

**CLEAN TECHNOLOGY FUND  
UPDATE OF INVESTMENT PLAN FOR INDONESIA  
(DRAFT)**

**28 February 2013**

## ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ADB-PSOD	ADB's private sector operations department
BAU	business as usual
CP	cleaner production
CIP	Country Investment Plan
CSO	civil society organization
CTF	Clean Technology Fund
EE	energy efficiency
ESCO	energy service company
GCPF	Global Climate Partnership Fund
GHG	greenhouse gas
GOI	Government of Indonesia
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
IPP	independent power producer
MEMR	Ministry of Energy and Mineral Resources
MOF	Ministry of Finance
MtCO <sub>2</sub> e	million tons of carbon dioxide equivalent
MTOE	million tons oil equivalent
NGO	non-government organization
PGE	Pertamina Geothermal Energy
PLN	Perusahaan Listrik Negara (or "state electricity company")
RE	renewable energy
TFC	Trust Fund Committee
UNFCCC	United Nations Framework Convention on Climate Change

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## EXECUTIVE SUMMARY

The Indonesian Clean Technology Fund (CTF) Country Investment Plan (CIP) was endorsed by the Trust Fund Committee (TFC) on 16 March 2010, with an envelope of \$400 million in CTF cofinancing. The original CIP comprised public and private sector investments in clean energy and energy efficiency. Pursuant to a scoping mission in October 2012 and subsequent request by the Government of Indonesia (GOI), a joint mission comprising Asian Development Bank (ADB), International Bank for Reconstruction and Development (IBRD), and the International Finance Corporation (IFC) was fielded from 28 January to 1 February 2013. The joint mission reviewed CIP implementation status, discussed possible reallocation within priority sectors, assessed the impact of such changes on achieving objectives and targets of the original CIP, and consulted with various stakeholders, including civil society organizations (CSOs), non-government organizations (NGOs), industry associations, think tanks, and other donors, on possible changes to the CIP.

The overall rationale for CTF intervention remains unchanged. The revisions to the investment plan reflect the evolution of relevant national policies and priorities, as well as adjustments in the energy regulatory framework and tariff structure. The enabling environment for private sector participation in renewable energy (RE) has been significantly improved, with some preference for geothermal, biomass, and small hydropower. Incentives for improved end-use energy efficiency (EE) have also improved. The GOI is looking towards the diversification of the energy mix as a means to ensure the sustainability, quality, and quantity of energy supply, particularly the increased utilization of RE and EE to support low-carbon economic and social development.

The GOI has determined that the concessional financing resources from CTF may be more appropriately and effectively utilized in the near term by targeting ready non-sovereign and private sector<sup>1</sup> geothermal development projects facing first-mover risks and financing barriers, even with the improving regulatory framework and market conditions. The reallocation of CTF resources from public to private sector investments has been found to be consistent with the GOI and CTF objectives to leverage commercial financing for expanded private sector participation in low-carbon development initiatives. Utilization of CTF cofinancing for private sector projects and programs may be able to achieve greater leverage of commercial financing than for public sector projects, as there is opportunity to utilize a wider variety of financing instruments and modalities.

The proposed changes in the CIP will reallocate some funds from (i) public to (ii) non-sovereign and private sector investments in geothermal energy development, and shift some resources from private sector financial intermediation to private sector geothermal projects, taking into consideration the evolving Indonesian energy and environmental policy framework. No changes have been proposed to the CTF allocations for the IBRD. The IFC is proposing to shift a small portion of funds from financial sector transformation for EE and RE to private sector geothermal investments. ADB is proposing to shift funds from public sector geothermal to non-sovereign and private sector geothermal investments. The 2-track strategy of the original CIP -- geothermal power and EE/RE development -- is retained but the proposed revisions would place private sector led projects at the forefront, with a broader array of financing instruments made available to a larger population of candidate geothermal projects.

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<sup>1</sup> In this context, non-sovereign financing follows the same CTF guidelines as private sector projects. Non-sovereign and private sector are synonymous in this document.

The indicative financing plans from the original CIP and the updated CIP with proposed reallocations are presented in Tables ES-1 and ES-2 respectively. A comparison of results indicators of the original CIP and updated CIP is presented in Table ES-3.

**Table ES-1: CTF Financing Plan (2010)**  
(US\$ Million)

MDB / Program	Total	CTF	MDB	PGE/PLN	Private Sector/FIs
IBRD (geothermal)	655	125	500	30	
ADB (geothermal)	630	125	500	5	
IFC / ADB (geothermal - investment and transaction advisory)	725	50	75		600
IFC (EE/RE)	550	50	250		250
ADB (EE/RE)	550	50	250		250
<b>Total</b>	<b>3,110</b>	<b>400</b>	<b>1,575</b>	<b>35</b>	<b>1,100</b>

Source: Indonesia CTF Investment Plan, 2010

**Table ES-2: Updated CTF Financing Plan (2013)**  
(US\$ Million)

MDB / Program	Total	CTF	MDB	Other Cofinancing
IBRD Geothermal Clean Energy Project	575	125	175	275
ADB Private Sector Geothermal Program	2,625	150	375	2,100
IFC Geothermal Program (Investment & Advisory)	1,760	40-50	120	1,600
IFC Energy Efficiency and Renewable Energy	260	25-35	125	100
ADB Energy Efficiency and Renewable Energy	250	50	50	150
<b>Total</b>	<b>5,470</b>	<b>400</b>	<b>845</b>	<b>4,225</b>

Source: Joint Mission Aide Memoire, 1 February 2013

**Table ES-3: Comparison of Results Indicators Original CIP vs. Revised CIP**

Indicators	Baseline (2010)	Investment Program Results Original CIP (2010)	Investment Program Results Revised CIP (2013)
<b>Geothermal</b>	1,050 MW	800 MW new capacity	1,900 MW new capacity
Annual GHG emission reductions	6.7 M ton	Additional 5.1 M ton	Additional 12.16 M ton
Replication potential	1,050 MW	10,000 MW	10,000 MW
<b>EE/RE</b>	0	2.0 Mtoe/y energy savings	1.0 Mtoe/y energy savings
Annual GHG emission reductions	0	5.5 M ton	2.4 M ton
Replication potential	0	10 Mtoe energy savings per year	5.0 Mtoe energy savings per year

CIP = Country Investment Plan, GHG = greenhouse gas, Mtoe/y = million tons oil equivalent per year, M ton = million tons, MW = megawatts

Source: Indonesia CTF Investment Plan 2010; MDB staff estimates

## I. INTRODUCTION

1. The Indonesian Clean Technology Fund (CTF) Country Investment Plan (CIP) was endorsed by the Trust Fund Committee (TFC) on 16 March 2010, with an envelope of \$400 million in CTF cofinancing. The original CIP comprised public and private sector investments in clean energy, energy efficiency, and pending availability of a second phase of funding, sustainable transport.

2. Pursuant to a scoping mission in October 2012 and subsequent request by the Government of Indonesia (GOI), a joint mission comprising Asian Development Bank (ADB), International Bank for Reconstruction and Development (IBRD), and the International Finance Corporation (IFC) was fielded from 28 January to 1 February 2013. The joint mission reviewed CIP implementation status, discussed possible reallocation within priority sectors, assessed the impact of such changes on achieving objectives and targets of the original CIP, and consulted with various stakeholders, including civil society organizations (CSOs), non-government organizations (NGOs), industry associations, think tanks, and other donors, on possible changes to the CIP.

3. Consultation with civil society including NGOs and energy industry associations was an integral part of the preparation of the revised CIP. Ahead of the joint mission a preparatory meeting was held with selected civil society representatives to identify stakeholders and develop a process for a consultation workshop to discuss the CIP revision. The consultation workshop, hosted by MOF, was held on 29th January and was attended by 21 representatives of civil society organizations as well as representatives of MOF, ADB, WB and IFC. The objectives of the workshop were to share information on the content and status of the CIP, obtain inputs from civil society groups on the revision of the CIP and identify a process for civil society engagement in the CIP going forward. Workshop discussions focused on the continuing barriers in the policy and legislative environment for RE and EE, and opportunities for the involvement of smaller RE and EE project developers and financial intermediaries in CIP implementation. Potential civil society roles in implementation of the CIP were identified as project consultations, community partnerships, and monitoring and evaluation; further meetings with civil society will be undertaken to elaborate their involvement. A summary of stakeholder outreach activities is presented in Appendix 1.

4. The proposed changes in the CIP will reallocate some funds from (i) public to (ii) non-sovereign and private sector investments<sup>2</sup> in geothermal energy development, and shift some resources from private sector financial intermediation to private sector geothermal projects, taking into consideration the evolving Indonesian energy and environmental policy framework. The overall context and long-term objectives of the updated CIP remain consistent with the original investment plan. The updated CIP is a business plan owned by the Government of Indonesia (GOI) and remains a dynamic document with the flexibility to consider changing circumstances and new opportunities.

5. No changes have been proposed to the CTF allocations for the IBRD. The IFC is proposing to shift a small portion of funds from financial sector transformation for energy efficiency (EE) and renewable energy (RE) to private sector geothermal investments. ADB is proposing to shift funds from public sector geothermal to non-sovereign and private sector geothermal investments. This document is organized as follows:

- Section I – Introduction to the Indonesian Updated CIP;

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<sup>2</sup> In this context, non-sovereign financing follows the same CTF guidelines as private sector projects. Non-sovereign and private sector are synonymous in this document.

- Section II – Review of the implementation status of the original investment plan;
- Section III – Explanation of circumstances and rationale for revising the investment plan and making changes to the projects and programs included;
- Section IV – Description of the proposed changes to the investment plan, i.e., proposed reallocation of funds as requested by the GOI; and
- Section V – Assessment of the potential impacts of the proposed changes on achieving the objectives and targets of the original investment plan.

## **II. STATUS OF ORIGINAL INVESTMENT PLAN IMPLEMENTATION**

### ***IBRD Geothermal Clean Energy Investment Project***

6. The Geothermal Clean Power Project was approved by the TFC in December 2010, approved by the IBRD Board in July 2011, and became effective in June 2012. The total project costs were estimated to be \$574.7 million, consisting of \$125 million from CTF, \$175 million from IBRD, and \$274.7 million from the project sponsor Pertamina. In parallel with the project, IBRD has been providing technical assistance to PGE with more than \$9 million grant for project preparation and further strengthening PGE's capacity building efforts.

7. The project supports development of two geothermal fields (Ulubelu and Lahendong) with respective capacities of 110 MW and 40 MW. The geothermal resources have been confirmed at both fields and the tendering for the above-ground steam gathering system and power plants are under way. The first disbursements from the CTF loan are expected by year-end 2013.

### ***ADB Private Sector EE/RE Investment Program***

8. The potential market for EE and RE is estimated at more than \$4 billion, comprising a broad spectrum of demand side management, green buildings, industrial energy efficiency and cogeneration, biomass/biogas, small hydropower, supply side efficiency, and electricity grid improvements, but only a fraction of the potential has been developed. The GHG abatement curve for Indonesia shows potential reductions of almost 100 Million tons carbon dioxide equivalent (MtCO<sub>2</sub>e) from demand side management and biomass energy alone. The Private Sector EE/RE Investment Program (the Program) is being designed to deliver a variety of financing products and alternatives tailored to the different needs of EE, RE, and cleaner production (CP) projects. Investment and advisory services will be provided to scale-up private sector investment with an initial focus on EE upgrades for commercial and residential buildings, industrial EE and CP, and RE-based distributed generation. ADB's Private Sector Operations Department (ADB-PSOD) has formally requested and received TFC approval for \$0.5 million project preparation funding from CTF for the preparatory and due diligence tasks of structuring the investment vehicle inclusive of \$50 million of CTF financing. The Program is expected to be presented for funding approval in late 2013. The rationale for the Program remains the same as envisioned in the original CIP.

