(s)
[✓] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Project Approval Date	Expected Project Closing Date	Expected Program Closing Date
26-Sep-2019	31-Oct-2029	31-Oct-2029

Bank/IFC Collaboration

No

MPA Program Development Objective

The Program Development Objective is to increase the share of renewable energy in Indonesia's energy mix.

MPA Financing Data (US$, Millions)

MPA Program Financing Envelope	840.00

Proposed Development Objective(s)

The project development objectives are to scale up investment in geothermal energy development and support the Borrower in its efforts to reduce greenhouse gas emissions in the country.

Components

Component Name	Cost (US$, millions)
Component 1 – Geothermal Resource Risk Mitigation Facility	455.00
Component 2 – Technical Assistance and Capacity Strengthening	10.00

Organizations

Borrower:	Government of Indonesia
Implementing Agency:	PT Sarana Multi Infrastruktur (Persero)

MPA FINANCING DETAILS (US$, Millions)

MPA Program Financing Envelope:	840.00
of which Bank Financing (IBRD):	325.00
of which Bank Financing (IDA):	0.00
of which other financing sources:	515.00

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	465.00
Total Financing	460.00
of which IBRD/IDA	150.00
Financing Gap	5.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	150.00

Non-World Bank Group Financing

Counterpart Funding	135.00
Borrower/Recipient	75.00
Sub-borrower(s)	60.00
Trust Funds	175.00
Clean Technology Fund	75.00
Green Climate Fund	100.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Annual	15.00	45.00	45.00	45.00	45.00	27.00	0.75	0.75	0.75	0.75
Cumulative	15.00	60.00	105.00	150.00	195.00	222.00	222.75	223.50	224.25	225.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?	
a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating

1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Substantial
9. Other	
10. Overall	Substantial
Overall MPA Program Risk	Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36	✓	
Pest Management OP 4.09		✓
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10	✓	
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37	✓	

Projects on International Waterways OP/BP 7.50	✓
Projects in Disputed Areas OP/BP 7.60	✓

Legal Covenants

Sections and Description

IBRD Loan Agreement and CTF Loan Agreement: Schedule 2, S I.A.1(a)(i)
The Borrower (i.e. the Republic of Indonesia) shall no later than six (6) months after the Effective Date, or such other date which the Bank has confirmed in writing is acceptable to the Bank for this purpose, ensure that the actions needed to extend the mandate of the joint committee established under its Geothermal Energy Upstream Development Project are taken to also encompass the Project.

Sections and Description

IBRD Project Agreement and CTF Grant Agreement: Schedule 2, S I.A.2(c), CTF Project Agreement Schedule S I.A.1
No later than (6) months after the Effective Date, or such other date which the Bank has confirmed in writing is acceptable to the Bank, [the Project Implementing Entity][the Recipient] (i.e. PT SMI) shall recruit on the basis of terms of reference, qualifications and experience satisfactory to the Bank, an environmental and social consulting firm to, among others, support the Project Implementing Entity in the due diligence on the environmental and social impacts of proposed Sub-projects, review the Safeguards Instruments prepared by the Beneficiaries, identify capacity gaps and risks, and monitor implementation and compliance with the relevant Safeguard Instruments during Sub-project implementation.

Sections and Description

IBRD Project Agreement and CTF Grant Agreement: Schedule 2, S I.D, CTF Project Agreement Schedule S I.A.1
Standard E&S covenants: due regard to health, safety, social and environmental practices and standards, compliance with Safeguard Instruments, preparation of ESIA, ESMP, IPP and or LARAP for Sub-projects in accordance with the frameworks, implementation of Sub-project LARAP (funding, compensation prior to displacement, M&E and reporting), no excluded activities, no amendment or waiver of the Safeguard Instruments, Bank's review of ToR for TA to take into account the requirements of the applicable Safeguard Policies and EHS Guidelines, reporting (quarterly or whenever the circumstances warrant or requested by the Bank, including reporting and notification of incidents from entities supervision the civil works, contractors and sub-contractors), and grievance redress mechanism).

Sections and Description

IBRD Project Agreement and CTF Grant Agreement: Schedule 2, S I.E.2(b), CTF Project Agreement Schedule S I.A.1
From a date no later than one (1) month after the Effective Date and throughout the implementation of the Project, the Project Operations Manual shall also set forth in form and substance acceptable to the World Bank (as part of the existing manual or as a separate manual): (i) the procedural steps for Beneficiaries to apply for a financing under Part 1 of the Project and for the Project Implementing Entity to process such application; and (ii) the financial terms of the Sub-loans and Sub-financing extended under Part 1 of the Project.

Sections and Description

IBRD Project Agreement and CTF Grant Agreement: Schedule 2, S I.F, CTF Project Agreement Schedule S I.A.1 Standard AWPB covenants

Sections and Description

CTF Grant Agreement Schedule 2, S I.G.1
The Recipient shall deposit into the CTF Reflow Account all funds received in connection with the assignment of Financing Instruments purchased through the extension of the Sub-financings with the funds of Category (1), all in accordance with the provisions of the Project Operations Manual.

Sections and Description

CTF Grant Agreement Schedule 2, S IV.B.1(b)
No first withdrawal shall be made under Category (1) (i.e. Sub-financings under Part 1.2 of the Project) until such date when: (A) either each of the IBRD Loan Agreement and the IBRD Project Agreement, or each of the CTF Loan Agreement and the CTF Project Agreement, as the case may be, has been duly executed and all conditions precedent to their effectiveness (other than the effectiveness of this Agreement) have been fulfilled; and (B) the Recipient is not in breach of any of its obligations under Section I.D of this Schedule.

Sections and Description

IBRD Project Agreement, CTF Project Agreement and CTF Grant Agreement: Schedule 2, S II.B.1(a)
The [Project Implementing Entity] [Recipient] (i.e. PT SMI) shall not later than forty-two (42) months after the Effective Date, or such other date as may be agreed in writing with the Bank, carry out jointly with the Bank and the Borrower, a midterm review of the Project.

Sections and Description

IBRD Loan Agreement Schedule 2, S III.B.1(b)(i)
No first withdrawal shall be made under Category (1) (i.e. Sub-loans under Part 1 of the Project) until such date when neither the Borrower nor the Project Implementing Entity is in breach of any of its obligations under Section I.C of this Schedule and Section I.D of the Schedule to the Project Agreement, respectively.

Sections and Description

CTF Loan Agreement Schedule 2, S IV.B.1(c)
No first withdrawal shall be made under Category (1) (i.e. Sub-loans under Part 1 of the Project) until such date when neither the Borrower nor the Project Implementing Entity is in breach of any of its obligations under Section I.C of this Schedule and Section I.A.1 of the Schedule to the Project Agreement, respectively.

Conditions

Type	Description
Disbursement	IBRD Loan Agreement Schedule 2, S III.B.1(b)(i) No first withdrawal shall be made under Category (1) (i.e. Sub-loans under Part 1 of the Project) until such date when neither the Borrower nor the Project Implementing Entity is in breach of any of its obligations under Section I.C of this Schedule and Section I.D of the Schedule to the Project Agreement, respectively.
Type	Description
Disbursement	CTF Loan Agreement Schedule 2, S IV.B.1(c) No first withdrawal shall be made under Category (1) (i.e. Sub-loans under Part 1 of the Project) until such date when neither the Borrower nor the Project Implementing Entity is in breach of any of its obligations under Section I.C of this Schedule and Section I.A.1 of the Schedule to the Project Agreement, respectively.
Type	Description
Disbursement	CTF Grant Agreement Schedule 2, S IV.B.1(b) No first withdrawal shall be made under Category (1) (i.e. Sub-financings under Part 1.2 of the Project) until such date when: (A) either each of the IBRD Loan Agreement and the IBRD Project Agreement, or each of the CTF Loan Agreement and the CTF Project Agreement, as the case may be, has been duly executed and all conditions precedent to their effectiveness (other than the effectiveness of this Agreement) have been fulfilled; and (B) the Recipient is not in breach of any of its obligations under Section I.D of this Schedule.
Type	Description
Effectiveness	IBRD Loan Agreement and CTF Loan Agreement: Article V Section 5.01 A subsidiary agreement for the on-lending of the funds of the Loan has been signed, delivered and declared effective in accordance with the provisions of Section I.B.1 of Schedule 2 to this Agreement.
Type	Description
Effectiveness	CTF Grant Agreement Article V Section 5.01 (a) The execution and delivery of this Agreement on behalf of the Recipient has been duly authorized or ratified by all necessary governmental or corporate action. (b) If the Bank so requests, the condition of the Recipient, as represented or warranted to the Bank at the date of this Agreement, has undergone no material adverse change after such date.

I. STRATEGIC CONTEXT

A. Country Context

1. Indonesia – a diverse archipelagic nation of more than 300 ethnic groups – has charted impressive economic growth since the Asian financial crisis of the late 1990s. Today, Indonesia is the world's fourth most populous country with over 260 million people, the eighth largest economy globally and the largest economy in Southeast Asia with a gross national income per capita of US$3,540.[1] Indonesia has also made enormous gains in poverty reduction. Since 1999, poverty rate has more than halved to around 10 percent. Nevertheless, around 26 million Indonesians still live below the national poverty line.[2] Approximately 40 percent of the entire population remains vulnerable of falling into poverty. The slow pace of job creation is another challenge to poverty reduction efforts, largely affecting the 1.7 million youth that enter the workforce each year.

2. Indonesia has maintained a real gross domestic product (GDP) growth of five percent over the past three years, hovering around 5.2 percent in 2018.[3] Greater investment has been bolstered by lower financing costs, improved business environment, and stronger public capital investment. While the Indonesian economy has seen some economic diversification in recent years, its economic performance is still substantially tied to commodities as a major exporter.

3. With its large yet dispersed population, maintaining modern and efficient infrastructure is vital for Indonesia to connect with markets at home and abroad to sustain robust growth. To this end, improving infrastructure is a top priority for the Government of Indonesia (GoI). In the 2018 budget, the GoI earmarked the highest amount ever allocated for infrastructure development – approximately US$27 billion – which will remain a priority at least for the next few years according to the 2015-2020 medium-term development plan. Many of the key infrastructure projects and programs have been implemented by the 24 state-owned enterprises (SOEs). The challenge lies in developing a risk-sharing model so that SOEs benefit from government-backed, lower borrowing costs without exposing the national budget to undue fiscal burden. Meanwhile, the GoI has made significant efforts in introducing many regulatory reforms to create a more conducive environment for private sector participation to close the infrastructure gap.

4. Meanwhile, Indonesia continues to rely heavily on fossil-fired power generation. In 2018, the total installed capacity was 57 gigawatts (GW)[4], of which 88 percent from fossil fuels[5] and 12 percent renewable sources, to meet a peak demand of 40 GW.[6] Important policy goals have been formulated by the National Energy Council to re-establish Indonesia's energy independence through (i) re-directing energy resources from export to domestic market and (ii) rebalancing the energy mix towards indigenous energy supplies. The policy implies increasing the exploitation and consumption of coal and renewable energy sources, optimizing the production and consumption of gas, and transforming the energy mix by minimizing oil consumption and raising the share of renewable energy in the country's energy mix.[7]

[1] World Bank: World Development Indicators 2017
[2] Central Statistical Bureau data, March 2018
[3] Indonesia Economic Quarterly. World Bank, December 2018
[4] MEMR presentation, January 2019
[5] This consists of 58% coal, 23% gas, and 6% diesel.
[6] Data from PLN Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik, or RUPTL), 2019-2028
[7] Infrastructure Sector Assessment Program, World Bank, June 2018

5. ***The GoI has set the renewable energy target of 23 percent by 2025.[8] This Multiphase Programmatic Approach (MPA) is designed to support the government in reaching this renewable energy target with a primary focus on geothermal energy***. Indonesia currently has 1.95 GW of installed geothermal capacity despite an estimated 29 GW in potential resources. The addition of 4.6 GW of geothermal capacity planned in PLN's Electricity Supply Business Plan (RUPTL) 2019-2028 would require investments of approximately US$25 billion. The MPA will implement an efficient risk sharing mechanism to achieve the scale needed to contribute to reaching the GoI's renewable energy target. To do so, it will pilot the use of an innovative financing instrument for geothermal exploration drilling and therefore leverage investments of up to US$4 billion enabling 1,000 megawatts (MW) of geothermal development by 2029. By doing so, it will avoid emitting around 187 million of metric tons of carbon dioxide ($MtCO_2$), and match the long lead time-horizon of geothermal development.

B. Sectoral and Institutional Context

Sector Context

6. Increasing household access to electricity services is a key objective for GoI, yet critical challenges remain particularly for the last-mile customers. Indonesia increased the electrification rate from 80 percent in 2013 to around 95 percent[9] in 2018, with the goal to achieve 100 percent within the next few years.[10] The electrification rate masks substantial regional disparities with provinces in Eastern Indonesia having much lower rates. For example, Papua has the lowest electrification rate at 44 percent followed by Nusa Tenggara Timur at 59 percent. Provinces such as Jakarta, Bangka Belitung and Banten have close to 100 percent electrification rate. Connecting the remaining households will be very costly, given that most are in remote areas, but remains an objective for the GoI. Most geothermal projects outside the main Java-Bali grid will be part of an electrification agenda aiming at equitable access to electricity.

7. Meanwhile, the state electricity company, PT Perusahaan Listrik Negara (PLN), consumed 3.45 million kiloliters of fuels (i.e., high-speed diesel, bio-marine fuel oil, olein) and produced 4,809 gigawatt hours (GWh) from its own diesel generation plants to serve customers in the eastern regions and outside of the main Java-Bali power grid.[11] Indonesia has also become a net crude oil and fuel importer due to reduced domestic oil production and inadequate refinery infrastructure. In 2016, the country imported 148.3 million barrels and 22.8 million kiloliters of oil fuels. To add another 56 GW of power generation capacity by 2028, PLN expects this will come from 26.9 GW of coal, 12.4 GW of gas, 9.5 GW of hydropower, 4.6 GW of geothermal and 2.5 GW of other renewable sources.[12]

Geothermal has high potential, but also high financial risk

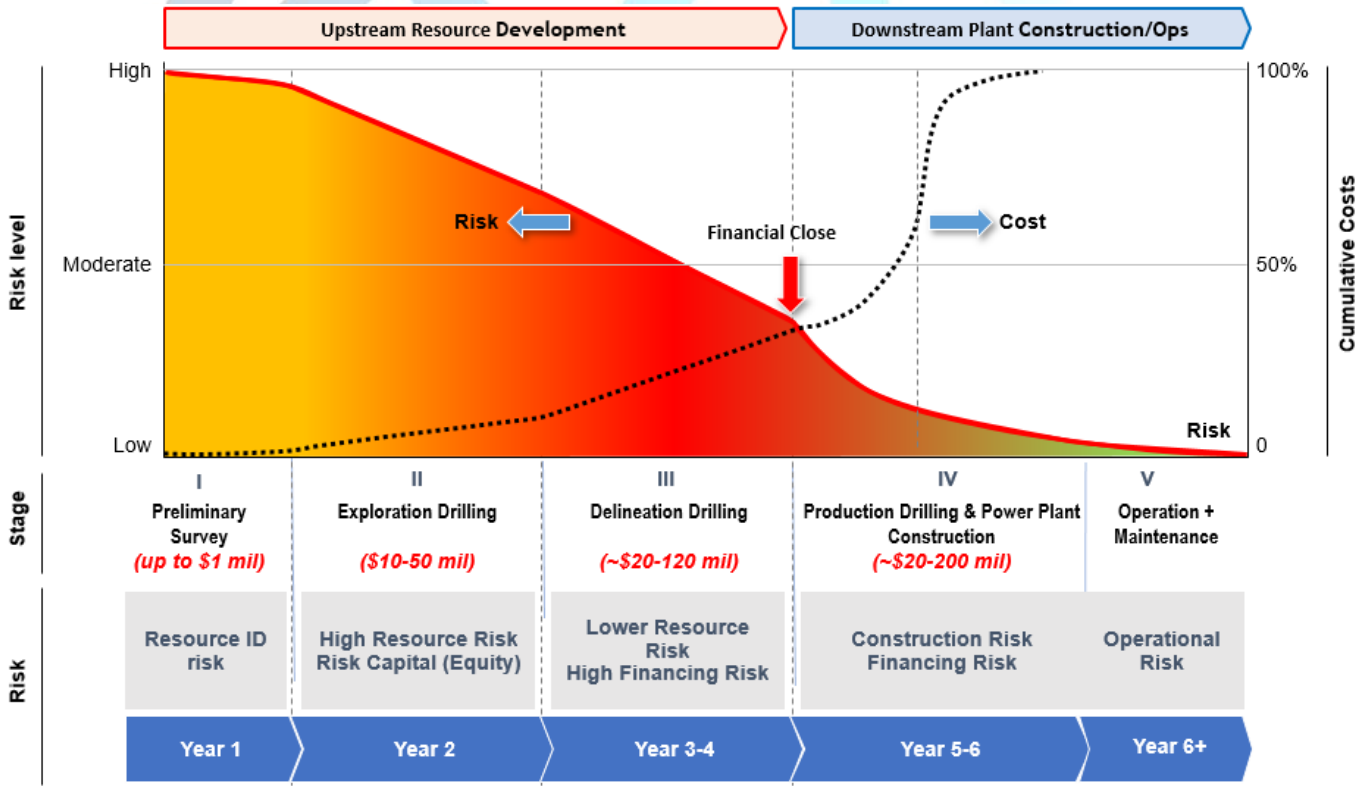
8. As a clean and renewable energy source, geothermal can play a significant role in decarbonizing Indonesia's power sector and furthering its climate change mitigation agenda in economical and sustainable ways. First, geothermal energy is a baseload technology that can displace coal in supplying power around the clock. Second, geothermal can be cost competitive with coal or natural gas, particularly when high-enthalpy resources can be accessed and developed with relative ease. Third, it is an indigenous source for Indonesia, which means that the country can depend less on imported fuels and enhance its energy security. Finally, its abundance across the country can contribute

[8] MEMR's Roadmap for Accelerated Development of New and Renewable Energy 2015-2025
[9] Estimates of electrification rates vary from source to source and sometime include and sometime exclude solar home systems and pre-electrification efforts like provision of solar lanterns. 95% is a best-guess estimate by the World Bank energy team.
[10] RUPTL PLN (Persero) 2019-2028 Executive Summary Presentation, February 2019
[11] MEMR's Oil and Gas Statistics 2016 and PLN's Statistic 2017
[12] PLN's RUPTL 2019-2028

to achieving universal access to electricity, and therefore economic growth, job creation and prosperity, especially on the eastern islands where electrification rates are much lower and poverty rates are higher than the national average.

9. Exploring and confirming geothermal resources for power generation is financially high-risk[13] and costly. It is expected that an exploration drilling program in Indonesia will cost approximately US$30 million assuming a minimum of three wells for a greenfield development and at least two wells producing an acceptable level of steam for the site exploration to provide satisfactory proof or resource availability. Geothermal energy is developed through successive phases, starting with preliminary surveys and surface studies followed by exploration drilling to confirm the availability and temperature of resources, which if successful, will be followed by delineation drilling to confirm the extent and productivity of the reservoir as well as the feasibility of its exploitation. Once the resource has been confirmed and financial viability established, project finance can be structured to cover production drilling and power plant construction, after which operation can start. Figure 1 illustrates the risk profiles and capital requirements for different stages of geothermal development.

Figure 1: Stage-wise Risk Profiles and Capital Requirements for Geothermal Development



10. Resource risk (also known as exploration drilling risk) and the large upfront risk capital required is the key barrier to geothermal development in Indonesia. Exploration drilling normally requires project owner's equity or corporate finance, which may not be recovered if the drilling reveals that the resource is not sufficient or economically viable for exploitation. Even though the costs for exploration drilling are relatively modest compared to the total cost of developing all stages of a geothermal operation, it is the riskiest phase of the operation and finding this initial capital

[13] Success of Geothermal Wells: A Global Study. International Finance Corporation, June 2013

has proven to be challenging for developers in Indonesia.

Many players in the market, most deterred by regulatory constraints

11. Indonesia has the second largest installed capacity of geothermal energy in the world with 1,948 MW after the US with 3,639 MW.[14] In the Indonesian geothermal market, there are three state-owned geothermal developers[15]: (i) Pertamina Geothermal Energy, a subsidiary of the state oil and natural gas company Pertamina[16]; (ii) PLN Gas and Geothermal, a subsidiary of PLN; and (iii) Geo Dipa Energi, an SOE with shares held by Ministry of Finance (MoF) (93 percent) and PLN (7 percent). There are also domestic and international private developers holding geothermal licenses, including Medco Power, Supreme Energy, Star Energy, Sabang Geothermal Energy, Jabar Rekin Geothermal, Wijaya Karya, Sintesa Banten, Spring Energy Sentosa, Sumbawa Timur Mining, Optima Nusantara Energi (Indonesia), Energy Development Corporate (the Philippines), Hitay Energy (Turkey), ENEL Joint Venture (Italy), and Ormat Geothermal Indonesia (US).

12. Since 2017, there have been major regulatory changes in the sector.[17] The most important changes relate to: (i) the procedure for issuing *geothermal licenses* for geothermal working areas (Wilayah Kerja Panas Bumi, or WKP), and (ii) the introduction of a *regional cap* on the off-take price from geothermal power producers.

13. *First*, the new procedure for WKP tender does not include tariff as the element of competition and solely evaluates the quality of bidder's development plan and the exploration funding commitment amount. For projects with basic data[18], developers should participate in an open competitive WKP tender. Furthermore, new tenders for greenfield projects will award the newly introduced Preliminary-Survey-Plus-Exploration (PSPE) license, where developers are selected based on pre-identified criteria and demonstrated capabilities for geothermal development. The PSPE license-holder is required to drill at least one well that meets the pre-defined steam yield level. Following successful completion of exploration drilling, Ministry of Energy and Mineral Resources (MEMR) will designate the greenfield project as a WKP and open a limited tender. Only the PSPE license-holder and public developers are invited to this WKP tender and the PSPE holder will be granted a "right to match" preference. The winning bidder will be awarded the full development license (Izin Panas Bumi, or IPB) for the WKP and negotiate a power purchase agreement (PPA) with PLN. Typically, IPB license-holders are expected to sign a Head-of-Agreement (HoA) with PLN, which lays out principles for the PPA that will be negotiated upon confirmation of the resource.

14. The two-step approach with issuing exploration-only (not full development) licenses and awarding PPA only after early success in exploration has been introduced to efficiently match tariff requirements with the confirmed resource level and expected development cost. However, while this is a positive development, it can in some cases reduce incentives for developers to put in upfront risk capital from equity or corporate finance. MEMR awarded eight PSPE licenses in 2018 and more can be expected in the coming years. This signals that the approach will be the norm going forward. However, market soundings confirm that an effective risk mitigation mechanism to cost-share the

[14] These are followed by the Philippines (1,868 MW), Turkey (1,347 MW), New Zealand (1,005 MW), Mexico (951 MW), Italy (944 MW), Iceland (755 MW), Kenya (676 MW) and Japan (542 MW). ThinkGeoEnergy, January 2019.
[15] State-owned developers are assigned full development licenses.
[16] Created in 1968, Pertamina is the largest crude oil producer in Indonesia after expiry of some Chevron Pacific Indonesia's oil & gas licenses.
[17] Previously, the GoI issued Law No. 21 of 2014 on Geothermal, and subsequently, Government Regulation No. 7 of 2017 on Geothermal for Indirect Use, which removed categorization of geothermal drilling as a mining activity, has allowed geothermal development to take place in conservation forest areas in a sustainable way, in conjunction with policies set by the Ministry of Environment and Forestry.
[18] This includes 3G (geology, geophysics, and geochemistry) and additional surface data. This may be available from Badan Geologi and/or through government-sponsored drilling.

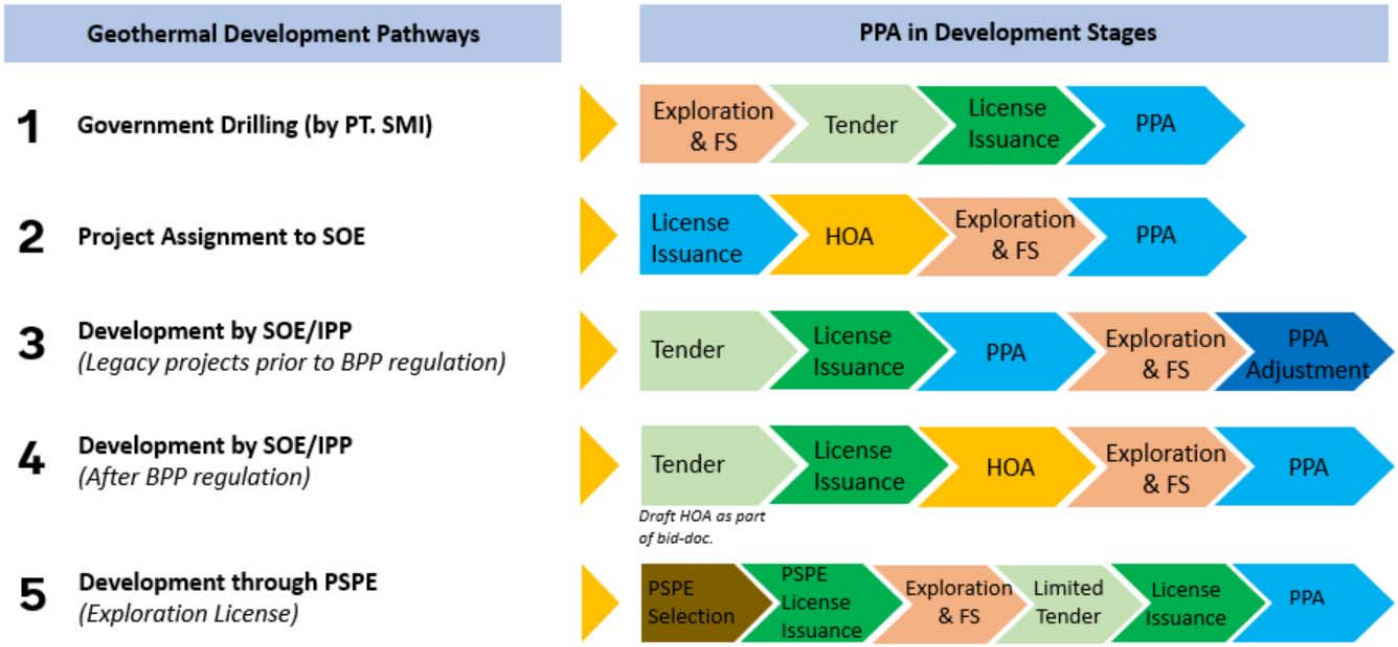
downside of exploration risks will be needed to enable these projects to go ahead.

15. *Second*, Regulation No. 50/2017 caps geothermal tariffs at the average regional electricity generation cost (Biaya Pokok Penyediaan, or BPP)[19] for the local grid. The BPP rule presents attractive tariffs in the diesel-based systems of the small- and medium-sized islands in eastern Indonesia; however, it may be challenging for geothermal to compete in the coal-dominated main power markets of Java-Bali and Sumatra where the average generation cost is much lower. There are a number of legacy projects where developers – both SOEs and independent power producers (IPPs) – have grandfathered PPAs that would not be affected by the BPP cap. Besides these, 22 out of 30 existing WKPs are in the Java-Bali and Sumatra grids. In addition, tariffs over the BPP can still be agreed in business-to-business negotiations with PLN and confirmed by MEMR. The result is that many future WKP assignments can be expected in Eastern Indonesia due to the high BPP – and therefore attractive prices – there. In Java-Bali and Sumatra, the effects are more mixed with few developers confident that they can obtain PPA prices high enough to ensure adequate return on investment.

16. Furthermore, PLN has been assigned IPB licenses for eight sites, of which four are in Eastern Indonesia, as part of its electrification mandate.[20] PLN has issued requests for proposals from private partners to jointly develop these WKPs under a public-private partnership (PPP) arrangement. PLN plans to sign a HoA with its partners, which would include the principles for the site development and methodology for a framework PPA calculation, where the actual PPA will be signed after completion of exploration drilling if the drilling results show the expected steam production as set out in the HoA. A similar approach to PPA tariff-setting can, in principle, also be applied to PSPE license-holder to mitigate the PPA uncertainty and where the developer is invited to negotiate a HoA with PLN before committing tens of millions of exploration cost. This means that for both PLN's private partners and PSPE license-holders, while the developer still takes resource risk, there is a way to get a PPA as set out in the HoA beforehand, which would make it worthwhile to put in the investment for the exploration drilling cost.

[19] The policy was designed to reduce the overall electricity subsidies and keep the end-user tariffs affordable to consumers.
[20] The full list of geothermal fields and licensing status is provided in Annex 2, Table 2.2.

Figure 2: Procedures for Signing Head-of-Agreement and Power Purchase Agreement by Geothermal Development Pathways[21]



Institutional Context

17. GoI have allocated resources to support the sector through dedicated programs such as the Infrastructure Financing for Geothermal Sector (Pembiayaan Infrastruktur Sektor Panas Bumi, or PISP), as well as providing fiscal incentives for developers by means of various tax deduction possibilities. PISP funds can be used to support investments by SOEs in geothermal exploration and exploitation as provided in MoF Regulation PMK No. 62-08/2017.

