Climate Investment Funds

CTF/TFC.5/6
February 18, 2010

Meeting of the CTF Trust Fund Committee
Manila, Philippines
March 15, 2010

CLEAN TECHNOLOGY FUND
INVESTMENT PLAN FOR INDONESIA

Clean Technology Fund Investment Plan for Indonesia

Executive Summary

Introduction

1. This Clean Technology Fund (CTF) Investment Plan for Indonesia proposes CTF co-financing of US$400 million to support Indonesia's goals of providing 17 percent of total energy use from renewable energy (RE) and improving energy efficiency (EE) by 30 percent from business-as-usual (BAU) by 2025. Specifically, the Investment Plan proposes CTF co-financing for two programmatic areas: (a) scale up of large-scale geothermal power, led by the public sector with the prospects also for some private sector investments, and (b) acceleration of initiatives to promote EE and RE (especially biomass). The CTF investments will mobilize financing of up to US$2.7 billion from multilateral financiers, state-owned enterprises (SOEs), and the private sector. If additional resources are available, a second phase of the Investment Plan is expected to include investment in low carbon transport and other renewable energies.

Country and Sector Context

2. Indonesia has made a strong economic recovery from the 1997 financial crisis. Its gross domestic product (GDP) grew at an average of 4.8 percent per year from 2000 to 2006. This strong economic performance has resulted in an annual 5.2 percent increase in primary energy consumption. Fossil fuels dominate the energy supply in Indonesia. To mitigate the local environmental impacts and diversify the fuel mix to hedge against the fossil fuel price volatility, the Government is launching a program to develop 10,000 megawatt (MW) of generation capacity by 2014 through a program of predominantly RE with a special focus on geothermal.

3. Indonesia is one of the world's largest emitters of greenhouse gases (GHGs). Land use change from peat and deforestation is the single largest contributor to GHG emissions in Indonesia. Interventions for mitigating such impacts are not eligible for CTF funding, though other funds are available for forestry. Ranked in the top 10 in the developing world, energy-related carbon dioxide (CO_2) emissions are dominated by industry, power, and transport sectors. The energy sector is the second largest source of CO_2 emissions in Indonesia. If Indonesia continues on a BAU path, its emissions will nearly triple by 2025.

Priority Sectors for GHG Abatement

4. The Government of Indonesia (GOI) is committed to mitigating climate change. At the G20 meeting in 2009, President Susilo Bambang Yudhoyono announced that Indonesia would reduce GHG emissions by 26 percent by 2020, and make a further reduction of up to 41 percent with international support. The Government also joined the G20 pledge to phase out subsidies for fossil fuels. Indonesia is developing a strategic, multi-year policy and investment program for low-carbon growth, as outlined in the

National Action Plan for Climate Change (NAP 2007) and the Development Planning Response to Climate Change (2008). The President has established the National Council on Climate Change (NCCC) with representation from 15 ministries to coordinate Indonesia's climate change policies and international positions. The Government is establishing a climate change trust fund, and have developed a Green Paper and prepared its Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).

5. The GOI has identified GHG reduction priorities in the energy sector, including (i) EE, particularly in the industrial sector; (ii) RE for power generation, primarily geothermal, but also including biomass; and (iii) low-carbon transport, especially public transport, vehicle efficiency improvements, and clean fuels. This CTF Investment Plan supports a broad programmatic approach that includes policy dialogue, capacity building and advisory services and transformational investments in the first two areas, while the transport sector is proposed for a possible Phase 2.

Rationale for Selected Sectors for CTF Co-Financing

6. The priority activities selected for CTF co-financing are:

a. Significant scale-up of large-scale geothermal power development: This includes (a) up to 260 MW geothermal power by Pertamina Geothermal Energy (PGE) to be co-financed by the World Bank; (b) up to 250 MW geothermal power by PT. Perusahaan Listrik Negara (PLN) to be co-financed by the ADB; and (c) development of about 300 MW of geothermal resources with private sector participation through risk mitigation efforts to confirm resources, with additional transaction advisory services and co-financing provided by the International Finance Corporation (IFC) and the Asian Development Bank (ADB) Private Sector Operations Department. These investments will nearly double the currently installed geothermal capacity in Indonesia. CTF financing would be used to (i) address the additional costs of geothermal power compared with alternative fossil-based sources so that these investments become viable and reflective of its environmental benefits in the investment decision; and (ii) reduce risks of early-stage geothermal exploration and field development that can be a barrier to development in the sector.

   CTF support will have the transformational impact of scaling up geothermal power in the country, which would substantially bend Indonesia's emission growth curve. Indonesia has the largest geothermal energy capacity in the world. Geothermal energy serves as an ideal renewable base-load source that would directly displace an equivalent need for future coal-fired power plants. These CTF supported investments will also help establish benchmarks for cost and performance for improved sector policy reforms, promote institutional learning, and economies of scale that could reduce, over time, the cost of geothermal development making it more competitive with conventional power. ADB has been working closely with the GOI and other partners on reforms in the power sector especially geothermal, which will continue through its upcoming

Geothermal Sector Development Program, To ensure long-term program sustainability and replication, the World Bank is also assisting the GOI in developing and implementing enabling policy frameworks to improve the investment climate for geothermal development, under a Global Environment Facility (GEF) funded project with the Ministry of Energy and Mineral Resources (MEMR). Furthermore, the World Bank is also designing a Framework for Carbon Financing for Geothermal Energy through a programmatic Clean Development Mechanism (CDM) approach to generate additional revenues to further improve the financial viability of geothermal projects. Together, this comprehensive set of reforms will ensure that the scale-up of the geothermal sector initiated through the CTF intervention will be sustained over time.

b. Acceleration of initiatives to promote EE and RE, (in particular, biomass): CTF financing would be used for (i) risk sharing facilities and mezzanine financing with participating state-owned or private commercial banks to increase access to financing for small and medium enterprises (SMEs) and cover the incremental risk premium of EE/RE investments or to extend loan tenors; and (ii) direct lending to large end-users for EE/RE to reduce the cost of financing. The approach will also include technical/advisory services to help local banks evaluate EE/RE projects, with risk sharing facilities or partial risk mitigation structures to leverage existing bank resources into the financing of EE/RE activities in the private sector. CTF support would address financing barriers to small- and medium-scale EE/RE investments by SMEs, such as substantial transaction costs, high perceived risks, and limited expertise for assessing EE/RE projects. This would lead to increased confidence of local banks to jumpstart and mainstream EE/RE business opportunities.

CTF support will transform the outlook of the Indonesian banking sector towards commercial EE/RE activities, and create a substantial financing market linking banks with firms interested to finance EE/RE projects. Experience from other countries (e.g., Russia, China) demonstrates that EE investments produce high rates of return for firms and are relatively low risk for banks — and therefore can support significant financial leverage. Both IFC and ADB will provide technical assistance to commercial banks to help build staff skills in analysis and evaluation of EE projects, along with tailor-made financing instruments including lines of credit, credit guarantees and/or risk sharing facilities to "crowd in" bank financing for these activities.

7. ***Potential for GHG reduction***: The geothermal investments of 800 MW can reduce CO_2 emissions by 5.1 million tons per year and over 100 million tons over a projected 20-year plant life. It is difficult to estimate the emission reductions from the EE component, given the fragmented nature of the investments. However, based on the World Bank/IFC EE investment portfolio, a US$1.1 billion investment in EE could save 2.0 million tons of oil equivalent (Mtoe) of energy that would result in an annual emissions reduction of about 5.5 million tons of CO_2.

8. ***Replication potential***: Indonesia has a potential of nearly 10 GW of geothermal resources that is economically justified and an estimated 27 GW that is technically viable, which could double the existing installed power generation capacity for the entire country. Indonesia also has nearly 50 GW technical potential for power generation from biomass. The Government's Technology Need Assessment estimated an energy saving potential of 10 Mtoe per year from now to 2025.

9. ***Development impact***: EE and RE interventions offer local environment benefits of reduced air pollutants of particulates, sulfur dioxides (SO_2), nitrogen oxides (NOx) from avoided coal-based power plants. RE can enhance energy security by diversifying the energy mix, hedging against fossil fuel price volatility, and increasing the utilization of indigenous resources. The geothermal investments are part of the Second Fast Track Program to rapidly address supply-demand imbalances which have caused rolling blackouts in many areas of the country and threaten economic growth. Both RE and EE can also contribute to creating jobs and building more efficient domestic manufacturing industries. Furthermore, EE measures can reduce consumers' bills, increase competitiveness of industries, and avoid or postpone the need for new generation capacity, whereby Indonesia would benefit from saving economic resources.

10. ***Readiness for implementation*** The GOI issued a Geothermal Law (Law 27/2003), making geothermal the only RE governed by its own law, and have established a dedicated directorate at the MEMR to oversee sector development. In addition, the Government is preparing a pricing policy that would eventually address the incremental costs for geothermal development, and includes, among other things, the support of carbon revenues. Furthermore, they are being supported by the IFC and the World Bank to competitively tender geothermal fields for development in an open and transparent manner. The geothermal projects proposed for CTF co-financing are also already included in the GOI "Bluebook" for external financing, and the World Bank project is included in its lending pipeline. Pertamina Geothermal Energy (PGE) has already prepared pre-feasibility studies, and the World Bank has provided a grant so that they can complete the remaining project preparation activities. The ADB has offered a grant to GOI so that PLN can complete its project preparation work. IFC has reached agreement with GOI regarding the provision of advisory services for geothermal tenders, and is in discussions with developers regarding financing opportunities. IFC has also launched a Sustainable Energy Finance project and has already been approached by several interested private commercial banks regarding EE and RE opportunities.

11. ***Additional costs and risk premiums***: First, the levelized financial cost of electricity of geothermal power is more expensive than coal-based power. The current incentives and pricing mechanism are insufficient to attract investments at the scale necessary to meet the GOI target. Second, geothermal has high resource risks particularly at early stage of field development. Third, geothermal has a higher upfront capital investment cost, which poses financing challenges. In addition, Indonesia has limited institutional capability to plan geothermal development and sufficiently engage suitable developers. Finally, SMEs have difficulties accessing finance for EE and RE investments; commercial banks have limited financing tools, knowledge, and

understanding of such opportunities, and tend to impose excessive collateral requirements when financing is made available.

Table 1: Financing Plan (all figures in US$ millions)

	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
Total	***3,110***	**400**	**1,575**	**35**	**1,100**

Table 2: Result Indicators

Indicators	**Baseline**	**Investment Program Results**
Geothermal	1,050 MW	800 MW new capacity
Annual GHG emission reductions	6.7 Mton	Additional 5.1 Mton
Replication potential	1,050 MW	10,000 MW economically viable potential
EE/RE	0	2.0 Mtoe energy savings per year
Annual GHG emission reductions	0	5.5 Mton
Replication potential	0	10 Mtoe energy savings per year

CURRENCY EQUIVALENTS

(Exchange Rate Effective as of May 1, 2009)

Currency Unit = Indonesia Rupiah (IDR)
US$1 = IDR 9300
US$0.000108 = IDR 1

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	KfW	The Reconstruction Credit Institute of Germany
BAPPENAS	National Planning and Development Agency	kWh	kilowatt-hour
BAU	Business as usual	LULUCF	Land use change and forestry and peat fires
BPPT	Agency for the Assessment and Application of Technology	LUCF	Land use change and forestry
BRT	Bus Rapid Transit	MDB	Multilateral Development Bank
CDM	Clean Development Mechanism	MEMR	Ministry of Energy and Mineral Resources
CO_2	Carbon dioxide	MToe	million ton of oil equivalent
CP	Cleaner production	$MtCO_2e$	million ton of carbon dioxide equivalent
CTF	Clean Technology Fund	MW	Megawatt
DPL	Development Policy Loan	NAP	National Action Plan for Climate Change
EE	Energy efficiency	NCCC	National Council on Climate Change
ESCO	Energy service company	NOx	Nitrogen oxides
FI	Financial intermediary	PCG	Partial credit guarantee
G20	Group of Twenty	PGE	PT. Pertamina Geothermal Energy
GEF	Global Environment Facility	PLN	PT. Perusahaan Listrik Negara
GDP	Gross domestic product	PLN-G	PT. PLN - Geothermal
Gg	Giga-grams	PPA	Power purchase agreement
GHG	Greenhouse gas	PPP	Public private partnership
GOI	Government of Indonesia	RE	Renewable energy
GWh	gigawatt-hour	RPJM	Indonesia's National Medium Term Development Plan for 2010-2014
IBRD	International Bank for Reconstruction and	SME	Small and medium enterprise

	Development		
ICCTF	Indonesia Climate Change Trust Fund	SOE	State owned enterprise
IEA	International Energy Agency	SO_2	Sulfur dioxides
IFC	International Finance Corporation	tCO_2e	ton of carbon dioxide equivalent
IP	Investment plan	TNA	Technology Needs Assessment on Climate Change Mitigation
ISO	International Standards Organization	UNFCCC	United Nations Framework Convention on Climate Change
JICA	Japanese International Cooperation Agency	WBG	World Bank Group

INDONESIA: CLEAN TECHNOLOGY FUND INVESTMENT PLAN

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INDONESIA: CLEAN TECHNOLOGY FUND INVESTMENT PLAN

I. INTRODUCTION

1. This Investment Plan (IP) is a business plan for the use of Clean Technology Fund (CTF) resources in Indonesia, including a pipeline of projects and notional resource envelopes. It is agreed between the Government of Indonesia (GOI), the Asian Development Bank (ADB), and the World Bank Group (WBG), and is based on Indonesia's *Second National Climate Change Communication* (2009), the *Indonesia Green* Paper (2009), the GOI *National Energy Policy* (2005), the *Energy Blueprint* 2005 - 2025, the *National Medium-Term Development Program for 2010 – 2014* (Rencana Pembangunan Jangka Menengah, or RPJM), the *National Action Plan for Climate Change* (NAP 2007), the *Development Planning Response to Climate Change* (2008), the *Climate Change Roadmap for the National Medium-Term Development Program for 2010 – 2014* (2009), *Indonesia's Technology Needs Assessment on Climate Change Mitigation* (TNA 2009), and other relevant sector development policies and programs. It also supports the new administration's 100-day program by indicating that concessional financing is being mobilized in support of key development objectives.