## **III. CIRCUMSTANCES AND RATIONALE FOR INVESTMENT PLAN UPDATE**

9. The overall rationale for CTF intervention remains unchanged. The revisions to the investment plan reflect adjustments, circumstances, refinements, and the evolution of relevant national policies and priorities, including the implementation of the Second Medium Term Development Plan for 2010 – 2014 (Presidential Decree No. 7/2009), the revision of the

Indonesian Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) in November 2010, issuance of the National Action Plan for GHG Reduction (Presidential Regulation No. 61/2011), and Energy Vision 25/25 in 2011, updating the targets of the National Energy Policy (Presidential Regulation No. 5/2006). Specifically, the GOI has been looking towards the diversification of the Indonesian energy mix as a means to ensure the sustainability and quantity of energy supply, particularly the increased utilization of RE resources and EE as mechanisms for supporting low-carbon economic and social development.

10. Major changes in circumstances underpinning the proposed investment plan revision include:

- (i) ***The GOI remains committed to the completion of the 10,000MW Fast Track Program – Second Phase (Presidential Decree No. 4/2010 and MEMR Regulation No. 15/2010), launched in January 2010 and valid until December 2014.*** Based on Ministry of Energy and Mineral Resources (MEMR) Regulation No. 1/2012, the electric power capacity addition target from geothermal resources comprise approximately 4,925MW of the total 10,047MW capacity to be installed under the Fast Track Program, with private sector projects expected to contribute 4,585MW. Ministry of Finance (MOF) Regulation No. 139/2011 in August 2011 enables the issuance of a viability guarantee in favor of IPP projects implemented under the Second Phase Fast Track Program. A recent analysis conducted by WWF on the current status and level of development envisioned in MEMR Regulation No. 1/2012 concluded that only 2,140 MW of the 4,925 MW target is expected to be completed on schedule, of which 1,750 MW is private sector projects and 390 MW by PLN.<sup>3</sup> Delays have been attributed to the reluctance of the private sector in finalizing the exploration stages of geothermal development due to inadequate supporting infrastructure, uncertainties in recouping exploration costs, and the perceived and actual risks associated with geothermal investments.<sup>4</sup> As of early 2013, the actual installed geothermal generating capacity is 1,226 MW versus the 3,442 MW target established in the National Geothermal Roadmap for 2012, suggesting that additional intervention is needed to complement GOI's regulatory reform and investment initiatives;
- (ii) ***Issuance of MEMR Regulation No. 2/2011 provided for a standardized geothermal pricing structure and set a benchmark tariff of \$0.097 per kWh<sup>5</sup>.*** This was replaced by MEMR Regulation No. 22/2012 in August 2012,<sup>6</sup> which establishes new off-take tariffs for private sector geothermal power plants. The benchmark tariff is \$0.10 per kWh, with higher tariffs differentiated by region up to \$0.17 per kWh. In addition to these new tariffs, the GOI has issued Ministry of Finance (MOF) Regulation No. 139/2011 in August 2011 which enables the issuance of a viability guarantee in favor of IPP projects implemented under the Second Phase Fast Track Program;

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<sup>3</sup> WWF. 2012. *Igniting the Ring of Fire: A Vision for Developing Indonesia's Geothermal Power*. Jakarta. pp. 94 – 104; S. Darma et al. 2010. Geothermal Energy Update: Geothermal Energy Development and Utilization in Indonesia. Background paper for the 2010 World Geothermal Congress. Bali, Indonesia.

<sup>4</sup> R. Pramudatama. 2012. PLN Geothermal Plants Likely to Miss Deadline. *The Jakarta Post*. 26 July. p.14.

<sup>5</sup> MEMR Regulation No. 22/2012 was issued in August 2012, which revised MEMR Regulation No. 2/2011 with updated tariffs, but has since been withdrawn.

<sup>6</sup> MEMR Regulation No. 2/2011 provided for a standardized geothermal pricing structure and set the maximum tariff, of \$0.097 per kWh; higher tariffs are subject to negotiation on a case by case basis.

- (iii) **Issuance of MEMR Regulation No.4 / 2012**, which established new off-take tariffs for RE power plants up to 10 MW per project, including biomass/biogas, hydropower, and waste-to-energy. The benchmark tariff is \$0.10 per kWh, with higher tariffs differentiated by region up to \$0.15 per kWh. The new tariff schedule is attractive relative to typical cost of biomass power generation of around \$0.08 – 0.09 / kWh;
- (iv) **Issuance of MEMR Regulation No.30 / 2012**, which increases retail electricity tariffs by approximately 27%, in quarterly increments during calendar year 2013. The increases apply to all consumer categories except for connections at 900 volt-amperes (vA) and lower, which are considered “lifeline” consumers; and
- (v) **The Indonesian sovereign credit rating has been upgraded to investment grade (BBB- on the Standard & Poor’s rating scale) by all of the major credit rating agencies in late 2011 and early 2012.**<sup>7</sup> This has allowed the relatively larger state owned enterprises to raise financing from commercial banks and/or access the international capital markets at acceptable lending rates for commercially viable projects. This has reduced the demand or need for sovereign guarantees by the Ministry of Finance and allowed the government to moderate its external debt position.<sup>8</sup>

11. Based on these circumstances, the enabling environment for private sector participation in RE-based power development have been significantly improved, with some preference for geothermal, biomass, and small hydropower, and incentives for improved end-use EE. The GOI has determined that the concessional financing resources from CTF may be more appropriately and effectively utilized in the near term by targeting ready private sector geothermal development projects facing first-mover risks and financing barriers, even with the improving regulatory framework and market conditions. The reallocation of CTF resources from public to private sector investments has been found to be consistent with the GOI and CTF objectives to leverage commercial financing for expanded private sector participation in low-carbon development initiatives. Utilization of CTF cofinancing for private sector projects may be able to achieve greater leverage of commercial financing than for public sector projects, as there is opportunity to utilize a wider variety of financing instruments and modalities.

12. **The GOI remains fully committed to its development policy framework for energy security, climate change, environmental management, and public health.** The general approach and overall objectives for low-carbon development presented in the original CIP remain the same. The GOI remains determined to reduce energy intensity and mitigate GHG emissions through a comprehensive policy framework as described in the original CIP. With respect to CTF cofinancing opportunities, the energy sector remains the highest priority with continued emphasis on geothermal power and financial sector transformation for EE and RE financing. Transport sector interventions remain a relatively lower priority for a possible subsequent phase of CTF funding in the future, as there are no clearly defined projects in the MDB programs that could be prepared and presented for CTF funding approval during the next 12 to 18 months. Such future transport and other energy projects may continue to be prepared and submitted to the CTF if more funds become available and/or a competitive reserve is allocated for countries to submit new projects ready for funding. In any event, the Government

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<sup>7</sup> The GOI issued 10-year bonds at 5.2% in December 2012, 83 basis points less than bonds issued in December 2011 reflecting the improved credit outlook.

<sup>8</sup> DatosMacro. Sovereign Ratings List. Accessed 12 December 2012 from: <http://www.datosmacro.com/en/ratings/indonesia>.

reserves the right to submit a Phase II investment plan if so permitted or invited by the CTF trust fund committee.

13. Indonesia has continued to experience steady economic growth averaging more than 5.7% since 2004, while steadfastly weathering the current global financial and economic downturn.<sup>9</sup> Economic growth prospects remain high for 2012: the GDP growth rate is expected to be 6% to 7% for the foreseeable future. With the current level of economic growth, the energy demand in the country has been expected to track the GDP growth along with a proportional increase in the amount of generated GHG emissions.

14. The Indonesian Second National Communication (SNC) to the UNFCCC, released in 2010, estimates the total GHG emissions to increase from 1,378 million tons of carbon dioxide equivalent (MtCO<sub>2</sub>e) in 2000 (base year) to approximately 2,560 MtCO<sub>2</sub>e by 2020 under a business-as-usual (BAU) scenario with an average annual growth rate equivalent to 3.1%. The SNC further estimates energy-related GHG emissions to be 324 MtCO<sub>2</sub>e in 2000, 369 MtCO<sub>2</sub>e in 2005, and 737 MtCO<sub>2</sub>e by 2020.

15. Consistent with the findings of the SNC, the GHG abatement cost curves prepared by McKinsey for the National Commission on Climate Change (DNPI) projected the total GHG emissions for Indonesia at 2,134 MtCO<sub>2</sub>e per year in 2005 (base year), with energy-related emissions at 389 MtCO<sub>2</sub>e per year.<sup>10</sup> According to the McKinsey study, GHG emissions from **electricity generation** may be expected to increase from 110 MtCO<sub>2</sub>e to 810 MtCO<sub>2</sub>e under a BAU scenario within the period from 2005 to 2030 (Figure 1). The projected increase may be attributed to higher electricity demand driven by growth in per capita incomes as well as an increasing dependence on coal. **Transport** GHG emissions are projected to increase from 60 MtCO<sub>2</sub>e to 443 MtCO<sub>2</sub>e, driven by the rapid growth in the number of personal and commercial vehicles, limited development and utilization of clean fuels, and the inadequate investment in mass transport systems. Emissions from the production and consumption of petroleum and natural gas may increase from 122 MtCO<sub>2</sub>e in 2005 to 135 MtCO<sub>2</sub>e in 2020 due to additional refining capacity expected to come online during the period.

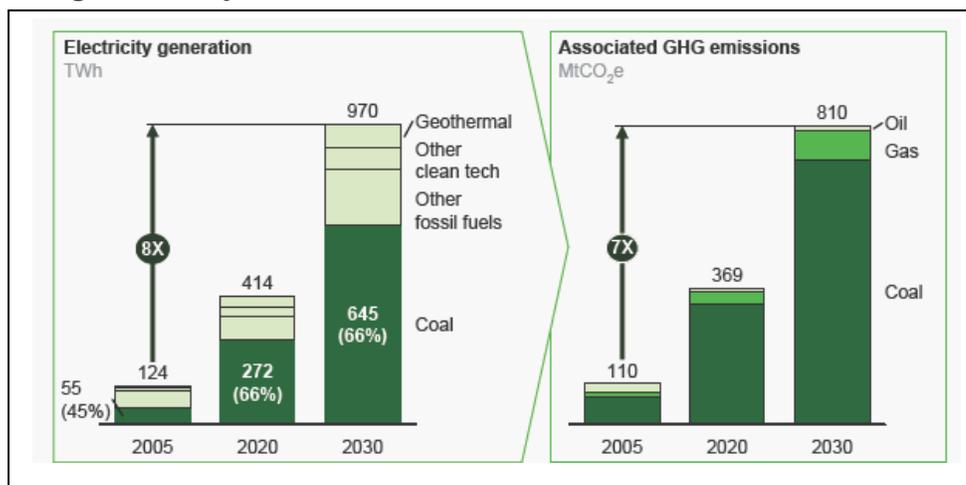
16. Figure 2 presents the GHG abatement cost curve for the electric power sector, which shows potential emissions reductions of 260 MtCO<sub>2</sub>e, of which demand-side management, small hydropower, geothermal, and biomass energy are consistent with CTF investment criteria and CIP objectives. Potential reductions from transportation sector interventions are estimated at about 90 MtCO<sub>2</sub>e, mostly from introduction of electric 2-wheelers, vehicle efficiency improvements, and hybrid cars. Based on the abatement cost curve, other analyses, and economic development imperatives of the GOI, priority investments which could be supported by CTF include: (i) geothermal and biomass power generation, (ii) small hydropower, solar, and wind generation, (iii) Industrial energy efficiency improvements, including cogeneration, demand-side management, and facility/process upgrades for cleaner production (CP), and (iv) EE improvements for commercial and residential buildings.