18. PT Sarana Multi Infrastruktur (PT SMI), a state-owned non-banking financial institution (NBFI) owned by MoF, has been assigned to be the PISP Fund Manager. PISP will provide counterpart financing to the proposed MPA. PLN has a constitutional mandate to provide electricity to all Indonesians and is the sole power off-taker. Local governments where the geothermal projects are proposed and supported under this MPA will be consulted and will have the authority to issue locally relevant permits for the sub-projects.

A Paradigm Shift

19. To meet the GoI's ambitious target of an additional installed capacity of 4.6 GW of geothermal energy, there needs to be: (i) clear and transparent procedures for awarding licenses and signing PPA, (ii) an optimized use of public funds and climate finance to bring down project development cost, and (iii) an efficient risk allocation strategy to incentivize private sector investments at scale.

20. The proposed MPA Program will increase the share of geothermal energy in the national energy mix. This would

[21] Government drilling refers to a program where the government (MoF) appoints PT SMI to conduct exploration drilling on a greenfield geothermal area through contracting drilling service providers. When the resource is confirmed, the data is provided to MEMR, which will designate the field as WKP and tender the site for development. This program is currently supported by the World Bank-financed Geothermal Energy Upstream Development Project (GEUDP) (P155047). It is described in various sections of this document.

be achieved through the implementation of a cost-efficient risk-sharing mechanism to mitigate geothermal resource risk, which would bring substantial leverage of developers' equity, public funds from PISP as well as International Bank for Reconstruction and Development (IBRD) and climate finance. Technical assistance (TA) will be provided to support improvements in licensing and PPA award procedures thereby mitigating regulatory risks in the medium- and long-term. The MPA enables the World Bank to deepen its engagement in Indonesia's geothermal sector in the upstream phase,[22] and achieves results at scale. The MPA design targets the riskiest part of the development phases, and in doing so, it supports the Government's vision of developing geothermal energy as a strategic indigenous energy source.

C. Relevance to Higher Level Objectives

21. Indonesia's 2005-2025 National Long-Term Development Plan (Rencana Pembangunan Jangka Panjang Nasional, or RPJPN) places an emphasis on developing infrastructure and enhancing quality of life for its citizens. The Masterplan for Acceleration and Expansion of Indonesia Economic Development (MP3EI) has laid out a medium-term target for high economic growth towards 2025 driven primarily by attracting around US$470 billion of private investments through public-private partnerships. Energy has been identified as one of the eight strategic areas for public support towards economic growth and innovation-driven growth. The proposed MPA aims to leverage the strategic use of public funds to bring in climate funds and private investments in clean energy deployment and achieve greater scale of geothermal deployment in the most cost-effective manner. In addition to working with SOEs, it will adopt private sector solutions and innovations in geothermal exploration drilling strategy and management, and therefore demonstrate the maximizing finance for development (MFD) approach. As a result, it is expected that Phase 1 will leverage around US$2 billion of private sector investments and around US$400 million public sector funds.

22. Indonesia's Nationally Determined Contribution (NDC) outlines the country's transition to a low-carbon future with commitments to reduce greenhouse gas (GHG) emissions by 29 percent on its own efforts and up to 41 percent with international support, compared to the business as usual (BAU) scenario, by 2030. The GHG emission level of the energy sector in 2016 was 619 metric tons of carbon dioxide equivalent ($MtCO_2e$) and predicted to be 1,669 $MtCO_2e$ by 2030.[23] For the energy sector, the expected GHG emission reduction is 314 $MtCO_2e$/year on its own efforts and 398 $MtCO_2e$/year with international support by 2030. Economic analysis (more in Annex 3) shows that the MPA expects to help the Government achieve GHG emission reduction of 187 $MtCO_2$ over the lifetime of the investments in contribution to Indonesia's NDC.

23. The MPA Program will contribute to Indonesia's and global efforts to mitigate climate change by enabling the use of clean energy technologies substituting coal-fired power generation in the main power markets of Java-Bali and Sumatra and diesel-fired generation in smaller and dispersed islands in Eastern Indonesia. The MPA is also part of the World Banks's Energy Transition initiative in Asia, which aims to assist countries with coal-dominated national grids in transitioning to a low-carbon path.

24. Finally, the MPA aligns with the 2016-2020 World Bank Group Country Partnership Framework (CPF)[24], specifically the Sustainable Energy and Universal Access Engagement Area, the RE and low-carbon development focus area and its linked outcome of incremental geothermal power installed capacity (MW) enabled. The MPA is part of a broader menu of support to GoI in meeting electricity demand, reaching universal access goal to benefit the bottom

[22] Previously, the WB has mainly focused on downstream investments, such as power plant construction, and more recently assisted the Government in setting up a geothermal exploration government-drilling program under the GEUDP.
[23] GHG Monitoring, Reporting, and Verification Report, Ministry of Environment & Forestry 2017.
[24] World Bank Report 99172, November 3, 2015

40 percent, and mitigating the risk of long-term over-reliance on fossil fuels for power generation.

D. Multiphase Programmatic Approach

(i) Rationale for Using MPA

25. The 10-year MPA Program will help the achievement of the Government's target of 23 percent of renewable energy in the national energy mix by 2025 through a program of longer-term, adaptive and continuous engagement. The MPA as the modality, has several advantages over a standalone Investment Project Financing (IPF) project, or its series:

- The MPA will support the Government program in introducing an innovative financial risk mitigation mechanism, the market acceptance of which would need to be tested during the first phase. The longer timeframe of the MPA matches the longer time horizon associated with establishing and implementing the first credit facility for geothermal exploration drilling by developers in Indonesia, including getting financing approved, mobilization for drilling, confirmation of results, negotiating PPA and achieving financial close, and loan repayment from developers. The 10-year time frame also mirrors the long lead time for geothermal development.

- The MPA provides a short to medium-term framework of engagement for the World Bank (WB) in Indonesia's geothermal sector, during which there would be opportunities to expand the scope of the program (based on lessons learned) to strengthen sector policies and regulations to further increase private sector participation, as well as improve the efficiency of SOEs in delivering geothermal energy services.

- The MPA seeks to incentivize scaled-up investments by established developers as well as supporting new, local developers and service providers to create a deeper market for geothermal development in Indonesia. Such an undertaking requires a consistent and focused engagement with the developers over a longer time-period. It is anticipated that the Bank' long-term support through the MPA would further strengthen market trust, reduce financing risks, and increase efficiency gains.

- The added benefits of the phased approach provide comfort to MoF and PT SMI, the implementing agency, in committing to IBRD funding for the first phase, while reducing the accumulated commitment fees over the program period.

- The funding from the Green Climate Fund (GCF) was approved in two tranches with Tranche 1 (US$100 million) supporting the first phase and Tranche 2 (US$85 million) supporting the second phase of the MPA.

(ii) Program Results Chain

26. As described in the preceding sections, the government's program objective is to reduce GHG emissions by 41 percent by 2030, and to reach 23 percent renewable energy in the national energy mix. The key challenge that the proposed MPA Program is addressing is the high risk associated with geothermal exploration combined with the uncertainties in the present regulatory framework, which are barriers for Indonesia to tap into its geothermal potential to replace fossil fuels and reduce GHG emissions.

27. The MPA will provide support to PT SMI to establish a risk sharing facility to support geothermal resource

confirmation (exploration and delineation drilling) and will support key sector entities (including Mo MEMR and PLN)[25] through capacity strengthening and technical assistance to improve the regulatory framework for geothermal power production including transparent and effective procedures for geothermal licensing and power offtake agreements. It is assumed that PT SMI will be able to develop their capacity to operate the Facility and that the Facility offerings in combination with the improvements in regulatory framework, licensing procedures and offtake agreements will be attractive to both public and private developers and that public developers will improve their capacity to implement geothermal projects. The expected result is the successful exploration of at least 13 prospective geothermal work areas leading to financing decisions for development of 1,000 MW of new geothermal generation capacity and subsequent investment of US$4 billion for steam production drilling and power plant construction. It is assumed that this geothermal capacity will produce power at a 92 percent load factor (leading to annual production of 8,059 GWh of electricity) and the total lifetime reduction of 187 million tons of carbon dioxide (CO_2) emissions.

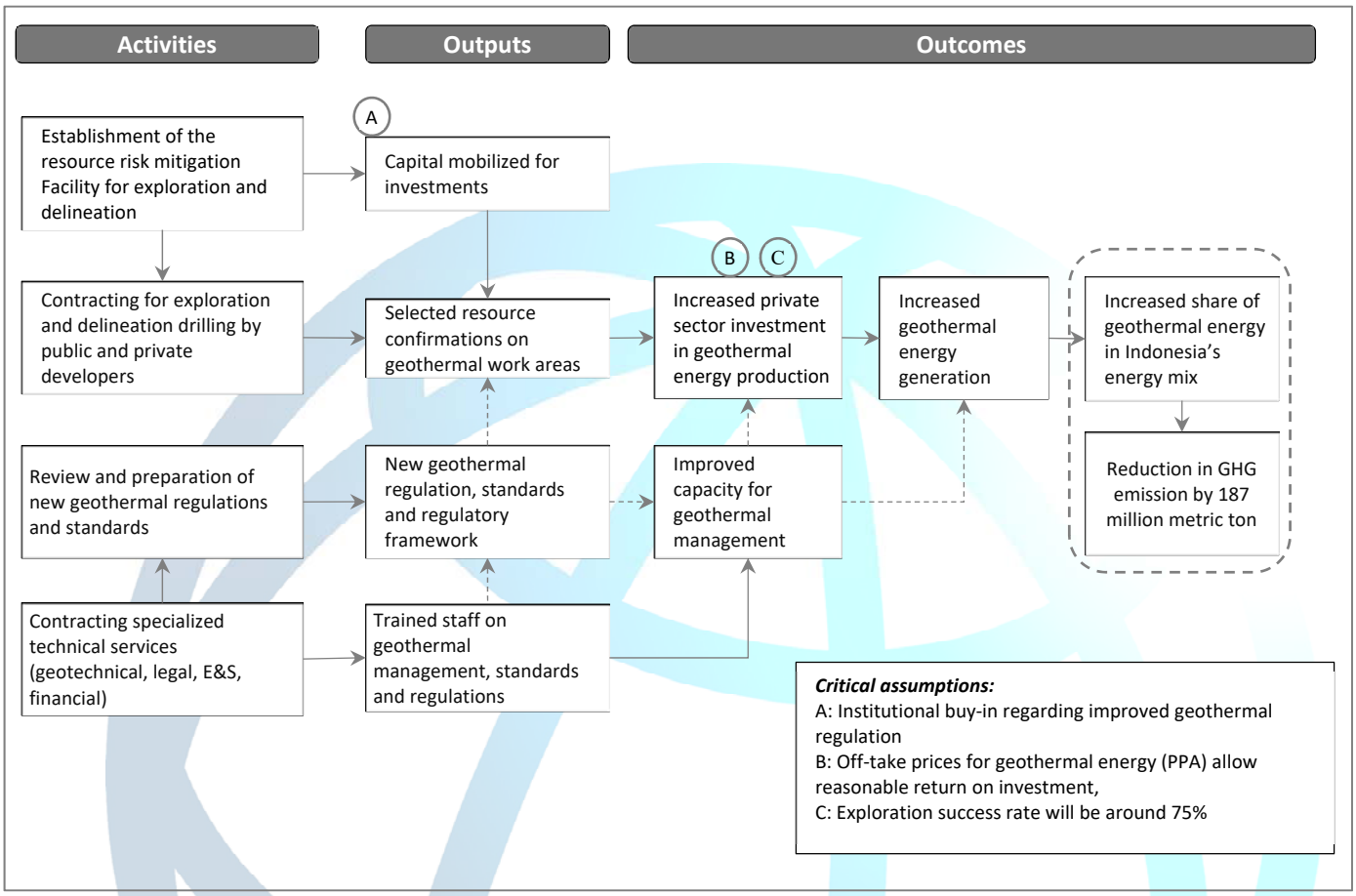
28. The proposed MPA will not be supporting access-related distribution or transmission investments, since such investments are already being addressed in existing programs financed by IBRD and other International Financial Institutions in the framework of the RUPTL. The table below describes these other investments.

P-Code	Project Title	Objectives	Closing Date	Size
P154805	Power Distribution Development Program-for-Results	To increase access to electricity services and to improve the efficiency and reliability of their delivery in selected areas of Indonesia.	4/30/2020	US$500M (IBRD)
P117323	Indonesia Power Transmission Development Project	To assist PLN to meet growing electricity demand, improve the reliability of electricity supply, strengthen the power transmission system, and support the preparation of hydropower projects.	10/31/2019	US$205M (IBRD)
P123994	Indonesia Second Power Transmission Development Project	To meet growing electricity demand and increase access to electricity in the Project Area through strengthening and expanding the capacity of the power transmission networks in the Project Area in a sustainable manner.	12/31/2019	US$137.60M (IBRD)
P169259	Indonesia Sustainable Least-cost Electrification	Support the Government of Indonesia, and in particular PLN, in adopting a framework approach for electrifying eastern Indonesia in a sustainable and cost-competitive manner while leveraging private sector investments.	06/31/2020	US$700,000 (CTF and various Trust Funds)

29. Figure 3 below illustrates the Theory of Change to achieve the program objectives.

[25] For TA activities not financed from GCF and CTF, the implementation arrangements will be decided when the financing agreements will be signed. It is possible that PLN and MEMR, respectively, will implement the TA activities for which they are themselves beneficiaries.

Figure 3: MPA Results Chain[26]



(iii) Program Development Objective and Key Program DO Indicators

30. The Program Development Objective (PrDO) is ***to increase the share of renewable energy in Indonesia's energy mix***. The progress towards PrDO will be measured by the following outcome indicators throughout the MPA Program implementation:

a) Generation capacity of geothermal sub-projects reaching financial close (Megawatts; baseline 0, program target 1,000)
b) Estimated GHG emission reduction compared to business as usual baseline (Metric ton; baseline 0; program target 187 million)

(iv) Program Framework

31. The proposed MPA includes two overlapping phases that will start at Year 1 and Year 3, respectively. The first phase, with a duration of 10 years, will start up the program and introduce the proposed innovative financing mechanism.[27] The second phase, with a duration of eight years, will scale up investment through the facility while

[26] The Project will enable the development of new geothermal capacity which is expected to displace fossil fuels in the national energy generation mix.

[27] Innovation in financial structuring for geothermal exploration supported by this operation would allow PT SMI to use a "reimbursable grant"

reflecting the changes and streamlining from the learning. The design of the future phase(s) will consider developed capacity of institutions and stakeholders, market response, risk appetite of key stakeholders, and learning from technical challenges. The overlapping of phases ensures that essential activities in each phase continue without there being a gap in program roll-out while the next phase is prepared. The MPA Program is designed to have the same components and outcomes for all its phases – but with a different scope and targets.

32. The MPA is currently envisioned to consist of two IPF phases. Depending on the client capacity and learning from the preceding phases, there could be a third phase. The decision for a third phase would be made during preparation of the second phase, tentatively scheduled to start two years after the first phase under the assumption that satisfactory progress has been made to justify adding more funding. Given the novelty and complexity of the MPA, as well as the historic context of Indonesia, the risk rating for both phases is Substantial[28]. The risks will be assessed periodically so the rating for the future phase(s) may be adjusted as appropriate.

Table 1: Program Framework

Phase #	Sequential or Simultaneous	Phase's Proposed DO	IPF or PforR	Estimated IBRD Amount (US$ million)	Estimated Other Amount (US$ million)	Estimated Approval Date	Estimated Environmental & Social Risk Rating
1	--	Scale up investment in geothermal energy development and support the Borrower in its efforts to reduce greenhouse gas emissions in the country.	IPF	150.00	315.00	September 26, 2019	Substantial
2	Simultaneous	Same as Phase 1 but with different results targets	IPF	175.00	200.00	September 26, 2021	Substantial
Total				325.00	515.00		
Estimated for the entire MPA Program				840.00			

as a convertible debt instrument vis-à-vis the sub-borrowers facilitating an effective risk mitigation by linking the amount of debt to be paid back to the value created in the sub-project that is being financed by PT SMI.

[28] The management will seek Board approval for all High or Substantial ESF risk phases per MPA Policy approved by the Board.

Table 2: MPA Phases and Estimated Financing

Funding Breakdown of MPA phases	Funding Sources							
	Project Cost	PISP	IBRD	GCF	CTF	Developer Equity	ESMAP[29]	GIF[30]
Phase 1	465	75	150	100	75	60	2.5	2.5
Phase 2 (tentative)	375	75	175	85	-	40	-	-
Total MPA	**840**	**150**	**325**	**185**	**75**	**100**	**2.5**	**2.5**

(v) Learning Agenda

33. The MPA provides an opportunity to integrate learning in the Program design. Currently, the knowledge gaps include lack of clear understanding on market acceptance of the Geothermal Resource Risk Mitigation (GREM) Facility (the Facility), and whether investments in capacity strengthening would have an impact on efficacy and efficiency in the sector:

a) **Market acceptance of the Facility**. Given that phase 1 will pilot an innovative financing scheme, the market response to which is not to be fully known in advance, the MPA will conduct a thorough assessment of the efficiency and effectiveness of the Facility and identification of the areas that need further revision of the terms and conditions and process. Key areas that will be evaluated include developer response regarding attractiveness of the financial proposition offered and the adequacy of the regulatory framework. This will be monitored through annual market sounding exercises carried out by PT SMI. A standard questionnaire has been developed for consistency (details as reflected in Operations Manual).

b) **Capacity strengthening**. The program will assess the impacts of strengthened capacity, both of the Facility management, in the use of technology, and implementation of regulations and verification on the overall management of Indonesia's geothermal energy sector. Key areas to be assessed will be response times and adherence to business standards for processing in PT SMI, actual progress on drilling programs compared to initial plans and progress on meeting the national targets for geothermal development. This will be monitored through annual progress reports prepared by PT SMI. Areas to be monitored in PLN include the operationalizing of the PPP arrangement and the efficacy of the commercial and legal advisory support on structuring of the HoA and PPA tariff-setting principles. A template for quarterly progress reporting has been provided in the Operations Manual.

II. PROJECT DESCRIPTION

A. Project Development Objective

34. The phase 1 development objectives are to scale up investment in geothermal energy development and support the Borrower in its efforts to reduce greenhouse gas emissions in the country. Its achievement will be

[29] Energy Sector Management Assistance Program
[30] Global Infrastructure Facility

measured through the following Project Development Objective (PDO) level indicators (baseline and end-phase targets are provided in the Results Framework – please refer to Section VI, which identifies results indicators for Phase 1 of the MPA):

- Generation capacity of geothermal sub-projects reaching financial close (Megawatt)
- Estimated GHG emission reduction compared to a business-as-usual baseline (Metric ton)

35. These indicators will be achieved as a result of potential geothermal sub-projects being brought to the point of financial closure facilitated by resource risk mitigation. Following financial closure, the likelihood of successful development of geothermal projects is very high, which will result in clean power generation and therefore GHG emission reductions.

B. Components

36. The MPA Program has two components, which are expected to be the same for the future phase(s). The following describes the components and investments under phase 1:

- Component 1 to mitigate risks in geothermal resource drilling supported through the establishment of a new financing facility is financed with US$455 million, which consists of US$150 million from IBRD loan, US$97.5 million from the GCF loan and reimbursable grant[31], US$72.5 million from the Clean Technology Fund (CTF) loan and contingent recovery grant, US$75 million from GoI's PISP loan[32], which will leverage US$60 million in private developers' equity.
- Component 2 for technical assistance and capacity strengthening is financed with US$10 million grant, which consists of US$2.5 million from GCF, US$2.5 million from CTF, US$2.5 million from the Energy Sector Management Assistance Program (ESMAP)[33] and US$2.5 million from the Global Infrastructure Facility (GIF)[34].

37. **Component 1 – Geothermal Resource Risk Mitigation Facility (US$455 million, of which US$122.5 million in grants, US$272.5 million in loans and US$60 million in developer's equity)**. Under phase 1, Component 1 will support the establishment of a geothermal resource risk mitigation facility, which will provide financing to mitigate the risk of resource confirmation (including exploration and delineation drilling) of eligible public sector entities and eligible private sector developers (each a Developer, and typically, a special purpose vehicle (SPV) established by their owner (Sponsor) for the development of a specific geothermal site).

38. Sub-component 1 will offer the following financing products for the public-sector entities (up to a maximum of $40 million total support for exploration and possibly a similar amount for delineation):

a. *For exploration*: a Sub-Loan under terms and conditions reflective of the source of funding (tentatively

[31] GCF has approved a total amount of US$185 million of loan, reimbursable grant and grant in support of the MPA. However, due to capital constraints it has allocated only US$100 million as a first tranche (GCF T1), with the expectation that the remaining tranche of US$85 million would be allocated not earlier than two years from the initial GCF Board approval. The second tranche will need to be approved by the GCF Board following proof of satisfactory implementation progress. Only the financing from GCF T1 is included in the Project's activities covered by this document and is referred to as the "Initial Project" in the financing table with GCF T2 referred to as "Additional Allocation".

[32] The GoI has allocated US$150 million of PISP for the MPA. It is assumed that US$75 million is for Phase 1 and US$75 million for Phase 2.

[33] The funding from ESMAP is not yet approved and may differ in actual amount from this budget estimate.

[34] The funding from GIF is not yet approved and may differ in actual amount from this budget estimate.

assumed to be 50-75 percent from IBRD loan[35], and 25-50 percent from GCF or CTF loan[36]). At the discretion of MoF, the PISP can provide up to 50 percent grant using government sources to the developer in order to cover part of the loan pay-back obligations in case the exploration is unsuccessful.[37]

b. *For delineation*: a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD, CTF and PISP with break-down to be included in the Project's Operations Manual).

39. Sub-component 2 will offer the following financing products for the private sector developers (up to a maximum of US$30 million[38] total support for exploration and possibly a similar amount for delineation):

a) *For exploration*: A Sub-Financing under terms and conditions reflective of the source of funding, including:
   (i) 50 percent sub-loan sourced from IBRD and fully guaranteed by the Sponsor; and
   (ii) 50 percent in the form of a subscription to an innovative instrument (referred to as Financial Instrument (FI)) to be issued by the Developer, the value of which is linked to the value of the shares in the Developer, funded from either GCF Reimbursable Grant or CTF Contingent Recovery Grant. The investment in the FI is secured by a pledge of the shares of the Developer in favor of PT SMI. This instrument is an innovative way to allow PT SMI to capture a part of the additional value (upside) from completed exploration projects. Because the value of the FI is linked to the value of the shares of the developer, it may increase (or not) after the implementation of the exploration sub-project, depending on the extent of the success (or not) of the sub-project. As per a pre-defined formula, successful exploration will lead to *full repayment of the FI with a premium*, whereas pay-back from partially successful exploration will be determined as a share of the *Fair Market Value* of the Developer – in cases of a fully unsuccessful exploration this value would be zero. The repayment/monetization options, including write-off for unsuccessful projects, are further explained in Annex 2.

b) *For delineation*: a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD, fully guaranteed by the Sponsor).

40. An indicative breakdown of the funding support for each sub-project is presented below.

Table 3: Funding Sources for Blended Loan from the Facility

	Public Sector		**Private Sector**	
Development Stages	Exploration	Delineation	Exploration	Delineation
Facility Share of Total Drilling Cost	100%	100%	75%	75%
Share of Sub-Loan in Drilling Program and its Break-down	50-75% IBRD 25-50% GCF/CTF	100% IBRD/CTF	25% Developer equity 37.5% IBRD 37.5% GCF/CTF	25% Developer equity 75% IBRD/CTF

41. Details on the operation of the Facility, including conditions and criteria for the selection of eligible public and

[35] The IBRD lending rate is available via this link: *http://treasury.worldbank.org/en/about/unit/treasury/ibrd-financial-products/lending-rates-and-fees*

[36] GCF's financial terms and conditions are available via this link. CTF terms and conditions are available via this link.

[37] PISP funds with loan forgiveness cannot be used for the private sector developers due to the risk of potential inequitable or non-transparent subsidies being delivered.

[38] The amount of support for private developers is smaller than for public developers because the former is obliged to put in 25% equity.

private sectors developers and Sub-Projects, are provided in the Operations Manual.

42. **Component 2 – Technical Assistance and Capacity Strenghtening (US$10 million in grants)**. Sub-component 2.1 will support Project implementation and management of the Facility by PT SMI. This includes supporting PT SMI's incremental operating costs as well as procurement of specialized (geotechnical, legal, environmental, social and financial) consulting services to support the rigorous evaluation of sub-financing proposals, validation of complex geoscientific data, and supervision of environmental and social safeguards compliance by the sub-borrowers. Sub-component 2.2 will finance technical assistance and capacity strengthening of the key stakeholders, namely MoF, MEMR, Geo Dipa Energi, and PLN (see Table 4). Support for MoF will encompass (i) capacity strenghtening in the area of geothermal policy in relation to fiscal and budgetary issues relevant for MOF, and (ii) support to the operationalization of the Joint Committee. Support to MEMR will focus on improving the investment climate and business environment for geothermal energy, through (i) support to preparation of sub-project pipeline, (ii) enhancing the transparency and efficiency of licensing/tendering process through international roadshows, (iii) identification of new geothermal drilling strategies for exploitation of medium-enthalpy resources and quicker deployment through modular plant development, and (iv) feasibility of innovative financing instruments involving the financial market toward geothermal risk mitigation. For state-owned geothermal developers, it will cover support to enhance their capacity for geothermal geoscientific and resource data management, drilling management, procurement and contract management through advisory and consulting services, on-the-job learning and training, and sharing of international best practices. Support to PLN will also focus on operationalizing the PPP arrangement through commercial and legal advisory support on structuring of the HoA and PPA tariff-setting principles. For TA activities not financed from CTF or GCF, the implementation arrangements will be decided when the financing agreements are signed.

43. In a separate activity, work will be commissioned on the impact side of geothermal development. This will seek to maximize impact of the MPA by considering how it can best boost electrification rates in the least developed areas of Indonesia, how it can promote employment and gender equality. Early results from this work will be compiled to inform the design of the second phase of the MPA. As part of this sub-component, data will be collected and reported by the participating developers in order to draw lessons in terms of the Program's gender-sensitive interventions laid out in this document (see Annex 6 and Section IV. Appraisal Summary, C. Environmental and Social Section on gender).

Table 4: Expected Capacity Strengthening Program (Sub-Component 2.2)

#	Activity	Beneficiary	Estimate (US$ M)	Comments
1	General capacity strengthening on regulatory issues, risk mitigation models and tariff for geothermal	MEMR and MoF	1.5	(i) Capacity strengthening and just-in-time support related to geothermal policy including fiscal and budgetary issues as well as regulation and tariff setting; and (ii) support to the operationalization of the Joint Committee
2	Preparation of project-level Gender Action Plans (GAPs) and general supervision	PT SMI	0.5	Preparation and implementation of GAPs and other due diligence under the Project.
3	Support joint venture/PPP structures and infrastructure planning for geothermal development	PLN	1.5	Strengthening of partnership arrangements either as joint venture arrangements or other PPP set-ups. Training and capacity strengthening of staff.
4	Data management software with training	Geo Dipa	1.0	Delivery of data management software and training in its use
5	Exploration and exploitation management focused training	Geo Dipa and PLN	0.5	Delivery of geothermal exploration and exploitation management focused training, including safeguards
6	Study to increase impact of geothermal development	MEMR and PT SMI	0.5	Early results from this work will be compiled to inform the design of the second phase of the MPA
Total			5.5	

44. **Additionality of climate funds**. GCF and CTF funds are an integral element of the Project design for two main reasons: (i) the risk profile of GCF and CTF's instrument and their catalytic effect in attracting public and private finance towards geothermal development; and therefore (ii) its contribution in helping Indonesia achieve its NDC and fight climate change as one of the Asia Energy Transition countries (China, India, Indonesia, Pakistan, the Philippines and Vietnam). These instruments have the risk capital profile to match the risk associated with early-stage geothermal exploration drilling supported by this Project. This will support the adoption of a cleaner solution than significant ramp-up of coal in the short- and medium terms, and therefore help reduce the lock-in of millions of tons of GHG emissions for the long term.