2. The IP builds on GOI's engagement with ADB, the International Bank for Reconstruction and Development (IBRD) and International Finance Corporation (IFC), and other donor agencies in evaluating resource efficiencies, cleaner production (CP), energy efficiency (EE), and renewable energy (RE), and cleaner fuels development during the past several years.

3. The IP is a dynamic document and this version is based on the economic development plans, investment programs, and mature project proposals considered at this time. As and when additional substantive mitigation proposals are formulated, they could be considered for inclusion subject to the availability of funds.

The GOI is committed to creating a low-carbon development path: At the G20 meeting in September 2009, President of the Republic of Indonesia, His Excellency Susilo Bambang Yudhoyono announced a unilateral objective to reduce GHG emissions 26 percent by the year 2020, and proposed a goal of 41 percent reduction by 2020 with international support. GOI also joined the G20 pledge to phase-out subsidies for fossil fuels.

II. COUNTRY AND SECTOR CONTEXT

4. Indonesia is the world's largest archipelago and has an ethnically diverse population of more than 230 million. It has considerable natural resources (timber, fish, petroleum, natural gas, and a variety of metals) and biodiversity. Following rapid growth and declining poverty in the early 1990s, the country witnessed a sudden deterioration of its gross domestic product (GDP) and heightened poverty during the period of 1997–2000, resulting from the Asian Financial Crisis. The economic development "clock" was effectively reset by the crisis, and Indonesia has emerged as a very different country with a truly democratic government, devolution of authority to provincial and local

governments, and a robust civil society (ADB CSP 2006 – 2009). In social and economic terms, Indonesia has seen much progress since. Its real GDP has been growing at 5-6 percent annually since 2002, and has remained positive even during the recent global downturn. Public investment has steadily increased over the past five years; poverty has declined and public services are receiving additional resources. While Indonesia is doing well, it could be doing far better in the areas of poverty reduction, service delivery and governance. As a result, the country may yet fail to reach several of its Millennium Development Goals' targets[1].

5. The key development objectives of the GOI are elucidated in its RPJM, which targets higher levels of pro-poor sustainable growth and the achievement of the Millennium Development Goals. Energy security, defined in the local context as ensuring adequate and reliable supply at affordable prices, features prominently in the RPJM along with consideration of lower carbon growth opportunities through RE, energy conservation, end-use efficiency, and more efficient transport systems.

2.1 Greenhouse Gas (GHG) Emissions

6. Indonesia's GHG emissions are globally significant. The GOI's recent Second National Communication on Climate Change to the UNFCCC provides the official figures on Indonesia's overall GHG emissions (Table 1). In 2000, total GHG emissions for the three main greenhouse gases (CO_2, CH_4 and N_2O) were 1.4 million Gg CO_2e, which has continued to increase in the aggregate over time. The most significant contributor to the overall emissions is from the impacts of LULUCF (Land Use Change and Forestry, or LUCF, and peat fires)[2]. Interventions for mitigating such impacts are not eligible for CTF funding, though other funds are available for forestry. Therefore, the GOI is pursuing other means of support for addressing these key emission sources[3].

Table 1: Summary of GHG emissions from 2000-2005 from all sectors (in Gg)[4]

	2000	2001	2002	2003	2004	2005
Energy	333,540	348,331	354,246	364,925	384,668	395,990
Industry	34,197	45,545	33,076	35,073	36,242	37,036
Agriculture	75,419	77,501	77,030	79,829	77,863	80,179

[1] World Bank Country Partnership Strategy for Indonesia, FY2009-12.

[2] Emissions estimates for LUCF and peat fires show considerable variability depending on the source study, and also display considerable inter-annual variation. The Indonesia Second National Communication to the UNFCCC attributes the differing estimates to alternate estimation methods and extrapolation techniques, and is actively working to improve the quality of such figures for the next National Greenhouse Gas Inventory. The same document indicates that the inter-annual volatility in LUCF and peat fire emissions is largely due to El-Nino impacts. For example, 2002 was an El-Nino year, when the emissions from LUCF and peat fires were significant higher than in other years. Despite these differences in estimates, there is considerable consensus that LUCF and peat fires make a uniquely substantial contribution to Indonesia's overall GHG emissions.

[3] The GOI is currently pursuing a Reduced Emissions from Deforestation and Degradation (REDD) initiative with support from several donors, including the World Bank and ADB, as well as a UN-REDD (supported by UNDP, UNEP and FAO). Indonesia is also a participant in the Forest Carbon Partnership Facility and has expressed interest in joining the Forest Investment Program, both multi-donor supported climate financing instruments.

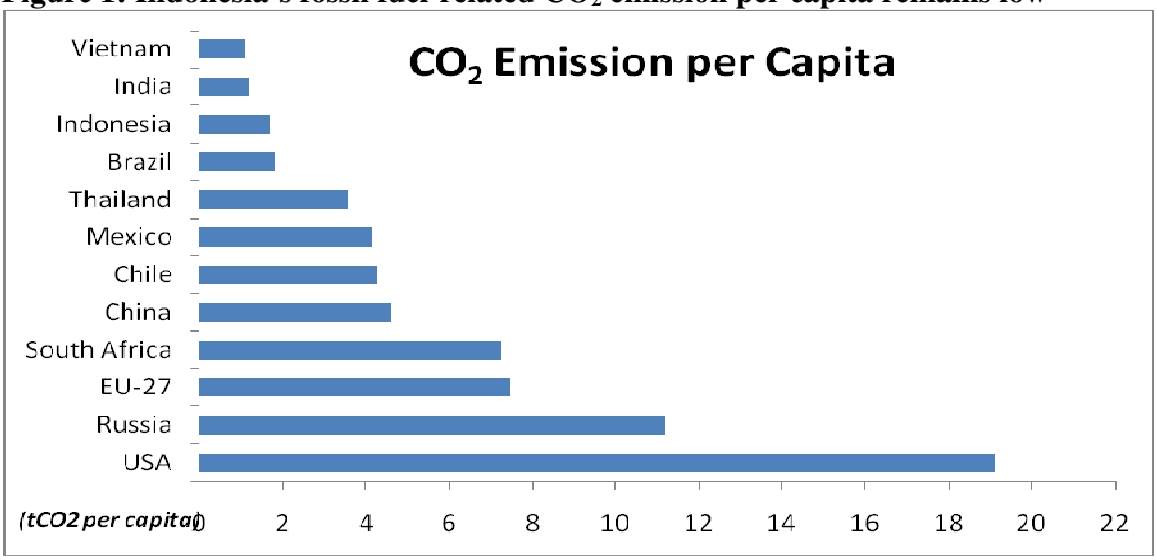
[4] National Greenhouse Gases Inventory was estimated using Tier 1 and Tier 2 of the 2006 IPCC Reporting Guidelines

Waste	151,578	153,299	154,334	154,874	155,390	155,609
LUCF	649,254	560,546	1,287,495	345,489	617,280	not available
Peat Fire[1]	172,000	194,000	678,000	246,000	440,000	451,000
Total with LUCF	**1,415,998**	**1,379,222**	**2,584,181**	**1,226,191**	**1,711,443**	**1,119,814 +LUCF**
Total Without LUCF	**594,738**	**624,676**	**618,686**	**634,701**	**654,162**	**668,814 +LUCF**

Note: 1. Emission from peat fire was taken from van der Werf et al (2008).
Source: Indonesia Second National Communication to the UNFCCC, 2009.

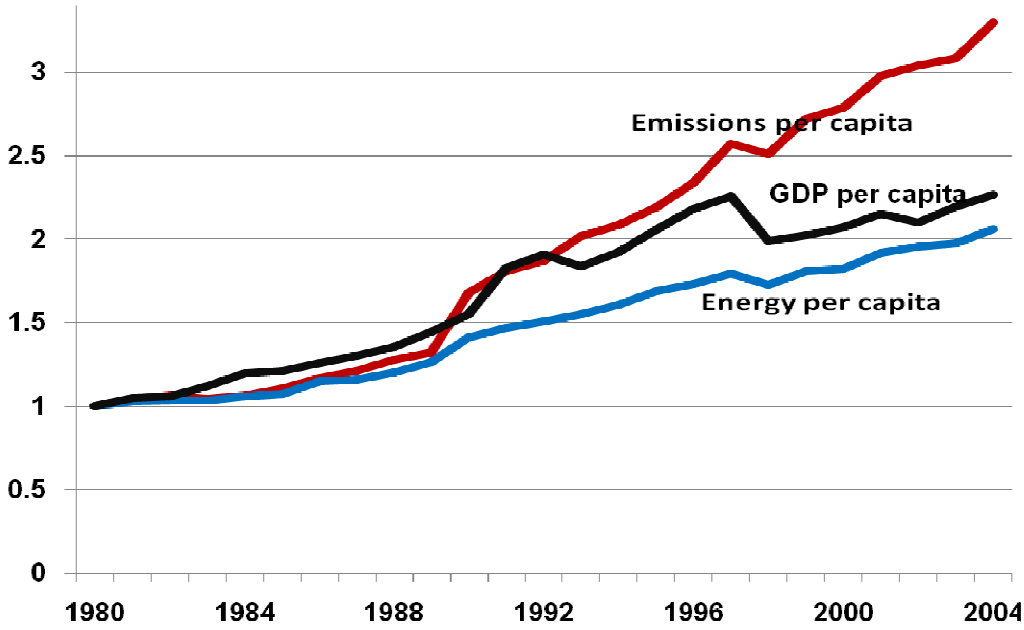
7. Energy use is the second largest source of GHG emissions behind LULUCF, and one of the fastest growing. Given its pace of growth, the IEA and other projections indicate that energy-related GHG emissions will become the dominant emission source by 2030. Although Indonesia's fossil fuel related CO2 emissions per capita remain low in comparison to other countries (Figure 1), its per capita energy use is increasing at about the same rate as GDP growth while emissions per capita (intensity) are increasing faster than GDP growth (Figure 2). This reflects the increasing contribution from the emission intensive sources such as coal for power generation and the rising use of motorized transport using petroleum-based fuels.

Figure 1: Indonesia's fossil fuel-related CO_2 emission per capita remains low



Source: International Energy Agency (2009)

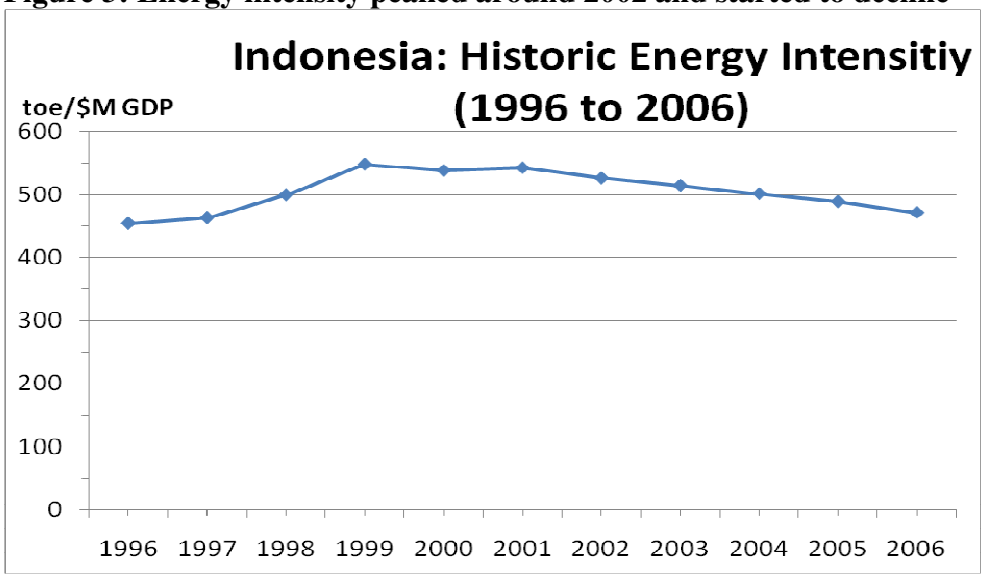
Figure 2: Emissions per capita outgrow GDP per capita



Source: IEA, 2007; cited in "Low Carbon Development Options for Indonesia," November 2008, supported by World Bank.