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<sup>9</sup> ADB. 2012. *Asian Development Outlook 2012*. Manila.

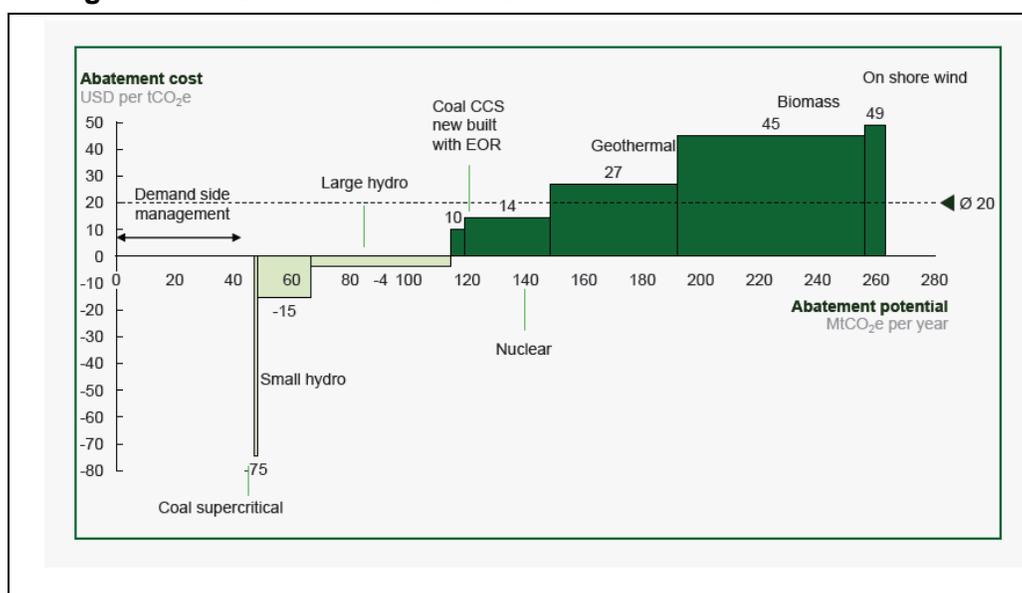
<sup>10</sup> GOI, National Commission on Climate Change (DNPI). 2010. *Indonesia Greenhouse Gas Abatement Cost Curve*. Jakarta. The overall estimates of CO<sub>2</sub> net emissions in 2000 from the DNPI and the SNC differ by approximately 8%. Significant differences appear in the composition of emissions reported by the DNPI and in the SNC, particularly in the LULUCF and peat sectors and in the level of GHG emissions absorption.

**Figure 1: Projected GHG Emissions for the Electric Power Sector**



Source: GOI, National Commission on Climate Change (DNPI). 2010. *Indonesia Greenhouse Gas Abatement Cost Curve*. Jakarta.

**Figure 2: GHG Abatement Cost Curve for the Electric Power Sector**



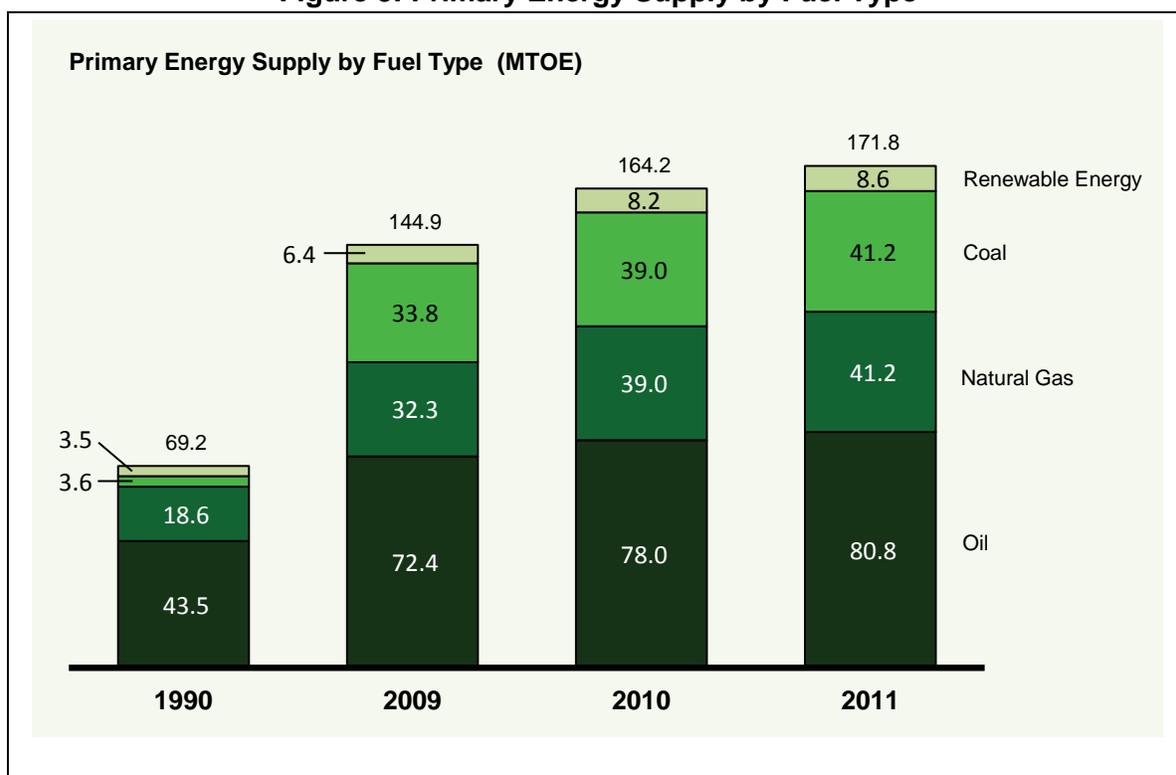
Source: GOI, National Commission on Climate Change (DNPI). 2010. *Indonesia Greenhouse Gas Abatement Cost Curve*. Jakarta.

17. Given the current level of economic growth, energy security through diversification of primary energy supply and energy conservation through demand-side management remains a high priority. Indonesia has historically relied on domestic petroleum and other fossil fuels for electric power generation, particularly oil and natural gas, with recent increases in the share of coal-fired generation. However, Indonesia's production and supply of oil decreased steadily in the last decade due to limited exploration activity and declining production. With approximately 30% of petroleum production exported and refined in countries like Japan and the US,

Indonesia has become a net importer of both crude oil and refined products.<sup>11</sup> Net imports have placed considerable strain on the Indonesian economy, with global oil prices trading above \$100 per barrel in February 2013.<sup>12</sup> Continued GOI expenditures for subsidies for oil and electricity have been estimated at \$9.78 billion in 2010 and \$3.68 billion in March 2011.<sup>13</sup>

18. Figure 3 illustrates the shift from oil to coal and natural gas for electricity generation while the share of RE has not increased appreciably during the last few years. The trend of increasing coal use has particular concern with respect to GHG emissions reduction objectives. Expanding the use of non-tradable domestic resources such as geothermal, biomass, solar, and wind will improve energy security by offsetting demand for imported oil and facilitate the mitigation of long-term GHG impacts from the use of fossil fuels.

**Figure 3: Primary Energy Supply by Fuel Type**



Sources: M.H. Hasan, T.M.I. Mahlia, and H. Nur. 2012. A Review on Energy Scenarios and Sustainable Energy in Indonesia. *Renewable and Sustainable Energy Reviews*. 16 (4). pp. 2316-2328; Ministry of Energy and Mineral Resources.

Note: The category for *Renewable Energy* accounts only for hydropower and geothermal energy.

<sup>11</sup> Energy Information Administration. 2011. *Country Analysis Briefs: Indonesia*.

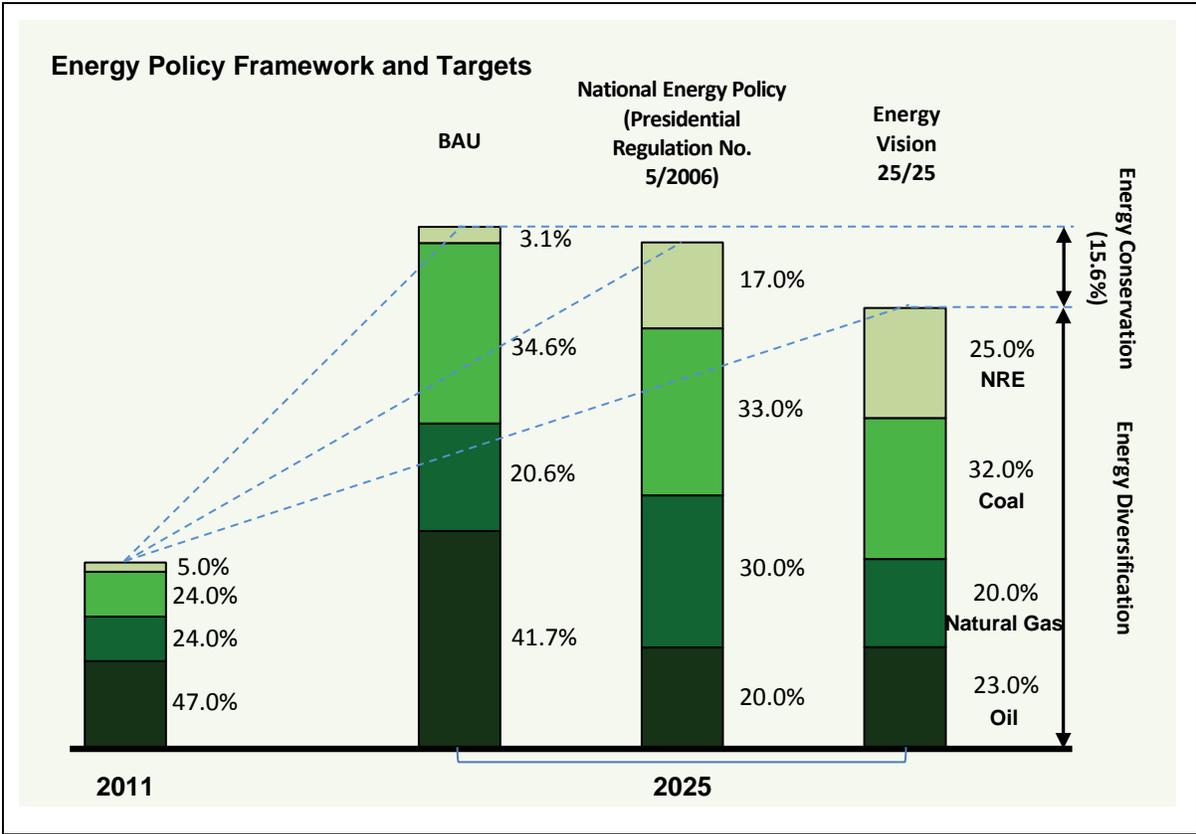
<<http://205.254.135.7/countries/cab.cfm?fips=ID>>. Quoted in R. Remigius. *Economic Policies and Incentives to Expand the Geothermal Energy Industry in Indonesia*. (MS Thesis, Lund University, 2012).