45. The proposed financing for this first phase of the MPA by component is summarized in Table 5.

Table 5: Expected Funding Allocation (US$ million)

	Funding Sources[39]							
	Project Cost	**PISP**	**IBRD**	**GCF**	**CTF**	**Developers' Equity**	**ESMAP**	**GIF**
Component 1. Geothermal Resource Risk Mitigation Facility	**455**	**75**	**150**	**97.5**	**72.5**	**60**		
Subcomponent 1.1 – Public Sector Developers	*170*	*75*	*47.5*	*7.5*	*40*	*-*		
Subcomponent 1.2 – Private Sector Developers	*285*	*-*	*102.5*	*90*	*32.5*	*60*		
Component 2. Technical Assistance and Capacity Strengthening	**10**			**2.5**	**2.5**		**2.5**	**2.5**
Sub-component 2.1 – Governance and Management Support to PT SMI	*4.5*			*2*	*2.5*		*-*	*-*
Sub-component 2.2 – Technical Assistance and Capacity Strengthening to MEMR, PLN, Geo Dipa Energi	*5.5*			*0.5*	*-*		*2.5*	*2.5*
Total	**465**	**75**	**150**	**100**	**75**	**60**	**2.5**	**2.5**

C. Beneficiaries

46. The primary beneficiaries of the Program will be electricity consumers who will benefit from greater access to reliable electricity from geothermal resources. The secondary beneficiaries would be people with skilled and unskilled labor that would be employed in all aspects of running a geothermal drilling operation, such as geoscientific studies and geotechnical analyses, infrastructure construction and access road civil works, drilling, and auxiliary services, including women whose participation will be promoted through targeted interventions under the Project. Given that an average (50 MW) geothermal project would generate employment for about 860 people with diverse skills over its full development cycle[40], Phase 1 of the Program is expected to generate jobs for some 6,000 people[41] and therefore welfare benefits for those families. Finally, Indonesian citizens at-large will benefit from access to cleaner energy and globally there will be benefits from lower GHG emissions in the long term.

47. Institutionally, the beneficiaries of the Program include: (i) PT SMI, which has been designated by the GoI to facilitate infrastructure financing, including support to geothermal development; (ii) MoF for technical assistance in support of geothermal policy in relation to fiscal and budgetary issues; (iii) MEMR, the sector regulator, for technical assistance to enhance geothermal sector governance; (iv) state-owned geothermal developers, such as Geo Dipa Energi and PLN, for capacity strengthening in geothermal drilling management and planning; and (v) private developers. Through the Program, the key stakeholders will benefit from just-in-time support to take advantage of the state-of-the-art knowledge on drilling technology and strategies, legal advisory on contract management, and international roadshow for tendering of geothermal prospects to attract the most technically qualified and financially solid investors

[39] The funding from ESMAP and GIF is not yet approved and may differ in actual amount from this budget estimate.
[40] Geothermal Energy Association (2010). *Green Jobs Through Geothermal Energy*, October 2010.
[41] It is assumed that the MPA will enable the development of about 13 new geothermal power plants, seven of which will be in phase 1.

and developers.

48. More broadly, the MPA will contribute to global collective knowledge and experience on how to undertake a geothermal resource risk mitigation operation. The successful implementation of the Facility for geothermal exploration drilling in Indonesia will showcase the benefits and impacts of such a facility to expand and deepen the world's geothermal market, while revealing how institutional, technical and operational challenges can be addressed. These lessons can be readily applied or adapted for other countries looking to develop a similar process and institution.

D. Rationale for Bank Involvement and Role of Partners

49. The World Bank is uniquely positioned to support the Government of Indonesia building on 10 years of development partnership in the geothermal sector. Earlier support has been directed towards downstream investments in power plant construction. More recently, it supported the establishment of a US$100 million government-drilling program for upstream exploration carried out by PT SMI on behalf of the Government. With the proposed MPA, the support for geothermal exploration drilling is extended for the benefits of developers through a risk mitigation facility of around US$840 million. Second, the Bank pools together and strategically deploys climate funds and government funds to devise an efficient risk-sharing mechanism to be tested under this MPA to support significant scale-up of the sector investments and clean power generation for Indonesia.

50. This operation is coordinated with ongoing efforts by the International Finance Corporation (IFC), which is considering offering financing for the last part of the resource confirmation, (i.e. once resource risk has already significantly been reduced but before the financial close for the construction and operation of the geothermal plant) for *private developers*. Such corporate financing could complement the support provided under the Project and thereby create synergies. This demonstrates its maximizing financing for development approach by financing and de-risking the riskiest phase prior to the construction and operation of geothermal plants, thereby opening up investment opportunities and leverage financing by other financiers downstream.

51. Several other development partners are present in Indonesia's geothermal market. The WB has closely coordinated with them in the areas described in Table 6. In the first phase of the MPA, none of these development partners are expected to co-finance exploration drilling but they may finance downstream development and/or co-finance subsequent phases of the MPA.

Table 6: Areas of Coordination with Development Partners

Partners	Areas of Coordination
Kreditanstalt fur Wiederaufbau (KfW) / Agence Française de Développement (AfD)	Risk mitigation modality
Japan International Cooperation Agency	Standard operating procedures for key stakeholders
United States Department of the Treasury	Structuring of public-private partnerships with PLN
New Zealand Ministry of Foreign Affairs and Trade	Technical expertise and advisory support
Asian Development Bank	Geothermal financing and Gender mainstreaming

F. Lessons Learned and Reflected in the Project Design

52. The MPA phase design incorporates lessons learned from global experiences in geothermal risk mitigation, as

well as best practices from previous Bank engagements in Indonesia with PT SMI in infrastructure and geothermal projects. Subsequent phase(s) will incorporate design modifications based on learning focused on these key issues.

Summary of global best practices in geothermal risk mitigation

- An efficient and more balanced geothermal risk mitigation program needs to account for the economic efficiency of climate and concessional funds deployed in risk position in these schemes and facilities. Too much concessionality results in waste of funds and too little concessionality makes the Facility unattractive to developers. See Box 1 for an overview of similar risk mitigation mechanisms worldwide that have been reviewed in designing this Program.
- Equity contribution is a demonstration of having "skin in the game" by developers and aligning the incentives (and successes) of the developers with the sustainability of the Facility supported by this MPA.
- Thorough market sounding and transparency in the process of financing applications, as well as the eligibility criteria, terms and conditions of the financing products, are key to ensuring the attractiveness of the Facility and the financing products. Also important is the need to structure the financial products based on the needs of market players in a given geothermal market, including the different risk appetites of international and local developers and sponsors.
- A critical issue in exploration financing is the early biodiversity screening, critical habitat assessment and impact avoidance as part of the funding application process review. The geothermal projects to be financed and developed are likely to be Category A or B given the likelihood of being located in forest areas. In Java or even in smaller islands, finding viable offsets can be challenging. There is a need to work with developers to raise awareness of the risks and issues with developments in forest areas and natural habitats and if needed screen out high-risk projects early on.
- Financial support needs to be complemented with technical assistance for key stakeholders and policy-makers to improve the overall investment climate.

Summary of best practices in geothermal project management and capacity strengthening for PT SMI

- The WB-supported Geothermal Energy Upstream Development Project (GEUDP), for which PT SMI is the implementing agency, provides important lessons in terms of (i) the importance of having a procurement strategy to inform the civil works and drilling cost benchmarks, (ii) the efficiency of willing buyer-willing seller mechanism for land acquisition and the use of land lease appropriately for exploration drilling projects, and (iii) need for prudent management of the general timeline and addressing potential areas for delays in developing a geothermal project. PT SMI is still on the learning curve for the exploration drilling and still trying to identify the most effective and efficient way in its implementation. These experiences and insights will help PT SMI in its evaluation of funding proposals submitted to the Facility under the proposed MPA.
- The importance of having adequate technical, fiduciary and safeguards staff, either in-house or through external consultancies, for implementing WB-financed projects cannot be underestimated. PT SMI has built useful standard operating procedures, as well as works, procurement and safeguards planning and implementation capacity under the GEUDP and the other WB-supported Regional Infrastructure Development Fund (RIDF) (P154947).

Box 1: Geothermal Risk Mitigation Programs Worldwide

There are different risk allocation approaches and modalities for financing geothermal resource risk mitigation depending broadly on the regulatory environment and existing geothermal market, and more specifically the nature of the resources, accessibility of the fields, presence and capacity of the developers in different countries, the depth of capital markets and funding sources and broader political economy context. Several key programs worldwide can be summarized as follows.

- The most recent World Bank-supported *Turkey Geothermal Development Project* includes a Risk Sharing Mechanism implemented by a local bank, which will pay out a predetermined fraction of each well that fails to meet predetermined success criteria (40 percent or 60 percent of the well's drilling targets based on geographical regions).
- The *Geothermal Development Fund (GDF) for Latin America* by KfW provides grants to cover the costs of surface studies and exploration drilling, while requiring a certain success rate of up to three wells to be met, where the Fund pays 8 percent of the costs for success wells and 40 percent of the costs for failed wells.
- The *Geothermal Financing and Risk Transfer Facility in Mexico* supported by the Inter-American Development Bank seeks to reduce value-at-risk for private developers through channeling CTF convertible loan and government sources for earlier stages and a combination of ordinary / subordinate / concessional debt, contingent finance and guarantees for construction and operation phase – most akin to GREM Project.
- The CTF-supported (WB administered) *Armenia Geothermal Exploratory Drilling Project*, which directly supported exploration drilling using grants from climate funds, similar to the Indonesia GEUDP described above.
- The *Geothermal Risk Mitigation Facility for East Africa* managed jointly by the African Union Commission, German Federal Ministry for Economic Cooperation and Development, the European Union-Africa Infrastructure Trust Fund and the UK Department for International Development (DfID) provides grants to cover eligible allowable costs (20 percent of infrastructure preparation, 80 percent of surface studies, 40 percent of exploration drilling and testing for confirmation wells) disbursed on actual expenses.
- The long-standing *African Rift Geothermal Development Program (ARGeo)* is a multi-donor funded risk mitigation facility, capacity strengthening and knowledge sharing platform for Kenya, Tanzania, Ethiopia, Uganda, Rwanda and Eritrea to promote geothermal development for electricity generation.
- The earlier WB-supported *Geothermal Energy Development Program (GeoFund)* for countries in the Eastern Europe and Central Asia Region channeled Global Environment Facility (GEF) grants to improve geothermal policies, with expected follow-on funding envisaged for a Geological Risk Insurance component to be designed to mitigate the geological risks associated with geothermal energy exploration and operation (though this did not materialize).

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

53. PT SMI will have the overall responsibility for implementation of the MPA in a financial intermediary role. In doing so, PT SMI will coordinate closely with a Joint Committee, which provides high-level oversight of the governance of the Facility. The Joint Committee (JC) will consist of Director General-level representatives from MoF and MEMR, and will be responsible for approval of funding as well as other strategic decision for the Facility. The exact roles of JC members will be determined on a case-by-case basis to ensure the most appropriate and beneficial outcomes are

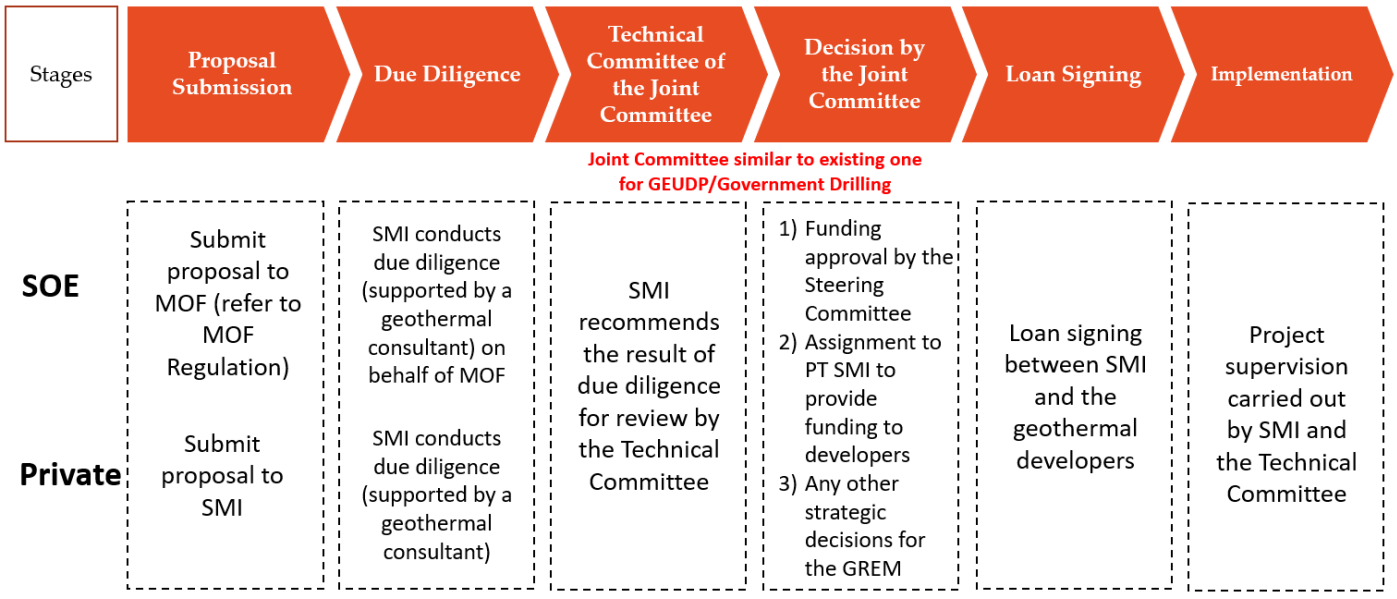
achieved.

54. The Project will be managed under the leadership of PT SMI's Director for Project Development and Advisory. PT SMI will assign a project manager to oversee the day-to-day operation of the Facility. In implementing Component 1, PT SMI will set the eligibility criteria for developers and sub-projects, manage the vetting process for Facility pipeline, and manage the portfolio of sub-loans and their associated safeguards and financial management compliance. It will use its internal departments and functions to manage the Facility, drawing from staff from those departments and hiring consultants and contractors to fill capacity gaps. PT SMI will engage several departments, namely sustainable financing, finance and investor relations, accounting and asset administration, general affairs and procurement, equity investment management and operation, financing and investment evaluation, environmental and social advisory evaluation, integrated risk management, special financing and investment management, legal and internal audit.

55. In implementing Component 2, PT SMI will coordinate closely with the relevant stakeholders on technical assistance needs, if financed from the CTF or GCF grants, and timeline for completion of planned activities to ensure alignment with the achievement of the MPA PrDO. PT SMI will prepare the Terms of References for those TA activities and specialized consulting services and ensure their successful completion. For TA activities financed from ESMAP and GIF, the implementation arrangements will be decided when the financing agreements will be signed.

56. PT SMI has adopted an Operations Manual, which contains clear guidelines for the decision-making process, as well as fiduciary, environmental and social safeguards requirements. The financial support provided for the public and private sector developers and draft term sheets and legal agreement templates are included in the Operations Manual. The Operations Manual will be a living document that may be amended as the Program unfolds, subject to mutual agreement between PT SMI and the Bank regarding any such change.

Figure 3: Governance of the Facility and Key Decision Points[42]



[42] The governance arrangement will be clarified in the Project Operations Manual. For the private sector window, it is possible that PT SMI will directly enter into business-to-business agreements with the sub-borrowers.

B. Results M&E Arrangements

57. The results framework, described in Section VI, identifies results indicators for Phase 1 of the MPA, as well as for each of its components. In addition to keeping track of the progress towards the outcomes and outputs of the PDO and project components, respectively, the results framework includes indicators to track progress on citizen engagement, gender and GHG emission reductions, among others.

58. PT SMI will be responsible for collecting and verifying data and for submitting progress reports to the Bank and other co-financiers on a quarterly basis for both the PDO indicators and the intermediate indicators.

C. Sustainability

59. The Government of Indonesia has set clear strategies and policies to develop the geothermal sector. As a result of extended discussions between MEMR, MoF and PT SMI, this proposed MPA is seen as the catalyst for the Government to meet its targets for the geothermal sector. GoI has committed over US$230 million to PISP for geothermal development and is firmly committed to further support to the geothermal sector by covering the future financial needs of state-owned developers.

IV. APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

Technical Analysis

60. As part of the MPA, this first phase goes beyond supporting power development out of geothermal steam. It is about developing an innovative way of approaching and mitigating geothermal resource risk, facilitating an enabling environment and institutional capacity, and mutually leveraging scarce resources from the public and private sides in maximizing finance for development. The main innovation is to allow a Financial Intermediary (in this case PT SMI) to use a “reimbursable grant” to support a convertible debt instrument issued by sub-borrowers allowing effective risk mitigation by linking the amount of debt to be paid back to the value created in the sub-project that is being financed.

61. This MPA follows the philosophy that the most concessional funding sources, including at-risk capital, should be deployed upstream to mitigate the high resource risk and costs, and less concessional funds to support lower-risk phases, ultimately leveraging the larger share of the total development cost in the downstream phases from private capital through financial close. The approach to geothermal risk mitigation supported by this first phase as well as the broader MPA has been based on: (i) a critical review of all geothermal risk mitigation models globally, (ii) rigorous market sounding of the risk appetite and financing needs of the public and private geothermal developers and sponsors in Indonesia, and (iii) extensive assessment of potential subproject pipeline and uptake. The market response to the concept has been encouraging and there is a pipeline of projects (see Table 2.2 in Annex 2) out of which 3-4 projects would be ready to be implemented during the first 18 months. The design and scale of this first-of-its-kind financing facility for geothermal exploration in Indonesia are underpinned by the need to maximize the effectiveness and efficiency of strategic deployment of scarce funding sources to deliver the best possible development results.

62. The MPA’s innovative approach is therefore four-fold. *First*, the **convertibility** of the Financial Instrument has been designed to track the sub-project developer’s value following exploration, and in doing so, aligning the Project

financiers' interest in minimizing the concessionality needed to achieve the Project objective and the sub-project developer's interest in building value in its company. *Second*, the **structure of the sub-financing** with requirement for 25 percent equity from the private developers for the exploration loan ensures that it favors financially qualified and vested and technically capable developers, thus improving the overall success rate of the portfolio. *Third*, the **size of financial support** for each sub-project has been determined based on the expected size of the pipeline subprojects and the cost benchmarks from actual geothermal projects that have been developed in Indonesia, thereby informing the realism of assumptions in the economic analysis and financial modelling at the Facility level and ultimately the effectiveness and efficiency of the use of concessional finance and public funds. *Fourth*, in order to achieve its intended impact of large-scale fossil fuel displacement and effective risk mitigation through a portfolio approach, the Project needs to be at the **right scale** to be able to reduce the overall risk in the portfolio.

63. The MPA is a good example of the World Bank's **MFD approach**, as it has redefined geothermal exploration development finance for Indonesia that can be replicated in appropriate contexts worldwide. This has been achieved by (i) developing the capacity for geothermal project management and cultivating a champion for the MPA in PT SMI, (ii) capitalizing on WB's accumulated knowledge of Indonesia's geothermal market since its reengagement in 2008 with the Geothermal Clean Energy Investment Project (P113078), where it has financed steam-field gathering system and power plant development using IBRD and CTF concessional loans, and (iii) leveraging WB's convening power to bring together all sources of finance to support Indonesia in its efforts to achieve geothermal and clean energy deployment target and NDC targets for GHG emission reduction. This first phase of the MPA is expected to mobilize US$2 billion in private capital.

Economic Analysis

64. An economic analysis was carried out to assess the economic viability of the full development of two typical sub-project candidates (a 110 MW and a 10 MW geothermal plant), in line with the World Bank Guidelines for Economic Analysis of Power Sector Investment Projects 2017 and Social Value of Carbon in Project Appraisal 2014. Key results are presented below and details are available in Annex 3.

Table 7: Expected Economic Net Present Value (ENPV) and EIRR for Two Typical Subproject Sizes

	Development 1 (110 MW)	Development 2 (10 MW)
ENPV @ 6 percent discount	US$570.4 million	US$166.3 million
EIRR Base Case	18.8 percent	32.3 percent
EIRR Low Case	15.8 percent	30.9 percent
EIRR High Case	23.2 percent	34.5 percent

70. In a base case scenario, the economic internal rate of return (EIRR) calculations factor in the benefits of the GHG emission reductions expected to be enabled by the Project interventions at a social value of carbon range of US$30/$tCO_2$-US$83/tCO_2. In a low-case scenario (US$15/$tCO_2$-US$50/tCO_2), the EIRR would be 15.8 percent for the 110 MW development and 30.9 percent for the 10 MW development. In a high-case scenario (US$50/$tCO_2$-US$150/tCO_2), the EIRR would be 23.2 percent for the 110 MW development and 34.5 percent for the 10 MW development. Without factoring in global externalities, the EIRR would be 11.6 percent for the 110 MW development and 29.1 percent for the 10 MW development. Thus, the Project would still be economically viable even in the case that climate co-benefits are

not accounted for. At a 6 percent social discount rate[43], the 100 MW development has an Economic Net Present Value (ENPV) of around US$570 million while the 10 MW development has an ENPV of a little less than US$170 million.

71. The economic value of the entire Phase 1 portfolio of the Facility has been simulated in an economic model. The results are presented in more detail in Annex 3. The model assumes a total portfolio of 10 sub-projects with only 7 being successfully developed. The result is an aggregated EIRR of **19.9 percent** and ENPV of **US$3.6 billion**.

Financial Analysis

72. The Financial Analysis was carried out from two different perspectives: (i) one from the developer's perspective, assessing the financial viability of the 110 MW and 10 MW developments on a with- and without-project basis; (ii) the other from the implementing agency's (PT SMI's) perspective, assessing its cash in- and out-flows related to the Facility.

From a Developer's Perspective

73. From a Developers' Perspective, the outcome of the financial analysis is as follows:

- Without-the-Project intervention, both the 110 MW and 10 MW geothermal developments are unlikely to be pursued due to high equity exploration costs coupled with real and perceived geothermal development-related risks. A coal baseline for the country's main load centers and a diesel baseline (with less electrification) for the smaller island grids of Eastern Indonesia would likely be the alternative scenarios; and
- With-the-Project calculations show that for the 110 MW development, due to the reduced equity requirements for exploration, the internal rate of return (FIRR) for a private investor will be adequate to meet or exceed the required return on investment, even for medium enthalpy[44] scenarios. For the 10 MW development, there would be adequate return for an IPP in high enthalpy resources, whereas an SOE, due to their lower hurdle rate, would be able to develop the project in all enthalpy scenarios.

From the Implementing Agency's Perspective

74. For purposes of the financial analysis, the full project development success rate (including resource risk and downstream development) is assumed to be 75 percent. This is in line with a development success rate range of 75 percent-80 percent for Indonesia. It is noted that with a single well success rate, the likelihood that the well can be used for steam production is around 55 percent-60 percent, and that a normal site success criteria is two-thirds of the exploration wells being productive. It is expected that at least 600 MW of new geothermal capacity could be enabled, thus leveraging at least US$2,400 million and reducing GHG emissions by 3.7 MtC02 annually. The impact of Phase 1 is expected to be around 60 percent of the impact of the full MPA.

75. A financial model has been built to simulate scenarios for testing sensitivity of key assumptions in terms of non-recovery rate (a non-recovery rate of zero means that the premiums paid to the Facility will balance out the losses). The scenarios show a base case of an average 75 percent success rate of exploration versus high and low cases of 85 and 65 percent, respectively. The results are presented in Table 8 and show that the non-recovery rate would be less than 0 percent in a base case version (meaning that the Facility has a surplus) and not higher than 7.1 percent in a 65 percent development success rate scenario. This indicates that the concept is sustainable.

[43] Discounting Costs and Benefits in Economic Analysis of World Bank Projects. OPSPQ, 2016.

[44] Enthalpy is a measurement of total energy in a thermodynamic system. In practical terms it is a measure that combines temperature and pressure in a geothermal steam resource.

Table 8: Facility Loss Rate Scenarios

Base case	Alternative Scenario 1	Alternative Scenario 2
75 percent success rate	85 percent success rate	65 percent success rate
-1.2 percent	-9.9 percent	7.1 percent

76. The CO_2 emissions reduction potential is estimated by subtracting projected lifetime emissions from a given sub-project (Sub-Project scenario) from the projected lifetime emissions in the BAU scenario (Baseline). In the Sub-Project scenario, CO_2 emissions are estimated using an average emission factor for geothermal energy facilities of 62.9 tCO_2/GWh. In the Baseline scenario, CO_2 emissions are estimated based on the country-wide combined marginal grid emission factor of 838 tCO_2/GWh. The net emission factor is therefore calculated as 838 tCO_2/GWh minus 62.9 tCO_2/GWh, which gives 775 tCO_2/GWh. The emission factors assumed are in line with the World Bank GHG guidelines, and for purposes of the calculations, a 6 percent discount rate was used along with a social value of carbon ranging from \$32/tCO_2 to \$83/tCO_2.

B. Fiduciary

(i) Financial Management

77. A Financial Management Assessment (FMA) was conducted as part of the fiduciary assessment of the first phase of the MPA. The FMA assesses the adequacy of the financial management system of the implementing agency, PT SMI, to produce timely, relevant and reliable financial information on project activities, and ensure the accounting systems for project expenditures and underlying internal controls are adequate to meet fiduciary objectives and allow the Bank to monitor compliance with agreed implementation procedures and progress towards its objectives. Project risks are mainly due to (i) complex financing arrangement and (ii) PT SMI's limited experience in acting as financial intermediary for exploration delineation drilling conducted by sub-borrowers. To mitigate the risks, PT SMI: (i) has prepared an Operations Manual to guide the implementation and monitor the progress of the Project covering organization structure, inclusion of program budget into MoF's Daftar Isian Pelaksanaan Anggaran (DIPA) (Budget Implementation List), payment verification mechanism, funds flow mechanism, Interim Financial Report (IFR) preparation and disbursement mechanism, internal and external audit arrangement; (ii) will appoint staff to implement the project and receive training on Financial Management arrangements meeting World Bank requirements; (iii) will, together with MoF, arrange periodic coordination with all stakeholders of the Project.

(ii) Procurement

78. The proposed operation envisages on-lending by PT SMI under Component 1 to (i) publicly owned developers, including SOEs, and joint ventures formed between SOEs and private partners where the public partner is majority owner; and (ii) private sector developers (i.e., IPPs) and joint ventures formed between SOEs and private partners where the private partner is majority owner. For sub-loans to publicly owned developers and to joint ventures between SOEs and private partners in which the SOEs have majority share, the procurement of goods, works, non-consulting services, and consulting services shall follow the World Bank Procurement Regulations for IPF Borrowers July 2016, revised November 2017 and August 2018 ("Procurement Regulations") and the provisions of the Procurement Plan and Operations Manual, which shall take precedence over any national procurement regulations. The procurement is expected mainly to support exploration and delineation drilling, such as procurement of *goods* for drilling materials such as wellheads and casings; procurement of *works* for integrated drilling services, drilling rigs, civil works;

procurement of non-consulting services for geology and geochemistry laboratory services, and procurement of *consulting services* such as for ESIA and Land Acquisition and Resettlement Action Plan (LARAP) study, and geological surveys. Private sector developers and joint ventures with majority private ownership will not have the obligation to comply with the Procurement Regulations and may follow their own procedures and good industry practices as appropriate.

79. Procurement to be carried out by PT SMI itself, including hiring of consultants under Component 2, will follow the Bank's Procurement Regulations and the provisions of the Procurement Plan and Operations Manual, which shall take precedence over any national procurement regulations. PT SMI is expected to procure highly specialized (geotechnical, legal, environmental, social and financial) consulting services to support the rigorous evaluation of sub-financing proposals, validation of complex geoscientific data, supervision of environmental and social safeguards compliance by the sub-borrowers as well as qualified individual consultants to assist PT SMI to support the project implementation, such as Geothermal Expert; Health, Safety and Environmental (HSE) Specialist; Social Specialist; Financial Management Specialist; and Procurement Specialist.

80. The assessment of PT SMI's procurement capacity and the experience from previous and ongoing Bank-financed projects, such as RIDF and GEUDP, indicates that PT SMI has been gradually building its procurement knowledge and experience and developing its own procurement systems and manuals with the support of external consultants. However, PT SMI's in-house procurement capacity still requires strengthening and it will continue to rely on substantial external support to be able to effectively carry out its own procurement and also oversee the procurement to be carried out by the beneficiaries of the sub-loans under the GREM Project. The Bank will provide guidance and support through procurement supervision missions conducted at least twice per year, including prior review of the large value, strategic, or critical contracts. It is also mandatory for PT SMI to use the Bank's online procurement planning and tracking tool (STEP).

81. PT SMI has its own General Affairs and Procurement Division; however, the division's responsibility is mainly to carry out corporate procurement for its own internal, mainly administrative, requirements. Support under Component 2 will enable PT SMI to continue capacity strengthening through the use of qualified procurement consultants, including those with the required specialized experience in procurement of drilling services and geothermal related equipment, to provide procurement support during project implementation, assist in the development of PT SMI's procurement systems and deliver training to PT SMI's procurement staff.

C. Environmental and Social

82. An Environmental and Social Management Framework (ESMF) incorporating a Land Acquisition and Resettlement Policy Framework and Indigenous Peoples Policy Framework has been prepared by PT SMI, who will be responsible for ensuring that the requirements in the ESMF are duly implemented by the developers.[45] Public consultation on the draft of ESMF was carried out in 2018, including a workshop on April 12, 2018 and the final draft of ESMF, which was prepared in May 2019 is available on PT SMI's website (https://www.ptsmi.co.id/wp-content/uploads/2019/06/ESMF-Geothermal-Resource-Risk-Mitigation-Project-GREM.pdf). The final ESMF, which has been subject to internal Bank review and clearance, includes additional feedback from stakeholders, as well as implementation and capacity strengthening arrangements. It had been publicly disclosed in PT SMI website on May 24, 2019 and on the Bank's external website on June 20, 2019 (*http://documents.worldbank.org/curated/en/683141519642635894/Environmental-and-social-management-*

[45] Subsequent phases of the MPA will be required to use the World Bank's new Environmental and Social Framework.

framework) before the appraisal began in July 2019. As a financial intermediary, PT SMI is responsible for appraising funding proposals. The private and public developers are responsible for preparing and implementing the project-specific safeguards instruments (e.g. ESIA, Environmental and Social Management Plan (ESMP), LARAP and Indigenous Peoples Plan (IPP)). PT SMI will supervise and assist the private and public developers to comply with the safeguards instruments throughout Project implementation.