8. The *APEC Energy Demand and Supply Outlook of 2006* (APERC) and the International Energy Agency (IEA) *Indonesia Energy Policy Review of 2008,* both indicate that Indonesia's aggregate energy intensity (on GDP basis) peaked in the early part of this decade (Figure 3). According to the IEA, Indonesia's industrial and transport sectors continue to display high energy intensities, but residential energy intensity remains low and the country is also experiencing growth in the less energy intensive service sector. These studies also project the energy intensity in Indonesia to continue to decrease in the future, but these forecasts rely significantly on gains in energy efficiency.

Figure 3: Energy intensity peaked around 2002 and started to decline



Source: IEA, 2008.

9. The relative contributions of GHG in total emissions in 2004 by sectors utilizing fossil fuels are presented in Table 2. The data indicate that industry and electricity sector are both large sources of emissions, but that emissions from power generation, and to a lesser extent, from transport, are growing rapidly. The trend in emissions growth exhibited from 1994-2004 is projected to continue particularly due to the continued motorization in the country and the considerable coal-based power expansion presently underway.

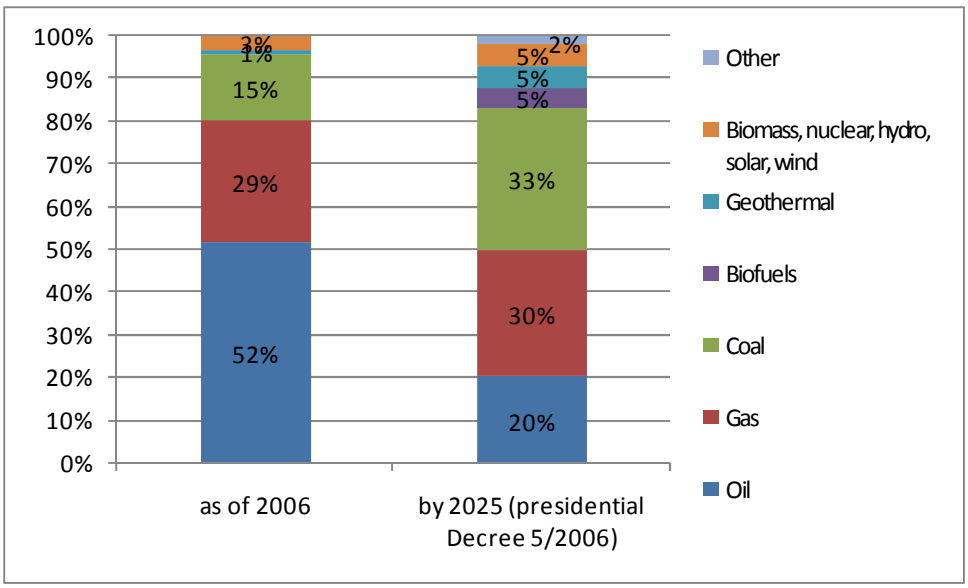
Table 2: Fossil Fuel Emissions by Fuel Source and Sector

Indonesia: Fossil Fuel Emissions ($MtCO_2e$ in 2004)						
By Consumption Group	**By Fossil Fuel Source**				**Share of Fossil Fuel Emissions**	**Emissions growth '94-'04**
	Coal	**Oil**	**Gas**	**Total Emissions**		
Industry	31.9	35.4	50.7	118.0	35%	48%
Electricity	54.9	25.2	9.9	90.0	27%	170%
Transport	-	78.0	-	78.0	23%	74%
Residential	-	41.0	9.0	50.0	15%	71%
Total	**86.8**	**179.6**	**69.6**	**336.0**	**100%**	**80%**

Source: IEA 2004, cited in "Low Carbon Development Options for Indonesia," November 2008, supported by World Bank.

10. The Presidential Decree No. 5 of 2006 (PerPres No. 5/2006) on National Energy Management maps out a development path that attempts to balance this growth in fossil fuels with the increased utilization of RE. It aims to enhance the country's energy security by expanding the utilization of alternate indigenous energy sources and reduce the reliance on oil that is increasingly imported. Based on the Presidential Decree, the GOI intends to increase the use of coal from 15 percent of overall energy use to 33 percent of energy use over 20 years, while also increasing the share of RE to 17 percent. The RE targets include 5 percent geothermal; 5 percent bio-fuels; a combined 5 percent for biomass, hydro, nuclear, solar, and wind; and 2 percent from other (unspecified) sources (see Figure 4).

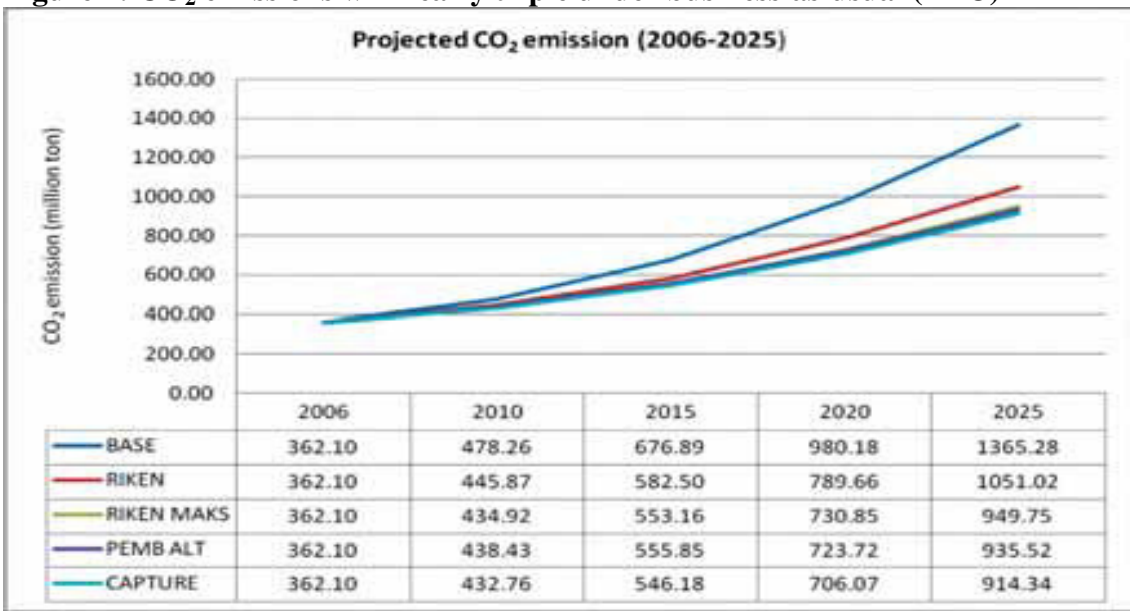
Figure 4: Increased role of coal as well as renewable energy under the Presidential Decree



Source: Ministry of Energy and Mineral Resources; Presidential Decree 5/2006

11. Despite the targets established in Presidential Decree 5/2006 for a more diversified energy mix, recent trends indicate that most of the power generation expansion has been dominated by coal-based technology without significant development of RE. Accordingly, the GOI's Technology Needs Assessment on Climate Change Mitigation (TNA, 2009) assumes a business-as-usual (BAU) outcome where future power generation is fully based on coal resources with negligible attempts for EE improvements and conservation measures. Under the BAU scenario Indonesia's emissions will nearly triple by 2025 (Figure 4 - BASE), mostly led by the emissions growth in electricity and transport sectors. Such a possibility in emissions growth is an important consideration for today's investments toward future emission reductions. Therefore, Indonesia's current development plans call for reducing emissions in the power and industry sectors through investments in RE and EE. The TNA analysis indicates that the BAU trajectory can be redirected through measures such as the application of EE (Figure 4 – RIKEN and RIKEN MAX), greater utilization of RE (Figure 4 – PEMPALT), and the introduction of advanced thermal technologies. Should Indonesia manage to follow an alternative path to the BAU emissions trajectory, it is likely to realize the energy mix targets established in Presidential Decree 5/2006 and the President's pledge to reduce emissions by 26 percent by 2020. Therefore, the GOI is requesting CTF support to develop key areas related to EE and RE where there is transformation potential that can contribute towards achieving its energy and climate change targets.

Figure 4: CO_2 emissions will nearly triple under business-as-usual (BAU)



	2006	2010	2015	2020	2025
BASE	362.10	478.26	676.89	980.18	1365.28
RIKEN	362.10	445.87	582.50	789.66	1051.02
RIKEN MAKS	362.10	434.92	553.16	730.85	949.75
PEMB ALT	362.10	438.43	555.85	723.72	935.52
CAPTURE	362.10	432.76	546.18	706.07	914.34

NOTES: BASE – Business-as-usual (BAU) scenario
RIKEN – Projection from BAU based on energy efficiency target of 15%
RIKEN MAX – Projection from BAU based on energy efficiency target of 30%
PEMB ALT – Projection from BAU based on application of advanced thermal power, nuclear and renewable energy technology
CAPTURE – Projection from BAU based on the application of advanced thermal power with carbon capture and storage technology

Source: TNA report, 2009.

12. Since the early 1990s, the GOI has been taking steps to address the energy and transport sector development challenges while attempting to address carbon related climate change impacts. These intentions are reflected in the following actions:

- Indonesia ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 through the Act on Ratification of Climate Change Framework Convention No. 6/1994. As part of the Indonesia's growing response to climate change, the country signed the Kyoto Protocol in 1997 and ratified it in 2004 through Law No. 17/2004.
- The RPJM will include new emphasis on climate change, low-carbon economic development, and energy security. EE and cleaner transport will feature prominently in the final version of the RPJM.
- The Ministry of Environment and the Agency for the Assessment and Application of Technology (BPPT) have prepared a Technology Needs Assessment for

climate change mitigation (March 2009), which provides a range of emissions reduction opportunities in energy, industry and transport sectors.

- GOI is creating the Indonesia Climate Change Trust Fund (ICCTF) which will support adaptation and mitigation activities with government and international donor contributions.
- The government has also prepared a Green Paper 2009 and the Second National Communications to UNFCCC.
- Energy Law No. 30 enacted in 2007 updates the legal framework for energy development. A series of enabling regulations and decrees support development of RE, biofuels, and coal bed methane. Energy subsidies to industry have been eliminated, while there are some attempts to reduce them to commercial and residential sectors. The new Electricity Law (UU 30 / 2009) provides an updated legal framework for the power sector.
- GOI sets ambitious targets in the energy sector: (i) providing 17 percent of total energy use from renewable sources by 2025; (ii) delivering 10,000 megawatt (MW) of new generation capacity in the proposed Second Fast-Track Program predominantly from RE with a special focus on geothermal power, which will contribute towards meeting the objective of 30 percent reduction of power sector emissions from BAU in 2025; (iii) improving EE to achieve demand side emissions reductions of 30 percent from BAU in 2025.
- The transport sector strategy includes (i) development of more efficient urban transport systems to facilitate a modal shift from private to public transportation, and (ii) development and deployment of cleaner fuels.

13. The GOI is committed to developing a low-carbon development path that moves away from the BAU approach towards a more climate friendly outcome. The GOI is developing a strategic, multi-year policy and investment program, as outlined in the *NAP* (2007, see Box1 on page 18) and the *Development Planning Response to Climate Change* (2008). Indonesia has embarked on a major policy-based borrowing program to support its own climate change development plans, with assistance from donors. The GOI is also establishing a climate change trust fund that can pool resources to support future efforts at adaptation and pilot projects. Finally, GOI is currently developing a low-carbon development strategy to highlight the way forward in implementing its comprehensive climate change related development agenda. These efforts are being supported by a number of donors and multilateral institutions that include Australia, Germany, Netherlands, the United Kingdom, ADB and the World Bank. To coordinate all of these climate change activities and establish the country's policy positions, the President of Indonesia has established the National Council on Climate Change (NCCC, *Dewan Nasional Perubahan Iklim*, DNPI) with representation from 15 ministries. Thus, Indonesia's commitment to climate friendly development is being demonstrated at the highest levels of the government making it a bright outlook for future prospects in this area.

2.2 Energy Sector

14. Indonesia is endowed with substantial energy resources that include both fossil fuels as well as a variety of RE resources. From the early days of independence until the

late 1990s, Indonesia was a major crude oil producer and exporter. Given this abundance, domestic consumption of petroleum products in the country was heavily subsidized, which also led to the development of the power generation subsector largely based on diesel and other petroleum-based fuels. By the 1990s, the crude oil reserve base was in decline and the Asian Financial Crisis contributed to the cessation of investments in new exploration as well as increasing the country's refining capacity. As a result, Indonesia has become a net oil importer. During this period, Indonesia also began to diversify its energy mix by developing its high quality coal reserves as well as its natural gas resources, which were being increasingly used for power generation. There was also a modest, yet significant, expansion of RE that included geothermal and hydro power. Despite this effort, Indonesia was unable to significantly reduce its dependence on petroleum-based fuels. The transportation sector continued to grow increasing its utilization of fuel while natural gas for domestic power generation became scarce since significant amounts were earmarked for exports.