<sup>12</sup> As of late February 2013, the most common benchmark prices, Brent and West Texas Intermediate (WTI) were trading at \$114.21 and \$93.15, respectively. Accessed on 26 February 2013 from: <http://www.bloomberg.com/energy/>

<sup>13</sup> F. Ardiansyah. 2011. Indonesia's Energy Challenge. *East Asia Forum*. 26 August. <<http://www.eastasiaforum.org/2011/08/26/indonesia-s-energy-challenge>>.

19. The GOI remains focused on diversifying the generation mix through increased production and use of indigenous RE resources, institutionalization of energy sector reforms, and implementation of energy conservation initiatives. Released in 2011, Energy Vision 25/25 serves as an update to the policy framework which is consistent with the National Energy Policy (Presidential Regulation No. 5/2006) and the National Energy Implementation Program Blueprint (2005 – 2025). Energy Vision 25/25 calls for the increased penetration of clean energy into the generation mix, complemented by gains produced from conservation and efficiency initiatives. The policy increases the diversification and conservation targets set in the National Energy Policy, increasing the utilization of RE from 17% of the generation mix to 25% by 2025 and reducing energy demand by 15.6% (updated from 33.9%) relative to a projected BAU scenario. Figure 4 provides a comparison of the targets contained in the National Energy Policy and Energy Vision 25/25.

**Figure 4: Comparison of Indonesian Energy Policy Frameworks and Targets**



Sources: Ministry of Energy and Mineral Resources.

Note: The breakdown for NRE under the National Energy Policy (Presidential Regulation No. 5/2006) accounts for bio-fuels (5%), geothermal energy (5%), other RE resources (5%), and coal liquid (2%).

20. In order to ensure the 25% RE target by 2025, additional RE capacity target of 18,154 MW has been set, which represents about 17% of the total RE potential of the country (see Table 1 and Table 2). Increasing the penetration of clean energy into the generation mix in terms of enhanced utilization of RE resources and EE technologies is consistent with the energy security and low-carbon development objectives of the GOI and CTF. The National Electrical Generation Plan (RUPTL) 2011 – 2020 proposes the deployment of additional coal-fired generating capacity of about 35,573 MW, equivalent to more than 64% of the total installed

capacity in Indonesia by 2020. The coincident GHG emissions from the combustion of coal have been projected to reach at least 90% of the total GHG emissions (estimated at 275 MtCO<sub>2e</sub>) generated by the electricity sector in 2020.<sup>14</sup>

**Table 1: Renewable Energy Generation Capacity Targets by Resource (MW)**

Resource	Actual		Targets					Year Updated
	Installed Capacity (2005)	Installed Capacity (2011)	Targeted Capacity Additions				Total Installed Capacity by 2025	
			2010	2015	2020	2025		
Geothermal <sup>a</sup>	807	1,226	1,816	1,654	1,721	3,500	9,500	2006
Biomass <sup>b</sup>	302	1,618	27	30	120	330	810 <sup>b</sup>	2006
Large Hydropower	3,224	6,654	-	-	-	-	12,900 <sup>c</sup>	2011
Small/Micro/Mini Hydropower <sup>b</sup>	206	229	235	504	950	950	2,846	2008
Wind <sup>d</sup>	0.6	2	-	-	-	-	970	2008
Solar <sup>b</sup>	10	22	80	173	169	437	870	2008
<b>Total</b>	<b>4,550</b>	<b>9,751</b>	<b>2,158</b>	<b>2,361</b>	<b>2,960</b>	<b>5,217</b>	<b>27,896</b>	

Notes:

<sup>a</sup> Targeted Capacity Additions values computed based on geothermal development milestones, cited in GOI, MEMR. 2005. *National Energy Management Blueprint (PEN) 2005 – 2025, Attachment P1: Geothermal Roadmap*. Jakarta.

<sup>b</sup> Targeted Capacity Additions values computed based on development milestones, cited in GOI, MEMR. 2006. *National Energy Management Blueprint (PEN) 2006 – 2025, Attachment O3: Alternative Energy Development Milestones*. Jakarta. The biomass target elucidated in 2005 has already been exceeded; a new target has yet to be announced.

<sup>c</sup> Data for the Total Installed Capacity by 2025 for large hydropower based on the Master Plan Study of Hydropower Development in Indonesia (2011), cited in M. Sofyan. 2012. *Private Participation on Hydropower Development*. Presentation for the Second Clean Power Asia Conference. Bali, Indonesia (14 May 2012).

<sup>d</sup> Total Installed Capacity by 2025 for wind from MEMR, cited in GOI, MEMR. 2008. Indonesia's Renewable Energy Potential. 25 August. <http://www.esdm.go.id/news-archives/general/49-general/1963-indonesias-renewable-energy-potential.html>

Sources: GOI, Research and Development Center for Electricity, New and Renewable Energy Technology, and Energy Conservation. 2012. *Developing Indonesia's GIS-Based Renewable Energy Resources Map*. Presentation for the ASEAN – India New and Renewable Energy Workshop. Delhi, India. 5 November; D. Sukarna. 2012. *Energy Efficiency and Renewable Energy in Indonesia*. Presentation for the Japan – Indonesia Third Energy Policy Dialogue. Fukuoka, Japan. 12 July; GOI, MEMR. 2006. *National Energy Management Blueprint (PEN) 2006 – 2025*. Jakarta.

21. With only 4.2% of the total RE potential currently utilized, geothermal continues to be one of the best options in further diversifying the country's primary energy mix. Geothermal power provides base-load generation capacity capable of displacing coal without the intermittency and variability associated with some other RE resources. Expanding the use of non-tradable domestic energy resources such as geothermal, biomass, solar, and wind will improve energy security by offsetting demand for imported oil and petroleum products. In addition, hydropower and biomass resources are the most widely available resources to provide off-grid solutions to increase rural electricity access that will contribute towards alleviating poverty and improving the quality of life for rural communities. As shown in Table 3, biomass

<sup>14</sup> D. Prasetyo. 2012. *Indonesia Power Development Plan and Long-Term Power System Security*. Presentation for the KEEL – ACE Joint Research Small Workshop. Jakarta, Indonesia. 2 May 2012.

power generation has the greatest potential after large hydropower and geothermal, and is one of the best options for smaller-scale energy development (including displacement of oil-based electricity generation) as biomass is available throughout most of the country, with only about 3.25% of the total potential developed.

**Table 2: Estimated Renewable Energy Potential in Indonesia**

Resource	Potential Capacity	Potential Electricity Generation (TWh/year) <sup>a</sup>	Potential GHG Reduction (MtCO <sub>2</sub> e/year) <sup>b</sup>	Installed Capacity in 2011 (MW)
Geothermal	29,038 MW	232	185	1,226
Biomass	49,810 MW	343	274	1,618
Large Hydropower	75,624 MW <sup>c</sup>	331	264	6,654
Small/Micro/Mini Hydropower	769 MW	3.4	2.69	229
Wind	9,290 MW (3m/s – 6m/s)	26	20.8	2
Solar	4.8 kWh/m <sup>2</sup> /day	-	-	22

Notes:

<sup>a</sup> Potential Electricity Generation values computed using the following capacity factors: Geothermal – 91.2%; Biomass – 78.6%; Hydropower – 49.9%; and Wind – 32.0%.

<sup>b</sup> Potential GHG Reduction computation assumes the use of RE resources for electricity generation directly offsets GHG from coal at 0.8 tCO<sub>2</sub>e per MWh.

<sup>c</sup> Released in 2011, the Master Plan Study of Hydropower Development in Indonesia estimates approximately 35% of the total potential capacity may be exploitable based on a data screening conducted during the course of the study utilizing socio-economic and environmental criteria.

Sources: Potential Capacity from MEMR, cited in D. Sukarna. 2012. *Energy Efficiency and Renewable Energy in Indonesia*. Presentation for the Japan – Indonesia Third Energy Policy Dialogue. Fukuoka, Japan. 12 July.

#### IV. PROPOSED CHANGES TO THE INVESTMENT PLAN

22. The original CIP identified prospective interventions in (i) utility-scale geothermal energy; and (ii) EE, RE, and CP including demand-side EE and distributed generation, to be supported through financial intermediation arrangements. The indicative financing plan endorsed in 2010 is summarized in Table 3.

**Table 3: Financing Plan As Endorsed (2010) (US \$ Million)**

MDB / Program	Total	CTF	MDB	PGE/PLN	Private Sector/FIs
IBRD (geothermal)	655	125	500	30	
ADB (geothermal)	630	125	500	5	
IFC/ADB (geothermal - investment and transaction advisory)	725	50	75		600
IFC (EE/RE)	550	50	250		250
ADB (EE/RE)	550	50	250		250
<b>Total</b>	<b>3,110</b>	<b>400</b>	<b>1,575</b>	<b>35</b>	<b>1,100</b>

Source: Indonesia CTF Investment Plan, 2010

### ***Geothermal Energy Development***

23. ADB has discussed a non-sovereign loan to Pertamina for early stage geothermal development (specific projects are still being identified). In parallel ADB-PSOD has been engaged with private sector geothermal developers representing a portfolio of several hundred megawatts of new RE capacity. Some of these projects have been delayed due to legal and contractual issues, but these have recently been positively resolved which will allow at least one advanced IPP project to move forward with the lenders. Several other geothermal projects are in the drilling exploration process, and if proven successful, may also go forward for financial close in the next 12-18 months. However, resource risk remains the key barrier for proving the entire megawatt capacity of a project and also for catalyzing the full amount of commercial debt and equity required within the timeframe allocated by the license. CTF will be deployed to specifically mitigate these risks with lenders and investors via a programmatic approach. ADB-PSOD intends to seek TFC approval of the program in Q2 or Q3 of calendar year 2013. The total CTF allocation for ADB private sector geothermal development is proposed as \$150 million (consistent with the allocations in the original CIP).

24. IFC has been in discussions with several private sector developers currently active in the geothermal sector in Indonesia. Despite initial delays, the recent approval of feed-in-tariffs for geothermal have resulted in renewed efforts in exploration activity. IFC management has cleared a concept for a geothermal exploration facility that is designed to mitigate resource exploration risks for several select geothermal projects in Indonesia. Concessional funding from CTF would be a key component of the facility to address the high exploration risk and uncertain return prospect of geothermal projects. The facility is to take a portfolio approach to dilute exploration risks over several geothermal fields/projects of around 1 GW worth \$3 billion. It is expected that at least one of these geothermal projects can be supported in calendar year 2013. IFC expects to submit a proposal for CTF Trust Fund Committee approval by Q2 of calendar year 2013 with a view of increasing the CTF fund allocation to \$50 million, by reallocating funds initially allocated to IFC's program below for Private Sector Energy Efficiency & Renewable Energy.

### ***Private Sector EE and RE Investment Program***

25. As discussed in Section II, the ADB-PSOD Private Sector EE/RE investment program is in the preparation stage. The investment pipeline comprises (i) EE in existing and new commercial and residential buildings; (ii) EE especially in heavy industries including cogeneration and cleaner production; and (i) RE power generation through biomass, and possibly small hydropower, solar, and wind resources. Various financial instruments and intermediation arrangements are being considered. As commercial banks have demonstrated limited appetite for scaling up EE and RE funding, a learning-by-doing approach will be employed to implement prototype investments; this early experience can then be transferred to financial institutions with an expedited learning curve. The CTF allocation for this program will remain at \$50 million. ADB-PSOD expects to submit a proposal for CTF Trust Fund Committee approval by the fourth quarter of calendar year 2013.