83. Locations and scope of the environmental and social impacts of sub-projects seeking financing from PT SMI will be determined during the screening and appraisal of the subproject proposals. Some areas are likely to be remote, potentially with agricultural land uses, forests, surface geothermal features and landscapes, and potentially other types of natural habitats within the sub-project area of influence. Further identification of potential safeguards issues is presented in the Integrated Safeguards Datasheet.

84. Some environmental impacts may be considered irreversible or unprecedented without adequate mitigation and management. Most of Indonesia's geothermal hotspots are located in, or close to, forest areas. In order to stimulate the industry, a major revision of the law in 2014 (Geothermal Law No. 21) removed substantial barriers when geothermal was no longer defined as a mining activity and allowed geothermal power development in utilization zone of conservation areas not previously available for development, while it is still prohibited in the core zone. The construction and operation of new geothermal power plants in the downstream phases are likely to add to the many pressures that are already affecting forest landscapes. The fact that the majority of the geothermal potential is located in or close to forest areas has raised societal concerns about environmental and social impacts, especially in forests that play an important role in supplying fresh water, harbor endangered wildlife, or have high cultural or religious values. The Bank will avoid financing projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats. The Bank will consider safety of the ponds that geothermal plants use to store fluids extracted from the ground. Besides Environmental Assessment Operational Policies / Bank Policies (OP/BP) 4.01, other safeguards policies that might apply include Natural Habitats OP/BP 4.04, Forests OP/BP 4.36, Physical Cultural Resources OP/BP 4.11, Safety of Dams OP/BP 4.37. Detailed guideline for the screening process is provided in the ESMF for this operation.

85. The Project is national in scope and the possibility exists that sites considered for exploration will be on lands of indigenous peoples and, in such situations the project activities would have impacts on the local indigenous communities, including both positive and negative impacts. An Indigenous Peoples Planning Framework (IPPF) has been prepared and incorporated in the ESMF, in line with relevant government laws, policies and World Bank OP/BP 4.10 on Indigenous Peoples. It provides guidelines to identify presence of indigenous peoples in subproject areas and the additional efforts required in case they are impacted. Indigenous Peoples Plans will be required to be prepared by developers for subprojects in line with the IPPF as part of their funding application.

86. Land acquisition may take place for the development of drilling pads and associated facilities such as access road, drilling water treatment facility, contractor's camp and disposal area. OP/BP 4.12 on Involuntary Resettlement might apply. Experience with geothermal project in Indonesia has indicated that land acquisition can be often carried out by means of commercial transaction (willing-seller willing-buyer) rather than expropriation. In some cases, the sites for infrastructure, access route and drilling pads may be adjusted in case land-owners object to releasing their land. A Land Acquisition and Resettlement Policy Framework (LARPF) has been prepared establishing the principles and procedures for land acquisition in case there are instances of land expropriation, that infrastructure is site-specific, that the land owners cannot object to release the land or that economic displacement exists. The LARPF provides guidance for Developers for preparing the Land Acquisition and Resettlement Action Plan.

87. PT SMI has an existing corporate Environmental and Social Management System (ESMS), and more broadly, the country safeguards system sets thorough requirements for mitigation of social and environmental impacts from geothermal exploration and exploitation activities. ESMS is the basis of GREM ESMF – with necessary supplemental provisions in compliance with relevant World Bank Safeguard Policies. Sub-borrowers seeking financing via a PT SMI-administered fund is required to prepare safeguards instruments that meet the requirements specified in the ESMF. PT SMI has safeguards teams in the Environmental Social Safeguard and Business Continuity Management (ESS&BCM) Division under the Risk Management Directorate and in the GEUDP PMU, with adequately qualified and experienced staff members. The safeguards team in the ESS&BCM Division will be responsible for overseeing the implementation of ESMF, while lessons learned can be drawn upon the GEUDP PMU's safeguards team. In the geothermal sector, PT SMI has been engaging with the World Bank on the on-going GEUDP, for which a respective ESMF was developed and is being implemented. The safeguards capacity strengthening plan focuses on increasing the number of staff supervising geothermal investments in PT SMI's portfolio and improving the supervision and oversight skills of the ESS&BCM Division for geothermal investments: (i) environmental and social risk management in geothermal projects, (ii) operationalization of the ESMF, (iii) evaluation of ESIA, ESMP, LARAP, and IPP, and (iv) supervision of developers and contractors.

88. While Indonesia has a reasonably sound policy and regulatory framework for environmental management, the country faces challenges in implementation and monitoring aspects. The scope of environmental and social assessment required for geothermal exploration under the regulatory framework is less than that required by the WB, and for GREM, the ESMF sets out procedures that follow both the Bank and regulatory requirements.

89. **Citizen engagement**. The Project's developer will engage the community in consultation throughout implementation on environmental and social impacts of sub-project activities, and this is tracked through an indicator in the results framework. The project will endeavor to ensure that women are adequately informed and invited and participate in community consultations and their concerns and interests are addressed, through PT SMI's oversight of the developer's compliance with provisions laid out in the Project's ESMF, LARPF and IPPF. A specific indicator has been included in the Results Framework to improve citizen and community participation and collaboration throughout the sub-project development during the execution of sub-financing provided by PT SMI.

90. **Gender**. Gender differences, particularly in terms of job status, mean that women in Indonesia tend to experience more economic vulnerability as compared to men. In 2013, 53.5 percent of the female working-age population was part of the labor force, compared to 86 percent of males.[46] Women constitute the majority of self-employed and unpaid family workers, making them more susceptible to personal and financial insecurity. Compared to men, women have a 24 percent higher probability of working in the informal sector.[47] Women-owned small and medium-sized enterprises are mostly self-employed by necessity.

91. A gender assessment was conducted to analyze the barriers and identify entry points that can be facilitated through the Project in promoting gender parity in the relatively new and growing geothermal sector, which is currently dominated by men. Nationwide data by the Geothermal Directorate under MEMR indicates that, from a survey of the 12 leading developers in the sector, the total number of employees is 1408. Just 14 percent (202) of these are female, the majority of whom (over 70 percent) are employed in administrative and support roles, rather than managerial or technical roles. At site, from the MEMR sample the number of women employed in technical and managerial roles was found to be smaller still, with just a total of 15 women in these positions across all 12 companies. One developer in the

[46] World Development Indicators database. World Bank, 2015

[47] Indonesia Country Partnership Framework 2016-2020. World Bank, 2015

assessment – with progressive employment practices and strong CEO support for gender equality – indicated that they employed six women in technical positions in their geothermal plant out of a total locally employed technical workforce of 90 people. Accordingly, women are estimated to be at best around 7 percent of this segment of the workforce working on site and employed by developers.

92. The gender assessment also showed qualitatively that women face barriers in entering many higher level professional technical positions, such as geologist and engineers, due to the remote nature of geothermal areas, where it is particularly challenging to balance between spending extended periods of time in the field flying in and out and accommodating care work with young children and the elderly. The lack of gender-sensitive on-site facilities, such as accommodations and bathrooms, is another factor making field-based work less attractive even to younger women who do not yet have home-based responsibilities. Policies and practices by geothermal developers were found to vary in terms of approaches to recruiting and retaining female talents and creating a welcoming workplace culture for both men and women. Women also face barriers in accessing lower skills technical positions, such as technician, plant operator and environmental monitoring officer, for which training and recruitment occurs locally around the plant site, due to the required minimum level of education. The relatively low proportion of women in remote areas who can access the education required to meet these high-school or university qualifications is a key reason these jobs continue to be mainly taken by men.

93. Widening and broadening the talent pool for the sector – and working with stakeholders to establish a framework for long-term equality of opportunity in employment – will contribute to the program's objective of facilitating scale-up of investment in the geothermal industry. The program will integrate a three-pronged approach in supporting the greater recruitment of women in technical and managerial positions in geothermal projects, specifically related to (i) female talent pipeline in technical roles in the sector, (ii) improving female experience in the workplace, and (iii) improving policy and regulations that promote women's employment.

- *First*, the program will fund a vocational training program for young women and men at project sites, to prepare them for work in technician and operator roles when plants come online and facilitate their access to the job application process.
- *Second*, the program will support documentation of best practice policies among employers with regards to gender in the geothermal sector workplace and incorporating these policies in the Operations Manual in due course. The project will also sponsor a learning and dissemination launch event with developers' representatives as an opportunity to learn from each other and fine-tune their policies in line with best practices. From the perspective of working women, standardizing these best practices will help to raise the profile of the sector as a work environment that recognizes and welcomes women and further helps to attract and retain female talent at every level.
- *Third*, the program will work with the Geothermal Directorate to develop Standard Operation Procedures on geothermal workplace health and safety by reflecting international best practice from a gender perspective, including policies on sexual harassment, gender-based violence, separate accommodation and bathroom facilities, and correctly sized personal protective equipment (PPE) for women. See Annex 6 for more detailed gender gap analysis and proposed interventions.

94. **Grievance Redress Mechanisms.** PT SMI has its own corporate system and procedures for registering grievance related to the projects it implements and projects it funds. This system has been used to track grievances under GEUDP and will be used for GREM. Developers will be expected to have their own Grievance Redress Mechanism which will be

fully compliant with the GREM / PT SMI Grievance Redress Mechanism, and PT SMI will supervise to ensure the satisfactory management and close out of complaints and grievances on projects funded by the Facility.

95. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

V. KEY RISKS

96. The overall project risk is assessed to be Substantial. The Substantial risks were identified for the following areas:

97. *Sector Strategies and Policies*: The Government has set clear strategies and policies to develop the geothermal sector. However, there have been significant and frequent changes in the sector regulatory framework, which have introduced uncertainties in the sector and deterred investments. The two-step approach to licensing and lack of clarity on PPA tariff-setting leaves investors with uncertainty about whether they will be able to secure a reasonable return on their investment if they commit to a full-scale drilling program and take the resource risk. It is also not clear how quickly sub-projects with PSPE licenses can move into full-scale implementation following resource confirmation. Component 2 will facilitate sector dialogue on these issues to ameliorate regulatory barriers to the sector. In addition, Component 2 will also assist PLN in operationalizing the PPP arrangement through commercial and legal advisory support on structuring of the HoA and PPA tariff-setting principles.

98. *Technical Design of Project*: The Project aims to establish a first-of-its-kind Facility to support exploration drilling by geothermal developers in Indonesia. The loan part of the financial support is provided on terms that reflect market conditions whereas the innovative financing mechanism introduced by the Facility is calibrated to the developers' risk appetites. Issues related to operational, financial, legal, and commercial risks for different parties and mitigation measures have been incorporated into project design and PT SMI's operating procedures. The project design has been market-tested with key developers, though implementation may pose unforeseen challenges. PT SMI is to maintain close contact with various market players, as well as with the relevant government stakeholders on the enabling legal framework.

99. *Institutional Capacity for Implementation and Sustainability*: Piloting a new risk mitigation facility with a complex *modus operandi* has inherent risks related to the institutional capacity of the key entities and stakeholders involved in establishing, managing, and overseeing such an innovative mechanism. Component 2 is designed to address the capacity issues and focus on specific policies and regulations to remove bottlenecks and facilitate investments into the geothermal sector. Furthermore, the Bank will build on its ongoing experience of working with PT SMI, MEMR, and PLN, and draw on international experiences, in supporting efforts to improve the geothermal development through extensive consultations with market players.

100. *Fiduciary:* While PT SMI has experience as a financial intermediary under the RIDF Project, PT SMI still lacks

experience in on-lending for such complex drilling operations. While PT SMI is starting to gain experience under the GEUDP in technology-driven drilling contracts by hiring consultants, project implementation has been delayed by several months. The major procurement risks are related to PT SMI's limited capacity for carrying out procurement appraisal of the beneficiaries during preparation of sub-projects and due diligence and oversight of the procurement to be carried out by the beneficiaries during sub-project implementation, particularly of complex drilling operations by SOEs. Furthermore, lack of experience of SOEs in the Bank's Procurement Framework and drilling services procurement procedures may lead to delays in implementation. In addition, there might be potential conflict of interest issues in procurement as some of the SOEs such as Pertamina Geothermal Energy (PGE) in the past have insisted to be allowed to directly contract its sister company for drilling activities. Experience from GEUDP shows that PT SMI at times has been inclined to follow Government Regulations over Bank Guidelines. This must be avoided since it may further delay the procurement process and/or result in failed bidding for the procurement to be carried out by PT SMI itself, particularly hiring of consultants under Component 2. Before the first financing agreement with an SOE beneficiary can be entered into, PT SMI and the SOE in question will be required to develop a joint Project Procurement Strategy for Development (PPSD) for SOE sub-projects with guidance from the Bank. For each individual SOE sub-project this joint PPSD will be amended to fit the specific sub-project in question by an SOE developer. PPSD will include *inter alia* a market analysis to design the appropriate approaches to the market and to facilitate preparation of the procurement plan for each sub-project. PT SMI is fully informed of the need for hiring of consultants to carry procurement capacity assessment of the beneficiaries, assist SOEs with market analysis and preparation of PPSD and procurement plan, and support PT SMI in overseeing and monitoring the procurement carried out by the beneficiaries. The specific mitigation measures, including the number and types of procurement consultants and their deployment timeframe, and establishment of systematic procedures and protocols for appraisal of beneficiaries' procurement capacity during subproject vetting and for supervision/oversight and monitoring of procurement during implementation will be agreed in the Operations Manual. Please refer to the analysis of financial management issues in Annex 5 for more details.

101. *Social and Environmental:* The program is to finance a resource risk mitigation facility to support upstream resource confirmation (i.e., exploration and delineation drilling). The physical activities will consist of: (i) drilling of exploration and delineation wells; and (ii) constructing access roads and other associated infrastructure to facilitate the drilling activities, at select geothermal sites. The program will target prospective geothermal work areas across the Indonesian archipelago, particularly in Eastern Indonesia where geothermal energy will play a role in the electrification agenda. Locations and scope of the environmental and social impacts of projects seeking financing from PT SMI will be determined during the screening and appraisal of the sub-financing proposals. The potential areas are likely to be remote areas, potentially with agricultural land uses, forests, surface geothermal features and landscapes, and potentially other types of natural habitats within the Project area of influence. Infrastructure such as roads and wharfs may be basic and require upgrading to allow rigs to get to site.

102. It is expected that sub-projects to be supported by PT SMI would qualify as Category A or B classification. Locations and the environmental and social impacts of projects will be determined during project implementation, further to the screening and appraisal of the proposals from potential developers.

- Indigenous peoples (IP) and their resources are likely to be potentially affected. The IP groups commonly have different views on development interventions and may apply customary land use and land rights practices.
- Land acquisition may take place with the development of access roads and drilling pads associated with exploration infrastructure.
- The fact that the majority of geothermal potential is located in or close to forest areas has raised societal

concerns about environmental and social impacts, especially in forests that play an important role in supplying fresh water, harbor endangered wildlife, or have high cultural or religious values. The Bank will avoid financing projects that, in the Bank's opinion, involve the significant conversion or degradation of critical natural habitats.

The Program on Forests (PROFOR) carried out "Rapid Environmental and Social Assessment of Geothermal Power Development in Conservation Forest Areas of Indonesia" in close consultation with the Government with support by the WB in 2017. The study conducted rapid environmental and social macro assessment to more than 300 geothermal potential fields in Indonesia. Through a micro-level assessment of 16 existing Indonesian geothermal projects, the study developed an improved insight into the key impacts and risks typically associated with geothermal power development in forest areas. The study developed a novel methodology that can rapidly assess the social and environmental impacts of geothermal development in forest areas. The result of risk assessments can help focus the key environment and social areas for further detail assessment. The methodology provides a simple tool for the Government of Indonesia and other key stakeholders to guide geothermal power projects towards the areas with the least environmental costs and lowest likelihood of societal concerns about these costs. This tool also helps the government, banks, other finance institutions and geothermal energy companies to avoid material and reputational risks that can be associated with geothermal energy development in high-risk areas. The tool will be useful to inform the screening process, however the eligibility and categorization (A or B) of sub-projects applying for funding will be based on a review of the developers' detailed assessment of the specific potential impacts in compliance with the safeguards instruments.

103. While PT SMI has a corporate environmental and social management system for their investment portfolio, there is institutional strengthening required to effectively implement their system and comply with World Bank safeguards policies and safeguards instruments such as ESMF, LARPF and IPPF to reduce environmental and social risks. They require strengthening to fully execute their role as safeguards supervisors in a financial institution. The capacity strengthening plan and the technical advisory support under Component 2 has been developed to strengthen PT SMI's compliance as a financial intermediary under World Bank policies, to implement their own ESMS and to improve environmental and social outcomes of geothermal investments. Under Component 2, PT SMI will hire environmental and social consultants to support PT SMI on the due diligence of the proposed subprojects and to monitor the developers' safeguards compliance during project implementation.

104. The capacity assessment of public and private sector developers indicates that there is a range of capability in terms of safeguards instrument preparation and implementation. This is risky in terms of ensuring high quality environmental and social management on the ground and may cause delays in the application and appraisal processes if instruments and developer capacity are sub-standard. PT SMI will need support from consultants to assist with the review of developer's safeguard instruments, provide training to developers and provide supervisory support to build developers' capacity.

105. *Stakeholder/Financing Risk*: Phase 1 of the Project is financed from a variety of sources, each with their own contractual arrangements. GCF Financing has been approved by the GCF Board but has not yet been contractually formalized. A Funded Activity Agreement will have to be agreed between GCF and IBRD acting as Accredited Entity and experience proves that it can be a complex and lengthy process. Subsequently, a GCF Loan Agreement will have to be entered into between IBRD acting as Accredited Entity for GCF and Indonesia and a GCF Project Agreement and a GCF Grant and Reimbursable Grant Agreement will have to be entered into between the Bank acting as Accredited Entity for the GCF and PT SMI, all on the basis of templates and standard conditions yet to be produced at the corporate level. Therefore, there is a risk of delay in the availability of the GCF financing. However, this risk is mitigated by the fact that

the Project may start being implemented using CTF financing in case the GCF financing is delayed. In addition, as the Bank is working on more GCF-financed operations, its experience in interacting with GCF is ramping up.

106. Neither ESMAP or GIF funding has been secured at the time of Project appraisal. In case the expected funding from these two sources fails to materialize it will be necessary to raise funds from alternative sources such as bilateral donors. If after 12 months following effectiveness date, adequate resources have not been secured to sustain the planned technical assistance program, a restructuring of the project and scale down of the scope of technical assistance will be considered.

VI. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: Indonesia

Indonesia Geothermal Resource Risk Mitigation Project (GREM)

Project Development Objective(s)

The project development objectives are to scale up investment in geothermal energy development and support the Borrower in its efforts to reduce greenhouse gas emissions in the country.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Facilitate investment in geothermal resource confirmation				
PrDO: Generation capacity of geothermal sub-projects reaching financial close (Megawatt)		0.00		1,000.00
PrDO: Estimated GHG emission reduction compared to business as usual baseline (Metric ton)		0.00		187,000,000.00
Phase1: Generation capacity of geothermal sub-projects reaching financial close (Megawatt)		0.00	60.00	600.00
Phase1: Estimated GHG emission reduction compared to a business-as-usual baseline (Metric ton)		0.00	11,230,000.00	112,300,000.00

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Geothermal Resource Risk Mitigation Facility				
Funding Proposals Approved (Number)		0.00	10.00	10.00
Sub-projects with Productive Resources Confirmed (Number)		0.00	3.00	7.00
Total capital mobilized for investment in geothermal power generation (Amount(USD))		0.00	240,000,000.00	2,400,000,000.00
Private capital mobilized for investment in geothermal power generation (Amount(USD))		0.00	200,000,000.00	2,000,000,000.00
Total number of exploration wells drilled (Number)		0.00	16.00	28.00
Success rate of wells drilled (Percentage)		0.00	60.00	60.00
Steam capacity from wells drilled (Megawatt)		0.00	16.00	48.00
Technical Assistance and Capacity Strengthening				
Regulatory framework and institutional capacity conducive to geothermal investments (Yes/No)		No	Yes	Yes
Establishment of national standards for geothermal data registration and professional certifications for geothermal sector (Yes/No)		No	Yes	Yes
Technical guidelines and manual for geothermal management developed for PLN (Yes/No)		No	Yes	Yes
Establishment of a geothermal data management tool and geothermal database for Geo Dipa (Yes/No)		No	Yes	Yes
Number of project-level Gender Action Plans (GAPs) prepared by sub-borrowers (Number)		0.00	10.00	10.00
Citizen/community collaboration in planning and decision-making (Yes/No)		No	No	Yes

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
PT SMI's compliance with business standards for decision making procedures (Percentage)		0.00	90.00	90.00
Women employed locally at site in technical roles (Percentage)		7.00	10.00	20.00
Standard operating procedures (SOP) developed for gender-informed geothermal workplace health and safety (Text)		No SOP currently exists in this area	SOP in place in place and in line with international best practice	SOP in place in place and in line with international best practice

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
PrDO: Generation capacity of geothermal sub-projects reaching financial close					
PrDO: Estimated GHG emission reduction compared to business as usual baseline					
Phase1: Generation capacity of geothermal sub-projects reaching financial close	Generation capacity at financial closure	Yearly	Project description as submitted in the financial closure documentation for each sub-project	Submission and review of sub-project feasibility studies	PT SMI

Phase1: Estimated GHG emission reduction compared to a business-as-usual baseline	Net GHG emission accounting	Yearly	PT SMI's progress reports	PT SMI's monitoring and evaluation framework	PT SMI

Monitoring & Evaluation Plan: Intermediate Results Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Funding Proposals Approved	Number of funding proposals approved by PT SMI	Yearly	PT SMI's periodic project progress reports	Reporting by sub-borrowers	PT SMI
Sub-projects with Productive Resources Confirmed	Number of sub-projects where geothermal resources have been confirmed as being adequate for further development as evidenced by the developer decision to continue.	Yearly	Sub-borrowers	N/A	PT SMI
Total capital mobilized for investment in geothermal power generation	Total public and private capital mobilized, as confirmed by funding confirmation for public projects and financial close for private projects.	Yearly	PT SMI's progress reports	PT SMI's Monitoring and Evaluation framework	PT SMI
Private capital mobilized for investment in geothermal power generation	Private capital mobilized, as confirmed by financial	Yearly	PT SMI's progress	PT SMI's Monitoring and Evaluation framework	PT SMI

	close.		reports		
Total number of exploration wells drilled	Exploration wells drilled by developers with agreed funding proposals. It assumes three wells are drilled per funding proposal.	Yearly	PT SMI's progress reports	PT SMI's Monitoring and Evaluation framework	PT SMI
Success rate of wells drilled	The percentage of wells drilled that are confirmed with steam production at or over the minimum level set in the exploration plan.	Yearly	PT SMI's progress reports	PT SMI's Monitoring and Evaluation framework	PT SMI
Steam capacity from wells drilled	It assumes six megawatts per sub-project with productive resources confirmed	Yearly	PT SMI's progress reports	PT SMI's Monitoring and Evaluation framework	PT SMI
Regulatory framework and institutional capacity conducive to geothermal investments	As a result of the technical assistance and capacity building provided, (i) MEMR has made changes to regulation(s) regarding licensing and tariff-setting, (ii) PLN has successfully implemented public-private partnerships that secure private sector investments and adopted economic off-take pricing regime, and (iii) Geo Dipa and PLN have improved capacity for management	Yearly	MEMR, PLN and sector players / sub-borrowers	N/A	PT SMI

	of geothermal development.				
Establishment of national standards for geothermal data registration and professional certifications for geothermal sector	Establishment of national standards for data registration under MEMR for uniform description of geothermal resources and development of professional certifications to increase the availability and caliber of Indonesian experts in geothermal resource assessments and drilling management	Yearly	MEMR and industry players	Meetings and interviews with MEMR and industry players	PT SMI
Technical guidelines and manual for geothermal management developed for PLN	Technical guidelines and manual developed to improve PLN's capacity for management of geothermal development	Yearly	PLN	N/A	PT SMI
Establishment of a geothermal data management tool and geothermal database for Geo Dipa	Geothermal data management tool and geothermal database established and relevant training provided to Geo Dipa to improve its capacity for management of geothermal development	Yearly	Geo Dipa	N/A	PT SMI
Number of project-level Gender Action Plans (GAPs) prepared by sub-borrowers	Gender Action Plan prepared for each sub-project by the respective developer	Yearly	Sub-borrowers	Sub-borrowers' submission of GAPs	PT SMI

Citizen/community collaboration in planning and decision-making	Sub-borrowers have enabled citizen / community collaboration in planning and decision-making related to proposed sub-project development evidenced through annual Citizen and Community Feedback Summaries submitted to Borrower with information about the feedback received from citizens and communities and how this has been incorporated in decisions related to the sub-project development.	Yearly	Sub-borrowers	Periodic reporting on sub-project progress to PT SMI by sub-borrowers as per the sub-financing agreements	PT SMI
PT SMI's compliance with business standards for decision making procedures	Compliance with business standards (maximum turnaround time for the different decision making procedures) as indicated in the PT SMI Operations Manual	Yearly	PT SMI's progress reports	PT SMI's Monitoring and Evaluation framework	PT SMI
Women employed locally at site in technical roles	Staff with technical background as opposed to administration, service, accounting etc - to be defined in the Operations Manual	Annual	Self reporting by participating developers	To be to submitted to PT SMI as part of the mandatory reporting - or collected annually be PT SMI in case where loan is paid back in full (so no more	PT SMI

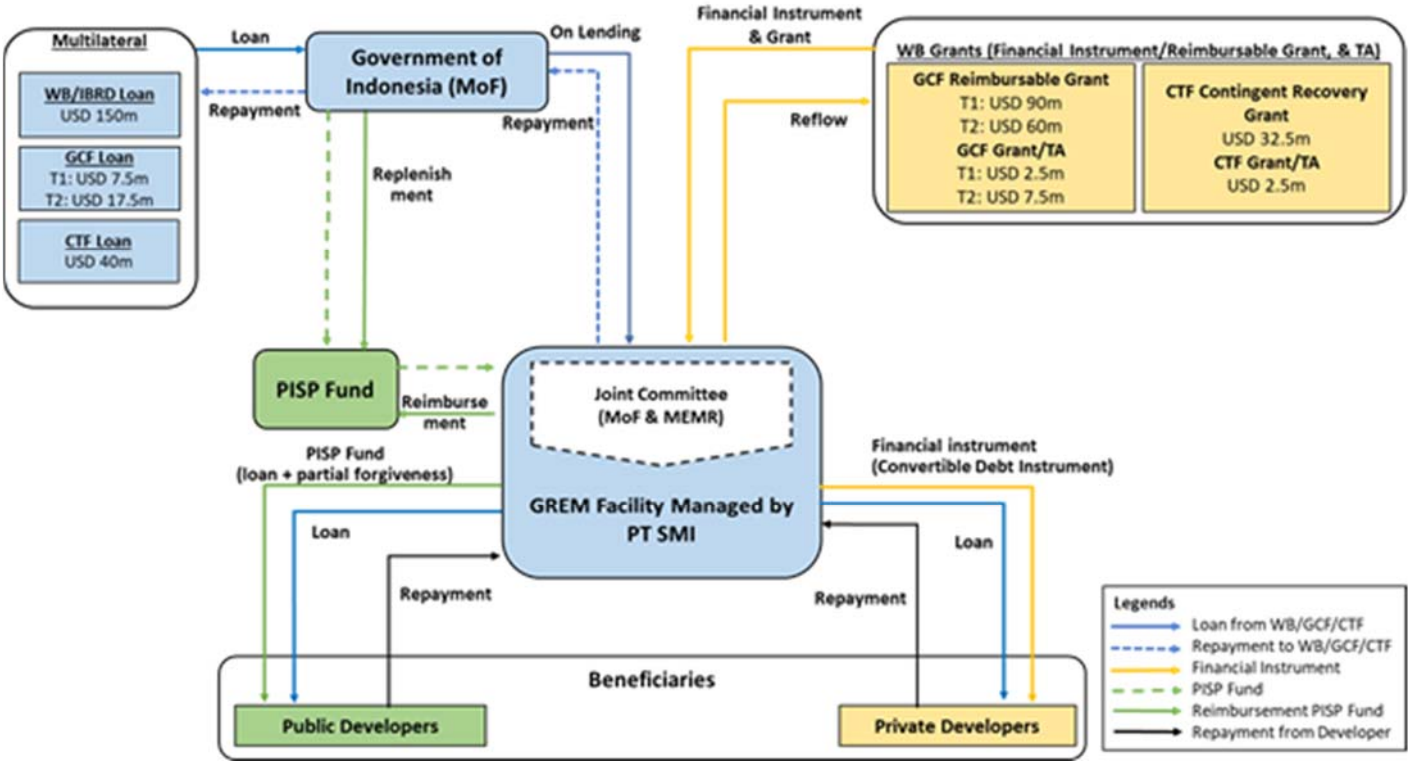
				reporting requirement)	
Standard operating procedures (SOP) developed for gender-informed geothermal workplace health and safety	Standard operating procedures (SOP) developed for gender-informed geothermal workplace health and safety	To be reported by PT SMI as the implementing agency annually	Developers and PT SMI	Reporting from developers	PT SMI

ANNEX 1: Implementation Arrangements and Support Plan

COUNTRY: Indonesia
Indonesia Geothermal Resource Risk Mitigation Project (GREM)

1. PT SMI will be the Implementing Agency for this Project in a financial intermediary role. Figure 1.1 provides an overview of the project institutional arrangement and fund flows.