15. Indonesia was at the epicenter of the Asian Financial Crisis in the late 1990s and its economy was badly affected and contracted significantly in its aftermath. As a result, there was excess power generation capacity in the country as the new millennium began. However, Indonesia has seen steady economic growth since, and the country's power sector has struggled to keep up with the high electricity demand growth triggered by the recovery. The financial position of the national power company (PT. Perusahaan Listrik Negara, PLN), already weakened by the crisis, further deteriorated due to the dramatic increase of oil prices on the international market from 2002 to 2008. PLN struggled to invest, requiring growing subsidies to maintain operations in a system that was still highly dependent on petroleum products where declining domestic production was being met with increasing levels of imports. Private sector investments also came to a halt during this period. Current power supplies barely keep up with demand which is increasing at around 8 percent per year, and brownouts and load shedding have become commonplace affecting economic growth and even ordinary consumers. PLN has estimated that some 2,500 MW of new power generation capacity is required each year in order to meet the growing demand. In 2006, the GOI devised the first "Fast-Track" program for the construction of 10,000 MW of coal-based power generation plants by PLN, which was viewed as the only readily available solution for utilizing abundant domestic coal resources to displace high-cost generation units in an affordable manner. This decision, along with existing heavy use of diesel, will further increase the country's dependence on fossil fuels, exacerbating local and global environmental impacts: an additional 10,000 MW of coal-fired power will add an estimated 55 million tons of CO_2 per year. Overall, estimates suggest that if this trend were to continue, it would result in a manifold increase in CO_2 emissions from the power sector over the next two decades.

16. In late 2008 GOI continued to expand its power generation capacity in order to keep up with demand by launching a Second Fast-Track Program to construct another 10,000 MW of capacity in which 60 percent will be comprised of RE, with geothermal accounting for about 4,800 MW and hydropower accounting for most of the other RE capacity. Geothermal power is one of the best options to diversify Indonesia's energy mix. It is a base load generation technology not subject to the intermittency and variability of most renewable electricity sources. As an indigenous energy source, it will

also enhance the country's energy security and serve as a natural hedge against the volatility of fossil-based commodity prices. As such, geothermal can directly displace coal-fired power generation. In addition, hydro power and biomass at various scales provide a useful opportunity to utilize local resources for grid-based power as well as for off-grid solutions to increase rural electricity access that will contribute towards alleviating poverty and improving people's quality of living.

17. The GOI has been reviewing electricity pricing and subsidy policies, since substantial economic distortions remain. Although some reforms have taken place, the aim is to further rationalize energy sector pricing, improving the targeting of subsidies to poor consumers, and promoting reforms necessary for the long term sustainable development of the energy sector. Energy subsidies still make up a substantial portion of the state budget. Since PLN continues to rely on petroleum-based fuels for a large part of their power generation, the increased international oil prices have driven their cost of supply from about US$0.06/kilowatt-hour (kWh) in 2004 to about US$0.12/kWh by 2008[5]. Since these price increases were not passed through at the retail level to consumers, PLN required a subsidy of US$6.5 billion in 2008 to cover the resulting losses. Fuel subsidies represent an even higher cost to the Government budget, although the GOI has eliminated them for some sectors such as power[6], industry and specific categories of transport[7]. As a result, the prospects for EE have improved, and opportunities will continue to get better as prices are further reformed and distortions are removed. Improved utilization of energy will not only make Indonesia economically more competitive, but also help reduce the strain on the power sector and reduce the burden on the national budget. Therefore, further rationalizing fuel pricing and subsidy policies remain an imperative for improving efficiencies, minimizing price shocks, and ensuring that the vulnerable are protected.

18. The GOI has also made strides to improve the policy environment so that reforms can take hold. The recently enacted Energy Law (UU 30/2007) and the Electricity Law (UU 30/2009) provide a renewed legal framework for the overall energy sector, with emphasis on economic sustainability, energy security, and environmental conservation. The Energy Law places high priority on development of domestic resources, including RE. The Electricity Law defines the regulatory and institutional framework for the power sector going forward, and is expected to further encourage RE and EE[8]. Therefore, the energy sector is at a crossroads where, with continued reforms and appropriate interventions, it can move towards greater efficiency in a climate friendly manner while protecting the poor.

2.3 Transport Sector

[5] Data from JICA, "Study on Energy Conservation and Efficiency Improvement in The Republic of Indonesia, Final Report Summary;" August 2009

[6] PLN no longer receives subsidized fuels, and its purchases reflect international market based prices. Therefore, PLN is no longer driven to favor one primary energy source over another because of the fuel subsidies.

[7] For example, the high grade gasoline for vehicles is no longer subsidized and domestic prices reflect levels based on international markets.

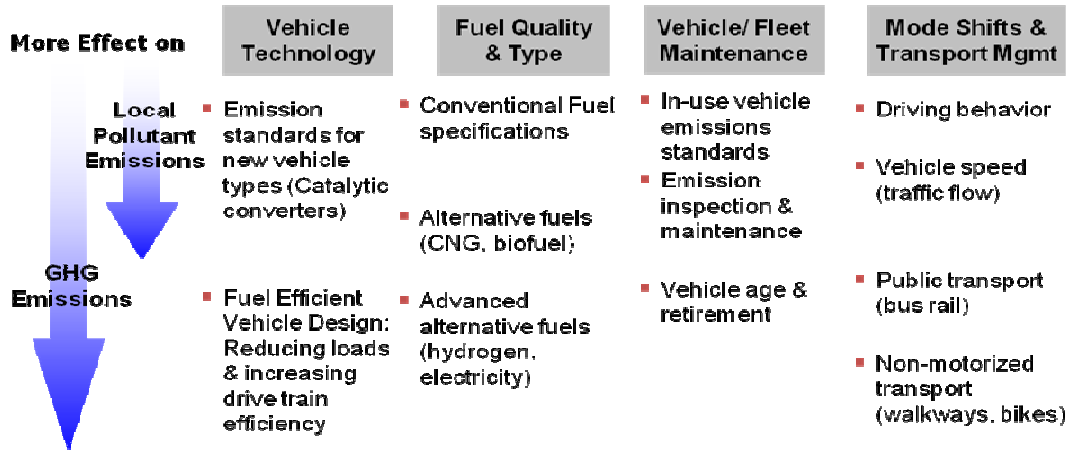
[8] For example, via provisions for open access that will allow RE producers to sell power "directly" to end-users.

19. The Indonesian transportation sector is currently the nation's largest consumer of petroleum products and a primary source of GHG emissions. Although emissions from the use of coal have been the fastest growing compared to other fossil fuels during the last decade, oil is currently the main contributor to total emissions. Almost all of the energy consumed in the transportation sector (99.7 percent) comes from three liquid fuels: gasoline, diesel, and jet fuel. Combustion of these fuels leads to about 75 million tons of CO_2 per year[9]. Gasoline and diesel contribute to over 91 percent of this total, dominating the transportation fuel market.

20. Figure 5 provides an overview of the factors affecting transport sector emissions. Categories of possible actions (across the top) include vehicle technology, fuel quality, vehicle maintenance, and modal shift. Within each category, there are a range of actions that can be taken, some of which have more effect on reducing local, hazardous pollution emissions (e.g., particulates, sulfates); while other actions have more potential effect on GHG emissions.

21. In keeping with its development position, Indonesia has made some progress with regards to vehicle technology, fuel quality, and vehicle maintenance. The GOI has imposed some standards on vehicle performance and fuel quality, but has not continued to upgrade and improve these standards over time similar to some neighboring countries. It is with this perspective that the GOI, faced with a variety of options to mitigate GHG emissions from the transportation sector, has thus far focused with modest success on fuel efficiency and quality. More efforts could be placed on developing attractive public transport systems that will lead to modal shifts from individual cars to public transport. Together, they would form a more comprehensive and integrated public transportation strategy leveraging all major factors that are responsible for the emissions arising from the transport sector.

Figure 5: Factors affecting transport sector emissions



Source: SwissContact, 2009. Analysis of Fuel Quality and Air Pollution Issues in the Road Transportation Sector. Technical input paper for low carbon options study for World Bank. With modifications from Kahn Ribeiro, et al, 2007.

[9] KLH, 2008.

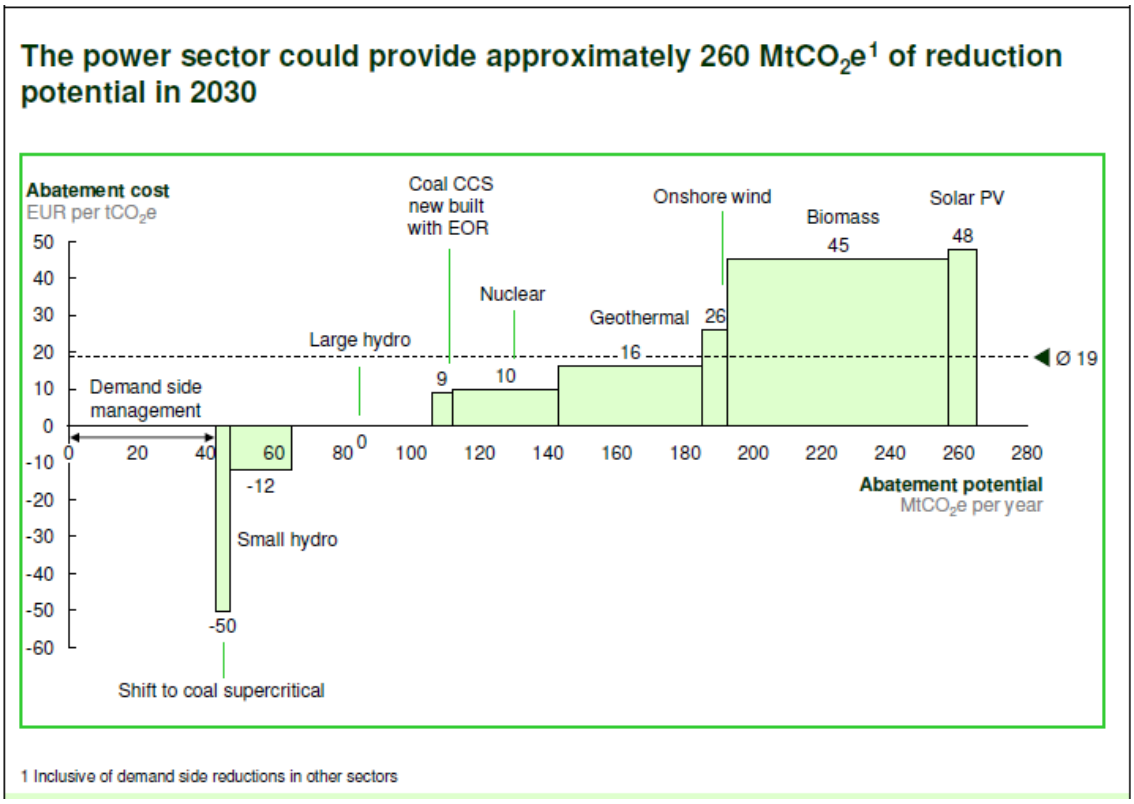
III. PRIORITY SECTORS FOR GHG EMISSION REDUCTION

22. The *NAP* (2007) provides analyses of GHG emissions and a comprehensive assessment and program for both adaption and mitigation. Mitigation targets for energy-related emissions include a 30 percent reduction from BAU during the period 2012–2025, and a 50 percent reduction from BAU during the period 2025–2050. Indonesia's *TNA* report (2009) includes energy modeling, technology assessments and cost estimates which indicate that over 30 percent GHG reductions are technologically feasible by 2025 (see Figure 4 above). Emission reductions would be achieved through acceleration and expansion of a combination of a broad spectrum of demand- and supply-side EE, accelerated development of RE systems, development of clean-coal plants, and deployment of carbon capture and storage from fossil-fuel power plants.

23. Based on technology and cost analyses presented in the 2009 *TNA* report, GHG reduction priorities are in industrial EE, EE and RE in the power sector, and cleaner transport. This is also substantiated by a recent draft marginal abatement cost curve (see Figure 6) presented by the NCCC in 2009, in which it highlights the ranking of costs and abatement potentials of mitigation options in the power sector, as the following: (i) EE and conservation, particularly industrial end-use efficiency; and (ii) RE, primarily geothermal, hydropower, and biomass. The third option, which is proposed for a second phase investment if CTF funding is forthcoming, is (iii) cleaner transport.[10]

Figure 6: Draft cost abatement curve for Indonesia's power sector

[10] At present, the GOI has not identified any transport sector projects in its dialogue with the MDBs; therefore, public transport interventions are proposed for a second phase of CTF support if funding is forthcoming.



Source: National Council on Climate Change, Indonesia, draft, 2009.