26. IFC has met with private commercial banks, and generally received little interest in financing EE/RE projects. However, IFC is in dialogue with the few private commercial banks that have indicated their interest in financing selected EE/RE projects given the recent improvement in the regulatory environment, including the increase in benchmark tariffs for small scale RE projects. As such, IFC is currently in discussion with several private sector financial institutions (FIs) to provide a comprehensive technical assistance package to build their

capacity in financing EE/RE projects, which would be eventually coupled with investment from IFC and CTF during calendar year 2013. IFC expects to submit a proposal for CTF Trust Fund Committee approval by the Q3 of calendar year 2013. Given the higher demand for CTF funds in geothermal projects, and relatively lower demand from the FIs, IFC seeks to reallocate about \$25 million to the above Private Sector Geothermal program.

27. The GOI now proposes to adjust priorities for CTF based on the circumstances outlined above and candidate project readiness. The private sector EE and RE financing programs continue to be a high priority, but the improved tariff regime for RE has resulted in a surge of new project development activity and investor interest, with reduced need for concessional financing. Geothermal development continues to be a high priority as well, but there is a need for interventions that will reduce upfront development risks and facilitate greater private sector investments. The major changes proposed are to shift CTF resources from public to private sector modalities for geothermal power, and to shift some CTF funding from EE and RE financing programs to private sector geothermal development. Table 4 presents the indicative financing plan after the proposed CTF reallocations. Concept papers for geothermal energy and EE/RE programs are presented in Appendices 2 and 3.

**Table 4: Indicative Financing Plan After Reallocation (US \$ Million)**

<b>MDB / Program</b>	<b>Total</b>	<b>CTF</b>	<b>MDB</b>	<b>Other Cofinancing</b>
Geothermal Clean Energy Project (IBRD)	575	125	175	275
Private Sector Geothermal Program (ADB)	2,625	150	375	2,100
Geothermal Program (Investment & Advisory - IFC)	1,760	40-50	120	1,600
Energy Efficiency and Renewable Energy (IFC)	260	25-35	125	100
Energy Efficiency and Renewable Energy (ADB)	250	50	50	150
<b>Total</b>	<b>5,470</b>	<b>400</b>	<b>845</b>	<b>4,225</b>

Source: Joint Mission Aide Memoire, 1 February 2013

Note: carbon finance is not expected to be mobilized as upfront cofinancing due to eligibility limitations, low prices, and high transaction costs. The revised financing plan includes a request for up to \$2 million grant to assist GOI in improving its national framework on monitoring and evaluation. These funds could be used to conduct impact evaluations as well as generate lessons learned from IP implementation, which may also help Indonesia to scale up its investments in the priority sectors.

## **V. POTENTIAL IMPACTS OF PROPOSED CHANGES ON INVESTMENT PLAN OBJECTIVES**

28. The proposed changes are expected to have a positive impact on investment plan objectives. Table 5 summarizes the potential impacts of the proposed changes with respect to the main CTF investment criteria. The prospective investments identified in the original CIP can be achieved through private sector modalities with at least the same development impact and potentially higher amounts of leverage from commercial sources of financing. As discussed above, the tariff framework for geothermal and other RE has evolved considerably and presents a more investment-friendly enabling environment than that which existed in 2009. However, upfront costs for RE remain a barrier to many developers and investors, and there is a growing pipeline of private sector clean energy investments which do require financing enhancements to achieve financial closure. Reallocating CTF resources to private sector investments is consistent with GOI and CTF objectives to leverage commercial financing for expanded private

sector participation in low-carbon development. CTF funds may be deployed in more innovative structures with the private sector to mitigate risks, which if proven successful, could have a strong replication effect in the market.

29. As discussed above, the overall objectives and strategy remain the same with respect to GHG reduction targets and priority sectors for intervention. The 2-track strategy of the original CIP -- geothermal power and EE/RE development -- is retained but the proposed revisions would place private sector led projects at the forefront, with a broader array of financing instruments made available to a larger population of candidate geothermal projects.

30. The geothermal investments may include stand-alone projects as well as investment programs, both of which are expected to result in greater capacity additions and energy output than the original CIP. The total investment mobilized for EE and other RE investments may decline, as the leverage ratio is expected to be lower than envisioned in the original CIP (as local commercial banks have demonstrated limited appetite for EE and RE financing). Thus, the GHG emissions reductions resulting from direct CTF support may decline slightly, but the demonstration effect of greater private sector participation should result in more replication and scale up over the long-term. Assuming a minor decrease in estimated GHG reductions, the cost-effectiveness of CTF support may also decline slightly.

31. The development impacts and demonstration potential at scale remain essentially the same. The replication and scale up potential is estimated at 10:1 for geothermal and at least 5:1 for EE and other RE.

32. Additional costs and risk premiums for geothermal development accrue from the geological risks inherent in early stage exploration. As discussed above, the upfront exploration and development of steam fields represents the life-cycle cost of fuel for the geothermal power plants. Intrinsic geological risks cannot be eliminated completely, but new financing instruments can be provided to address some of the drilling risk (e.g., "dry hole" insurance).

**Table 5: Assessment of Proposed Changes**

CTF Investment Criteria	Original Investment Plan	Revised Investment Plan
<b>Potential for GHG Emissions Savings</b>	Investments targeted (i) utility scale geothermal power, and (ii) EE, cleaner production, and smaller-scale RE development with financial intermediation.	Increased support for non-sovereign and private sector geothermal with improved financial leverage is expected to accelerate investment resulting in faster capacity additions. Life-cycle GHG reductions will increase for geothermal but may decrease for EE/RE; total reductions are estimated to increase.
<b>Cost-effectiveness</b>	$(\text{CTF } \$400 \text{ M}) / (10.6 \text{ MtCO}_2\text{e/y}) \times 20 \text{ y project lifetime} = \text{CTF}\$1.89 / \text{tCO}_2\text{e}$	$(\text{CTF } \$400 \text{ M}) / (14.56 \text{ MtCO}_2\text{e/y}) \times 20 \text{ y project lifetime} = \text{CTF}\$1.37 / \text{tCO}_2\text{e}$
<b>Demonstration Potential at Scale</b>	Transformation potential estimated at 10 for geothermal and 5 for EE/RE	No change in estimates of total potential, but increased emphasis on non-sovereign and private sector financing expected to accelerate market penetration of geothermal, EE, and smaller-scale RE.
<b>Development Impact</b>	Emphasis on public sector investment in utility-scale geothermal and private investment in EE, CP, and RE. Good co-benefits from avoided coal- and	Co-benefits from improved energy security, access to energy, and environmental benefits should be higher than the original CIP; impacts on employment may be lower than the original

CTF Investment Criteria	Original Investment Plan	Revised Investment Plan
	petroleum-based generation.	CIP.
<b>Implementation Potential</b>	IBRD geothermal project approved in 2010. ADB public sector geothermal project was at appraisal stage as of mid-2012; further processing and approvals on hold as per GOI request. Several geothermal projects remain to be implemented with government funding support (> 2,500 MW).	ADB-PSOD and IFC are developing a pipeline of geothermal projects with aggregate capacity of about 1,900 MW; judicious placement and pricing of CTF funds can facilitate successful implementation. Most of these projects will avail of the new benchmark tariffs of \$0.0975 / kWh.  Financial intermediation mechanisms for EE/RE/CP are under development. New tariffs introduced in 2012 have increased interest in RE projects up to 10 MW per plant. Increases in retail electricity prices enacted in early 2013 will improve the attractiveness of demand side EE. See Table 8 for further notes on implementation risks and mitigation.
<b>Additional Costs and Risk Premium</b>	New geothermal feed-in tariff was introduced in 2009, but the overall geothermal development program faced legacy and first-mover risks. Additional costs of RE systems and unproven business models for EE present investment barriers.	New feed-in-tariffs introduced for geothermal and other RE including biomass and small hydro up to 10 MW per plant are helpful but commercial bank financing remains largely absent from the market.

Source: CTF mission team

### **Results Indicators and Co-Benefits**

33. Table 6 presents the proposed results and performance indicators for the revised CIP in accordance with the CTF results framework approved in late 2012. For ease of comparison, Table 7 presents the results indicators from the original CIP compared to the proposed indicators for the revised CIP. The estimated GHG reductions assume an emissions factor of 0.8 tCO<sub>2</sub>e/MWh, which is near the high end of factors used in registered Clean Development Mechanism (CDM) projects in Indonesia (this emissions factor is used in this document for consistency with the original CIP). This emissions factor does not include (i) consideration of black carbon, which may be significant given the amount of oil-based electricity generation capacity, or (ii) future reductions in emissions factor due to increased penetration of RE and EE. These estimates are subject to further revision, based on actual project proposals submitted subsequent to endorsement of the updated CIP (see Appendix 4 for additional notes on GHG calculations).

**Table 6: Results Indicators and Performance Indicators**

Result	Indicator	Baseline <sup>a</sup>	Target <sup>a</sup>	Data Source & Means of verification
<b>Transformational Impact</b>				
<b>Transformed low carbon economy</b>	Country level GHG / unit of GDP	565 TOE / \$million GDP	[?]	Central statistics office [3 <sup>rd</sup> party verification TBD]
<b>CTF Program Outcomes</b>				
<b>Avoided GHG emissions <sup>b</sup></b>	tCO <sub>2</sub> e reduced or avoided	0	14.56 MtCO <sub>2</sub> eq/y	DNPI
<b>Increased Financing mobilized for low-carbon development</b>	Leverage factor of CTF Funding	n/a	> 1:4	MDB cofinancing agreements
<b>Increased supply of RE – geothermal power</b>	Installed capacity (MW)	1,226	1,900 MW	MDB project Monitoring
	Design Output (GWh/y)	n/a	15,200 GWh/y	
<b>Increased supply of RE – other RE <sup>c</sup></b>	Installed capacity (MW)	1,872	n/a	MDB project Monitoring
	Design Output (GWh/y)	n/a	n/a	
<b>Increased EE <sup>c</sup></b>	Design Output (GWh/y)	n/a	3,000 GWh/y	MDB project Monitoring

Source: MDB staff estimates.

Notes: <sup>a</sup> Baselines are set in 2012 unless otherwise noted. Targets are the incremental changes relative to the baseline.

<sup>b</sup> GHG reductions are estimated as follows: (15,200 GWh/y + 3,000 GWh/y) x (800 tCO<sub>2</sub>e/GWh) = 14.56 MtCO<sub>2</sub>e/y. The emissions factor of 800 tCO<sub>2</sub>e/GWh (0.8 tCO<sub>2</sub>e/MWh) is near the high end of current CDM projects, and is used here for consistency with the original CIP.

See additional discussion of GHG reduction estimates in Appendix 4.

<sup>c</sup> Other renewable energy and energy efficiency are not disaggregated as the investment programs have not been fully defined. The baseline for other RE comprises installed biomass, small hydro, wind, and solar, as shown in Table 2. The private sector EE/RE investment program envisions a mix of avoided generation capacity through EE and new RE output which delivers the equivalent of 500 MW capacity at 6,000 hours/year, with an equivalent output of 3,000 GWh/y.