Figure 1.1: Institutional Arrangement and Flows of Fund[48]



2. The Project will be managed under the leadership of PT SMI's Director for Project Development and Advisory. PT SMI will assign a project manager that will oversee the day-to-day operation of the Facility. A new Geothermal Resource Risk Mitigation Facility will be established and managed by PT SMI. Through the Facility, PT SMI will provide to developers financing for their geothermal resource confirmation[49] through: (i) extension of soft loans to public sector developers, and (ii) extension of loans to private developers and subscription of Financial Instruments issued by private developers, the proceeds of which are to be used alongside the private developer's equity.

3. PT SMI's main role will be to manage the vetting process for the Facility pipeline, set eligibility criteria for

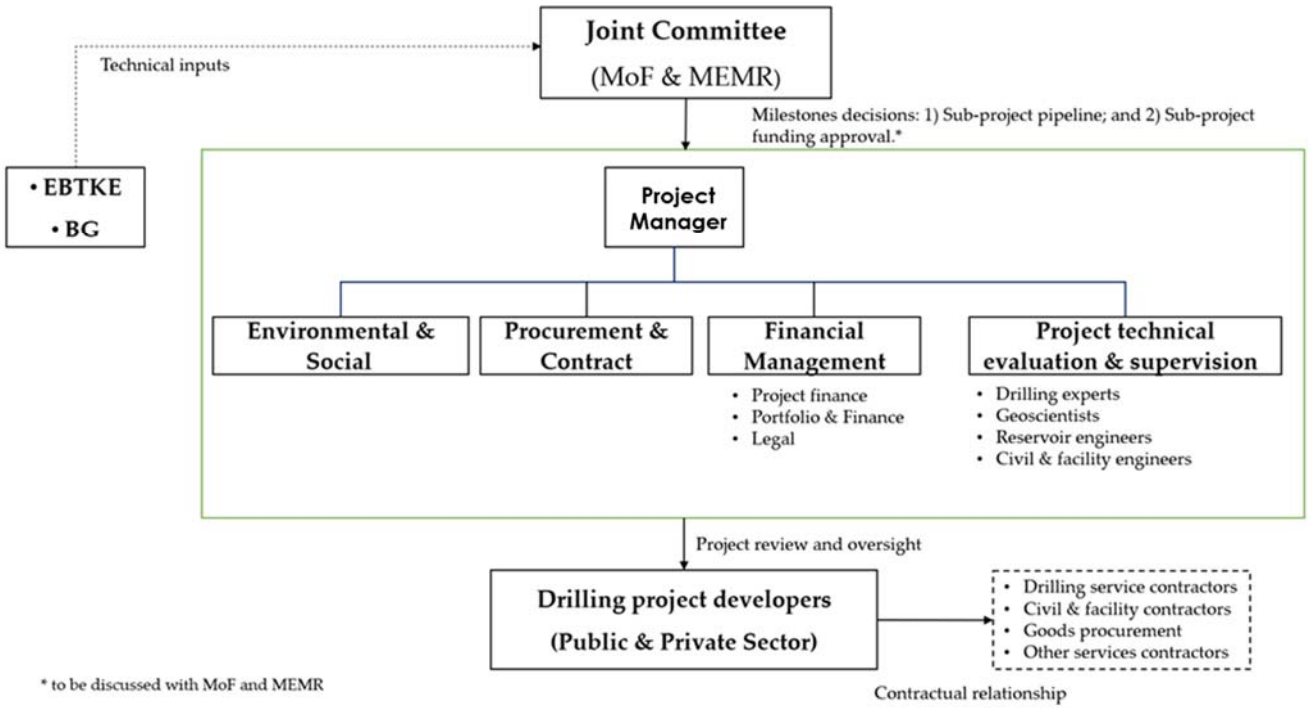
[48] T1 refers to Tranche 1 of the GCF funding and T2 refers to Tranche 2.
[49] A resource confirmation program consists of an initial phase of exploration drilling, the successful conclusion of which will be followed by a phase of delineation/test drilling.

developers accessing the Facility funds, and manage the sub-loan portfolio. More specifically, PT SMI is responsible for, but not limited to, the following:

- Appraising and providing recommendation to the Joint Committee for approving/rejecting subproject proposals based on a technical, economic, financial, procurement capacity, and environmental and social review of applications from developers;
- Assessment and verification of the value of the private developers;
- Overseeing procurement compliance of public sector developers with the Bank's Procurement Regulations and monitoring procurement performance of public sector developers;
- Overseeing compliance and monitoring environmental and social management performance, including land acquisition, undertaken by both public and private sector developers;
- Financial management of the project, including budget preparation, payment verifications on contracts, accounting, financial reporting and submission of audited financial report;
- Preparing periodic reports on subproject progress and aggregated results at the Facility level;
- Preparing Terms of Reference for consulting services; and
- Facilitating external evaluations and ensuring that relevant recommendations from Project financiers are implemented.

4. In managing the Facility, PT SMI will use its internal departments and functions to manage the Facility, drawing from staff from those departments and hiring consultants and contractors to fill capacity gaps. PT SMI will leverage in-house knowledge developed under GEUDP on drilling strategies, critical cost benchmarks, project timeline and management of Project and portfolio risks. PT SMI will also coordinate closely with a Joint Committee, which provides high-level oversight of the governance of the Facility. The Joint Committee will consist of Director General-level representatives from MoF and MEMR. Figure 1.2 provides an overview of the project implementation arrangement. The same Joint Committee is currently overseeing the governance and implementation of the ongoing GEUDP, which has shown to work well in facilitating key technical decisions and strategic dialogues between MoF and MEMR as two key ministries in geothermal development in Indonesia.

Figure 1.2: Project Implementation Structure[50]



5. The Bank will continue to provide support to PT SMI throughout project implementation. This includes: (i) ensuring that PT SMI has defined acceptable key design features and decision-making process of the Facility, (ii) supervising compliance with WB requirements and standards, such as eligibility criteria for developers and subprojects, fiduciary requirements and safeguards measures, sub-loan terms and conditions and contractual arrangements; and possibly (iii) ensuring that PT SMI has assessed, in a manner acceptable to the Bank, the developers' proposed drilling strategy, program and results. In addition to standard reporting obligations to the WB, PT SMI will provide reports as requested by other project co-financiers as per the corresponding legal agreements.

6. Implementation of Component 2 will include capacity strengthening for PT SMI in managing the Facility as well as procurement of specialized consulting services to support the rigorous evaluation of sub-financing proposals, validation of complex geoscientific data, supervision of environmental and social safeguards compliance by the sub-borrowers, and a multi-year technical assistance program to build capacity within the key sector stakeholders to improve the overall geothermal sector governance, investment climate and drilling management capacity for various state-owned developers in Indonesia.

7. Capacity strengthening for PT SMI will encompass ongoing or just-in-time support in the following areas: (i) financial advisory in carrying out due diligence of sub-borrowers (developers/sponsors); (ii) legal advisory in handling issues related to sub-loan and contract management; (iii) technical advisory through a geothermal technical expert or

[50] EBKTE: Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi, or Directorate General of New Renewable Energy and Energy Conservation; BG: Badan Geologi, or Geological Agency

a firm/ team of experts to review the geology, geochemistry, and geophysics (3G) surveys and topographic mapping in sub-borrowers' funding proposals or drilling results; and (iv) safeguards advisory to assist PT SMI's oversight of the sub-borrowers' compliance with WB's safeguards standards.

8. Technical assistance will be provided to MEMR to help improve the sector's investment climate and doing business environment and addressing the key bottlenecks to scaling up geothermal development. This would cover, but may not be limited to, (i) support to enhancing the tender process, including international roadshows to attract international investors, (ii) support to better understand new drilling strategies for exploitation of medium-enthalpy resources and quicker deployment through modular plant development approaches, and (iii) feasibility of innovative financing instruments involving the capital markets toward geothermal risk mitigation. Support will also be provided to state-owned entities such as PLN and Geo Dipa Energi to further enhance their capacity in geothermal geoscientific and resource data management, drilling management, procurement and contract management through advisory and consulting services, on-the-job learning and training, and sharing of international best practices. All procurement under the Project shall follow the Bank's Procurement Regulations.

9. The main outcomes will be PT SMI's enhanced capacity in managing a complex geothermal financing facility, better human resources for state-owned entities with cutting edge geothermal knowledge and drilling management capacity, and more transparent license award process and appropriate tariff-setting mechanisms by the regulator and policy-makers.

Implementation Support Plan

10. The Strategy for implementation support has been developed on the basis of the nature of the Project and responds to specific nature of the Project. The majority of World Bank team members will be based in the region, mostly in the Jakarta office to ensure timely response to the client, perform close project implementation and anticipate implementation problems. The objective is to ensure that the World Bank's resources and staff are sufficient to supervise and support implementation.

11. The Bank team will be composed of a mix of skills and experience for successful project implementation. The table below outlines the expected staff weeks and travel required to make sure the actions and schedule are appropriately resourced. The total average annual budget is about US$180,000 for the first five years of implementation. The annual average budget will be reduced to around US$80,000 for the second five years with heavy supervision duties focuses in the earlier years.

Table 1.1 – Estimated Implementation needs

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 24 months	Staffing of project team at PT SMI and finalization of the OM. Finalization of procurement documents.	Engineering; procurement; financial management; environmental; and social and legal.	US$360,000	Close cooperation with MoF, MEMR and other key stakeholders
24-60 months	Review of progress in GREM Facility management and capacity building;	Engineering; sector regulatory and planning; Monitoring and	US$360,000	Close cooperation with MoF, MEMR and other key

	review of sector technical and financial performance; procurement; monitoring and evaluation; safeguards; financial management.	Evaluation Specialist; environmental and social.		stakeholders
60-120 months	Review of progress in GREM Facility management and capacity building; review of sector technical and financial performance; procurement; monitoring and evaluation; safeguards; financial management.	Engineering; sector regulatory and planning; Monitoring and Evaluation Specialist; environmental and social.	US$400,000	Close cooperation with MoF, MEMR and other key stakeholders

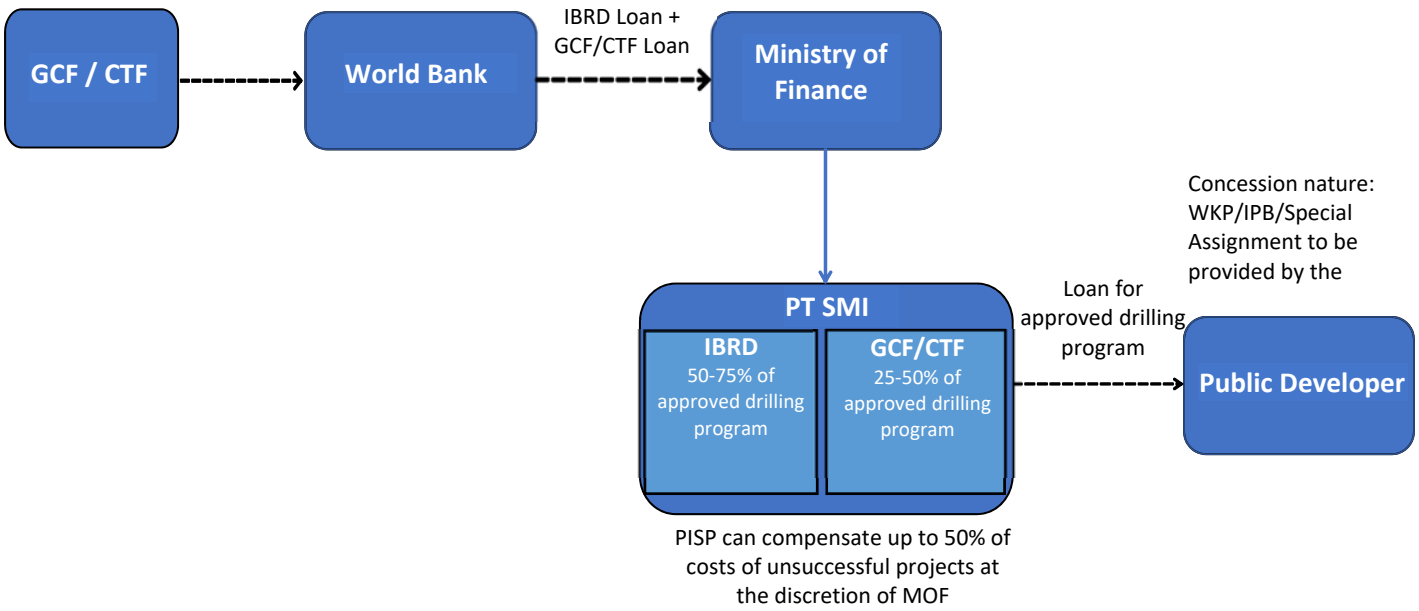
ANNEX 2: Detailed Project Design

1. A geothermal resource risk mitigation facility will be established under Component 1 of the proposed Project. The Facility will provide financing to mitigate the risk of resource confirmation (including exploration and delineation drilling) of eligible public sector entities (such as SOEs) through Public Sector, and eligible private sector developers (each a Developer, and typically, a SPV established by their owner (Sponsor) for the development of a specific geothermal site) through Private Sector. For each subproject, the exploration drilling loan will be capped at US$30 million with a four-year grace period, with the possibility for an extension of another US$30 million[51] and another two years for delineation drilling. Each sub-financing package will include PT SMI's reasonable mark-up and costs.

2. For the Public Sector, the Facility will offer:

a. *For exploration*: a Sub-Loan under terms and conditions reflective of the source of funding (tentatively assumed to be 50-75 percent from IBRD loan, 25-50 percent from CTF or GCF loan). At the discretion of MoF, the PISP can provide up to 50 percent grant to the developer in order to cover part of the loan repayment in case the exploration is unsuccessful.[52]
b. *For delineation*: a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD, CTF and PISP with break-down to be finalized in the Project's Operations Manual).

Figure 2.1: Flow of Funds through the Public Sector



[51] For the public sector developers, a higher total loan amount for exploration may be agreed to by PT SMI after consultation with MoF
[52] PISP funds with loan forgiveness cannot be used for the private sector developers due to the risk of potential inequitable or non-transparent subsidies being delivered.

3. Procurement by public sector developers as public sector entities will follow the WB Procurement Regulations.

4. *For the Private Sector*, the Facility will offer:

a. *For exploration:* A Sub-financing under terms and conditions reflective of the source of funding, including:
   (i) 50 percent Sub-loan sourced from IBRD and fully guaranteed by the Sponsor; and
   (ii) 50 percent in the form of the payment of the price for the subscription of an instrument (referred to as Financial Instrument (FI)) issued by the Developer, the value of which is linked to the value of the shares in the Developer, funded from either GCF Reimbursable Grant or CTF Convertible Recovery Grant. This instrument allows PT SMI to capture a part of the additional value (upside) from completed exploration projects. Because the value of the FI is linked to the value of the shares of the developer, it may increase (or not) after the implementation of the exploration sub-project, depending on the extent of the success (or not) of the sub-project. As per a pre-defined formula, successful exploration will lead to *full repayment of the Financial Instrument with a premium*, whereas pay-back from partially successful exploration will be determined as a share of the *Fair Market Value* of the Developer – in cases of a fully unsuccessful exploration this value would be zero. The repayment/monetization options, including write-off for unsuccessful projects, are further explained in Box 3.

b. *For delineation:* a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD and CTF guaranteed by the Sponsor with break-down to be finalized in the Operations Manual).

5. The private sector developers will be required to commit Sponsor Funds (equity) equivalent to at least 25 percent of the total cost of the exploration drilling program. It is required that the Sponsor's equity will start disbursing first, to finance the investments needed on the site as a prerequisite to start exploration drilling, such as the access road. Disbursement of the price of the Financial Instrument and the corresponding Sub-loan will be made *pari passu* (i.e. so that the ratio between the Financial Instrument and the IBRD loan always is maintained as 50:50) and will finance drilling activities. The aggregate amount disbursed by PT SMI will not exceed 75 percent of the total expenses of the developer at any time, so as to maintain a developer's debt to equity ratio of 75 percent/25 percent throughout the implementation of the Sub-project).

Figure 2.2: Flow of Funds through the Private Sector

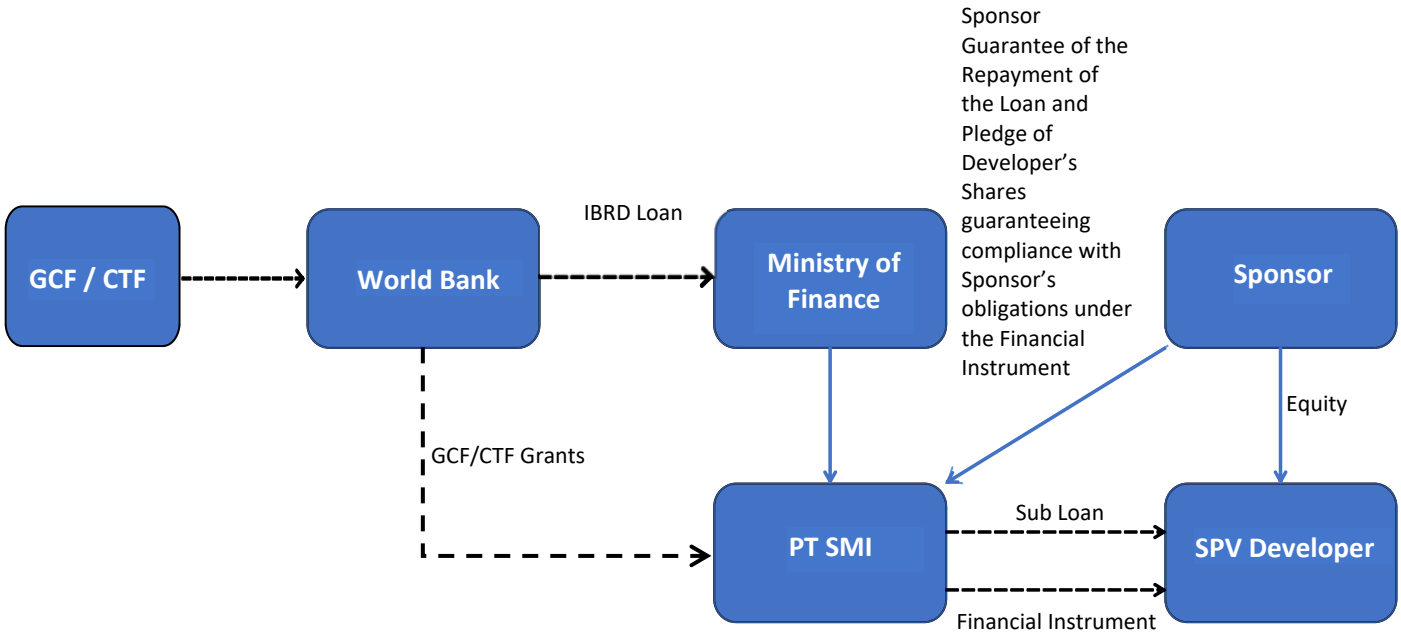


Table 2.1: Indicative Financing Cost Components to Sector Developers

	IBRD loan	GCF loan	CTF loan	GoI/PISP loan	PT SMI
Public Sector	LIBOR[53] + Spread	0.25+0.50*	0.18+0.25**	0.34	Risk Margin***
Private Sector	LIBOR + Spread	0.25+0.50*	0.18+0.25**	-	Risk Margin***

**Service fee and commitment fee, respectively*
***MDB fee and service charge, respectively*
****Depending on risk assessment of developers*

[53] London Inter-bank Offered Rate

Box 3: Features of the innovative Financial Instrument for private sector developers

PT SMI will exit the Financial Instrument through: a) an assignment of the Financial Instrument to the Sponsor through the exercise of its Put Option or the exercise of the Sponsor's Call Option under the Financial Instrument; b) an assignment of the Financial Instrument to a third party through a sale, under the terms and conditions stipulated in the Financial Instrument, or c) possibly, a conversion of the Financial Instrument into shares of the Developer strictly identical to the ones held by the Sponsor. However, it is anticipated that in practice this conversion would only happen in extreme cases, due to the other exit options available to PT SMI. Finally, in the worst-case scenario, PT SMI may be permitted not to fully exhaust its exit options and write-off any remaining payment it would otherwise be entitled to receive.

1. The put and call prices and the conversion rate are calculated on the basis of the Notional Value or the Fair Market Value calculated as follows:

The **Notional Value ("NV")** is the higher of:

- 130 percent x the initial face value of the Financial Instrument (i.e. the aggregate amount of each payments made by PT SMI to the Developer for the purchase of the Financial Instrument at that time); and
- The initial face value of the Financial Instrument (i.e. the aggregate amount of each payment made by PT SMI to the Developer for the purchase of the Financial Instrument at that time), each such payment being escalated at 7 percent per annum (compounding), from the date of payment by PT SMI to the date when the Sponsor pays the purchase price of the Financial Instrument to PT SMI.

The **Developer Fair Market Value** (FMV) is the lower of these two options (but not less US$1.00):

- The value determined through: (i) a transparent process involving either an independent evaluation (to be established at the initiative and implemented at the expense of the Developer following parameters selected by agreement between the Borrower and the Beneficiary prior to the issuance of the Financial Instrument and consistent with the requirements of the Operations Manual); or (ii) a market-priced sale of the developer; and
- The aggregate amount of the Sponsor paid equity and the amounts paid to the Developer by PT SMI for the purchase of the Financial Instrument.

2) PT SMI's Put Option

PT SMI may put the Financial Instrument to the Sponsor (in which case the Sponsor has the obligation to purchase the Financial Instrument at the price equal to NV ("Put Price") in the following cases:

(i) The Developer breaches any of the terms and conditions of the Financial Instrument, after the cure period for such default, if any, has lapsed; or

(ii) At any time during the period which begins on the fourth anniversary of the purchase of the Financial Instrument by PT SMI even if no default has occurred under the Financial Instrument. PT SMI will automatically exercise the put option at the date which is the fifth anniversary plus thirty days of the purchase of the Financial Instrument by PT SMI.

3) Sponsor's Call Option

The Sponsor may call the Financial Instrument from PT SMI (in which case PT SMI has the obligation to sell the

Financial Instrument at the price ("Call Price") set out below at any time during the period which begins on the day PT SMI purchases the Financial Instrument and ends on the date which is the fifth anniversary of the purchase of the Financial Instrument by PT SMI. The price to be paid by the Sponsor to PT SMI when the Sponsor exercises its Call Option is:

(i) If the Sponsor exercises its Call Option during the period which begins on the day of the purchase of the Financial Instrument by PT SMI and ends on the date which is the fourth anniversary of the purchase of the Financial Instrument by PT SMI, the Call Price is the NV; or

(ii) If the Sponsor exercises its Call Option during the period which begins on the day after the fourth anniversary of the purchase of the Financial Instrument by PT SMI and ends on the date which is the fifth anniversary of the purchase of the Financial Instrument by PT SMI by PT SMI, the price is, at the option of the Sponsor, the NBV or the Share of Participation in the Developer Fair Market Value (as determined using a pre-agreed formula checked by an independent third-party), at the choice of the Sponsor.

4. Sale of the Financial Instrument.

PT SMI may decide to exercise its right to sell the Financial Instrument in accordance with the terms and conditions of the Financial Instrument through a publicly advertised competitive auction. The Sell price shall be the best price obtained through the auction.

5. Conversion of the Financial Instrument.

PT SMI may decide to exercise its right to convert the Financial Instrument in accordance with the terms and conditions of the Financial Instrument. The shares of the Developer obtained further to such conversion shall be the number of shares obtained by applying the following conversion rate: *NV/FMV* ("Conversion Rate").

6. In case of Sponsor default

If the Sponsor defaults on his obligation to pay the Put Price or the Call Price under Option (ii) for whatever reason or in any other way defaults on his obligations, PT SMI shall exercise its share pledge, seize control of all the shares of the Developer and offer them for sale to a third party, and receive the sale price (but not more than the NV, the net surplus, if any, will have to be returned to the Sponsor). If PT SMI is not able to sell the shares of the Developer, it will force a liquidation of the Developer's assets in order to receive its share of the net proceeds of such liquidation. However, if the FMV is determined to be lower than $500,000 or PT SMI has run an auction (2 attempts) and there were no buyers, then the FI will be deemed to have a value of US$1.00 (to avoid a formal write-off).

7. Avoidance of system gaming

In cases of Sponsor default or where PT SMI only receives the minimum value of US$1 following the FMV determination, PT SMI will have obtained a commitment from the Sponsor and the Developer that none of the Sponsor, the Developer and any company affiliated to the Sponsor or the Developer, shall develop the same site for a period ten (10) years.

6. The proposed design aims to direct public and climate funds towards financing the exploration/delineation drilling, while incentivizing private developers to put in equity under a more balanced risk allocation, reducing the developers' exposure in case the drilling reveals insufficient resources, and allowing for much more commercial finance

to come in downstream at a significantly larger scale after the riskiest part of the geothermal project has already been completed. The project design has incorporated feedback in terms of cost structure for an exploration/delineation drilling program as well as the optimal use of concessional funds. Market sounding has been carried out with the majority of the geothermal developers, most of which have expressed interest in accessing financial support provided under the Facility to be established under Part 1 of the Project.

7. Details on the operation of the Facility, including conditions and criteria for the selection of eligible public and private sectors developers and Sub-Projects, are provided in the Operations Manual.

8. The following table lists designated WKPs managed by MEMR and their licensing status. Such WKPs constitute a potential pipeline for the Facility, for which the sub-project sponsor may seek financing. The pipeline is purely indicative, and PT SMI shall carry out a rigorous process for the due diligence and assessment of each sub-financing application before any funding decision.