24. Indonesia's most recent policy document on climate change is the *Second National Communication under the UNFCCC* (November 2009). The Communication reports that energy is the largest non-land use source of emissions, growing from 333,540 Gg CO_2 in 2000 to 395,990 Gg CO_2 in 2005 which represents a 25 percent increase. The Communication further notes that, with RE and EE efficiency measures, emissions from the energy sector could be reduced by 2020 in a range between 35 and 40 percent compared with the BAU scenario. Mitigation options include increased power generation from new/renewable energy sources such as geothermal and increased EE in the transportation, industry and residential/commercial sectors.

25. Indonesia has also recently issued its *Green Paper* on *Economic and Fiscal Policy Options for Climate Change Mitigation* (Ministry of Finance, November 2009). For the energy sector, it proposes to: (i) impose a carbon tax/levy on fossil fuel combustion coupled with access to international markets, facilitated by negotiation of a "no-lose" target, and (ii) introduce complementary measures to incentivize EE and deployment of low-emission technology, exemplified by a specific geothermal policy strategy.

26. The identified GHG reduction priorities are being translated into actions (investments, programs and policies) through the following vehicles:

- *NAP* – the *NAP* (2007) calls for a range of mitigation actions in the energy sector revolving around efficiency and renewables. These were translated into a set of initial investments for 2008-09 by BAPPENAS through the *RPJM* (2008).

- Climate Change Roadmap – reducing carbon emissions from the energy and forestry sectors are pillars of the roadmap that seeks to bridge the period between the NAP and the National Medium-Term Development Program 2010-2014.
- Presidential commitment – the President of Indonesia has recently committed to significant reductions in future GHG emissions. He has asked that nearly half of these reductions come from the energy sector and by reducing waste. The Government is currently formulating its proposals for achieving these targets.

Box 1 – Indonesia's National Action Plan (NAP) to Combat Climate Change

Indonesia does not have any obligation to reduce its greenhouse gas emissions; however, it has demonstrated interests in playing an active role in the global efforts to tackle climate change. The NAP, which was released in November 2007, is a dynamic instrument to serve as guidance to various domestic institutions in carrying out a coordinated and integrated effort to address climate change. In the area of mitigation, the NAP identifies energy and land use change and forestry as key priorities where Indonesia will seek international cooperation and funding to support its effort. In the energy sector, the NAP establishes an emissions reduction target of 30 percent from BAU during the period 2012–2025, and a 50 percent reduction from BAU during the period 2025–2050. The three main priorities areas of focus are diversification toward renewable energy sources, improving energy efficiency in industrial sectors, and implementation of cleaner energy technologies. Under adaptation, the NAP aims to target a range of key areas, including climate information forecasting to manage risk; agricultural intensification and irrigation technologies; water resources management improvements; energy and water saving technologies in the industry sector; and health sector improvements to prevent disease, identify impacts, and utilize natural medicinal plants.

The NAP also focuses strongly on the need for institutional capacity building and for harmonization and revision of the regulatory policy framework for sustainable development management. The NAP outlines existing climate change response actions, including ratification of international agreements, creation of domestic institutions, passage of laws and regulations in the energy, minerals, and forestry sectors, and implementing programs to improve energy use, address forest and land fires, combat illegal deforestation, improve management of peat land, address flooding issues and conduct integrated coastal zone management. To implement the actions outlined in the NAP, Indonesia plans to utilize domestic public finance through new mechanisms and fiscal instruments; develop approaches for technology transfer from developed countries; and increase international support for its development priorities.

27. Beyond these specific actions, Indonesia has put forward three consistent development and climate change messages: (i) climate change cannot be addressed at the expense of the poor; (ii) climate investments must be consistent with development goals; and (iii) climate assistance must be on top of past development assistance commitments.

3.1 Energy Efficiency

28. GOI recognizes that EE gains are key to delivering improvements in commercial energy and electric power services. EE investments in particular can deliver benefits more quickly than large, capital-intensive, centralized generation plants. Indonesia's *2003-2020 National Energy Policy* and *Energy Blueprint 2005-2025* include EE and conservation components. These include operational elements common with the EE plans of many other nations. Successful operational agencies like PT Energy Management Indonesia have sound skills and experiences. Together they form a commendable platform from which to develop future EE and conservation efforts. The current policy framework also comprises the following key items:

a. National Energy Policy: Presidential Regulation No. 5/2006 and Presidential Instruction No. 10/2005 specifies the objective of reaching energy elasticity less than 1 in 2025 and energy mix in 2025 (oil can be reduced from 52 percent to 20 percent and the rest are to be contributed by gas (30 percent), coal (33 percent) and new and renewable energy (17 percent)). The enforcement of Presidential Instruction No. 10/2005 and its derivative (Ministerial Regulation 31/2005) are intended to enable EE investment opportunities.
b. Energy Law No. 30/2007 states that utilization of energy has to consider energy resources potential and availability, therefore, the utilization of energy has to follow energy conservation directives/policy and the provisions concerning energy utilization is to be regulated by a Government Regulation (derivative of Energy Law).
c. National Master Plan of Energy Conservation (RIKEN, Presidential Decree No 43/1991). Energy conservation target: 13 percent commercial/residential, 16.6 percent industrial, and 13 percent transportation sector in 1998/1999.
d. National Energy Policy (KEN) 2003–2020 provides the global energy conservation target of reduction of annual national energy intensity at 1 percent.
e. Presidential Instruction No. 10/2005 requires the government sector to perform EE measures in government buildings and transport facilities.
f. Ministerial Regulation No. 31/2005 outlines procedures and guidelines of energy conservation implementation.

29. The recently approved Electricity Law No. 30/2009 (Article 25) includes provisions to encourage use of local resources and RE, and stipulates that provision of electric power must "optimize the utilization of technology processes that are clean, environment friendly, and efficient." While this new law pertains primarily to supply-side operations, removal of energy subsidies to industrial consumers sends appropriate market signals to stimulate demand-side EE investments in the near term[11].

30. Industrial EE, CP, and RE present excellent opportunities for GHG reductions because investments generally can be implemented more quickly than energy supply additions, and reduction in energy end use has a multiplier effect up the supply chain: with current transmission and distribution losses of around 11 percent, 0.89 MW of end use savings offsets 1 MW of centralized supply. EE investments are typically one-third to two-thirds the cost of centralized generating plants (or less) and represent virtually permanent energy savings. Recent analyses indicate that GHG emissions can be reduced by 15–30 percent in industries, and 10–30 percent through demand side management programs targeting commercial and residential sectors (e.g., TNA 2009, ADB Energy Efficiency Initiative Inception Report 2007, and IEA 2008). The TNA 2009 report estimates that 15 percent EE gains would result in 190 $MtCO_2e$/year (see Figure 4 above).

31. Candidate sub-sectors identified for EE include: cement, iron and steel, petroleum refining and petrochemicals, fertilizers, pulp and paper, agro-processing, and textiles (TNA 2009). A variety of technologies are available for EE applications. Relatively low-

[11] Removal of fossil-fuel subsidies is also part of the pledge made by GOI together with other G20 countries.

cost opportunities exist in most subsectors for more efficient pumps, motors, and boilers. More efficient mills and co-firing with biomass are applicable to the cement industry. Waste heat recovery for power generation may be feasible for energy-intensive industries including cement and iron and steel. Energy recovery from waste streams is particularly applicable to the agro-processing (e.g., palm, rice, and sugar milling) and pulp and paper sub-sectors.[12] IFC's 2009 study of EE and RE opportunities in the rice and palm oil milling industries found that these industries can generate five times their own power needs by utilizing biomass waste for co-generation. Many firms within these industries are already using biomass waste to generate energy to meet their own needs[13].

32. Many industrial plants in Indonesia rely on captive power units, and almost all industrial facilities (as well as most commercial and residential buildings) maintain diesel-fired back-up generating units. Efficiency gains of 30–40 percent can be realized by upgrading back-up and captive generation units to micro-turbines, advanced cogeneration, and/or tri-generation (combined cooling, heat, and power). Existing diesel generator sets could also be re-tuned for co-firing of a diesel-biogas blend. Biomass cogeneration is being deployed on a few projects in some agro-industrial estates,[14] and biomass power is expected to expand as energy prices are further reformed and subsidies are phased out.[15] The feasibility of these projects depends largely on energy pricing and reliability of grid-supplied power; introduction of net metering could facilitate rapid implementation and scale-up. These factors will be carefully examined during the project preparation phase.

33. Potential supply-side EE opportunities which may be considered include: renovation of existing power plants, including technology upgrades for existing geothermal units; technical loss reductions in electricity transmission and distribution networks using advanced composite core conductors and "smart grid" technologies[16]; and advanced energy storage technology to optimize utilization of intermittent RE resources.

34. EE opportunities are attractive based on potential GHG reductions and the ability to implement projects faster than large centralized generation plants, but are challenging due to the continued weakness in the energy pricing regime, lack of in-country project experience, and limited commercial bank financing. However, rationalization of some energy prices has improved the prospects for EE, while the GOI has committed to the further removal and eventual elimination of subsidies in the sector[17]. Bilateral and multilateral supports can be mobilized for capacity building for local technical experts, while the CTF can assist in eliminating investment barriers by catalyzing commercial

[12] E.g., the PT Budi Acid Jaya Biogas Project utilizes methane recovery from wastewater for power generation. This was successfully registered as a CDM project in 2007.
[13] *Scoping Study on Clean Technology Opportunities and Barriers in Indonesian Palm Oil Mill and Rice Mill Industries: Final Report*, prepared by IRG Philippines for IFC, Jakarta, March 2009.
[14] E.g., the Nagamas Biomass Cogeneration project in Riau Province utilizes waste biomass from agricultural processing. This was successfully registered as a CDM project in 2006.
[15] Indonesia has removed fuel subsidies for certain sectors such as specific industries, which has enhanced the viability and prospects of the EE measures being sought by the proposed engagement.
[16] E.g., high-voltage direct current (HVDC) and advanced composite core conductor technologies can be deployed for expansion and upgrade of the power transmission grid, especially for inter-island connections.
[17] As indicated by GOI joining the G20 pledge to phase-out subsidies for fossil fuels

bank financing via risk-sharing facilities, mezzanine financing, and financial support for energy management and service companies[18] (see further discussion in next section).

3.2 Renewable Energy

35. Indonesia has a variety of RE sources with substantial potential. They include biomass, geothermal, hydropower, non-conventional gas, solar, and wind, which all remain relatively under-developed. The estimated power generation potential from each of these resources is summarized in Table 3 below:

Table 3: Estimated RE Potential in Indonesia

Resource	Potential capacity (MW, except as noted)[a]	Potential Generation Output (TWh/y)[b]	GHG Reductions ($MtCO_2e/y$)[c]
Biomass	49,810	343	274.4
Geothermal	27,150	217	169.6
Large hydro	75,000	328	262.4
Solar	4.8 $kWh/m^2/day$	N/A	N/A
Wind (Eastern Islands)	9,280	26	20.8

Sources:

[a] *RE potential from Ministry of Mines and Energy, cited in IEA 2008 Energy Policy Review of Indonesia, 2008; and TNA 2009.*

Notes:

[b] *Plant availability/load factors: biomass – 70 percent; geothermal – 90 percent; hydro – 50 percent; wind – 30 percent.*

[c] *GHG reduction assumes direct offset vs. coal at 0.8 tCO_2e/MWh.*

36. Indonesia has the world's largest known geothermal power generation potential at 27,000 MW, of which at least 8,000 – 10,000 MW is considered to be economically viable when its environmental benefits are considered. Although geothermal power has been utilized in Indonesia for over two decades, only a fraction of the potential resources – a little over 1,000 MW – has been developed thus far. However, geothermal power is one of the best options for expanding base-load generation capacity, as it is provides power on a "24/7" basis, providing reliable dispatch with plant availability factors which are typically higher than most similar power sources (e.g., more than 90 percent availability in many instances for geothermal vs.75-80 percent for coal). With most of the prospects identified on Sumatra (13,800 MW), Java and Bali (9,250 MW), and Sulawesi (2,000 MW), geothermal resources are also ideally located in proximity to the largest and fastest growing power demand centers in Indonesia. Therefore, developing

[18] The term energy service company (ESCO) refers here to a broad spectrum of potential service providers and does not specifically refer to the common international definition of ESCOs which work under performance and shared-savings contract mechanisms. In the Indonesia context, ESCOs may be expected to work in a variety of modes including stand-alone energy advisory services (audits and feasibility studies); engineering, procurement and construction management services; and performance contracting.

geothermal power can directly off-set an equivalent development of coal-based power and curtail the emission of GHGs. The GOI recognizes this opportunity which is a significant reason that geothermal capacity is so prominently represented in the next 10,000 MW Fast-Track Program to increase generation capacity. In fact, the GOI geothermal roadmap goes even beyond the 4,700 MW targeted by 2014 through the Second Fast Track Program, and aims to develop a total of 9,500 MW of geothermal power generation capacity by 2025 and help reach the RE target established in the Presidential Decree 5/2006.