**Table 7: Comparison of Results Indicators Original CIP vs. Revised CIP**

Indicators	Baseline (2010)	Investment Program Results Original CIP (2010)	Investment Program Results Revised CIP (2013)
<b>Geothermal</b>	1,050 MW	800 MW new capacity	1,900 MW new capacity
Annual GHG emission reductions	6.7 Mton	Additional 5.1 Mton	Additional 12.16 Mton
Replication potential	1,050 MW	10,000 MW	10,000 MW
<b>EE/RE</b>	0	2.0 Mtoe/y energy savings	1.0 Mtoe/y energy savings <sup>a</sup>
Annual GHG emission reductions	0	5.5 Mton	2.4 Mton <sup>a</sup>
Replication potential	0	10 Mtoe energy savings per year	5.0Mtoe energy savings per year <sup>a</sup>

CIP = CTF Country Investment Plan, GHG = greenhouse gas, Mtoe/y = million tons oil equivalent per year, Mton = million tons, MW = megawatts

Source: Indonesia CTF Investment Plan 2010; MDB staff estimates

Notes: <sup>a</sup> The revised investment plan expects to mobilize less total financing for EE/RE than envisioned in the original investment plan; the energy savings in Mtoe per year are revised downward on a *pro rata* basis. The GHG reductions are estimated as shown in note <sup>c</sup> to Table 6: 500 MW equivalent capacity at 6000 hours per year = 3000

$\text{GWh/y} \times 0.8 \text{ tCO}_2\text{e/MWh} = 2.4 \text{ MtCO}_2\text{e/y}$ . The grid emissions factor of  $0.8 \text{ tCO}_2\text{e/MWh}$  is the high end of registered Clean Development Mechanism projects in Indonesia, and is not discounted for future EE and RE penetration (see additional discussion of GHG reduction estimates in Appendix 4).

34. Project-specific outcomes and indicators will be further described in the project documentation when presented to the TFC for approval, in accordance with the CTF Results Framework approved in late 2012. This will include the following co-benefits where available (but not necessarily limited to):

- Improved energy security (access to energy) co-benefits: 1,000 MW of equivalent generation capacity operating 8000 hours per year provides 8 million MWh /year; assuming 1 MWh / year per person, and 5 people per household, 1,000 MW of new capacity will support 1.6 million households. The revised investment plan is expected to deliver 1,500 MW of baseload equivalent output, which would support secured access by 2.4 million households;
- Environmental and health co-benefits: This will include benefits to local air pollution that otherwise would have been generated from coal or diesel-fired generation. Benefits include reduced nitrous oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>) and total suspended particulates each per year.
- Employment co-benefits: Jobs directly and indirectly created by these investments, disaggregate by gender and skilled/unskilled.

### **Implementation Potential and Risks**

35. Although GOI has recognized the need for enhanced EE and reduction of GHG emissions against the status quo, important policies continue to severely limit the attractiveness of private investment in EE and RE. A key factor is the low retail electricity tariff structure, which at an average of about \$0.11/kWh is the lowest in the region. The new benchmark tariffs for geothermal and other RE are intended to incentivize and accelerate development of new and additional RE generation capacity. As noted above, retail tariff increases are being implemented in quarterly stages in 2013 under MEMR regulation No. 30/2012. On a macro-economic basis, the increased retail tariffs will reduce the subsidies required to cover PLN's losses, which were about \$6 billion in 2009 and more than \$8 billion in 2011<sup>15</sup>; this in turn will partially offset the cost of the new geothermal and other RE benchmark tariffs. Implementation potential and risk summary are presented below in Table 8.

**Table 8: Implementation Potential and Risk Summary**

<b>RISK</b>	<b>MITIGATION</b>	<b>RESIDUAL RISK</b>
<b>Project Readiness</b>	<p>ADB-PSOD and IFC are engaged with various non-sovereign and private sector geothermal power developers with projects at different stages of development and risk profiles. A broad array of risk mitigation instruments are being considered and will be applied to specific investment proposals.</p> <p>The EE and RE investment programs will also require a broad array of financial instruments so that funding solutions are appropriate to the differing risks of EE and RE projects.</p>	Medium

<sup>15</sup> C. Fulland. 2012. The Feed-in-Tariff Paradox of Indonesia. *The Differ Blog*. 19 January. <http://www.differgroup.com/blogs/p/The-Feed-in-Tariff-Paradox-of-Indonesia?ctl=Details&did=5&mid=6085>

RISK	MITIGATION	RESIDUAL RISK
<p><b>Policy and Regulatory Framework</b></p> <p>Clarity of policies related to geothermal, other RE, and EE/CP</p>	<p>GOI has updated tariffs for geothermal and other RE-based power, but retail electricity tariffs are set below the cost of supply; GOI covers the cost gap via subsidies to PLN. GOI is also attempting to further rationalize energy tariffs, which would improve PLN's long-term financial health and would increase incentives for demand side management and other EE investments.</p>	<p>High</p>
<p><b>Implementation Capacity</b></p>	<p>Private sector geothermal projects will be selected partly based on capacity of the project companies, which is considerable given their long experience in the sector. This will include, not only in depth knowledge and long experience in the sector (taking into account the specifics of geothermal as compared to oil &amp; gas, for instance), but also understanding of the local regulations and approval requirements. TA will be provided as necessary to accelerate project development and implementation with PGE. It is expected that by shifting resources from public to private sector, implementation risks will be reduced or more formally mitigated by commercial lenders.</p> <p>EE/RE development via financial intermediation will require on-going TA for program development, capacity development and project implementation.</p>	<p>Medium</p>
<p><b>Finance</b></p> <p>Commercial banks are reluctant to lend for EE/CP/RE</p>	<p>Innovative financial products will be utilized to address financial sector's reluctance to lend to EE/CP/RE proponents. Current bank liquidity and other viable investments present opportunity costs for bank's lending decisions. Technical assistance will be provided as necessary to upgrade commercial bank capacity to assess and mitigate project risk as well as to internally promote EE/CP/RE as viable bank business lines.</p>	<p>Medium</p>
<p><b>Private Participation</b></p> <p>Private sector is sensitive to upfront exploration and other transaction costs</p>	<p>Advisory services will be provided to sufficiently structure geothermal tenders so that they would be attractive to private developers. Successful conclusion of landmark and demonstration geothermal private sector transactions (e.g., under ADB-PSOD program) will signal to the international market of Indonesia's readiness to support IPP power development in geothermal. Commercial banks will also note successful financial closure and look for follow on activities that can be accelerated relative to the initial batch of projects.</p>	<p>Medium</p>
<p><b>Scale-up and Replication</b></p>	<p>Perceived financial risk will be reduced as successful project implementation will demonstrate that financing of geothermal, EE/CP/RE projects are good business opportunities for the domestic financing sector. This applies to large scale geothermal development and smaller scale projects being tendered by provincial governments. Increase in domestic geothermal development capacity and benchmarks from the proposed investments to enhance the policy environment will enhance the abundant scale-up and replication potential of additional geothermal power generation capacity.</p>	<p>Medium</p>

RISK	MITIGATION	RESIDUAL RISK
<p><b>Safeguards</b></p> <p>Some geothermal prospects are located in environmentally sensitive areas</p>	<p>Project design will follow GOI and multilateral development bank safeguard policies. Appropriate environmental management and social development measures will be incorporated into project design. Advisory services will be provided to upgrade and enhance domestic capacity to implement good practice safeguard measures in geothermal development (as well as commercial lender capacity to assess risks).</p> <p>Potential impacts from EE and RE are mostly confined to “inside-the-fence” operations.</p>	<p>Low</p>

Source: MDB staff estimates.

## **Appendix 1: Summary of Stakeholder Outreach**

1. To ensure effective and sustained civil society engagement in the revision of the CTF a preparatory meeting was held with selected CSOs in January 2013 ahead of the joint mission to revise the CTF investment plan. The aim of the meeting was to identify relevant CSO stakeholders for consultation and develop an initial process for engagement. It was agreed that a CSO consultation meeting would be held during the joint mission.

2. The consultation meeting, hosted by the Fiscal Policy Agency of the Ministry of Finance, was held on Tuesday, January 29, 2013 at Hotel Borobudur, Jakarta. The objective of the meeting was to discuss the status and possible changes to the CTF IP scheduled for re-endorsement in March 2013. It was attended by representatives from 15 Indonesian CSOs including industry associations and by MDB representatives of the CTF joint mission. The half-day workshop was facilitated by an independent facilitator and divided into four parts: (i) an opening by the MOF, (ii) a presentation by ADB on the status of the CTF IP, (iii) a moderated discussion on inputs to the IP, and (iv) a dialogue on possible mechanism for future coordination with the CSOs.

### **(i) Opening by Irfa Ampri, Vice Chairman of the MOF Fiscal Policy Agency**

3. In his introduction to the workshop Mr. Ampri recognized the important role civil society has to play in addressing sustainability issues in Indonesia. He acknowledged the impact of fuel subsidies on competitiveness in the RE and EE sectors and on wider budget and development issues in the country and emphasized that the MOF is working to create a productive policy framework that will accelerate RE and EE development. Mr. Ampri reiterated the targets within Indonesia's National Action Plan for Mitigation which aims to reduce 26% of GHG emission by its own efforts and 41% with international assistance. He described how the CTF aims to help reduce GHG emissions by providing loans and leveraging funding for EE and RE projects while involving the private sector in the initiative.

### **(ii) Presentation by the Joint MDB Mission Team Leader**

4. The presentation provided the rationale for the CTF in Indonesia and an overview of the structure and governance of the fund as well as the financial products provided. The content of the original IP was reviewed and the need for, and limitations to, a revision of the IP were explained. It was emphasized that sector priorities would not change and that the main revisions would cover financing aspects of the plan.

### **(iii) Moderated discussion session**

5. The CTF IP was generally welcomed by the CSOs as an additional mechanism to speed up clean energy development in Indonesia particularly on financing. The industry associations such as Indonesian Geothermal Association, Indonesian ESCO Association and Indonesian Renewable Energy Society took a particularly active part in discussions. However, most of the CSOs were unfamiliar with the technical and financial aspects of the CTF and a considerable part of the discussion was taken up with clarifications (see summary on next page).

6. There was considerable discussion on policy issues including; fuel subsidies, the structure and level of the feed in tariff for RE, the loss of potential RE biomass through export of waste and the lack of incentives and standards for EE initiatives. The MOF pointed out that these issues were not directly related to the revision of the CTF but they would arrange separate discussions with industry organizations on these issues.

7. Many participants were interested in how the CTF funds could be accessed and what sort of projects can be included. The Joint Mission emphasized that all types of RE and EE project could be funded whether upstream or downstream, SOE or private sector, but projects must accord with CTF criteria and be ready for submission to the CIF within the next twelve months. For geothermal, projects

any stage of development could qualify, but must have a power purchase agreement, access and rights to the steam and local government approvals.

Main Clarifications	Joint Mission Responses
1. What is the duration of the IP, how does it relate to future funding under the Green Climate Fund(GCF)?	1. Projects must be ready to implement by March 2014. If the CTF is successful further funding may be available under CIF or GCF.
2. For EE projects are there incentives for retrofitting buildings and is there a minimum size as many EE projects are quite small.?	2. Under CTF the EE emphasis will be on retrofitting but new buildings qualify, we are looking at aggregation of smaller projects for funding.
3. What will be the interest rates for loans under CTF and can they be adjusted according to scale and location?	3. CTF loans are concessional, but for loans channeled through banks we cannot specify a rate as this will depend on the risks. To keep rates lower a good feasibility study is important and we will help banks with risk profiling and aggregation of projects.
4. How are the various risks of RE projects evaluated and is there a government guarantee for CTF loans?	4. All RE projects have their risks that need to be understood and it will be reflected in the pricing of the loan when financed through the private sector.
5. What is meant in the CTF by 'development impacts'?	5. Development impacts could include local air quality, nature conservation, income generation, etc.
6. Can cooperates qualify as financial intermediaries under CTF?	6. Involving cooperatives as financial intermediaries for RE projects can be included.
7. Who owns the carbon credits from CTF projects?	7. Carbon credits will belong to the project owners.