Table 2.2: Potential Facility Pipeline

No	Working Area	Developer	POD (MW)	Grid	PPA	Remarks
Public Sector Projects						
1	Dieng Candradimuka	Geo Dipa	40	Java	No PPA yet, BPP tariff $6.81 cent / kWh	Central Java, no wells drilled yet, showing interest to use the Facility
2	Umbul Telomoyo	Geo Dipa	55	Java	No PPA yet, BPP tariff $6.81 cent / kWh	Central Java, no wells drilled yet, showing interest to use the Facility
3	Seulawah Agam	PGE	110	Sumatera	No PPA yet, tariff at tender was $6.90 cent / kWh, BPP tariff $11.14 cent / kWh	Aceh – Sumatera, no wells drilled yet, showing interest to use the Facility
4	Tulehu	PLN	20	Eastern Indonesia (island)	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $20.00 cent / kWh but may get exception for higher tariff as PLN project.	Ambon – Maluku, 4 wells have been drilled and only 2 MW confirmed. Interested to continue the exploration.
Public / Private Sector Projects						
1	Tangkuban Perahu	PLN (with partner)	60	Java	PPA will not be needed, internal agreement between PLN and subsidiary & private partner. BPP tariff $6.81 cent / kWh but may get exception for higher tariff as PLN project.	West Java, a slim hole exploration program has been started but it failed on technical drilling issue, showing interest to use the Facility
2	Atadei	PLN (with partner)	10	Eastern Indonesia (island)	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $16.49 cent / kWh but may get exception for higher tariff as PLN project.	Lembata Island – East Nusa Tenggara, two shallow wells were drilled early 2000s by MEMR, showing interest to use the Facility
3	Songa Wayaua	PLN (with partner)	10	Eastern Indonesia (island)	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $14.08 cent / kWh but may get exception for higher tariff as PLN project.	Bacan Island – North Maluku, no wells drilled yet, showing interest to use the Facility
4	Ungaran	PLN (with partner)	55	Java	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $6.81 cent / kWh but may get	Central Java, no wells drilled yet, showing interest to use the Facility

					exception for higher tariff as PLN project.	
5	Kepahiang	PLN (with partner)	110	Sumatera	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $7.18 cent / kWh but may get exception for higher tariff as PLN project.	Bengkulu – South Sumatera, no wells drilled yet, showing interest to use the Facility
6	Gunung Sirung	PLN (with partner)	5	Eastern Indonesia (island)	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $16.49 cent / kWh but may get exception for higher tariff as PLN project.	Pantar Island – East Nusa Tenggara, no wells drilled yet, showing interest to use the Facility
7	Oka Ile Ange	PLN (with partner)	10	Eastern Indonesia (island)	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $16.49 cent / kWh but may get exception for higher tariff as PLN project.	Flores Island – East Nusa Tenggara, no wells drilled yet, showing interest to use the Facility
8	Danau Ranau	PLN (with partner)	55	Sumatera	PPA will not be needed, internal agreement between PLN and subsidiary / private partner. BPP tariff $6.99 cent / kWh but may get exception for higher tariff as PLN project.	Lampung – South Sumatera, no wells drilled yet, showing interest to use the Facility
Private Sector Projects						
1	Blawan Ijen	Medco	110	Java	PPA has been signed with tariff $8.58 cent / kWh	East Java, first exploration drilling program has been started, showing interest to use the Facility
2	Sarulla	Sarulla Operation Ltd	<200	Sumatera	No PPA yet, BPP tariff $9.77 cent / kWh	North Sumatera, expansion of predicted separate reservoir form the existing one. 3G surveys have been completed. Interested to use the Facility.
3	Graho Nyabu	EDC Indonesia	110	Sumatera	No PPA yet, BPP tariff $7.18 cent / kWh	Jambi – Sumatera, PSPE (exploration assignment)
4	Klabat Wineru	Ormat Geothermal Indonesia	20	Sulawesi	No PPA yet, BPP tariff $13.00 cent / kWh	North Sulawesi

5	Rajabasa	Supreme	220	Sumatera	PPA has been signed with tariff $9.50 cent / kWh	Lampung – Sumatera, no wells drilled yet, showing interest to use the Facility
6	Gunung Talang – Bukit Kili	Hitay Energy	20	Sumatera	No PPA yet, BPP tariff $7.25 cent / kWh	West Sumatera, no wells drilled yet, showing interest to use the Facility
7	Gunung Geuredong	Hitay Energy	35	Sumatera	No PPA yet, BPP tariff $11.14 cent / kWh	Aceh – Sumatera, PSPE (exploration assignment)
8	Hu'u Daha	PT Sumbawa Timur Mining	20	Eastern Indonesia (island)	No PPA yet, BPP tariff $16.73 cent / kWh	West Nusa Tenggara, PSPE (exploration assignment)
9	Simbolon Samosir	Optima Nusantara Energi	110	Sumatera	No PPA yet, BPP tariff $9.77 cent / kWh	North Sumatera, PSPE (exploration assignment)
10	Suoh Sekincau Selatan	Star Energy	220	Sumatera	No PPA yet, BPP tariff $6.99 cent / kWh	Lampung – Sumatera, PSPE (exploration assignment)
11	Gunung Hamiding	Star Energy	10	Eastern Indonesia (island)	No PPA yet, BPP tariff $20.00 cent / kWh	Halmahera Island - North Maluku, PSPE (exploration assignment)
12	Rawa Dano	Sintesa Banten	110	Java	PPA has been signed with tariff $8.39 cent / kWh	Banten – West Java, no wells drilled yet
13	Jaboi	Sabang Geothermal Energy	10	Sumatera	PPA has been signed with tariff $13.38 cent / kWh	Aceh – Sumatera, exploration drilling has been completed.
Not Yet Assigned						
1	Sipoholon Ria Ria	-	20			North Sumatera
2	Gunung Gede Pangrango	-	85			West Java
3	Gunung Ciremai	-	110			West Java, no wells drilled yet, showing interest to use the Facility

4	Marana	-	20			Central Sulawesi
5	Bora Pulu	-	40			Central Sulawesi
6	Gunung Galunggung	-	110			West Java
7	Lesugolo	-	5			Flores – East Nusa Tenggara
8	Gunung Endut	-	40			Banten – West Java
9	Gunung Pandan	-	60			East Java
10	Songgoriti	-	35			East Java
11	Laenia	-	20			Central Sulawesi
12	Suwawa	-	20			Gorontalo – Sulawesi
13	Pentadio	-	25			Gorontalo – Sulawesi
14	Telaga Ranu	-	5			North Maluku
15	Gunung Wilis	-	20			East Java

ANNEX 3: Economic and Financial Analysis

Economic Analysis

1. The proposed Project will contribute to Indonesia's geothermal development goal of adding 4.6 GW by 2027, and by doing so, will contribute to: (i) displacing highly-polluting alternatives; (ii) diversifying Indonesia's generation portfolio; and (iii) ultimately contributing to lowering emissions from the energy sector in comparison to a BAU scenario. An economic analysis was carried out to assess the economic viability of two sample sub-project candidates (the full development of a 110 MW and a 10 MW power plant), and the results are presented below.

Cost-benefit analysis

2. The economic cost estimates were derived based on known or inferred relationships between costs and technical characteristics of geothermal projects, excluding taxes and duties. Investment costs of geothermal development are determined by the following factors: (i) size of the development (MW) determined by both resources availability and demand; (ii) the enthalpy and depth of the resources; (iii) difficulty of access to the concession area; and (iv) cost and efficiency of project management.

3. In terms of composition, geothermal development comprises four types of costs: (i) drilling costs, a function of the number wells and the cost of each well; (ii) infrastructure costs for construction roads, well pads and other infrastructure facilities; (iii) equipment costs, including power plant and steam field above ground systems (SAGS); and (iv) project management costs.

4. Drilling cost is a function of the following factors: (i) well productivity; (ii) success rate of drilling; (iii) well depth, and (iv) prevailing services and material cost. Well productivity, in turn, depends largely on the enthalpy of the resources and well permeability (i.e. the ease with which fluids flow into the well).

5. Three enthalpy scenarios were assumed in the analysis: (i) low enthalpy, i.e., temperature between 180°C and 230°C; (ii) medium enthalpy with temperature above 230°C but relatively low pressure[54]; and (iii) high enthalpy with both high temperature and high pressure. The base case scenario assumes medium enthalpy for both fields. It was further assumed three wells will be drilled at the exploration phase.

6. Infrastructure Costs are driven primarily by the difficulty in site access. The analysis laid out three scenarios: (i) easy access with initial access road length ranging between 0 and 7.5 km from existing public access road; (ii) medium with initial access road between 7.5 km and 20 km; and (iii) difficult with initial access road longer than 20 km.

7. Power Plant Equipment Costs were assumed at US$1,500 per kW for a standard single-unit 110 MW plant, and $1,650 per kW for the 10 MW plant. For any other sizes, the plant costs were estimated using an experiential formula derived from actual plant cost data.[55]

8. Assuming medium enthalpy and easy access, the total cost of geothermal development under the base case

[54] Defined as less than 10% excess enthalpy compared to reservoir temperature when measured in a discharging well with at least 5 barg Well Head Pressure (WHP), a definition agreed with MEMR albeit minor insistencies with the international conventions.
[55] Single unit plant cost = 1.6051 * (plant capacity in MW unit)$^{-0.316}$

scenario was thus estimated at US$396.8 million for the 110 MW site, and US$41.2 million for the 10 MW site.

Table 3.1: Total Investment Cost

	Development 1 (US$ million)	Development 2 (US$ million)
Drilling	165.5	18
Infrastructure	8.9	3.3
Power plant and SAGS	203.5	18
Project management	18.9	2
Total	396.8	41.2

Benefits

9. The economic benefits of each development comprise two parts: (i) the economic value of the power supply from the plant; and (ii) the avoided cost in CO_2 emissions vis-à-vis thermal powered generation.

10. **Plant Factor.** A plant factor of 92 percent was assumed based on experience from operations of existing geothermal power plants in Indonesia.

11. **Power supply**. The annual power output amounts to 886.5 GWh from the 110 MW plant, and 80.6 GWh from the 10 MW plant.

12. The economic value of the power supply from each geothermal development is estimated as the weighted average of the cost of diesel-based power supply it substitutes and the willingness-to-pay for the additional power supply it enabled to provide access to un-electrified households.

Table 3.2: Economics Analysis, ENPV and EIRR Results

	Development 1 110 MW	**Development 2 10 MW**
ENPV @ 6 percent discount rate	US$570.4 million	US$166.3 million
EIRR	18.8 percent	32.3 percent

Facility-Level Economic Benefits

13. The economic value of the entire Phase 1 portfolio of the Facility has been simulated in an economic model. The results are presented in the two tables below. Table 3.3 presents the assumed portfolio of 10 sub-projects with only seven being successfully developed (success assumption = 1). The model has background assumptions on steam quality (high, medium or low enthalpy) meaning that some sites are more expensive to develop per MW than others, on avoided fuel (coal or oil) and on final size of plant (percentage of theoretical potential).

14. The result of the Facility-level analysis is presented in Table 3.4, which shows an aggregated EIRR of **19.9 percent** and ENPV of **US$3.6 billion**.

Table 3.3: Portfolio Overview

Site	Potential [MW]	Success Assumption (0/1)	Investment ($million)	Annual GHG Avoidance ($MtCO_2$)	Levelized Cost ($/kWh)	ENPV ($million)	EIRR (percent)
1	60	0	30	-	-	-	-
2	10	1	41	0.1	0.133	166	32.4 percent
3	5	0	10	-	-	-	-
4	10	1	41	0.1	0.133	166	32.4 percent
5	10	1	41	0.1	0.133	166	32.4 percent
6	110	1	397	0.7	0.068	570	18.8 percent
7	20	1	86	0.1	0.113	34	10.0 percent
8	220	1	785	1.4	0.064	1,218	19.8 percent
9	110	0	30	-	-	-	-
10	220	1	1,022	1.4	0.064	1,218	15.4 percent

Table 3.4: Portfolio Summary

Number of sites explored		10
Number of sites developed		7
Total site potential	MW	775
Total site potential realized	MW	600
- substituting coal	MW	570
- substituting diesel	MW	30
Investment	$ million	2,483
WTP		
- substituting coal	$/kWh	0.092
- substituting diesel	$/kWh	0.262
- weighted average	$/kWh	0.101
Annual avoided GHG emissions	$MtCO_2$	3.7
ENPV	$ million	**3,633**
EIRR	percent	**19.9 percent**

Financial Analysis

15. The Financial Analysis was carried out from two different perspectives: (i) one from the developer's perspective, assessing the financial viability of the 110 MW and 10 MW developments on a with- and without-project bases; (ii) the other from the implementing agency's perspective, assessing its cash in- and out-flows related to the Facility.

From a Developer's Perspective

16. **Financing mix**. In Indonesia, the costs of geothermal exploration are typically borne by the developer through full equity financing because debt financing is usually not available at this stage of the development due to the high

levels of resource uncertainties. Once resources risks are greatly reduced, developers can access debt financing more easily. Thus, in the without-Project scenario the financing mix is assumed to vary from full equity financing at the exploration stage, to a 70/30 debt-to-equity thereafter.

17. **Financing cost**. Each stage of geothermal development is associated with a certain amount of risks and capital requirements. Although the capital requirements are higher in later stages, the resource risks at early exploration stages are often deemed insurmountable from a financial perspective, stalling the sector's development. Developers would demand a risk premium commensurate with the high resource uncertainty associated with the exploration stage of the geothermal development.

18. **Cost of capital**. A cost of debt at 8.0 percent and corporate tax at 25 percent have been assumed. Outcome of the financial analysis from a developer's perspective:

- Without the Project intervention, both the 110 MW and 10 MW geothermal developments are unlikely to be pursued due to high equity exploration costs coupled with real and perceived geothermal development-related risks. A coal baseline for the country's main load centers and a diesel baseline (with less electrification) for the smaller island grids of Eastern Indonesia would likely be the alternative scenarios; and
- With the Project calculations show that FIRR for a private investor will be adequate to meet or exceed his required return on investment for the 110 MW case - even for low enthalpy scenarios. For the 10 MW plant, high or medium enthalpy resources would, marginally, allow a private developer an adequate return whereas an SOE, due to their lower hurdle rate, would be able to develop the 10 MW plant in all enthalpy scenarios.

From the Implementing Agency's Perspective

19. **Investment Mix**. The proposed Facility would be supporting public, private and PPP investments[56], based on a pipeline of WKPs designated by MEMR. The pipeline as well as the site specifications, such as ease of access and expected sizes, have been included in the financial model.

20. **Development Success Rate**. For purposes of the financial analysis, the development success rate (including resource risk and downstream development) is assumed to be 75 percent. This is in line with a development success rate range of 75 percent-80 percent for Indonesia. It is noted that with a single well success rate, the likelihood that the well can be used for steam production is around 55 percent-60 percent, and that a normal site success criteria is two-thirds of the exploration wells being productive.

21. **Financial Rate of Return**. Without the Project intervention, the typical 110 MW and 10 MW geothermal developments would yield a Financial Rate of Return (FIRR) in the range of 10-20 percent, which in some cases will be higher than the Weighted Average Cost of Capital (WACC) requirement of developers. While the smaller plants are more expensive per MW, they tend to be located in the Eastern Island and normally have higher power prices due to the higher cost of the avoided fuels. However, given the high equity exploration cost and the real and perceived development-related risks, the FIRRs for both the smaller and the larger developments are inadequate to attract

[56] PPP arrangements can either be financed using public or private sector guidelines depending on whether the SPV that is the subject of the financial support is majority publicly or privately owned during the period of financial support.

developers except for in certain high enthalpy[57] scenarios.

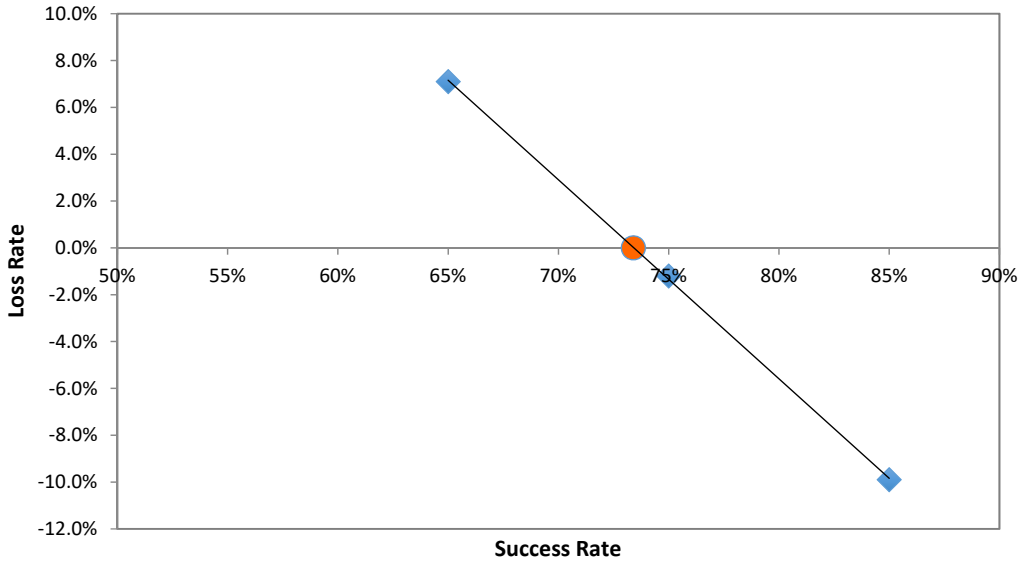
22. With-the-Project calculations show that for the 110 MW development, due to the reduced equity requirements for exploration, the FIRR for a private investor will be adequate to meet or exceed the required return on investment, even for medium enthalpy scenarios. For the 10 MW development, there would be adequate return for an IPP in high enthalpy resources, whereas an SOE, due to their lower hurdle rate, would be able to develop the project in all enthalpy scenarios.

23. Outcome of the financial analysis from the implementing agency's perspective: It is expected that at least 600 MW of new geothermal capacity could be enabled, thus leveraging at least US$2,400 million and reducing GHG emissions by 3.7 $MtCO_2$ annually.

24. Based on sensitivities, the non-recovery rate (Facility net loss) would be less than 0 percent in a base case version and not higher than 7.1 percent in a 65 percent development success rate scenario. This indicates that the concept is sustainable and that there is a solid exit strategy for GCF. A simple interpolation analysis shows the switching value (the success rate at which the Facility will balance out gains and losses) to be 73.1 percent

Table 3.5: Facility Loss Rate Scenarios[58]

Base case	Alternative Scenario 1	Alternative Scenario 2
75 percent success rate	85 percent success rate	65 percent success rate
-1.2 percent	-9.9 percent	7.1 percent



[57] Enthalpy is a measurement of total energy in a thermodynamic system. In practical terms, it is a measure that combines temperature and pressure in a geothermal steam resource.
[58] "Mixed realized potential" indicates that sub-projects are assumed to show different levels of realized potential – not simply one assumed value across the board for all.

ANNEX 4: Assessment of Indonesia's Financial Sector and PT SMI as Financial Intermediary

I. Assessment of Indonesia's Financial Sector

1. Indonesia's financial markets are considered very shallow, and capital markets smaller and less liquid, compared to the regional and emerging market peers. This is primarily due to low capital market utilization to finance investments and limited intermediation by non-banking financial institutions (NBFIs) with modest hedging and insurance facilities. Securities and equity markets are relatively underdeveloped and market capitalization of Indonesia's listed companies is lower than that of its regional peers. The country's banking penetration – both conventional and Islamic – remains at a relatively low level.

2. Despite relatively stable GDP over the past decade, the shallow financial market in Indonesia is characterized by limited-to-nascent development of various key financial instruments, such as corporate bonds, exchange-traded funds (ETFs), real estate investment trusts (REITs), options and futures for index and individual stocks and other money market instruments. For capital users, there is a limited number of equity and debt capital markets issuers at around 20, compared to 116 in Malaysia, due to lack of participation of large state-owned enterprises as major players in the economy. For capital providers, the Indonesian corporate sector is heavily reliant on bank funding, whereas the market is constrained by limited asset base of domestic institutions. While basic building blocks for market infrastructure are in place (such as the establishment of the Indonesian Stock Exchange in 2007, the availability of a resettlement mechanism of over-the-counter (OTC) derivatives for the foreign exchange (FX) market, and the improving coverage and quality of credit information), there remains a lack of clear guidelines on risky asset pricing, as well as a credible benchmark for corporate bond market. Currently, the 5- to 20-year government bond curve is well-established, however, there is no such curve in the less-than-5-year and greater-than-20-year windows. To improve financial deepening, the country is undergoing fundamental changes, including developing long-term domestic institutional investors in the market, expanding investor base for bond and equity markets and developing collateralized money market products with non-bank participation, among others.[59]

3. The broader financial market structure and infrastructure has presented limited financing instruments and options to address geothermal resource risk in Indonesia. Existing projects were financed by both the public and private sector. Public sector projects were financed by a mix of internal funding and concessional funding from the multilateral development banks (MDBs). Private sector projects (e.g., Wayang Windu, Star Energy) – once the resource was significantly proven – were financed by expensive, limited-long-term recourse project finance loans from international (offshore) commercial banks. These project finance loans were later refinanced by project bonds, which was only after the assets had been in operation for many years thereby demonstrating commercial viability. In the context of Basel III regulatory requirements on banks regarding risk-adjusted capital, long-term commercial bank lending along the lines of 2007 are no longer feasible. Participation of international financial intermediaries (IFIs) and export credit agencies (ECAs) is necessary to ensure long-term lending can be arranged for the construction phases.

4. Furthermore, 58 percent of corporate funding is provided by commercial banks, and not by the bond market as in other regional and more developed markets. In no event could investors in the corporate bond market consider

[59] Financial Deepening in Indonesia: Funding Infrastructure – Catalyzing Economic Growth. Oliver Wyman and Mandiri Institute. 2015.

financing the complex risks of a greenfield geothermal project (i.e., before development and construction phases). The ratings on such issuances would be extremely low and therefore cost prohibitively high. This is a worldwide phenomenon with capital markets in the financing of infrastructure.

5. It is expected that greenfield geothermal projects will be financed by bank lending, and not the capital market. Even in developed countries, the capital market does not take construction risks on greenfield projects. Capital market participation is only possible for refinancing operating assets. The risk sharing facility supported through this Project will help develop database of information on risks and losses, which is how banks will be able to make decisions on how to fund projects and how to price loans to compensate for expected losses.

6. Under the existing financial market constraints, this proposed Project aims to utilize a combination of financing sources with an innovative risk sharing mechanism to mitigate the uncertainties associated with geothermal resource risk and leverage the initial investment of US$740 million (plus US$100 million in leveraged equity financing from the private sector) to achieve US$4 billion in downstream investments.

II. Assessment of PT SMI as a Financial Intermediary

7. As part of Project preparation, an assessment of PT SMI's financial and institutional capacities was undertaken in order to assess PT SMI's readiness to operate the Facility. This assessment has informed the assessment of risks of this Project that have been discussed elsewhere in this Project Appraisal Document. The findings of this assessment have also fed into the Project design, including for the identification of areas of focus for the World Bank's implementation support to PT SMI. This annex summarizes the findings of this assessment, and is structured into two broad sections, first on financial aspects and then on institutional aspects.

8. Since its inception in 2009, PT SMI has shown stable growth by expanding its product and service offerings and diversifying its sectoral and geographical coverage. The portfolio of loans and advances is fairly diversified across infrastructure sectors including electricity, telecommunications, roads, transport, water supply, irrigation, and oil and gas. Total assets have grown at a compound annual growth rate (CAGR) of 22,000 percent, from IDR 2,121 billion (US$ 170.5 million) in fiscal year (FY) 2010 to IDR 55,386 Billion (US$3.79 billion) in FY17, with loans and advances accounting for a major portion of total assets. PT SMI has maintained a sufficient proportion of total assets in cash, and cash equivalents, and marketable securities which are likely to have a zero-risk weighting.

9. The major source of financing for PT SMI has been equity capital infused by GoI from time-to-time to ensure sufficient capital adequacy in line with the growth of the loan book, and borrowings from multilateral agencies. The company has received capital injections four times, with IDR 1 trillion (US$ 80.4 million) at inception, another IDR 1 trillion in FY 2010, IDR 2 trillion (US$ 161 million) in FY 2012, and most recently a further IDR 2 trillion in FY 2015. During FY2012-2014, borrowing from GoI for on-lending to Indonesian Infrastructure Financing Facility (IIFF) accounted for a major portion of total liabilities. Based on existing OJK (Indonesia's Financial Services Authority) regulations on non-bank infrastructure financing institutions, there is currently no requirement for PT SMI to report on its capital adequacy ratio; however, it is understood that at present this ratio stands at around 65 percent. PT SMI is an NBFI that is fully subject to all relevant OJK regulations.

10. PT SMI has also diversified its borrowing portfolio by raising debt from the capital market through the issuance of bonds worth of IDR 1 trillion (US$ 80.4 million) in FY 2014. Following this successful issuance, PT SMI got approval

for a Continued Public Offering Bond worth a total of IDR 30 trillion in commitments. Two tranches of this total commitment value have since been issued: IDR5 trillion in 2016 and IDR7 trillion in 2017. The company has also raised debt through a US$ denominated syndication facility from a consortium of commercial banks led by Standard Chartered, worth of US$ 175 million in FY 2014. PT SMI achieved a local rating of AA+ with a stable outlook for its rupiah denominated bond issuance in FY 2017, and a global rating of BBB- which reflects the sovereign rating.

11. Income from PT. SMI's operations is contributed by four sources: interest/fees income, treasury income, income from advisory services, and income from project preparation support. Interest income accounts for a major portion of the income from operations; this stood at 51 percent in FY 2012, rising to 70 percent in FY 2017. Total revenues have grown at a CAGR of 64 percent, from IDR 82 billion (US$ 6.6 million) in FY 2010 to IDR 598 billion (US$ 48.1 million) in FY 2014 and IDR 3155 billion in FY 2017.

12. The major contributors to PT SMI's operating expenses are interest expenses and impairment loss provisions, business development expenses, and general administration expenses. Impairment loss provisions have grown in line with the growth in the loan book, accounting for 4 percent of total operating expenses in FY2012 and increasing to 21.7 percent in FY2017. As of 2017, non-performing loans (NPLs) stood at IDR 322 billion, constituting 2.07 percent of the loan portfolio. This NPL ratio is comparable to the average for Indonesian banks with infrastructure lending portfolios (3.0 percent, according to Bank of Indonesia's statistics for August 2017), as well as to similar institutions in other countries (e.g. Infrastructure Finance Company Limited in India and Korea Development Bank in the Republic of Korea, at 2 to 4 percent).

13. PT SMI enjoys an operating profit margin around 50 to 60 percent, and a net profit margin of 40 to 55 percent. The operating profit and net profit margins are relatively high compared to the corresponding averages for the banking sector of 18 to 30 percent, and 15 to 20 percent, respectively. Table 3.6 below provides a summary of the financial statements and key financial ratios of PT SMI for the last three fiscal years.

Table 3.6: Summary of Key Financial Statements of PT.SMI (FY 2015-2017)

	FY2015	FY2016	FY2017
Income Statement (IDR billions)			
Revenue	744	2329	3155
Operating Cost	368	794	1483
Operating Profit	**352**	**1384**	**1550**
Other Income Net of Other Expenses	13.7	42	(15)
Profit Before Tax	**365**	**1426**	**1535**
Tax Expense	60	213	273
Net Profit	305	**1213**	**1262**
Balance Sheet (IDR billions)			
Loans and Advances	19,708	32,648	33,324
Investments	662	691	2,759
Total Assets	**31,714**	**44,332**	**55,386**
Borrowings and Other Liabilities	7,282	13,496	21,065
Total Equity	25,433	30,836	34,321

	FY2015	FY2016	FY2017
Total Liabilities	**32,715**	**44,332**	**55,386**
Key Financial Ratios (percent)			
Net Interest Margin			
Operating Profit Margin	47	59	49
Net Profit Margin	41	52	40
Return on Assets	2.5	3.0	2.4
Return on Investment	3.0	3.6	2.9
Return on Equity	6.4	4.8	4.1
Operating Expenses to Operating Revenue Ratio	49.4	34.1	47.0
Debt to Asset Ratio	22	30	38

Source: Audited Annual Reports of PT SMI

14. A financial assessment of PT SMI has been undertaken based on its business plan from FY2015 to FY2019, following the consolidation of Indonesia's Government Investment Center (Pusat Investasi Pemerintah, or PIP) portfolio with PT SMI. Return on equity (ROE) and Return on Assets (ROA) for FY2015 onwards are lower than in FY2014. This is attributable to a significantly large increase in equity capital and total assets relative to the increase in net profit. Especially in FY2015, the additional equity raised has not been fully deployed to advance additional loans. Table 3.7 below summarizes the key projected financial indicators for PT SMI from FY2015 to FY2019.

15. Risk management frameworks and processes are under continuous development and improvement at PT SMI. In line with international good practice, a project risk rating tool based on S&P's Capital IQ templates has been recently introduced for new investment applications at PT SMI. A Risk Register and a Risk Control Matrix tool are also under development with assistance from an external consulting firm, with implementation in 2016. PT SMI also has an adequate management information system and risk analytics unit. This unit undertakes functions such as risk management, data analytics and support, reviewing the consolidated risk management report, reviewing portfolio management and risk monitoring, and reviewing stress test and risk sensitivity analysis.

Table 3.7: Key Financial Indicators of PT SMI (FY2015-FY2019)

Key Ratios (percent)	H1 2015	FY2015	FY2016	FY2017	FY2018	FY2019
ROE	5.0	2.0	4.2	4.5	4.0	4.7
ROA	2.4	1.6	3.3	2.7	1.7	1.4
Net Interest Margin	4.4	2.1	6.0	4.8	3.0	2.5
Operating Profit Margin	44.5	57.7	72.4	60.9	36.1	28.3
Net Profit Margin	36.0	45.9	55.6	46.8	27.8	21.8
Debt to Equity Ratio	104.5	23.0	22.4	61.0	124.5	210.4
Debt to Capital Ratio	51.1	18.7	18.3	37.9	55.5	67.8

Source: Analysis from business plan projections provided by PT SMI

16. More generally, PT SMI's basic appraisal methodology adopts a typical corporate banking approach based on specific lending norms, followed by an internal rating assigned by the Risk Management Team.

17. With respect to corporate governance practices, PT SMI's governance framework is in line with Indonesian laws. PT SMI follows directives issued by MoF, its sole shareholder. It also adheres to regulations on non-bank financial institutions issued by OJK, Indonesia's Financial Service Authority. PT SMI has in place an independent audit committee to monitor compliance and the functions of the company as a whole. In addition, it has various sub-committees that aid in the decision-making processes of Board of Directors and Board of Commissioners. The company has implemented good corporate governance practices based on the implementation outline provided by the Ministry of State-Owned Enterprises Decree No. PER-01/MBU/2011. The principles underlying the company's good corporate governance are transparency, accountability, responsibility, independence and fairness.

18. PT SMI has started to increase the staff base and has developed some in house capabilities due to the WB-funded GEUDP in which PT SMI acts as an equity developer. In 2017, the PT SMI recorded a total of 261 employees.

19. PT SMI has also strengthened its staffing and capabilities in relation to environmental and social safeguards. PT SMI is currently focusing on ensuring that national standards related to safeguards are fully implemented as part of its operations. In addition, international standards on safeguards have been applied to projects that PT SMI is co-financing with international agencies. Going forward, PT SMI aims to adopt international standards from 2017, in so far as these are appropriate, reasonable and relevant to actual conditions that are encountered in Indonesia.