37. The GOI has also taken significant policy and institutional measures in order to try and enhance the investment climate so that financing can be mobilized at a greater scale for geothermal development. In 2003, Indonesia issued the Geothermal Law (Law 27/2003), making geothermal the only RE governed by its own law. The Law, amongst other things, provided regulatory authority in the sector to the Ministry of Energy and Mineral Resources (MEMR), "grandfathered" existing developers rights to develop the fields already concessioned to them, and mandated future geothermal development opportunities to be offered through competitive and transparent tenders. To oversee sector development, the MEMR has also established a dedicated directorate for geothermal which is responsible for managing and regulating geothermal development in the country. Under the auspices of the MEMR, substantial survey work has already been undertaken resulting in the mapping of 250 geothermal sites across the country with high-temperature geothermal resources. Based on these prospects, the GOI has established a Geothermal Road Map with targets for overall sector development.

38. The GOI is also continuing with its long-term reform program in the sector aimed at addressing several of the key remaining barriers so that greater levels of financing can be mobilized in the sector. This effort is being supported by the WBG Geothermal Power Generation Development Project by the World Bank funded through a US$4 million GEF grant and additional transaction advisory services for tendering geothermal fields by IFC, as well as by other development agencies (see Annex 1 for more details). Some of these critical reforms include, amongst others, the development of a pricing and incentive policy for geothermal, the transparent and competitive tendering of new geothermal concessions in line with the Geothermal Law, addressing sector risks, and increasing domestic capacity. These reforms will be also supported by the proposed Climate Change Development Policy Loan (DPL) which the GoI and the World Bank will prepare in 2010. It is expected that policies supported under this loan will enhance the regulatory environment for greater investment in renewable energy sources and improved fossil fuel efficiency.

39. The GOI is also attempting to increase the use of carbon financing in order to help scale-up sector development, which is being supported by the World Bank, ADB, and others. The MEMR, with the assistance of the World Bank, is preparing a framework for the programmatic application of carbon finance so that emission reductions from geothermal power can be traded streamlined manner extending beyond the current Kyoto Protocol commitment set to expire in 2012 Carbon Finance Framework (CFF) for Geothermal Development, currently under development with support from the World Bank's Carbon Partnership Facility (CPF).

40. Although these key reforms are underway, it is also understood that improving the investment climate will take time before sector development can be progressively scaled-up, particularly to attract the necessary volume of private investments. There have been limited private investments in Indonesia over the last five years even in conventional power generation technologies such as coal[19]. In geothermal, there has been only a single expansion of an existing field by a private developer[20] that has come on-line during the same period, while there have been no development of the riskier "greenfields". Therefore, given the pressing need for increased power generation capacity and to meet the targets established in the Second 10,000 MW Fast-Track Program, the GOI has decided to immediately scale-up the development of geothermal resources that are under public control with key state-owned enterprises (SOEs) on a fast-track basis. In this regard, several SOEs have established dedicated subsidiaries for developing geothermal resources under their control. Pertamina, the national oil and gas company which has a history of developing geothermal resources in the country, has established Pertamina Geothermal Energy (PGE). They are expected to rapidly scale-up the majority of the resources that are publicly controlled. PLN has also established PLN Geothermal (PLN-G), which is also expected to contribute towards the GOI target by developing several prospective projects that have already been identified.

41. Biomass offers one of the best prospects for large-scale emissions reductions via distributed generation applications, and is technically viable where sufficient biomass resources are in proximity to industries which can deploy biomass cogeneration. Recent market assessment conducted by IFC concluded that some agro-processing enterprises could generate up to five times their internal demand, with the surplus available for export to the grid. These types of biomass power plants would be designed to operate 7,000 – 8,000 hours per year, and thus could provide dispatchable base-load power. However, security of biomass feedstock supply remains a limiting factor for developing reliable grid-connected capacity in other sub-sectors. Agro-processing, wood, and pulp and paper sub-sectors are good candidates for biomass cogeneration as a demand side efficiency supplement. The present prospective biomass energy pipeline is estimated by IFC to be at about 2,500 MW or larger.

42. Other prospective resources of RE are small hydropower, wind, solar, and solid waste. Each option has a good deal of potential to provide electrification solutions in remote areas where grid connections can be cost-prohibitive. Solar power has already been deployed in outer islands and other remote locations. Wind power has also seen limited development in Indonesia due to its high cost, intermittent nature and low wind speeds in the country, although the prospects in the eastern islands are estimated at about 10,000 MW. There is more wide-spread development of small hydropower resources, which could be expanded where resources are available. However, these renewable resources are also generally not likely to offset a base-load technology such as coal since they mainly operate outside the grid, often at household levels. Instead, they are more likely to offset emissions from traditional biomass (e.g., fuel wood and dung) and small

[19] PLN carried out a number of tenders for the private sector to invest in coal-based IPPs, yet none of them have reached financial closure. This was partly the reason that led to the Government-led, PLN implemented, first 10,000 MW Fast-Track Program to increase the country's power generation capacity.
[20] The Darajat geothermal field was expanded by 110 MW in 2007 by Chevron.

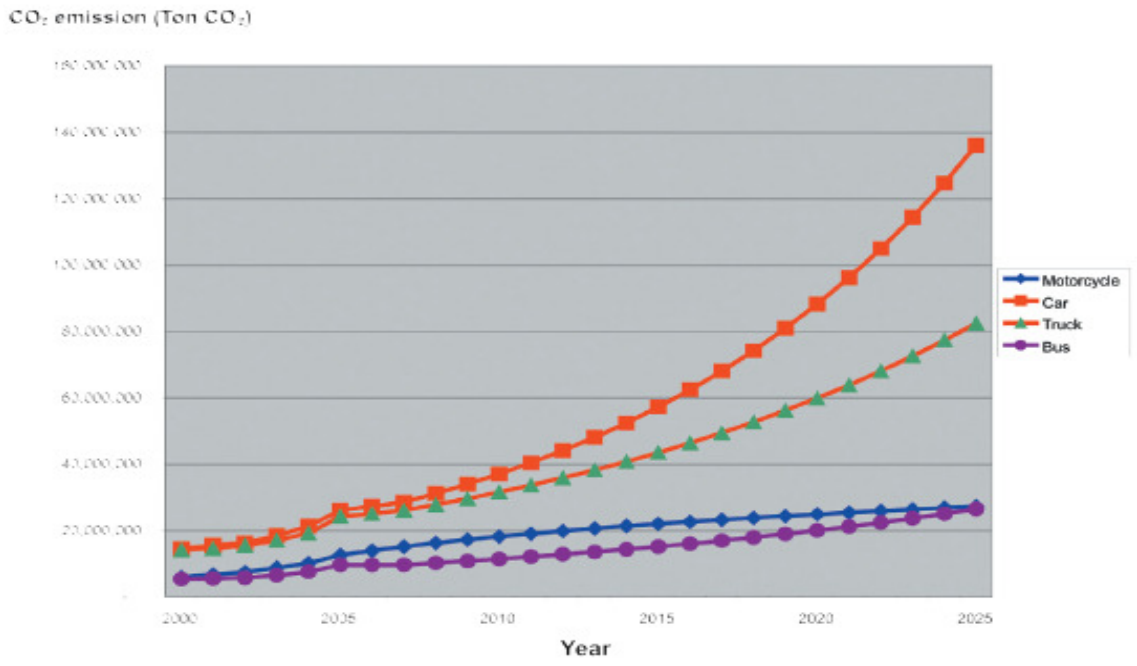
diesel generators. In order to encourage the development of these relatively abundant resources, the MEMR has issued a policy that aims to establish prices and provides for off-take by PLN for renewable opportunities of less than 10 MW in capacity. While the development impact would be high, emissions reductions from these renewable resources would be lower in comparison to the utilization of biomass and geothermal to offset coal-fired power in the grid.

43. The GOI has made RE a priority subsector for development in order to address their energy and climate change needs. It is one of the key subsectors that can help Indonesia move away from the increasing use of fossil fuels (as is the case of the BAU scenario), whereby the country can continue to meet its rapidly increasing power demand needs in an environmental friendly way. There is clear emphasis on developing geothermal energy, as it provides the best opportunity to develop the needed based-load capacity displacing additional use of coal. The GOI is strongly committed to the scale-up of geothermal power in place of coal, as indicated by the prominence of geothermal in the Government's development goals, the substantial reforms undertaken thus far towards this end, and the considerable coordination with international development agencies in this effort. Therefore, CTF support that will leverage multilateral development assistance will be critical in helping GOI achieve its objectives and targets in the sector.

3.3 Transport Sector

44. The transport sector in Indonesia is a significant GHG emitter due to its substantial consumption of fossil fuels. Road transportation consumes 88 percent of primary energy consumption in the sector. Without significant actions to reduce the carbon intensity of the road transportation sector, GHG emissions are projected to double in less than 10 years. Emissions are roughly split between use of motor petrol (gasoline) and diesel and the future projections of GHG emissions (Figure 7) are a matter of concern if current transport modal distribution and technology efficiency trends hold.

Figure 7: Projected vehicle CO_2 emissions in Indonesia



Source: TNA 2009

45. Several of Indonesia's major cities are becoming metropolitan centers in their own right, with populations of up to 5 million inhabitants. They are facing increasing difficulties in meeting their urban mobility needs as car and motorcycle ownership grows and congestion subsequently becomes a serious problem and a threat to their sustained growth. A mix of informal minibuses and regular buses provide inefficient, uncoordinated and unreliable transport services with high social and environmental costs (congestion, accidents, air pollution and GHG emissions).

46. The GOI has recognized these challenges and is taking appropriate steps to develop sustainable public transport systems. Indonesia is already a leader in introducing Bus Rapid Transit (BRT) to Asia through the TransJakarta Busway (December 2004) and is planning to extend this experience to other selected cities. More recently, the Government has amended the Traffic and Transportation Law 22/2009 which makes the provision of dedicated public transport lanes (i.e. BRT) a requirement for any city of more than half a million inhabitants.

47. BRT systems have relatively low capital and maintenance costs. If the share of buses in passenger transport were to increase by 5-10 percent, the CO_2 emissions would fall by 4-9 percent at costs in the order of US$60-70 per tCO_2. Home-grown examples such as the TransJakarta Busway provide evidence of environment friendly public transit options for Indonesia's growing cities. Since its opening, TransJakarta has expanded to ten corridors which operates Compressed Natural Gas buses and currently serves over 160,000 passengers a day. Over 20 percent of TransJakarta passengers have switched

from using private cars for some trips, and CO_2 emissions alone are being reduced at the rate of 20,000 metric tons a year[21].

48. CTF funding would enable the acceleration of a comprehensive preparation of the BRT projects, as well as an integrated public transport system development that may otherwise remain severely limited and at the stage of pilot operations. Clearly, even large Indonesian cities have financing and institutional capacity restrictions and would need support to be able to deploy an integrated BRT system to cover the entire metropolitan area.

IV. RATIONALE FOR SELECTED SECTOR OR SUB-SECTOR FOR CTF CO-FINANCING

49. CTF funding is proposed to contribute towards GOI's specific goals of (i) providing 17 percent of total energy use from renewable sources by 2025; (ii) delivering at least 60 percent of new generation capacity in the Second Fast-Track Program from renewable sources including geothermal power, which will contribute to meeting the objective of 30 percent reduction of energy sector emissions compared with the BAU estimate for 2025; (iii) improving EE to help achieve demand side emissions reductions of up to 30 percent from BAU in 2025; and (iv) achieving modal and technology shifts in transport.

50. The IP is proposed to be executed in two phases. Phase 1 comprises transformational, high-impact energy sector investments that are ready for implementation within the next 12 to 18 months. The requested CTF allocation for Phase 1 is US$400 million. Two investment programs are proposed: (i) significant and rapid scale-up of large-scale geothermal power development, through ADB, IBRD and IFC; and (ii) acceleration of investments in EE, RE including biomass, through ADB private sector operations and IFC.

51. Other sectors, for which GOI has not yet identified projects in its dialogue with the MDBs but which would be consistent with GOI priorities for GHG emissions savings would be slated for Phase 2 of the IP, subject to the availability of additional CTF funds. Indicative Phase 2 investments in low-carbon transport include Mass Rapid Transit, BRT, cleaner fuels, and vehicle efficiency improvements. Furthermore, the GOI may propose additional interventions in clean energy development that may include solar home systems and the expansion of smaller scale grid connected RE.

4.1 Geothermal Power Development Program

52. Geothermal development is a strategic priority for the GOI that meets both its energy and climate change needs. It is an abundant resource located in proximity to the major power demand centers in the country. Geothermal energy can provide reliable base load power generation while avoiding much of the local and global environmental impacts that result from coal, which would be the alternate choice in most instances. As

[21] Institute for Transportation and Development Policy, ITDP

a clean and renewable resource, geothermal can eliminate as much as 90 percent of the GHG emissions when compared with coal based generation and also virtually eliminates local pollutants such as sulfur dioxides (SO_2), nitrogen oxides (NOx), and particulates. Furthermore, geothermal serves as a natural hedge against the volatility that faces fossil-based commodity prices, whereby it is a useful resource to have in order to diversify and optimize Indonesia's energy mix. Being an indigenous and non-tradable resource, geothermal also enhances the energy security of the country. Given its world's leading potential, geothermal energy in Indonesia can have a transformational impact since it can be expanded at a significant scale to serve the burgeoning energy needs of the country. Geothermal development provides the best opportunity for Indonesia to reduce its reliance on coal for its increasing base-load power needs and alter the BAU trajectory of emissions that would arise from the continued expansion of coal based generation capacity.