8. Participants raised a number of issues on CTF content for consideration including: (i) greater inclusion of biomass and biogas projects, (ii) calculation and classification of geothermal resources, and (iii) capacity building at all levels. Participants also highlighted the problem of the funding required to connect geothermal plants to the network and the licensing conflicts between the national and local government level. The Mission responded that the strong pipeline of RE projects is good, but re-emphasized the readiness issue and while capacity building can be included, a project solely on geothermal resource classification and capacity building would not qualify, but could be considered for non CTF MDB funding.

#### (iv) Dialogue on future coordination with CSOs

9. CSO participants and mission members agreed on the importance of CSO involvement in the further development and implementation of the CTF. Some NGOs pointed out this was particularly important given the lack of engagement since 2010 and that CSOs require further information and updates on the CTF. Areas in which participants thought CSOs had a key role to play included engaging with local communities for project development and monitoring CTF implementation. The mission emphasized that there would be an opportunity for CSOs to comment on the revised IP and consultation with CSOs would continue as the content of the CTF developed.

## Appendix 2: Private Sector Geothermal Investment Programs

### Problem Statement

1. Geothermal power is one of the best options to diversify Indonesia's energy mix, especially for base load generation, directly displacing coal and other fossil fuels. As a non-tradable indigenous energy resource, it will also enhance the country's energy security and serve as a natural hedge against the volatility of fossil-based commodity prices. Indonesia has one of the largest geothermal resources in the world, with a technical potential of 27,000 MW, of which about 8,000-10,000 MW is considered to be economically viable at present. Currently, only 1,226 MW (~ 4 percent of this potential) has been exploited. Despite being regarded as a commercially viable RE technology, geothermal power development is constrained by significant barriers including the following:

- The tariff regime as of early 2013 has evolved considerably, and has improved the attractiveness to private investors, but geothermal projects have a long lead time and developers and investors must compete in a market that lacks renewable portfolio standards.
- Geothermal has high risks associated with upfront field exploration and confirmation drilling in the development stage; and maintenance of steam wells, gathering systems, and turbines in the operational stage. Geological risks are not readily mitigated with the current regulatory and tariff regime. Geothermal has higher upfront costs, reflecting the fact that the upstream exploration and development provides the "fuel" for the operating lifetime of the associated power generation units. These additional upfront fuel costs and development risks are site-specific and not fully predictable.
- Given the technical issues noted above, commercial financing is generally unavailable until after a particular project has advanced through the confirmation drilling stage and most of the geological risk has been reduced. Commercial financing is limited mostly to export credit agencies and a handful of project finance lenders. Creative financial structuring and new financing instruments could provide risk coverage to improve the investment profile of most geothermal prospects.

2. Prior to the global financial crisis in 2008, there were approximately 25 international project finance banks that were active lenders in Asia Pacific. In last few years, this number has declined to approximately 15 banks which are principally Japanese, Australian, Singaporean, and two regional banks. Noticeably absent are any European banks who were very active lenders until recently.

### Proposed Transformation

3. Geothermal is less expensive than petroleum-based generation, and less than PLN's average cost of supply, which presents an opportunity to improve PLN's long-term financial health while improving energy security through reduced reliance on petroleum fuels. Accelerating development of geothermal requires this comparative advantage to be recognized and monetized, which points to the need for innovative financing arrangements to reduce early stage development risk and reduce the cost of capital.

4. ADB-PSOD and IFC have been engaged with various private sector sponsors who are developing about 1,000 MW of geothermal capacity comprising new "greenfield" and "brownfield" legacy projects. As each geothermal prospect is different with respect to the geologic resources, and each project has different risks and financing needs related to the development stage, a broad array of financing instruments and arrangements will be developed.

5. ADB-PSOD has met with several geothermal IPP developers and the common area where they see CTF to be transformational (in addition to catalyzing international commercial banks above) is funding for drilling, both pre- and post- Financial Close. Concessional funds would be especially valuable for

some of the smaller developers (or even the local joint venture partners who need to fund their *pro rata* share of drilling costs). CTF funds could be deployed as senior or subordinated debt covering the remaining resource risk, guarantees to commercial lenders to extend the tenors of the loans to ensure the project's financial viability or as risk sharing bridge financing during the exploratory drilling phase of project development

6. Indonesian banks are not active project finance (i.e., non-recourse) lenders and have shown very limited appetite for geothermal projects to date. However, this could change once there is an established track record of a few successful geothermal project financings. As an example, the Malaysian power market is largely financed by domestic banks and bonds due to its successful and established track record. In this context, the remaining commercial banks which are still active in project finance in Asia face two key issues that CTF funds could help alleviate:

- a. **Loan Tenor Limitations:** Geothermal projects in Indonesia typically have a 25 year power purchase agreement which necessitate relatively long-tenored loans to match the revenue stream and amortize the relatively high capital costs. International commercial banks (especially the few remaining European banks) due to the impact of Basel III and other factors are unable to provide these long tenors that geothermal developers require. To mitigate this, ADB may leverage CTF resources by guaranteeing the tail end of the required tenor to fund the tenor that is typically beyond their credit limits.
- b. **Resource Risk:** As there are very few reference private sector projects in Indonesia or elsewhere in the world, commercial banks may require higher debt service coverage ratios to get comfortable with the resource risk. CTF funds may be deployed in a subordinated debt position to specifically cover the resource risk and achieve credit approvals for the large amounts of senior debt required to bring these projects to financial close (without incurring further delays while waiting for additional wells to be drilled and resource proven)

### **Rationale for CTF Funding**

7. The proposed projects and investment programs are transformational due to the following reasons:

- Indonesia has the world's largest geothermal potential of over 27,000 MW, most of which remains undeveloped. Scaling up the use of this renewable resource has national, regional and global impacts.
- Geothermal is one of the only "24/7" base-load RE resources which can directly displace coal and other fossil fuel power plants. Therefore, it is the best supply-side resource in Indonesia with respect to utility scale generation and GHG reductions. By displacing coal-fired power, which has seen the greatest growth in Indonesia's power sector over the past decade, large-scale deployment of geothermal technology would significantly bend the GHG emissions growth curve.
- The proposed investments of up to [1,900 MW] in additional power generation capacity will help the GOI accelerate the scale-up of geothermal development towards reaching the target of 9,500 MW by 2025 (and the "25 x 25" scenario outlined in the main text). This would be more than 8-fold increase from the country's current installed capacity of 1,226 MW.

8. CTF funds are requested to address the additional costs and risk premiums in order to enhance the financial viability of the proposed projects and investment programs. The CTF funds would be blended with multilateral financing in order to: (1) reduce geothermal field exploration and exploitation risks through financial instruments (i.e. risk sharing, insurance), (2) address additional costs for deployment of advanced drilling technology, (3) additional costs for deployment of advanced power generation technology (e.g., binary and combined cycle) to upgrade existing generation units or to exploit medium-grade thermal resources, (4) support interest rate buy-down to improve financial returns

commensurate with risks, and (5) develop domestic technical and managerial capacity to sufficiently accelerate program and project development.

### Implementation Readiness

9. ADB-PSOD and IFC have engaged with private sector geothermal developers over the past several years to understand the risks and barriers to projects moving ahead. While some progress has been made by the Government side, there remain challenges with commercial lenders. The key risks of resource assessments continue to be a problem. Both ADB-PSOD and IFC have designed their programs to address these risks with different stakeholders in the market. Both institutions intend to present proposals for approval during calendar year 2013.

11. IFC aims to target and apply CTF funds to support several private sector geothermal projects and will address existing market barriers and ultimately aim to transform the renewable energy sector in Indonesia. The program will seek to retain flexibility (in terms of approach, project selection, and application of CTF funds) in structuring the best way to accelerate the implementation of these renewable energy investments with minimum concessionality on a project-by-project basis. Although it is expected that equity and/or quasi-equity would be the instrument most likely to be used, IFC would retain the flexibility to use other products such as subordinated loans and senior loans, depending upon the structure of each project. The products will be chosen based on what can most effectively address the barriers to accelerate investment and most efficiently use CTF funds to leverage private sector capital. Final agreement to provide funding to any project would be subject to a full due diligence and approval process.

### Financing Plan

12. The indicative financing plan for the geothermal investment programs is shown in Table A2.1.

**Table A2.1: Financing Plan for Geothermal Sector Development Project (US\$ Million)**

<b>MDB /Program</b>	<b>Total</b>	<b>CTF</b>	<b>MDB</b>	<b>Other Cofinancing<sup>a</sup></b>
Private Sector Geothermal Program (ADB-PSOD)	2,625	150	375	2,100
Geothermal Program (Investment & Advisory - IFC)	1,760 - 1770	40-50	120	1,600
Total <sup>b</sup>	<b>5,515 - 5,525</b>	<b>190 - 200</b>	<b>525</b>	<b>4,800</b>

Source: Joint Mission Aide Memoire 2013

Notes: <sup>a</sup> Commercial bank and other co-financing

<sup>b</sup> Carbon finance is not expected to be mobilized as upfront cofinancing due to eligibility limitations, low prices, and high transaction costs.

## Appendix 3: Private Sector EE and RE Investment Program

### Problem Statement

1. The marginal abatement cost curve (MACC) for Indonesia presents the potential GHG reductions of about 47 MtCO<sub>2</sub>e from demand-side opportunities and more than 50 MtCO<sub>2</sub>e from biomass energy. The MACC shows a compelling picture of large GHG reductions with negative abatement costs, i.e., the investments will pay for themselves through energy savings and avoided fuel costs. Many EE and captive RE generation projects will pay for themselves through energy savings, avoided fuel costs, and other resource savings: simple pay-back periods of less than 5 years are common, but monetizing the potential value of these savings remains elusive. For grid-connected RE projects, the cost of electricity production is typically estimated to be below PLN's cost of supply, as recognized by the tariffs for small-scale RE established by MEMR Regulation No. 4/2012.

2. The overall electricity subsector is driven by a supply-side mentality, even though there are no large-scale, short-term, supply-side solutions to Indonesia's electricity challenges. A similar supply-side bias persists in the case of petroleum fuels, even though Indonesia has been a net importer of crude oil and petroleum products for several years. Further, the MACC explicitly assumes that capital constraints do not exist, but commercial financing is not readily available for demand side EE interventions as well as captive RE generation, as there are no readily available market instruments to monetize the value of "mega-watts" and avoided fossil fuel costs. Many commercial banks have clients which may be borrowing for facility upgrades and other process improvements which may have good efficiency and GHG benefits, but these lending operations are not characterized as "EE and RE lending." Commercial banks, building owners, ESCOs, industries, and IPPs need better awareness of (i) opportunities to increase commercial financing for EE and RE, and (ii) the risk offsets and financial packages that have been introduced in other major middle income countries which could be adapted to the Indonesian market.

3. Despite the large potential for EE improvements in industries and buildings as well as various RE resources<sup>16</sup>, the Indonesian banking sector has so far not undertaken a systematic effort in developing products and solutions for facilitating investment at scale. Banks in Indonesia follow opportunities identified by their corporate clients rather than leading the way in "green lending". Indonesia has the lowest retail electricity prices in South East Asia which lowers the attractiveness of EE investments through longer payback periods. Availability of long term domestic currency capital is limited and foreign currency capital is associated with substantial foreign exchange rate volatility risks. While some efforts are ongoing to build capacity of banks and other financial institutions, the Indonesian financial sector as a whole has yet to recognize the potential of EE and RE investments as a viable business line.