ANNEX 5: Financial Management

1. A Financial Management Assessment (FMA) was undertaken as part of the Fiduciary Assessment of GREM to evaluate the adequacy of the financial management systems of the implementing agency, PT SMI, in producing timely, relevant and reliable financial information on Project activities. The FMA also assesses whether the accounting systems for Project expenditures and underlying internal controls are adequate to meet fiduciary objectives and allow the World Bank to monitor compliance with the agreed implementation procedures and to appraise progress towards Project objectives.

2. **Fiduciary Risk**. PT SMI is an SOE owned by the Government of Indonesia through the MoF, and it plays a crucial role in supporting Indonesia's infrastructure development agenda. PT SMI has extensive experience in the management of World Bank-financed projects, with their finance, accounting and internal audit staff displaying sufficient capacity to implement the Project, and operational procedures already in place to guide daily operations efficiently. However, two main risks were identified during the FMA: (i) PT SMI insufficient experience in financing geothermal exploration and delineation drilling activities; and (ii) the complex financing arrangements of the Project. In order to comply with the minimum requirements under the World Bank Policy and Directive IPF September 30, 2018, the FMA affirms the need for the preparation of the Project Operations Manual; the recruitment of additional staff for the implementation of the Project and provision of training on WB financial management; and periodic coordination among all stakeholders. The overall risk of the Project has been assessed as Substantial, but effective implementation of the above-mentioned mitigation measures and the proposed financial management arrangements are expected to convert the risk rating to Moderate.

3. Overall responsibility for the oversight and implementation of the Project will be with PT SMI in its financial intermediary role. PT SMI's Director for Project Development and Advisory will lead Project implementation, whereas a Project Manager will be appointed to oversee the day-to-day operations of the Facility. PT SMI will also coordinate closely with a Joint Committee constituted of MoF and the MEMR.

4. As a result of the Financial Management Capacity Assessment of PT SMI, the following institutional and implementation arrangements need to be reflected in the Project Operations Manual to be prepared by PT SMI. Project implementation will follow PT SMI Operational Guidelines, while for specific Project implementation guidelines the Operations Manual will cover: (i) the Project organizational structure; (ii) guidelines for inclusion of Project budget into PT SMI annual budget and DIPA, or the Budget Implementation List of MoF; (iii) supervision and payment verification mechanism; (iv) funds flow mechanism; (v) the IFR format, its preparation and its submission; (vi) the disbursement mechanism and withdrawal application preparation process; (vii) annual Project financial statement preparation; (viii) and internal and external audit arrangements.

5. **Budgeting**. In Indonesia, financing arrangements for World Bank/CTF/GCF projects implemented by Central Government Agencies are governed by an integrated budget or DIPA. The budget for Component 1 will be included in the DIPA for on-lending to PT SMI to finance activities under Component 1 of the project. PT SMI will still need approval from MoF to be able to allocate the project activity in the DIPA allocation for fiscal year 2020. An approval letter will need to be obtained after the issuance of Green Book and "daftar kegiatan" from Bappenas. For Component 2, the project will follow PT SMI budgeting process as documented in their Financial Management Manual, which is deemed adequate to support GREM loan and grant activities.

6. **Accounting and Reporting**. PT SMI has sufficient knowledge of the World Bank's reporting requirements based on their experience from previous and current Bank-funded projects. PT SMI's accounting system, Oracle, records and stores all journal entries and produces monthly cash flow statements and bank reconciliation reports. The Project expenditures will be integrated in Oracle, which, in turn, will generate transactions information based on fund sources. PT SMI's Finance Unit will also be responsible for submitting quarterly IFR to the World Bank through the MoF within 45 days after the end of the reporting period.

7. **Internal controls**. The Financial Management Capacity Assessment has highlighted the risk that PT SMI may not have sufficient control over payments made for the Project, especially for its investment component. PT SMI will strengthen their existing team in their internal control systems by hiring a Supervision Consultant and a Relationship Manager, as well as by establishing a Task Force in charge of payment verification, and a Compliance Audit Team to monitor compliance of the participating Developers with the sub-financing agreement. Detailed internal control mechanisms for payment requests appraisal and verification, as well as auditing and monitoring and evaluation arrangements will be reflected in the Project Operations Manual.

8. PT SMI will appraise funding requests from developers, who will be required to sign a so-called "integrity pact" (with certain key provisions to ensure transparency and good governance) before the appraisal process starts. PT SMI's will oversee the vetting process for the Facility pipeline, set eligibility criteria for developers accessing the Facility funds, and managing the sub-loan portfolio. A sub-financing agreement between PT SMI and participating Developers will indicate that the latter's annual audit reports must be submitted to PT SMI. During verification, a Supervision Consultant will issue Monthly Certificates for all sub-projects that will be combined and proposed for payment by a Relationship Manager (RM). The RM will need to ensure all supporting documentation (including evidence of transfers made to the contractor for the previous payment) is in place before submitting the payment requests to a Task Force for verification. The RM will also be responsible to monitor the progress of sub-projects implementation and report regularly to the Director for Project Development and Advisory of PT SMI. PT SMI Internal Audit Unit will support the improvement of the effectiveness and efficiency of the internal control system of the entity and the Project during implementation.

9. **Flow of Funds**. A subsidiary loan agreement between PT SMI and MoF, as well as a series of sub-financing agreements, each between PT SMI and a participating Developer to finance exploration and delineation drilling, will be signed. One pooled designated account (DA) will be established and managed by PT SMI to be used for receipt of loan proceeds from the Project financiers (Component 1). Another pooled DA will be used for Recipient Executed Trust Funds (RETFs), financing TA activities for PT SMI, MoF, MEMR, PLN and Geo Dipa (Component 2). PT SMI will be directly managing both pooled DAs.

10. **Disbursement Arrangements**. The applicable disbursement methods are Advance and Reimbursement, though direct payment and special commitment methods are also available. Two separate pooled DA accounts will be opened. One DA in USD will be opened in a government-owned or commercial bank acceptable to the World Bank under the name of PT SMI for receipts of funds from IBRD loan, CTF loan, CTF Contingent Recovery Grant, GCF loan and GCF Reimbursable Grant. Separate subledgers will be set up by PT SMI to track the inflows and outflows of funds from each of the funding sources. Advances from the Bank and CTF/GCF will be deposited into this DA and will be solely used to finance eligible expenditures under Component 1 of the Project. Another pooled DA in USD will also be opened in a government-owned or commercial bank acceptable to the World Bank for receipts of RETFs; at this stage this pooled

DA will be also under the name of PT SMI. Separate subledgers will be set up by PT SMI to track the inflows and outflows of funds from each of the funding sources. This second pooled DA will be used for financing eligible expenditures under Component 2 of the Project, including goods, training/ workshop, operating costs, consulting services and non-consulting services. Both DAs will be pooled accounts with fluctuating ceiling. In its capacity as implementing entity for the CTF and accredited entity for the GCF, the Bank will process requests for a withdrawal of the funds of the CTF and GCF funds, respectively, in accordance with its own policies and procedures and disburse the corresponding funds accordingly. For both pooled DA accounts, the choice of GCF or CTF will depend on the decision of Joint Committee and reflected in the annual work plan and subject to be updated quarterly and approved by the World Bank. Disbursement arrangement for the Project will be reflected in the Project Operations Manual and agreed with the Bank. Applications for the replenishment of the DA advance may be submitted through quarterly IFRs which consist of (i) DA Activity Statement; (ii) Statement of Expenditures under the Bank's prior review and non-prior review; (iii) Project Cash Forecast for 6 months period; and (iv) Project Sources and Uses of Funds. Any advance funds from IBRD/CTF/GCF remaining unutilized or uncommitted at Project closing date will be refunded back to the Bank/CTF/GCF.

11. **Financing percentage.** For purposes of withdrawal application and disbursements, actual financing percentage by respective financing sources (including IBRD, CTF and GCF) for components 1 and 2 of the Project in respect of different activities (including exploration and delineation; operating costs, consulting services, etc.) will be based on annual work plan ex ante approved by the Bank, further subject to quarterly updates of work plan reviewed and approved by the Bank. Such financing arrangement requirements will be detailed in the Project Operations Manual.

Allocation of the Loan Proceeds

For Component 1

Category	Amount of the IBRD Loan Allocated (expressed in USD)	Amount of the CTF Loan Allocated (expressed in USD)	Amount of the GCF Loan Allocated (expressed in USD)	Amount of CTF Contingency Recovery Grant Allocated (expressed in USD)	Amount of GCF Reimbursable Grant Allocated (expressed in USD)	percent of Expenditures to be financed (inclusive of taxes)
1. Sub-loans under Part 1 of the Project	150,000,000	40,000,000	7,500,000	32,500,000	90,000,000	100 percent of the agreed share specified in the Annual Work Plans and Budgets and quarterly updates
2. Management Fee						Amount payable in accordance with Section 2.04 of this Agreement and Section 4.01(a) of the Standard Conditions]
TOTAL AMOUNT	150,000,000	40,000,000	7,500,000	32,500,000	90,000,000	

Allocation of the Grant Proceeds

For Component 2

Category	Amount of the CTF Grant Allocated (expressed in USD)	Amount of the GCF Grant Allocated (expressed in USD)	Amount of ESMAP[60] Allocated (expressed in USD)	Amount of GIF[61] Allocated (expressed in USD)	percent of Expenditures to be financed (inclusive of taxes)
Goods, training/ workshop, consulting services and non-consulting services, operating cost for Component 2 of the Project	2,500,000	2,500,000	2,500,000	2,500,000	100 percent of the agreed share specified in the Annual Work Plans and Budgets and quarterly updates
AMOUNT	2,500,000	2,500,000	2,500,000	2,500,000	

12. **Reflow Account**. During the life of the Project, PT SMI will open and maintain reflow account(s) to account for CTF Contingent Recovery Grant/GCF Reimbursable Grant received from developers in the case of successful

[60] The funding from ESMAP is not yet approved and may differ in actual amount from this budget estimate.
[61] The funding from GIF is not yet approved and may differ in actual amount from this budget estimate.

exploration. The funds will stay in the reflow account for a limited number of days only for administration purposes, as PT SMI is not in favor of keeping the funds for a longer period because of potential tax implications. These reflowed funds will be sent back to the Bank.

13. **Retroactive Financing**. Retroactive financing will be provided for the following against payments made against Eligible Expenditures on or after November 1, 2018:

a. *IBRD Loan*: An amount not to exceed $15 million against disbursement for Sub-Loans under component 1 of the Project;
b. *CTF Loan*: An amount not to exceed $4 million against disbursement for Sub-Loans under component 1 of the Project;
c. *CTF Contingent Recovery Grant*: An amount not to exceed $3.25 million against disbursement for Sub-Financings under component 1.2 of the Project; and
d. *CTF Grant*: An amount not to exceed $250,000 against disbursement for eligible expenditures under component 2 of the Project.

14. **External Audit Arrangement**. The Project will be subject to External Audit. Each audit will cover a period of one fiscal year of the recipient (PT SMI). The World Bank will accept the audit made by an external auditor of PT SMI's corporate accounts with disclosure on the use of the Bank's funds. Audit reports and audited financial statements will be furnished to the Bank by not later than six months after the end of the fiscal year concerned and shall be made available to the public.

15. **Supervision Plan**. Risk-based supervision of the Project financial management will be conducted, and it will involve field visits and desk supervision, including review of IFRs, audit reports and financial statements. The financial management supervision plan will be enacted every 6 months together with the task team as part of the Project implementation support.

ANNEX 6: Gender Analysis and Proposed Interventions

I. Gender Gap Analysis

1. Gender differences, particularly in terms of job status, mean that women in Indonesia tend to experience more economic vulnerability as compared to men. In 2013, 53.5 percent of the female working-age population was part of the labor force, while 86 percent of the male working-age population was part of the labor force.[62] Women constitute the majority of self-employed and unpaid family workers, making them more susceptible to personal and financial insecurity. Compared to men, women have a 24 percent higher probability of working in the informal sector.[63] Women-owned Small and medium-sized enterprises are mostly self-employed by necessity.

2. The potential growth and expansion of the geothermal sector creates an opportunity to embed approaches to job preparation, recruitment, and workplace policies that promote gender equality and support the employment and retention of female as well as male workers. Geothermal developers hire staff both in head office positions and at site; in each case, jobs opportunities – particularly for technical and managerial positions – offer competitive salaries and attractive career prospects. Currently, the sector is heavily male dominated. Nationwide data provided by the Geothermal Resources Directorate (MEMR) indicates that, from a survey of the 12 leading developers in the sector, the total number of employees is 1408. Just 202 of these are female (around 14 percent of the workforce), the majority of whom (over 70 percent) are employed in administrative and support roles, rather than managerial or technical roles. At site, the number of women employed in technical and managerial roles is smaller still, with just 15 women in these positions across all 12 companies from MEMR's sample.

3. Given the remote nature of most geothermal resource areas, educated women with degree qualifications in relevant fields still face significant barriers to entering many higher-level professional positions in the sector, such as geologist and engineer. Such jobs typically require spending long periods of time in the field on a fly-in, fly-out basis, creating a challenge to women who are also likely to be balancing domestic care work with young children or the elderly. While little discrimination exists, women themselves appear to be opting out for this reason. Additionally, focus group discussions with recent female geosciences graduates revealed that the lack of suitable accommodation and bathroom facilities encountered at some sites were factors in field-based work becoming less attractive even to younger women who do not yet have home-based responsibilities.[64]

4. Policy practices between geothermal developers were found to vary in terms of approaches to recruiting and retaining female talent and creating a welcoming workplace culture for both men and women. While most developers appeared open to and welcoming of initiatives to strengthen gender equitable employment practices, attendees of a recent Women in Indonesia Geothermal (WING) meeting identified the practices that women in the sector considered to be most helpful for creating a conducive working environment for female talent retention. These included flexible work hours and remote working; software-based performance development coaching and evaluation for employees to identify strengths and areas for growth; an active focus from companies on creating and communicating female achievement via role models and celebrating improved performance on gender equality; and creating opportunities

[62] World Bank (2015), World Development Indicators database
[63] World Bank (2015) Indonesia Country Partnership Framework 2016-2020
[64] Research carried out February 2019, in Yogyakarta

for mentoring and coaching, working with the existing WING women's network.

5. Women also face barriers in accessing lower skilled technical positions for which training and recruitment occurs locally around the plant site – for example, jobs like technician, plant operator, and environmental monitoring officer. Entry level requirements for such jobs include high school level education or bachelor's degree, and/or vocational training, and unlike the higher-level professional jobs mentioned above do not pose the same conflicts as fly-in, fly-out work, as female candidates hired locally at site could live at home. The relatively low proportion of women in remote resource areas who are able to access the education required to meet these qualifications means that this field of employment is heavily dominated by men, as the above figures evidence. The cause of this gender gap is deeply rooted in the talent pipeline, and the lower rates of educational attainment for women in rural areas, especially in technical subjects. Greater availability of technical training programs in regions of geothermal development could potentially help to spur more equitable job creation.[65] Specific areas for cooperation with line ministries and local government include ensuring teachers' availability, developing appropriate curriculum and actively promoting the sector to school-aged students and their parents.

6. At a policy level (set by the MEMR), the geothermal sector does not yet have any mandatory guidelines in terms of gender in workplace health and safety, covering issues like sexual harassment and gender-based violence, and appropriately sized personal protective equipment (PPE). Both MEMR and developers indicated willingness to engage in this area; the addition of such a policy framework would bring Indonesia in line with the Bank's own international best practices and create a strong foundation for safe and equitable working conditions during future growth of the sector.

II. Proposed Interventions

7. Under the MPA, a three-pronged approach will be taken with the goals of: i) creating a pipeline of female talent for locally hired technical roles, ii) improving the experience for women in the workplace, and iii) bringing sector policy/regulations up to international best practice on gender.

8. **Female talent pipeline**: This can be developed through support for a training program for young women and men at sub-project sites, to prepare them for work in technician and operator roles when the plants come online. The MPA Program has identified several activities that can be undertaken, working in complementarity with existing initiatives and funding in this area[66:]

(a) Engage a training provider (for example Mae Chu Change) to develop (in coordination with the industry) a stand-alone year-long job readiness training program for young women and men with a view to entering technical jobs in the sector once geothermal facilities come online. The goal would be to run one course per geothermal development region / sub-project site, with the exact number of participants (men and women) in each location to be finalized in concert with resource developers.

(b) Carry out feasibility studies (for example CoAction): i) a market study to map the skills required by industry in

[65] CoAction Indonesia, a Non-governmental organization with a mandate to support career development for renewable energy, stated that region-by-region long-term planning and investment in technical vocational education are key to building a sustainable talent pipeline for the industry while opening up local opportunities for both male and female youth in geothermal.
[66] The New Zealand Embassy have confirmed their interest in supporting activities aimed at promoting gender parity in geothermal development. This will be confirmed in further discussions, where the specific scope of collaboration will be identified.

each region where the Project is funding developers, and the suitability of curricula offered by existing educational facilities available in those regions, and ii) a social study to understand the local cultural attitudes and identify any constraints/misconceptions around opportunities for women in technical roles in each region. This information could then be included in the national planning exercise that the Government of New Zealand (via the Waikato Institute of Technology - WINTEC) is currently leading with the Indonesian government to develop a geothermal technical vocational qualification and training of teachers, working through and with the existing national network of SMKs[67] (vocational high schools).

(c) Work with developers who gain funding from the Facility to facilitate internships, career fairs, mentoring and linkages with entry level job opportunities in the sector for young people who undergo vocational training around sites, with a particular emphasis on inclusion of, and opportunities for, women.

9. **Improving female experience in the workplace**: The Program can consider supporting the engagement of a gender specialist human resources consultant to document the best practice policies among employers with regard gender in the geothermal sector workplace and include these in the Operations Manual, and then host an annual seminar as a learning/dissemination event with developer representatives to discuss progress and lessons learned. This would not require a big shift in human resources culture, as many of the developers already have good practices in place, but more of an opportunity to learn from each other and fine tune. From the perspective of working women, standardizing these best practices could potentially help to raise the profile of the sector as a female-friendly work environment and further help to attract / retain female talent at every level. This will inform the Gender Action Plan to be prepared by the developers to be monitored by the Implementing Agency.

10. **Gender in Policy / Regulation**: The Program can also consider the support of a gender policy consultant to help MEMR develop regulatory guidelines on gender, health and safety for the sector in line with international standard, for example through the inclusion of actions like mandating developers have policies on sexual harassment, provide separate accommodation and bathroom facilities for women, and offer female employees correctly sized personal protective equipment. This would further help to increase the profile of the sector as a female-friendly work environment. This can be done under the broader framework of the technical assistance to MEMR.

[67] Sekolah Menengah Kejuruan

ANNEX 7: Clean Technology Fund

COUNTRY: Indonesia
Indonesia Geothermal Resource Risk Mitigation Project (GREM)

Table 7.1 Results Framework

Indicator	GREM MPA[68] (10-yr implementation)	Transformational Scaled-up Phase: Indonesia's NDC Target of Geothermal Capacity by 2030
Geothermal electricity generation capacity enabled [MW electrical]	850	5,800
Tons of GHG emissions reduced or avoided -Tons per year [tCO_2/yr] -Tons over lifetime of the Project [tCO_2][69]	 - 5,300,000 tCO_2/yr - 159,100,000 tCO_2	 - 36,200,000 tCO_2/yr - 1,086,300,000 tCO_2
Financing leveraged through CTF funding [$ million]	US$3,980 million, including: **Before financial close** - US$225 million IBRD - US$150 million GoI - US$100 million GCF - US$100 million private sector - US$5 million from development partners for TA **After financial close** - US$2,800 million private capital - US$600 million public funds	US$25,000 million mostly from private sector
CTF leverage ratio [1:X]	1:53	n.a.
Cost effectiveness - CTF cost effectiveness [$\$_{CTF}/tCO_2$ avoided over lifetime of the Project] - Total Project cost effectiveness [$\$_{Total\ Project}/tCO_2$ avoided over lifetime of the Project]	 - 0.5 US$\$_{CTF}/tCO_2$ - 25 US$\$_{Total\ Project}/tCO_2$	 n.a. n.a.
Other co-benefits	• Improved Energy Security • Environmental Co-benefits • Improved Energy Access • Employment Opportunities	

A. Introduction

[68] The project has been scaled-up into two phase MPA with 1,000 MW target, but the CTF Annex keeps the original target values at the time of CTF approval for the sake of consistency.
[69] Assumes a 30-year useful life

Country and Sector Context

1. Indonesia - a diverse archipelagic nation of more than 300 ethnic groups - has charted impressive economic growth since the Asian financial crisis of the late 1990s. Today, Indonesia is the world's fourth most populous country with over 260 million people, the eighth largest economy globally and the largest economy in Southeast Asia with a gross national income (GNI) per capita of US$3,540[70]. Indonesia has made enormous gains in poverty reduction. Since 1999, poverty rate has more than halved to around 10 percent. Nevertheless, around 26 million Indonesians still live below the national poverty line.[71] Approximately 40 percent of the entire population remains vulnerable of falling into poverty. The slow pace of job creation is another challenge to poverty reduction efforts, largely affecting the 1.7 million youth who enter the workforce each year.

2. Indonesia has maintained a real GDP growth of five percent over the past three years, which is estimated to hover around 5.2 percent in 2018.[72] Greater investment has been bolstered by lower financing costs, improved business environment, and stronger public capital investment. While the Indonesian economy has seen some economic diversification in recent years, its economic performance is still substantially tied to commodities as a major exporter.

3. With its large yet dispersed population, maintaining modern and efficient infrastructure is vital for Indonesia to connect with markets at home and abroad in order to sustain robust growth. To this end, improving infrastructure is a top priority for the GoI. In the 2018 budget, the GoI earmarked the highest amount ever allocated for infrastructure development – approximately US$27 billion – which will remain a priority at least for the next few years according to the 2015-2020 medium-term development plan. Many of the key infrastructure projects and programs have been implemented by the 24 SOEs across different sectors. The challenge lies in developing a risk-sharing model so that SOEs benefit from government-backed, lower borrowing costs without exposing the national budget to undue fiscal burden. Meanwhile, the GoI has made significant efforts in introducing many regulatory reforms to create a more conducive environment for private sector participation to close the infrastructure gap.

4. Meanwhile, Indonesia continues to rely heavily on fossil-fired power generation. In 2018, the total installed capacity was 57 GW[73], of which 88 percent from fossil fuels[74] and 12 percent renewable sources, to meet a peak demand of 40 GW.[75] Important policy goals have been formulated by the National Energy Council to re-establish Indonesia's energy independence through (i) re-directing energy resources from export to domestic market and (ii) rebalancing the energy mix towards indigenous energy supplies. The policy implies minimizing oil consumption, increasing the exploitation and consumption of coal and renewable energy sources, optimizing the production and consumption of gas, and transforming the energy mix by raising the share of RE in the country's energy mix.[76]

5. The GoI has set the RE target of 23 percent by 2025.[77] This MPA is designed to support the government in

[70] World Bank: World Development Indicators 2017
[71] According to the Central Statistical Bureau data, March 2018
[72] World Bank (2018) Indonesia Economic Quarterly, September
[73] MEMR presentation, January 2019.
[74] This consists of 58% coal, 23% gas, and 6% diesel.
[75] Estimated data from PLN RUPTL 2018.
[76] Infrastructure Sector Assessment Program, World Bank, June 2018.
[77] MEMR's Roadmap for Accelerated Development of New and Renewable Energy 2015-2025

reaching this renewable energy target with a focus on geothermal energy. Indonesia currently has 1.95 GW of installed geothermal capacity despite an estimated 29 GW in potential resources. Addition of 4.6 GW of geothermal capacity planned in RUPTL would require investments of approximately US$25 billion. The MPA will pilot and deliver an innovative financing instrument to achieve the scale needed to contribute to reaching the GoI's RE target. To do so, it will facilitative an efficient risk sharing mechanism for geothermal exploration drilling and therefore leverage investments of up to US$4 billion enabling 1,000 MW of geothermal development by 2029 and accordingly avoiding around 187 million of $MtCO_2$, while matching the long lead time-horizon of geothermal development.

6. To meet the GoI's ambitious target of an additional installed capacity of 4.6 GW of geothermal energy, there needs to be: (i) clear and transparent procedures for awarding licenses and signing PPA, (ii) an optimized use of public funds and climate finance to bring down project development cost, and (iii) an efficient risk allocation strategy to incentivize private sector investments at scale.

7. The proposed MPA Program will increase the share of geothermal energy in the national energy mix. This would be achieved through the implementation of a cost-efficient risk-sharing mechanism to mitigate geothermal resource risk, which would bring substantial leverage of developers' equity, public funds from PISP as well as IBRD and climate finance. Technical assistance will be provided to support improvements in licensing and PPA award procedures thereby mitigating regulatory risks in the medium and long-term. The MPA enables the World Bank to deepen its engagement in Indonesia's geothermal sector in the upstream phase,[78] and achieves results at scale. The MPA design targets the riskiest part of the development phases, and in doing so, it supports the Government's vision of developing geothermal energy as a strategic indigenous energy source.

CTF Dedicated Private Sector Program III

8. In December 2017, the CTF Trust Fund Committee endorsed the Dedicated Private Sector Program III proposal which presents potential project concepts to promote private sector engagements in clean energy projects. The proposed Project for US$75 million CTF funding was included in the program for its expected contribution in unlocking geothermal potential with its innovative design feature building up on the existing CTF investments made under the CTF Investment Plan for Indonesia.

9. Under the CTF Investment Plan for Indonesia, US$324 million of CTF resources have been approved for geothermal development. The first project, Geothermal Clean Energy Investment Project (US$125 million CTF soft loan and US$175 million IBRD loan) financed the construction of two geothermal power plants with a total capacity of 150 MW (GoI own funds financed the earlier phases of exploration and steam production drilling). The second project, Asian Development Bank's Private Sector Geothermal Energy Program, supports private developers in financing of delineation and steam production drilling of projects that already have carried out early exploration drilling. The Program is financed with concessional loans, including a CTF allocation of US$150 million.

10. In the third project, GEUDP, a US$49 million CTF contingent recovery grant is co-financed by US$49 million from PISP to support government-sponsored exploration drilling to confirm geothermal resources of pre-identified greenfield areas before they are tendered out. GEUDP strategically uses CTF resources to tackle the riskiest part of

[78] Previously, the WB has mainly focused on downstream investments, such as power plant construction, and assisted the Government in setting up a government-drilling program in geothermal exploration under the GEUDP.

geothermal development to unlock downstream private sector investment for production drilling and power plant construction. It explores the business model where government and climate funds are used to de-risk geothermal projects, ultimately reduce the overall risk and tariff requirements for supported projects. Managed on a portfolio basis, GEUDP promotes investment efficiency, as the costs associated with unsuccessful projects are covered through a premium on repayments from successful projects. With implementation starting in 2017, the project has been showing satisfactory progress with two initial sites assigned (Waesano in Flores and Jailolo in North Maluku) and infrastructure mobilization expected to begin during the first half of 2019. It is the plan that a total of four sites will be de-risked during implementation of GEUDP, which is planned to be completed in mid-2023. GEUDP has demonstrated the concept of upstream de-risking for the benefit of unlocking commercial capital for downstream development and has positioned PT SMI – the Project's Implementing Agency – as a central player in the GoI's efforts to promote investments in geothermal energy.

Brief Project Description

11. The Project has two components, which are expected to be the same for the future phase(s). The following describes the components and investments under phase 1:

- Component 1 to mitigate risks in geothermal resource drilling supported through the establishment of a new risk mitigation facility is financed with US$455 million, which consists of US$150 million from IBRD, US$97.5 million from the GCF[79], US$72.5 million from the CTF, US$75 million from GoI's PISP, expected to leverage US$60 million in private developers' equity.
- Component 2 for technical assistance and capacity strengthening is financed with US$10 million, which consists of US$2.5 million from GCF, US$2.5 million from CTF, US$2.5 million from the ESMAP and US$2.5 million from the GIF[80].

12. **Component 1 – Geothermal Resource Risk Mitigation Facility (US$455 million)**. Under phase 1, component 1 will support the establishment of the Facility, which will provide financing to mitigate the risk of resource confirmation (including exploration and delineation drilling) of eligible public sector entities and eligible private sector developers (each a Developer, and typically, an SPV established by their owner (Sponsor) for the development of a specific geothermal site).

13. Sub-component 1 will offer the following financing products for the public-sector entities (up to a maximum of $40 million total support for exploration and possibly a similar amount for delineation):

c. *For exploration*: a Sub-Loan under terms and conditions reflective of the source of funding (tentatively

[79] GCF has approved a total amount of US$185 million in support of the MPA. However, due to capital constraints it has allocated only US$100 million as a first tranche (GCF T1), with the expectation that the remaining tranche of US$85 million would be allocated not earlier than two years from the initial GCF Board approval. The second tranche will need to be approved by the GCF Board following proof of satisfactory implementation progress. Only the financing from GCF T1 is included in the Project's activities covered by this document and is referred to as the "Initial Project" in the financing table with GCF T2 referred to as "Additional Allocation".
[80] The funding from ESMAP and GIF is not yet approved and may differ in actual amount from this budget estimate.

assumed to be 50-75 percent from IBRD loan[81], and 25-50 percent from GCF or CTF loan[82]). At the discretion of MoF, the PISP can provide up to 50 percent grant to the developer in order to cover part of the loan pay-back obligations in case the exploration is unsuccessful.[83]

d. *For delineation*: a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD, CTF and PISP with break-down to be finalized in the Project's Operations Manual).