53. Indonesia began to scale-up development of its geothermal resources in the 1990s. The current capacity of 1,050 MW, about 4 percent of the total potential, was mostly developed under a 1991 GOI initiative to develop about 4,500 MW of geothermal power under Presidential Decree 45/1991. Development stalled in the aftermath of the Asian Financial Crisis when most power purchase agreements (PPA) including geothermal contracts with private producers were suspended during the economic turmoil of 1997/1998. Some PPAs were subsequently renegotiated at much lower tariff levels or cancelled. Many other developers who had rights but were yet to develop their fields opted to transfer these assets back to public control either as a result of arbitration or the cancellation of their contracts. Indonesia has struggled to attract investments into the sector since the Asian Financial Crisis.

54. The GOI is now renewing its commitment toward geothermal development and is taking significant steps to revive the sector. As noted previously, there is a considerable program underway to reform the sector and mobilize investments, with significant actions already taken by the GOI with the assistance of development partners, while further reforms are under preparation. The GOI has also identified around 250 working areas and about 50 projects for a total of 9,076 MW that are ready for detailed exploration or exploitation. Of this total, there is about 700 MW of unexploited geothermal power potential under concessions to existing private developers and the larger share of about 3,000 MW with SOEs. Most of these resources are in areas which are close to load centers and where geological surveys have indicated the initial reserves, and are immediately ready for further expansion, making these fields priorities for development. The Second Fast-Track Program to add another 10,000 MW of power generation capacity to the national grid is part of the 10-year power development plan (RUPTL)[22] released in January 2009. At least 60 percent of the target under this program will need to come from renewable resources and geothermal will account for approximately 4,700 MW.[23] This will also help Indonesia to improve its energy mix with geothermal power accounting for nearly 8.5 percent of the total power generation by 2014, and provide the basis for the

[22] The RUPTL is a power expansion plan prepared by PLN in coordination with the GoI. It is PLN's optimized power development plan, taking into consideration critical assumptions that reflect the company's and the governments overall development objectives.
[23] This includes the estimated 3,700 MW of potential with existing private developers and SOEs.

continued expansion towards the GOI longer term target of developing 9,500 MW by 2025.

55. Despite its prospects, geothermal has been slow to develop in Indonesia. Geothermal development is capital intensive, and the proposed target in the Second Fast-Track Program alone can require total financing in the range of US$10–12 billion. This far exceeds private investments that are being made in the entire power sector, which has averaged only around US$350 million in recent years[24]. Furthermore, the nature of geothermal resources also presents geological and technical risks that are quite different from fossil-based power and even other renewable resources. There can be significant uncertainty when the upstream steam fields are being drilled in order to develop the "fuel" for the geothermal power plant. Each exploration or production well can cost between US$3-5 million in most instances, yet the steam production of each well can vary substantially[25]. Therefore, it is unpredictable as to how costly it may be to develop the steam field, particularly in the early stages of drilling when there is less information and understanding about field conditions. Furthermore, there is also limited domestic capacity in Indonesia including equipment manufacturing and technical expertise for planning, managing, and implementing geothermal developments, which also tend to drive up costs[26]. Due to the generally higher cost of developing geothermal and the associated risks, developers typically require a higher wholesale tariff for investing in geothermal compared with more conventional alternatives such as coal. Although these costs vary and depend on specific field conditions and developer preferences, preliminary estimates indicate that geothermal costs range from about US$0.067/kWh to US$0.078/kWh, although some estimates suggest costs could be even higher when developing certain fields[27]. In comparison, the cost of coal-based power is estimated to be around US$0.05/kWh, again, based on specific assumptions including the cost of coal supplies. The MEMR recently issued a Ministerial Decree (No. 32/2009) that recognizes the incremental costs associated with geothermal power development in Indonesia, and guides PLN to consider paying a power purchase price of as much as US$0.097/kWh. However, the Government is still in the process of developing a set of sources for funding these incremental costs[28], which is a vital part of any comprehensive pricing policy[29]. The GOI is also considering arrangements for sharing the upstream risks and field development costs to further incentivize developers. Once an adequate pricing and incentive program is implemented, then an increasing number of developers will be able

[24] World Bank Private Participation in Infrastructure Database, data from 2001-06.
[25] Including unproductive "dry holes", which are a risk faced by all geothermal projects.
[26] Although these costs remain high at present, it is likely that over the longer-term, a large expansion as the one proposed, will increase the economies of scale in the sector and can drive down costs by making geothermal development in Indonesia more wide-spread and efficient.
[27] These figures are based on preliminary estimates utilizing a number of assumptions. Other studies and estimates utilizing different assumptions may conclude price ranges that are different. However, there is general consensus that the perceived cost of geothermal development in Indonesia is higher than that of alternatives such as coal, whereby higher tariffs are required by developers before undertaking investments.
[28] "Someone has to pay" the higher financial cost of electricity from geothermal resources, and the options for GOI are to either pass the costs through to consumers and/or compensate from the Government budget and/or to sell emission reductions to generate carbon revenues to the extent possible. The GOI is in the process of developing such funding sources/mechanisms to support a geothermal pricing policy.
[29] The development of a comprehensive pricing policy is being supported by the World Bank through the Geothermal Power Generation Development Project by the World Bank funded through a US$4 million GEF grant.

develop their geothermal concessions since they will be able to secure a return on their investments commensurate with the risks they face in the sector. Over time, it is also expected that a geothermal expansion program of this size will result in economies of scale, enhanced domestic content, and reduced risk perception that would lead to lowering the cost of geothermal development making it more competitive with conventional power options.

56. The GOI is now at a cross roads where an opportunity exists for a transformational shift towards large scale development of geothermal to meet a significant part of its growing power demand needs. If successfully implemented, the proposed geothermal expansion program will help alter the BAU trajectory for emissions from the power sector. If this expansion were to fall short, then Indonesia would be compelled to seek alternative energy sources to supply its base-load generation needs by most likely reverting to an equivalent expansion of coal-based capacity in-line with the BAU scenario. Time is also of the essence in beginning the implementation of the Second Fast-Track Program since power shortages are already evident in many areas across the country. Any delay in the implementation of the geothermal development program would likely lead to coal substitution in order to cover the resulting shortage in power supply, which will end up increasing emissions from the sector. For example, a one year delay in the expansion of 1,000 MW (about one fifth of the Second Fast-Track Program) would result in 6.4 million tons of additional CO_2 emissions while this number would accumulate to over 19 million tons if the geothermal program were to stall for up to three years[30]. Moreover, once additional coal-fired plants are constructed, their environmental impact will be long-term because they are not likely to be decommissioned quickly and will operate for some time to come. Therefore, there is a compelling need and considerable urgency to particularly undertaking the priority development of resources that are already under the control of existing developers. This would result in considerable progress towards achieving the GOI geothermal development targets, and for Indonesia to meet its energy sector needs while at the same time reduce its future carbon footprint from the power sector.

57. The GOI is already undertaking considerable reforms with the assistance of its development partners to address some of the barriers and scale-up the development of its vast geothermal resources. However, addressing these barriers will take time before reforms take hold and investor confidence can be fully established. Therefore, given the development urgency, the GOI wants to make an effort, in parallel to its sector reforms, to rapidly scale-up the considerable geothermal resources under the control of SOEs so that they can meet the immediate power demand needs without compromising its climate change objectives. In this regard, the GOI has specifically requested the assistance of the ADB and the World Bank to help finance the immediate scale-up needs by providing loans to its SOEs. The GOI proposes to channel resources from the CTF to help fast-track these developments by addressing some of the barriers that still remain and would take longer to resolve. It is important to note that the impact of CTF funds will not be limited only to the immediate scale-up proposed in this Investment Plan. Instead, it will

[30] GHG reduction is estimated based on power plant operation of 8000 hours per year, and a coal emission off-set factor of 0.8 tCO_2e/MWh of electricity produced from geothermal resources.

also help strengthen the capacity of two key SOEs and generate considerable institutional learning amongst all the public and private stakeholders in the sector, thereby increasing the prospects of developing the remaining geothermal resources under public control. By the time the proposed investments are complete, the GOI fully expects to have successfully addressed a majority of the barriers that presently curtail development, so that the sector can continue to expand on a sustained basis. In fact, the proposed CTF supported intervention would be applied in coordination with activities in carbon financing[31] (see Annex 1 for more details) as well as policy reforms[32] (see Annex 1 for more details) so that the eventual impact will indeed be towards helping Indonesia achieve its long-term target of 9,500 MW of geothermal power generation capacity by 2025.

58. The proposed CTF intervention is to support GOI's fast-track efforts to develop geothermal by helping develop about 500 MW of additional generation capacity by co-financing ADB and World Bank public sector loans for investments. The investments would focus on geothermal fields that are at advance stages of readiness so that they can be implemented quickly to meet urgent power demand needs. The proposed new capacity could generate as much as 3,950 GWh of base-load power per year, directly offsetting coal-fired generation. GHG reductions estimated at about 3.2 $MtCO_2e/y$[33], which would result in *cumulative emissions savings* of 63 million tons over a 20-year plant life.

59. As previously noted, there have been little private investments in geothermal development in Indonesia in recent years. Furthermore, the decline in overall private funding for even conventional power sources provides an indication as to the limitations that the geothermal sector is likely to face in terms of attracting financing. In fact, the Government has tendered several batches of geothermal working areas for private development over the past couple of years, but these offers have attracted limited interest from developers and none of them have reached financial closure. Once pricing and other reforms are in place, geothermal tenders are expected to be more "bankable" to private investors, but the sheer magnitude of the financing requirements and recent history dictates a more measured approach to scaling up private participation with realistic expectations. It is expected that once a small number of geothermal fields are successfully awarded to developers, they can serve as a model for progressively increasing private participation in the sector over the longer term. Therefore, the GoI is keen to begin preparing several well structured transactions to tender new (unallocated) geothermal working areas (fields) with the intention of attracting some credible and qualified private developers. To this end, IFC is providing advisory services through BAPPENAS to help the GoI prepare several competitive tenders to be offered for either sole private development or as a part of a public-private partnership (PPP). If two of these tenders achieve financial closure, it could result in the initial development of about

[31] Carbon Finance Framework (CFF) for Geothermal will provide long-term access to carbon funds for all interested and eligible geothermal developers.
[32] Geothermal Power Generation Development Project by the World Bank funded through a US$4 million GEF grant, is assisting GOI address some key reforms, which will also benefit all geothermal developers.
[33] GHG reduction is estimated as follows: 500 MW x 8000 hours per year operation = 4 million MWh per year. This offsets coal-fired emissions at 0.8 tCO_2e/MWh = 3.2 $MtCO_2e/y$ reduction.

200 MW of geothermal capacity. As a part of structuring these investments, consideration would be given to possible revolving fund or other mechanisms that can reduce the technical drilling risks and help towards confirmation of geothermal resources which would reduce the risks faced by private developers before they undertake substantial field development. IFC is also in dialogue with a private sector developer who is considering expanding the development of a geothermal field where they already have a concession. This could yield an additional 100 MW of geothermal capacity financed by the private sector. In total, the private sector support could lead to the development of up to 300 MW of capacity, which would generate as much as 2,400 GWh of base-load power per year, directly offsetting coal-fired generation. The resulting GHG reductions are estimated at about 1.9 $MtCO_2e/y$, which would result in *cumulative emissions savings* of about 38 million tons over a 20-year plant life.[34]

60. The *replication and scalability potential* for geothermal power in Indonesia is more than 4,000 MW of capacity in the next 10 years, with an additional capacity of at least 4,000 MW by 2025. It is important to note that no other country in the world has such a large scale-up potential for geothermal power development. The CTF supported investments are timely as it will help immediately begin the scale-up of the GOI geothermal program, while also establishing and strengthening key institutions so that efforts can be replicated on a sustained basis for developing geothermal resources through the public sector. Furthermore, these initial geothermal investments will provide valuable benchmarks that can be then utilized in the formulation of sector policies through the ongoing reform program. For example, CTF-supported investments would result in a better understanding of geothermal field development costs and performance benchmarks, which could contribute towards refining the pricing policy to more accurately reflect the sector requirements. Presently, such information is limited leading to erroneous and speculative design and calibration of policy that often prove to be ineffective. As the policy environment and the investment climate improve, the private sector engagements proposed for CTF support will also begin to take shape so that private financing can be progressively mobilized towards sector development. The ultimate objective is to mobilize sufficient investments to achieve the GOI target, which will require complementing investments from both public as well as private financing sources.