### Proposed Transformations

4. In the absence of direct banking and other financial sector intermediary initiatives supporting small and medium sized EE and RE investments, ADB has started identifying private firms that are suitable as aggregators for such investments consistent with their core business orientation. Such firms include (a) property investors and managers of commercial and residential buildings seeking to build and retrofit EE through building insulation and electrical management; and (b) engineering companies that work with (i) heavy industries in EE process reengineering, (ii) industrial producers and operators of RE power plants both for captive power generation and electricity sales to the grid which include biomass, hydro, solar, and heat recovery for electricity generation. Despite low electricity tariffs and inefficiencies of power utilities, these firms have emphasized strong demand for EE investments facilitating substantial energy cost savings and ensuring RE production on sites that may not have access to Indonesia's electricity grid or currently rely entirely on fossil energy supplies. Local banks are more likely to identify EE and RE investment projects through such aggregators given their track record, relatively good credit rating, and the economies of scale involved in the aggregation process, rather than directly sourcing such investments.

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<sup>16</sup> Various assessments estimate the potential EE and RE market at up to \$10 billion in total investments.

5. IFC is in dialogue with the few private commercial banks that have indicated their interest in financing selected EE/RE projects given the recent improvement in the regulatory environment, including the increase in feed-in-tariff for small scale RE projects. As such, IFC is currently in discussion with several private sector financial institutions (FIs) to provide a comprehensive technical assistance package to build their capacity in financing EE/RE projects.

6. CTF will provide critical financing to create and implement new financial intermediation and risk reduction measures and to mobilize commercial financing for the EE/RE/CP market coupled with advisory services components. CTF resources are proposed to cover additional costs and risks such as but not limited to: (i) cost reduction of partial credit guarantees and risk-sharing facilities provided to commercial banks, (ii) additional cost for deployment of RE systems, co-generation, and other clean energy technologies; and (iii) credit enhancements to improve financial rates of return.

### **Rationale for CTF Financing**

7. The ADB private sector EE and RE investment program is in the preparation stage. The investment pipeline comprises (i) EE in existing and new commercial and residential buildings; (ii) EE and CP in industries, including cogeneration; and (iii) biomass energy, and possibly small hydropower, solar, and wind projects. Various financial instruments and intermediation arrangements are being identified to respond to identified constraints (i.e., unlocking the potential for investments). As commercial banks have demonstrated limited appetite for scaling up EE and RE funding, a learning-by-doing approach will be employed to implement prototype investments; this early experience can then be transferred to financial institutions with an expedited learning curve.

8. IFC's sustainable energy finance program is designed to support the government's initiatives as well as complement bilateral/multilateral institutions' efforts to promote EE and RE projects by encouraging private sector investment through the use of appropriate concessional financing instruments. IFC's program will include both investment and advisory service components to support the scale-up of SE projects in Indonesia, targeting the industrial, commercial, and residential sectors. The investment component aims to engage the financial sector as a key change agent in promoting low-carbon, climate-conscious behavior. The advisory services component is designed to encourage local FIs to develop appropriate lending programs for industries and project developers to facilitate investment in EE/RE projects, help build capacity of selected local energy auditors/engineering consultants in assisting industries to conserve energy, and conduct a broader awareness raising activities to enhance the understanding of stakeholders on the benefits of sustainable energy initiatives. The goals are to support the development of renewable energy and reduce energy consumption, leading to a reduction in GHG emissions.

### **Implementation Readiness**

9. The ADB-PSOD Private Sector EE/RE investment program is under preparation through a project preparatory grant (approved by the TFC in March 2012 and by the Government in December 2012).<sup>17</sup> The CTF allocation for this program will remain at \$50 million. ADB-PSOD expects to submit a proposal for CTF Trust Fund Committee approval by Q4 of calendar year 2013.

10. IFC is in discussions with several commercial banks/financial institutions (FIs) and IFC will choose the FIs as partners based on the following criteria: (i) strong commitment to sustainable energy financing, (ii) commitment to improving risk management capacity, (iii) innovative mindset to pilot new products; (iv) extensive branch network, (v) ability and willingness to co-finance advisory services provided, and (vi) strong capital base and low level of non-performing loans. IFC intends to partner mainly

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<sup>17</sup> As referenced in the project preparatory grant proposal, ADB is considering an investment in the Global Climate Partnership Fund, alongside CTF funds, for investments in Indonesia.

with local FIs that are active in the corporate and SME segments. IFC expects to submit a proposal for CTF Trust Fund Committee approval by the third quarter of calendar year 2013.

### Financing Plan

11. The indicative financing plan is presented in Table A3.1.

**Table A3.1: Financing Plan for EE and RE Sector (US\$ Million)**

<b>MDB / Program</b>	<b>Total</b>	<b>CTF</b>	<b>MDB</b>	<b>Other Cofinancing<sup>a</sup></b>
Energy Efficiency and Renewable Energy (ADB)	250	50	50	150
Energy Efficiency and Renewable Energy (IFC)	250 - 260	25-35	125	100
<b>Total<sup>b</sup></b>	<b>500 - 510</b>	<b>75 - 85</b>	<b>150</b>	<b>275</b>

Source: Joint Mission Aide Memoire, January 2013

Notes: <sup>a</sup> Commercial bank and other co-financing

<sup>b</sup> Carbon finance is not expected to be mobilized as upfront cofinancing due to eligibility limitations, low prices, and high transaction costs.

#### Appendix 4: Notes on Emissions Reductions Estimates

1. As noted in the main text, an emissions factor of 0.8 tCO<sub>2</sub>e/MWh is used as the basis for estimated emissions reductions. This factor is near the high end of that used for registered CDM projects in Indonesia, and is used for consistency with the original CIP (wherein the explicit assumption was that RE projects would be displacing coal-fired generation at 0.8 tCO<sub>2</sub>e/MWh). Indonesia has different emissions factors which reflect the generation mix in the discrete grids (e.g., Java-Bali-Madura, Sumatra, Kalimantan, etc.), and emissions factors vary from project to project depending on the specific location by a factor of 1.8. Outside of Java and Sumatra, the generation mix tends to be dominated by petroleum-based fuels, which may have significant black carbon (BC) emissions, which are not included in CDM Project Design Documents (PDDs). If black carbon is factored into diesel emissions, the total emissions factor may be higher than that for coal. As RE and EE investments are scaled up, the emissions factors will decrease, i.e., the baselines will change. In the CTF context, the cost-effectiveness of GHG reductions will decrease accordingly (given the difficulty in forecasting, CTF guidance does not include specific consideration for changing baselines as is the case with CDM).

2. Table A4.1 below presents GHG reduction estimates for 1,000 MW of RE-based generation running at 8000 hours per year (8000 GWh/y; this is equivalent to 91.3% capacity factor, which is not unusual for geothermal power plants) for a variety of grid emissions scenarios. The base case scenarios use the existing range of grid emissions factors from registered Clean Development Mechanism projects in Indonesia (see Table A4.2). Carbon emissions factors for diesel are calculated using UK Department of Environment, Food, and Rural Affairs (DEFRA) carbon dioxide coefficients<sup>18</sup> and a range of fuel consumption expressed in terms of kg fuel / kWh electricity.<sup>19</sup> BC emissions are also calculated to illustrate the additional global warming potential associated with diesel-fired power plants. The low-end range of 100-year global warming potential for BC is used for simplicity.<sup>20</sup> BC content of diesel is the low-end of the range presented in Bond and Sun (2005).<sup>21</sup> The emissions reductions scenarios also include future reduction of grid emissions factors which result from increased penetration of RE. A simple discount of 20% is made based on current share of 5% RE versus the 25% share targeted in Energy Vision 25/25 (see main text, Figure 4). The estimated GHG reductions vary by up to 3.5 times across the various scenarios (not including the basic estimate for BC emissions only).

**Table A4.1: GHG Reductions for 1,000 MW of Baseload RE Capacity (MtCO<sub>2</sub>e/year)**

Scenario	Emission Factor <sup>a</sup>	GHG Reduction
Base case: displacing grid mix – high	0.901	7.1
Base case: displacing grid mix – low	0.487	3.8
Displacing diesel – high	1.060	8.4
Displacing diesel – low	0.743	5.9
Displacing only black carbon – high	0.330	2.6
Displacing only black carbon – low	0.231	1.8
Displacing diesel high + black carbon high	1.390	11.0
Displacing diesel low + black carbon low	0.974	7.7
Displacing grid mix high - 20% discount for future RE penetration	0.721	5.7
Displacing grid mix low - 20% discount for future RE penetration	0.390	3.1

<sup>a</sup> See Table A4.2

<sup>18</sup> Accessed on 1 February 2013 from: <http://www.defra.gov.uk/publications/files/pb13773-ghg-conversion-factors-2012.pdf>

<sup>19</sup> Consumption estimates are from: [http://en.wikipedia.org/wiki/Diesel\\_generator](http://en.wikipedia.org/wiki/Diesel_generator)

<sup>20</sup> The range is quoted at: [http://en.wikipedia.org/wiki/Black\\_carbon#cite\\_note-110](http://en.wikipedia.org/wiki/Black_carbon#cite_note-110)

<sup>21</sup> Tami C. Bond and Haolin Sun. 2005. *Can Reducing Black Carbon Emissions Counteract Global Warming?* Environmental Science and Technology, Vol. 39, No. 16, pp. 5921-5926.

<b>Assumptions for Table A4.1</b>	
RE capacity	1000 MW
Capacity Factor	90%
Operational Hours	8760
Diesel consumption (kg/kWh)	0.28 - 0.4
Black carbon 100 year global warming potential (GWP)	1055
Black Carbon Content of Diesel (kg/kg fuel) [Calculated as 0.009 kg BC/kg carbon in fuel x 1055 GWP = 0.950]	0.950
Carbon content of diesel (kg C/kg fuel)	0.869
Emissions factor for black carbon in diesel (kg BC/kg Diesel) [Calculated as BC content of diesel x Carbon content of diesel: 0.950 x 0.869 = 0.83 kgCO <sub>2</sub> /kg fuel]	0.83
Diesel consumption – high (kg/kWh)	0.4
Diesel consumption - low (kg/kWh)	0.28
BC emissions factor – high (0.83 x 0.4 = 0.33) [in kgCO <sub>2</sub> e/kWh, or tCO <sub>2</sub> e/MWh]	0.33
BC emissions factor – low (0.83 x 0.28 = 0.23) [in kgCO <sub>2</sub> e/kWh, or tCO <sub>2</sub> e/MWh]	0.23

**Table A4.2: Emissions Factors from CDM Projects in Indonesia**

Project	Grid	Grid Emission Factor <sup>a</sup> (tCO <sub>2</sub> e / MWh)
<b>Greenfield / Capacity Addition</b>		
Patuha	JAMALI	0.725
Rantau Dedap	Sumatra	0.743
Rajabasa	Sumatra	0.743
Wayang Windu Phase 2	JAMALI	0.901
Lumut Balai	Sumatra	0.743
Muara Laboh	Sumatra	0.743
Lahendong	Minahasa Kotamobagu	0.487
<b>Upgrade / Retrofit</b>		
Ganung Salak 1, 2, and 3 (Upgrade)	JAMALI	0.882

<sup>a</sup> Institute for Global Environmental Strategies. List of Grid Emission Factors.  
<http://enviroscope.iges.or.jp/modules/envirolib/view.php?docid=2136> (Accessed 5 September 2012).

Compiled by ADB carbon finance unit, 2012