14. Sub-component 2 will offer the following financing products for the private sector developers (up to a maximum of $30 million total support for exploration and possibly a similar amount for delineation):

a) *For exploration*: A Sub-financing under terms and conditions reflective of the source of funding, including:
(iii) 50 percent sub-loan sourced from IBRD and fully guaranteed by the Sponsor; and
(iv) 50 percent in the form of a subscription to an innovative instrument (referred to as Financial Instrument (FI)) to be issued by the Developer, the value of which is linked to the value of the shares in the Developer, funded from either GCF Reimbursable Grant or CTF Convertible Recovery Grant. This instrument is an innovative way to allow PT SMI to capture a part of the additional value (upside) from completed exploration projects. Because the value of the FI is linked to the value of the shares of the developer, it may increase (or not) after the implementation of the exploration sub-project, depending on the extent of the success (or not) of the sub-project. As per a pre-defined formula, successful exploration will lead to *full repayment of the Financial Instrument with a premium*, whereas pay-back from partially successful exploration will be determined as a share of the *Fair Market Value* of the Developer – in cases of a fully unsuccessful exploration this value would be zero. The repayment/monetization options, including write-off for unsuccessful projects, are further explained in Annex 2.

b) *For delineation*: a Sub-Loan under terms and conditions reflective of the source of funding (from IBRD, fully guaranteed by the Sponsor).

15. An indicative breakdown of the funding support for each sub-project is presented below.

[81] The IBRD lending rate is available via this link: *http://treasury.worldbank.org/en/about/unit/treasury/ibrd-financial-products/lending-rates-and-fees*
[82] GCF's financial terms and conditions are available via this link. CTF terms and conditions are available via this link.
[83] PISP funds with loan forgiveness cannot be used for the private sector developers due to the risk of potential inequitable or non-transparent subsidies being delivered.

Table 7.1: Funding Sources for Blended Loan from the Facility

	Public Sector		Private Sector	
Development Stages	Exploration	Delineation	Exploration	Delineation
Facility Share of Total Drilling Cost	100 percent	100 percent	75 percent	75 percent
Share of Sub-Loan in Drilling Program and its Break-down	50-75 percent IBRD 25-50 percent GCF/CTF	100 percent IBRD/CTF	25 percent Developer equity 37.5 percent IBRD 37.5 percent GCF/CTF	25 percent Developer equity 75 percent IBRD/CTF

16. Details on the operation of the Facility, including conditions and criteria for the selection of eligible public and private sectors developers and Sub-Projects, are provided in the Operations Manual.

17. **Component 2 – Technical Assistance and Capacity Strengthening (US$10 million)**. The component will support Project implementation and management of the Facility by PT SMI. This includes supporting PT SMI's incremental operating costs as well as procurement of specialized (geotechnical, legal, environmental, social and financial) consulting services to support the rigorous evaluation of sub-financing proposals, validation of complex geoscientific data, and supervision of environmental and social safeguards compliance by the sub-borrowers. The component will also finance technical assistance and capacity strengthening of the key stakeholders, namely MoF, MEMR, Geo Dipa Energi, and PLN (see Table 4). Support for MoF will encompass (i) capacity strenghtening in the area of geothermal policy in relation to fiscal and budgetary issues relevant for MOF, and (ii) support to the operationalization of the Joint Committee. Support to MEMR will focus on improving the investment climate and business environment for geothermal energy, through (i) enhancing the transparency and efficiency of licensing/tendering process through international roadshows, (ii) identification of new geothermal drilling strategies for exploitation of medium-enthalpy resources and quicker deployment through modular plant development, and (iii) feasibility of innovative financing instruments involving the financial market toward geothermal risk mitigation. For state-owned geothermal developers, it will cover support to enhance their capacity for geothermal geoscientific and resource data management, drilling management, procurement and contract management through advisory and consulting services, on-the-job learning and training, and sharing of international best practices. Support to PLN will focus on operationalizing the PPP arrangement through commercial and legal advisory support on structuring of the HoA and PPA tariff-setting principles. For TA activities not financed from CTF or GCF, the implementation arrangements will be decided when the financing agreements will be signed. It is possible that PLN and MEMR, respectively, will implement the TA activities for which they are themselves beneficiaries.

18. In a separate activity, work will be commissioned on the impact side of geothermal development. This will seek to maximize impact of the MPA by considering how it can best boost electrification rates in the least developed areas of Indonesia, how it can promote employment and gender equality. Early results from this work will be compiled to inform the design of the second phase of the MPA. As part of this sub-component, data will be collected and reported by the participating developers in order to draw lessons in terms of the Program's gender-sensitive interventions laid out in this document (see Section IV. Appraisal Summary, C. Environmental and Social Section on gender).

Table 7.2: Expected Capacity Strengthening Program (Sub-Component 2.2)

#	Activity	Beneficiary	Estimate (US$ M)	Comments
1	General capacity strengthening on regulatory issues, risk mitigation models and tariff for geothermal	MEMR and MoF	1.5	(i) Capacity strengthening and just-in-time support related to geothermal policy including fiscal and budgetary issues as well as regulation and tariff setting; and (ii) support to the operationalization of the Joint Committee
2	Preparation of Project-level GAPs and general supervision	PT SMI	0.5	Supporting the preparation and review of GAPs and other due diligence under the Project.
3	General capacity strengthening in geothermal and support to infrastructure planning for geothermal development	PLN	1.5	Training and capacity strengthening of staff including preparation of site-specific plans with recommendations on transmission and distribution infrastructure.
4	Data management software with training	Geo Dipa	1.0	Delivery of data management software and training in its use
5	Exploration and exploitation management focused training	Geo Dipa and PLN	0.5	Delivery of geothermal exploration and exploitation management focused training, including safeguards
6	Study to Increase impact or geothermal development	MEMR and PT SMI	0.5	Early results from this work will be compiled to inform the design of the second phase of the MPA
Total			5.5	

19. **Additionality of climate funds**. GCF and CTF funds are an integral element of the Project design for two main reasons: (i) the risk profile of GCF and CTF's instrument and their catalytic effect in attracting public and private finance towards geothermal development; and therefore (ii) its contribution in helping Indonesia achieve its NDC and fight climate change as one of the Asia Energy Transition countries (China, India, Indonesia, Pakistan, the Philippines and Vietnam). These instruments have the risk capital profile to match the risk associated with early-stage geothermal exploration drilling supported by this Project. The alternatives would be a ramp-up of coal in place of a cleaner solution in the short and medium terms, and therefore the lock-in of millions of tons of GHG emissions for the long term.

20. The proposed financing for this first phase of the MPA by component is summarized in Table 7.3.

Table 7.3: Expected Funding Allocation (US$ million)

	Funding Sources[84]							
	Project Cost	**PISP**	**IBRD**	**GCF**	**CTF**	**Developers' Equity**	**ESMAP**	**GIF**
Component 1. Geothermal Resource Risk Mitigation Facility	**455**	**75**	**150**	**97.5**	**72.5**	**60**		
Subcomponent 1.1 – Public Sector Developers	*170*	*75*	*47.5*	*7.5*	*40*	*-*		
Subcomponent 1.2 – Private Sector Developers	*285*	*-*	*102.5*	*90*	*32.5*	*60*		
Component 2. Technical Assistance and Capacity Strengthening	**10**			**2.5**	**2.5**		**2.5**	**2.5**
Sub-component 2.1 – Governance and Management Support to PT SMI	*4.5*			*2*	*2.5*		*-*	*-*
Sub-component 2.2 – Technical Assistance and Capacity Strengthening to MoF, MEMR, PLN, Geo Dipa	*5.5*			*0.5*	*-*		*2.5*	*2.5*
Total	**465**	**75**	**150**	**100**	**75**	**60**	**2.5**	**2.5**

B. Assessment of Proposed Project with CTF Investment Criteria

Potential for GHG Emissions Savings

21. It is expected that the proposed Project will enable 850 MW of new geothermal capacity. The operation of 850 MW of geothermal capacity will displace higher polluting alternatives for power generation. Therefore, the proposed Project is expected to avoid about 5.3 $MtCO_2$ per year or 159 $MtCO_2$ over the typical lifetime of geothermal power plants.

22. **Assumptions**. The CO_2 emissions reduction potential was estimated by subtracting projected lifetime emissions from the Project (Project scenario) from the projected lifetime emissions in BAU scenario (Baseline). In the Project scenario, CO_2 emissions were estimated using an average emission factor for geothermal energy facilities of 62.9 gCO_2/kWh[85] added by emissions from deforestation due to drillings. Emissions from deforestation were calculated using local deforestation emission factors for identified pipeline sub-project sites. Following assumptions were made additionally:

a) All pipeline sub-projects involve deforestation in well pad preparation

b) For the pipeline sub-projects where drilling has already started, no additional well pad preparation is assumed

c) For the pipeline sub-projects where drilling has not started, three well pads (the minimum number of wells required for greenfield projects) per sub-project will be prepared

[84] The funding from ESMAP and GIF is not yet approved and may differ in actual amount from this budget estimate.
[85] *Geothermal Power Plant Emissions in Indonesia, 2015*

d) One well pad requires 2.5 hectare of land area

e) Drilling sites will be in primary forest areas

23. In the Baseline scenario, CO_2 emissions were estimated based on the grid emission factor of 838 gCO_2/kWh for Indonesian generation mix. The capacity factor was assumed as 92 percent, therefore 600 MW of geothermal capacity was assumed to produce about 4,838 GWh per year.

Cost-effectiveness

24. CTF cost-effectiveness is 0.5 US$/$tCO_2$, calculated as the ratio of US$ CTF per tCO_2 avoided over the lifetime of the Project. Total Project cost effectiveness (total CTF project cost per tCO_2 reduced/avoided) is estimated at US$25 total per tCO_2. Thus, the marginal abatement cost will be well below US$200 per tCO_2.

Demonstration Potential at Scale

25. The Project (Phase 1 of the MPA) will lead to the development of 600 MW of new geothermal power with GHG savings of 3.7 million tCO_2 per year and the Facility would be able to support more projects resulting in more MWs and GHG savings depending on whether PT SMI will be able to recycle funds beyond the 10-year project period. The Project achievements will directly contribute toward the PLN's plan to add 4.6 GW of geothermal capacity by 2027 under RUPTL 2018-2027. This scale-up would result in avoided emissions at a cumulative 862 million tons of CO_2 over a thirty-year period.

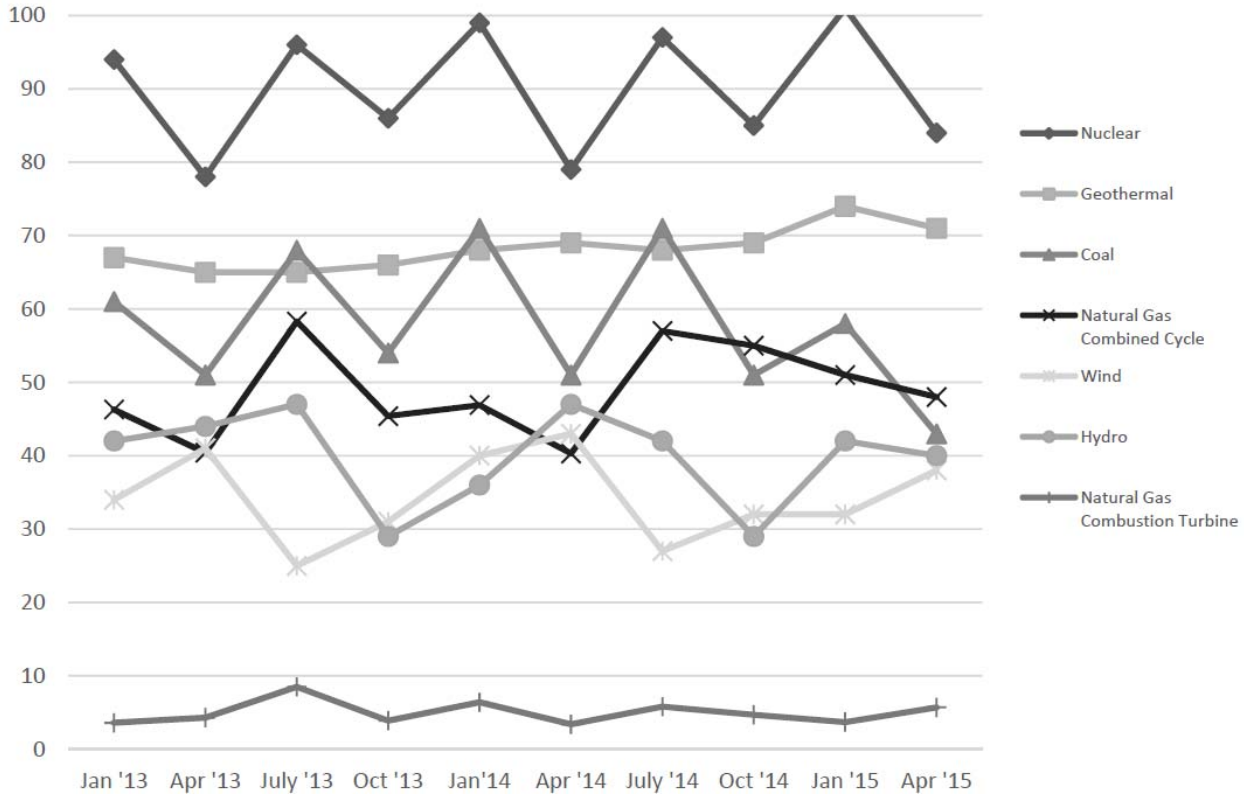
26. The Project will demonstrate the MFD approach by facilitating significant private sector financing in geothermal sector in Indonesia. It has been prepared in coordination with the IFC. Supporting private sector participation is an integral aspect of scaling up geothermal investments in Indonesia, as public funds alone will not be sufficient to meet the government's ambitious target. This operation will adopt private sector solutions and innovations in geothermal exploration drilling strategy and management with the potential to achieve greater scale of geothermal deployment in the most cost-effective manner. This innovative risk mitigation approach has the potential to be replicated in other geothermal-rich countries and regions as well. They may include but are not limited to Chile, Dominica, Mexico, Nicaragua, El Salvador, Costa Rica and Saint Lucia in Latin America; Ethiopia, Tanzania, Kenya and Djibouti in East Africa; Turkey and Armenia in Eastern Europe and the Balkans; and the Philippines and Fiji in the Pacific. The risk mitigation model developed under this Project could be adapted to country contexts to potentially facilitate a rapid world-wide scale-up of geothermal development through demonstration effects.

Development Impact

27. **Improved energy security**. Geothermal energy is a renewable baseload source of power. Harnessing geothermal power can have great implications in terms of greening and diversifying the energy mix and increasing energy security of resource-rich countries. Geothermal energy is not affected by price fluctuations and delivery of fuel, as is the case of higher polluting alternatives – such as the diesel fuel that would be substituted on the smaller islands of Easter Indonesia. The replenishment of heat from natural processes and modern reservoir management techniques enable the sustainable use of geothermal energy - the same cannot be said about fossil fuels. With appropriate resource management, the tapped heat from an active reservoir is continuously restored by natural heat production, conduction and convection from surrounding hotter regions, and the extracted geothermal fluids are replenished by natural

recharge and by injection of the depleted (cooled) fluids. In addition, geothermal power plants operate fairly steadily with the global average capacity factor[86] close to 75 percent and newer installations reaching 96 percent and above (Intergovernmental Panel on Climate Change or IPCC, 2011). A visual representation of how the capacity factor of geothermal plants stacks up vis-à-vis other technologies/fuels is given in Figure 7.1.

Figure 7.1: US-observed Capacity Factors for Geothermal and other Technologies/Fuels, 2013 - 2015



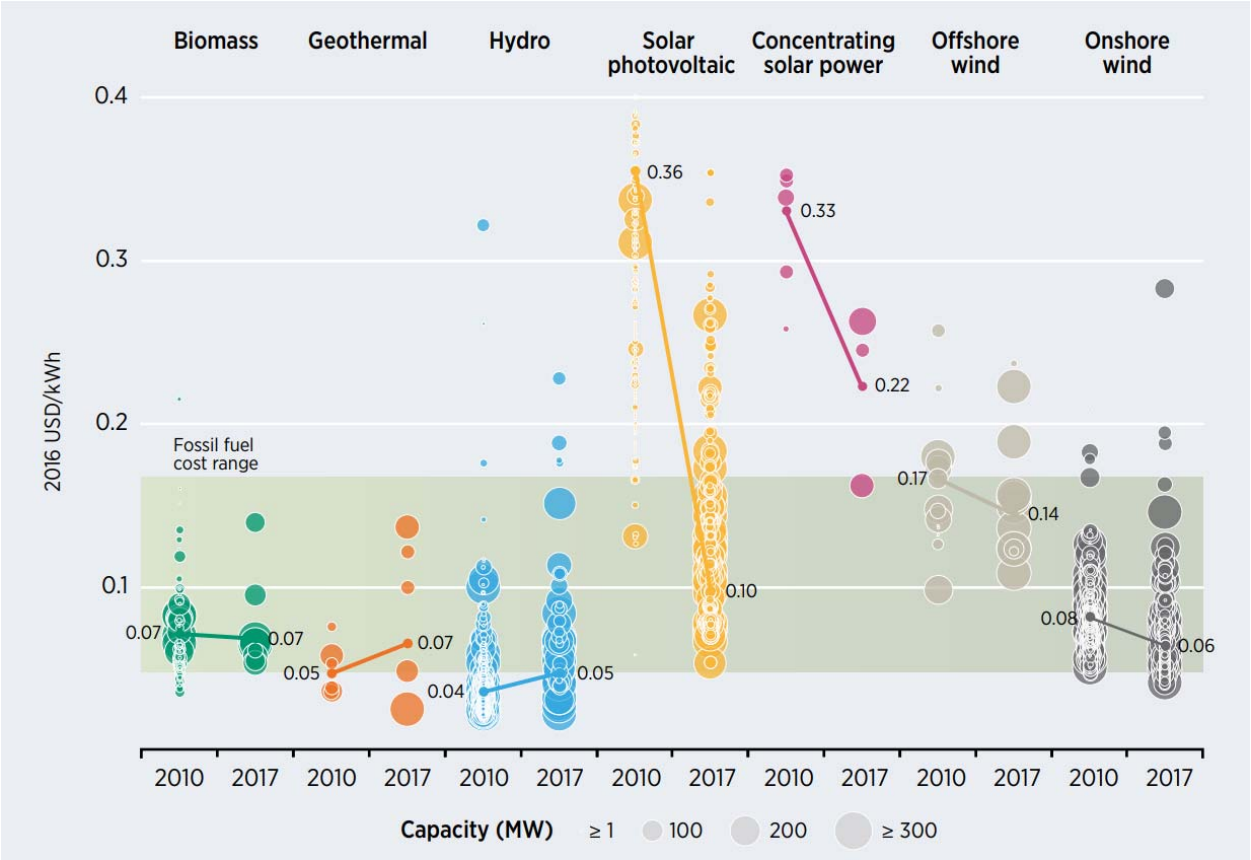
Source: Adapted from U.S. Energy Information Administration (EIA): *http://www.eia.gov/todayinenergy/detail.cfm?id=14611#*

28. **Environmental co-benefits**. Geothermal power's environmental benefits far outweigh potentially adverse impacts. First and foremost, there is no combustion in the geothermal development process, which technically means no technology-driven CO_2 emissions. Practically, however, direct emissions do exist and are linked to the geology of the underground reservoir and fluids. Nonetheless, these are dwarfed by the emissions of thermal-power plants. At the local pollution level, geothermal power has also negligible emissions of sulfur dioxide, nitrogen oxides, and total suspended particulates. Secondly, Geothermal has minimal land and freshwater requirements. For example, condensing geothermal plants use 5 gallons of water (geothermal condensate, not fresh water)

[86] Capacity factor is the ratio of the actual output of a generating unit over a period of time (typically a year) to the theoretical output that would be produced if the unit were operating uninterruptedly at its nameplate capacity during the same period of time. The figure of 75% is due to the existence of many mature, low-load US plants. This number is not representative of what could be expected from new Indonesian plants.

29. **Improved energy access**. Geothermal power can be an economically attractive generation option, which could contribute to increased energy access in Indonesia. Especially in Eastern Indonesia with high poverty rate and expensive diesel-fired power generation, reliable and affordable access to electricity is expected to contribute to sustained and sustainable economic growth for about 4 million poor people. The levelized cost of geothermal generation is typically between four and 7 US cents per kWh (Figure 10) in the best geothermal areas. The observed cost range makes geothermal power competitive against higher polluting energy sources. This a particularly important point given that reconciling the electrification and renewable energy expansion plans of many developing country governments puts great pressure on pursuing least-cost renewable generation options.

Figure 7.2: Global levelized cost of electricity from utility-scale renewable power generation technologies, 2010-2017



Source: IRENA, Renewable Power Generation Costs in 2017

30. **Employment opportunities**. The Project will increase drilling activity, contributing to the direct creation of jobs as part of the drilling crews and associated services. In addition, jobs in construction and maintenance of power plants and other geothermal facilities will be created, both directly investments under the Facility and indirectly through the full development of sub-projects for which resources are confirmed. For reference, the Geothermal Energy Association estimated that approximately 860 different people with a wide range of skills are employed over the development

cycle in a typical 50MW geothermal project. Approximately 2 people per MW are involved during the drilling phase.[87]

107. The Project also aims to encourage female employment in the Project area by adopting Gender Action Plan (GAP). The GAP not only plans to increase number of women benefiting from the new job opportunities created under the Project, but also improve the quality of female employment by hiring them for skilled formal sectors. Female employments in Geothermal Center of Excellence are planned for leadership role and engineer positions under the GAP.

Implementation Potential

31. Geothermal development is a pillar of the country's Low Carbon Growth Strategy and a key development priority for GoI. The MEMR's "Roadmap for Accelerated Development of New and Renewable Energy 2015-2025" sees geothermal contributing 7 percentage points of GoI's renewable energy target of 23 percent by 2025 – today's overall RE installed capacity stands at 6 percent. Geothermal power is expected to contribute to the country's Greenhouse Gas (GHG) emission reduction efforts, which target a 29 percent cut by 2030 compared with a BAU emissions projection that starts in 2010. With GoI's commitment and international aid support as well as considering Indonesia's geothermal resources, the implementation potential is assessed as high.

32. **Leveraged co-financing**. The proposed Project's financing plan totals US$455 million giving a leverage ratio of 1:6. Out of this, the Facility will be capitalized with a US$32.5 million CTF Contingent Recovery Grant, a US$40 million CTF loan in soft term, a US$150 million IBRD loan, US$75 million in PISP funding, a US$90 million GCF Reimbursable Grant and a US$7.5 million GCF loan. The Project also crowds in private investment with requirement for 25 percent equity from the private developers for the exploration loan. Component 2 will be funded by US$2.5 million from CTF, US$2.5 million from GCF, and other available sources in the amount of US$5 million. Following the financial close of sub-projects, the Project is expected to further leverage US$2.4 billion in private and public downstream investment, thus drawing the leverage ratio to 1:37.

CTF Additionality

33. CTF funds are an integral element of the G Facility for four main reasons: (i) the risk profile of CTF instruments and their catalytic effect in attracting public and private finance towards geothermal development; (ii) the CTF TA grant provides necessary supports in building capacity of PT SMI, which enables the implementation of the proposed scheme; (iii) enabling the scale-up of cost-sharing efforts targeted at geothermal development; and (iv) the contribution made towards helping Indonesia achieve its NDC and fight climate change as one of the Energy Transition countries.

34. First, CTF instruments have the risk capital profile to match the risk associated with early-stage geothermal exploration drilling supported by this Project. In Indonesia, exploration drilling comes at a hefty price tag of up to US$8 million plus supporting infrastructure, which needs to be put at risk and therefore could be prohibitive for developers to significantly expand their geothermal operations. CTF sources will be a crucial element of a blended financing arrangement for public developers and a convertible debt instruments for private developers. Experiences in the past decade have shown that without support for de-risking in the exploration phase, investments -particularly private- have been lackluster at best. The CTF funded Facility will fill the gap of a shallow local capital market unable to provide

[87] Geothermal Energy Association (2010). Green Jobs Through Geothermal Energy, October.

adequate and attractive financing terms to geothermal developers. As a key development objective, it also aims to support the GoI in bringing on-line on a mass scale more reliable and cheaper power in the fossil fuel-dominated national grids. Following exploration drilling which will be cost-shared between the Facility and the developers under the proposed Project and where the resources are confirmed, the developers will be able to access project finance from the market.

35. Second, the Project would not happen without CTF TA grant even though it takes the smallest share of the CTF funding envelop. The TA to be supported by the CTF TA grant aims (i) to support PT SMI with the management of the proposed Facility and (ii) to enhance the technical leadership of MEMR and other key stakeholders on issues pertaining geothermal development, with an emphasis on mitigating resource risk. While GEUDP has supported PT SMI in building its capacity for managing complex drilling operations, this Project will strengthen SMI's system and capability for managing a large fund for renewable energy investments. It will further expand SMI's risk appetite and improve its capacity in managing those risks. These achievements are imperative to (i) improve the overall sector governance and investment climate for geothermal development in Indonesia; and (ii) support greater geothermal development by the Beneficiaries.

36. Third, cost-sharing as a means to mitigate resource risk is currently the focus of much of the global push for geothermal development, as it has proven to enable risk capital and private expertise to be mobilized towards geothermal drilling. For example, Japan and the United States experienced a major period of geothermal development thanks to cost-shared drilling programs. After two decades of cost-shared development which allowed installing some 500 MW of geothermal capacity (about 90 percent of the country's total), the Japanese program came to a halt in 1995 and no new significant developments have been undertaken since. After 2011's earthquake and Fukushima disaster, the central government has been taking important steps towards reviving geothermal power development, including reintroducing cost sharing for resource estimation.

37. Lastly, CTF funds plays a critical role in enabling innovative climate solutions to facilitate a low-carbon future for Indonesia through scaling up geothermal investments as a clean source of energy and electricity. The alternatives will be a rapid ramp-up of coal in place of a cleaner solution in the short and medium terms, and therefore the lock-in of millions of tons of GHG emissions for the long term. This Project – underpinned by much needed climate finance from CTF – will help the GoI in reaching its NDC of 29 percent reduction of GHG emissions by 2030 with an expected annual avoidance rate of 5.3 $MtCO_2$ compared to a business-as-usual scenario with heavy ramp-up of fossil-fueled electricity generation. The Project has already been highlighted at the 2017 One Planet Summit in Paris by SMI President Director as one of GoI's priority efforts in reaching the NDC (*link to source*), as well as the World Bank Group President as one of the flagship Projects that will have a transformational effect in reducing carbon emissions by one of the biggest coal-producing countries in the world (*link to source*). This showcases the strong commitment from the GoI and the WB for this initiative, and CTF stands to become a pivotal part of that effort.

Implementation Readiness

38. PT SMI will be the recipient for the CTF funding and enter into related legal agreements covering the loan, the contingent recovery grant, and the TA grant. Overall responsibility for oversight and implementation of the Project will be with PT SMI. PT SMI will be the implementing agency for the Project in a financial intermediary role. PT SMI has been implementing WB-financed projects, including in Financial Intermediary operations for several years, including

the ongoing RIDF and GEUDP. In doing so, PT SMI will coordinate closely with a Joint Committee constituted of MoF and MEMR. Early assessment on environmental and social safeguards, procurement and financial management capacity finds that SMI has the system in place to manage a large-scale lending facility.

39. The head of GREM project implementation will be PT SMI's Director for Project Development and Advisory. PT SMI will assign a project manager that will oversee the day-to-day operation of the Facility. In implementing Component 1 of the Project, PT SMI will set the eligibility criteria for developers and sub-projects, manage the vetting process for Facility pipeline, and manage the sub-loan portfolio and its associated safeguards and financial management compliance. It will use its internal departments and functions to manage the Facility, drawing from staff from those departments and hiring consultants and contractors to fill capacity gaps.

40. PT SMI will engage a number of functions, namely sustainable financing, finance and investor relations, accounting and asset administration, general affairs and procurement, equity investment management and operation, financing and investment evaluation, environmental and social advisory evaluation, integrated risk management, special financing and investment management, legal and internal audit. In implementing Component 2, PT SMI will coordinate closely with the various stakeholders and communicate the agreements on each counterpart's technical assistance needs and timeline for completion of planned activities.

41. Adequate technical assistance for Project implementation will be critical. Based on experience with other projects implemented by PT SMI, the team proposed in this section should be adequate to plan and supervise Project activities. The Project will also provide support for the recruitment of consultants with specialized skills, knowledge and experiences to assist with addressing ad-hoc challenges related to managing such a complex facility.

42. PT SMI is in the process of developing a detailed Operations Manual with the support from World Bank to adopt for the implementation of the Project. The Operations Manual contains clear guidelines for the decision-making process, as well as fiduciary, environmental and social safeguards requirements. The financial support provided for the Public Sector and the Private Sector and draft term sheets and legal agreement templates are included in the Operations Manual.