61. There are a number of *development impacts* (economic and social co-benefits) that will arise as a result of the proposed engagement. First and foremost, Indonesia would enhance its energy security by developing an indigenous energy source and will stabilize the cost of power generation by serving as a hedge against the volatility of fossil based commodity prices. The expanded and improved power supplies in proximity to the large demand centers would help eliminate the blackouts that have become common place across Indonesia. As a result, it could spur industrial development, create employment, and increase people's welfare. Furthermore, the greater availability of power supplies would better enable PLN to achieve the GoI's objective of providing

[34] GHG reduction is estimated as follows: 300 MW x 8000 hours per year operation = 2.4 million MWh per year. This offsets coal-fired emissions at 0.8 tCO_2e/MWh = 1.9 $MtCO_2e/y$ reduction.

electricity access from the present 65 percent[35] of the population to 90 percent by 2020. Through the utilization of a cleaner fuel source, geothermal development will also result in *environmental co-benefits* in the form health and other improvements due to reduced emissions of local pollutant (NOx, SO_2, and particulate) from avoided coal-fired power plants.

62. *Priority activities* are to utilize CTF funds to complement multilateral financing to increase the viability of developing geothermal resources in Indonesia. They would largely focus on blended financing to reduce incremental costs and cover risks associated with sector development. The CTF resources can be specifically utilized in a number of ways that could include: (i) reduce geothermal field exploration and exploitation risks through financial instruments (i.e. risk sharing, insurance), (ii) additional costs for deployment of advanced drilling technology, (iii) 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, (iv) interest rate buy-down to improve financial returns commensurate with risks, and (v) develop domestic technical and managerial capacity to adequately undertake the proposed rapid expansion. It is expected that a combination of upstream risk reduction efforts, concessional financing, and the utilization of carbon funds can significantly bridge the incremental costs and associated risks in order to help with the upcoming immediate scale-up of geothermal power in Indonesia. Furthermore, the domestic capacity built through these projects along with the benchmarks they provide as input into further enhancement of the policy environment, will support the sector to continue developing over time to achieve the long run target established by the GOI. The intervention proposed for CTF financing comes at a critical time since it will kick-start the GOI geothermal program without delay, and help avoid the potential for a significant further increase in emissions that would occur in its absence through the increased use of coal. Results indicators for the geothermal program are summarized in Table 4.

Table 4: Results Indicators for Geothermal Subsector

Indicators	Baseline	Investment Program Results
Installed Grid-connected geothermal power	1,050 MW	800 MW new capacity
Estimated annual GHG emissions reductions	6.7 $MtCO_2e/y$	Additional 5.1 $MtCO_2e/y$
Replication toward GOI goal of 5 percent of total energy from geothermal by 2025	< 3%	10,000 MW economically viable potential (>5%)

Source: CTF joint mission 2009

63. The *additionality* of the geothermal program is evident in the (i) re-invigoration of the geothermal development program in Indonesia with prospective replication of several thousand MW of power generation capacity, (ii) direct mitigation of an equivalent

[35] According to the data provided by the MEMR and cited in the APEC Energy Demand and Supply Outlook 4th edition, the electrification ratio in Indonesia is 65 percent as of 2009.

quantity of power that would otherwise be generated from coal, which would result in the reduction of GHGs as well as local pollutants, (iii) acceleration of immediate planned investments that have been back-logged in recent years and avoid the environmental costs of further delays, (iv) realization of additional expansion and new projects as the backlog is cleared, including some through private financing sources, (v) enhancement of the policy framework for geothermal investments due to advisory services and establishment of benchmarks through the proposed investments, and (vi) strengthened capacity at domestic institutions to support the continued scale-up of geothermal in Indonesia. The proposed geothermal program is discussed in more detail in Annex 1.

4.2 Energy Efficiency and Renewable Energy

64. The *NAP* (2007) and *TNA* (2009) analyses indicate there are considerable opportunities for improvement in end-use EE, combined with CP and RE. The peak electricity demand reduction realized through EE alone could amount to 2,500 MW[36] of virtual power per annum, or roughly equivalent to the existing annual electricity shortfall identified by PLN. The huge biomass energy potential (see Table 3) is amenable to smaller-scale applications, typically in the range of 5 – 10 MW.[37]

65. ADB market assessments conducted during 2009 conservatively estimate Indonesia's EE retrofit requirements to amount to US$3 billion, of which US$1.1 billion for EE improvements in electrical equipment, US$1.0 billion in EE improvements in existing coal-fired systems, and US$0.9 billion in EE improvements in diesel-fired plants.[38] An additional US$1 billion (US$800 million in electrical equipment retrofits and US$200 million in operating efficiency improvements) is required to finance the building retrofit requirements of shopping malls, office buildings, and hotels. Most of the US$4 billion can be funded through commercial lending at 3-6 year terms for equipment with an average 8-10 year life, to realize energy savings of 15-30 percent per year (based on recent energy audits conducted in ADB DMCs). IFC has independently assessed the EE/CP/RE market potential at around US$5 billion for EE, and an additional US$5 billion for RE using renewable resources such as biomass (most of which is currently disposed as solid waste).

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[36] Sadiq Zaidi, Senior Energy Advisor (ADB), Bappenas under RETA 6392: Supporting the Implementation of the Energy Efficiency Initiative in Developing Member Countries. ADB's EE market assessment in Indonesia (concluded in 2008), indicates the industrial sector consumes 40.42 MMToe/y (41.3 percent in coal, 25.4 percent in natural gas, 20.8 percent in kerosene/diesel, 11.4 percent in electricity, and 1.1 percent in LPG).

[37] Larger biomass power plants are possible, e.g., up to 50 MW, but are limited in practice by the "catchment area" of feedstock, typically about 35-50 kilometer radius from the project site.

[38] ADB (A. Ablaza) estimates the EE potential in the Indonesian industrial sector (at 30 percent participation rate) as follows:

- Potential annual savings in MMTOE: 0.96 MMToe/y (0.21 MMToe/y in electricity, 0.50 in coal-fired, 0.25 in kerosene/diesel-fed)
- Potential annual savings in US$: US$738 million/yr (US$362 million in electricity, US$205 million in coal-fired, US$171 million in kerosene/diesel-fed)

ADB's EE market assessment in Indonesia (concluded in 2008), indicates the industrial sector consumes 40.42 MMToe/yr (41.3 percent in coal, 25.4 percent in natural gas, 20.8 percent in kerosene/diesel, 11.4 percent in electricity, and 1.1 percent in LPG).

66. There are a number of barriers to widespread EE, including up-front costs, a fragmented array of products and end-users covering hundreds of thousands of buildings and millions of devices, project transaction costs, and a lack of awareness that efficiency exists as a "fuel source" itself. Barriers to RE, in particular biomass, are mainly due to lack of biomass feedstock mapping which presents feedstock supply risks, low wholesale tariffs offered by PLN for grid-connected biomass and other small-scale RE power plants, and a lack of commercial financing.

67. The dispersed nature of these opportunities requires mechanisms for market aggregation and financial intermediation. Enterprise-level solutions must be tailored to the various end users, as the various sub-sectors have different challenges and opportunities, for example:

- Labor-intensive industries such as textile, garment, shoe manufacturing as well as the food and beverage industry and ceramics industry are also the largest employers and thus fulfill national policy objectives on regional development, as well as with respect to income generation for semi-skilled workers and new entrants into the labor force. The larger exporting enterprises will also need to improve compliance with new international standards related to deployment of energy efficient technologies. In 2011, the International Standards Organization (ISO) will introduce ISO 50001, an energy management standard that will foster long-term increases in EE.[39] Indonesia's industrial exporters will also be required to ensure compliance measures and begin upgrading industrial processes according to the benchmark in order to remain part of international supply chains.
- Industrial estates, particularly with large foreign-invested enterprises, have an interest in showcasing Corporate Social Responsibility and showcasing new systems such as co-generation and tri-generation.
- Residential EE solutions, in particular the reduced monthly energy bill through improved and upgraded appliances (refrigerator, plasma TV, etc.), require specific consumer focused financial products and verification of manufacturers' standards for household electrical appliances ("white goods") and other electronic devices.

68. At present, commercial banks, energy service companies (ESCOs) and the industry associations have a significant need to improve awareness of the commercial financing, and the risk offsets, that have been introduced in other major middle income countries. ADB has been evaluating the EE market and exploring opportunities to facilitate EE financing by Indonesia's commercial banking sector. IFC is also building awareness in the banking sector through its client network focused upon commercial banks. The project is modeled after successful commercial projects ongoing in Russia, China, and other countries. Based on interactions to date, commercial banks are keen to service this potentially large market, provided appropriate concessional financing instruments and technical support are made available to design appropriate financial

[39] Based on broad applicability across national economic sectors, the standard could influence up to 60 percent of the world's energy demand. Corporations, supply chain partnerships, utilities, energy service companies, and others are expected to use ISO 50001 as a tool to reduce energy intensity use and carbon emissions in their own facilities (as well as those belonging to their customers or suppliers) and to benchmark their achievements.

products, build capacity of staff to analyze the financial viability and risk profile of EE and RE projects, create partnership alliances with appropriate technology suppliers, and improve coordination with ESCOs on the conduct of energy audits for existing portfolio clients.

69. In order to facilitate EE market penetration, ADB proposes to focus first on the most commercially viable EE projects in order to create a demonstration effect for commercial banks and for industry on the net benefits resulting from basic EE technology (operations and management cost benefits resulting from using one large piece of equipment such as a new chiller or boiler, as opposed to an entire industry process upgrade). ADB's EE activity will therefore address the EE retrofit requirements of commercial building owners and operators, government buildings that are in arrears with payment of energy bills, commercial buildings, and industrial parks (heat conversion).

70. IFC's program will focus on developing tailor-made financial packages that include capacity building of commercial bank partners to lend to clients for EE (agro-processing, textile industry, amongst others) and RE (in particular, biomass). IFC can provide various financing instruments in order to build commercial banks' portfolios of EE and RE loans. Indonesia's commercial banks, particularly its private commercial banks have liquidity, are well capitalized, and are capable of expanding their lending into new sectors. Banks are conservative, however, and highly risk-averse, and bank personnel are not generally skilled in technical analysis of EE or RE. IFC's approach in Russia, China, the Philippines and now Indonesia is to help banks to target initially their existing clients; since all businesses use energy, practically all businesses have opportunities to realize energy cost savings. In addition, IFC has uncovered significant opportunities for RE projects such as in palm oil mills that can switch from traditional diesel fuel to biogas for their gensets and vehicles, of which biogas can be sourced from their own waste biomass (primarily palm oil mill effluent, or POME, but also from fiber and shells, and empty fruit bunches). Many of these mills have existing banking relationships, but their banks do not have sufficient capacity to understand the dynamics of EE projects, and therefore believe them to be risky, which is not, in fact, the case. Furthermore, there is an opportunity, should PLN's pricing for RE from biomass be made more attractive, for these mills to supply any excess electricity that they can produce to the grid. IFC estimates that the market for financing new equipment to support widespread fuel switching in the palm oil milling and rice milling industries is approximately US$3 billion. The value of equipment financing to support equipment upgrades to be able to use existing biomass feedstock to produce a maximum amount of energy - assuming the excess could be supplied to PLN - is estimated at US$2 billion. IFC has projected that the market for equipment financing related to EE is US$5 billion. The potential financing needed to take advantage of existing EE and readily available biomass RE opportunities, therefore, is US$10 billion.[40]

71. CTF co-financing is proposed to provide the necessary financing packages to transform the behavior and improve the capacity of commercial banks to analyze EE and

[40] Calculations developed by IFC Sustainable Energy Finance Project team in Jakarta, October 2009, supported by analysis contained in *Scoping Study on Clean Technology Opportunities and Barriers in Indonesian Palm Oil Mill and Rice Mill Industries,* cited above.

RE projects, develop an EE and RE project pipeline and build capacity on EE assessment among the industry groups, industrial parks, and technology providers thus building the EE knowledge network. The EE/CP/RE investment program will be coupled with advisory service components which could include the following activities:

a. Facilitate coordinated Technical Assistance (TA) across commercial banks, industry associations, ESCOs, and equipment providers to create a "knowledge network" on EE finance solutions and supporting financing instruments.
b. Undertake due diligence of ESCOs in order to assess debt or equity financing to improve ESCOs' financial leverage and their ability to scale up performance bond issuance over the medium-term;
c. Work with pre-screened commercial banks with large portfolio exposures in the commercial building sector in order to "scale-up" EE financing for commercial building owners, operators, and other businesses with EE opportunities in need of financing;
d. Engage major industry associations into knowledge networks that can enhance understanding of specific industry upgrade technologies and create linkages with major international equipment suppliers;
e. Determine the need to offset risk for term loans of longer than 3 years through ADB Partial Credit Guarantee (PCG) facility to offset and mitigate term exposure by commercial banks;
f. Scale up EE financing activities with the commercial banks across major industrial sectors and assess options to partner with ongoing Government incentives on e.g. VAT exempt equipment import to facilitate industry process upgrading;
g. Undertake due diligence (financial and energy audit) on major SOEs to facilitate debt finance for EE upgrades –particularly in the cement, fertilizer and iron and steel sector.

72. *Priority activities* are to create and implement measures to promote large scale mobilization of commercial financing for the EE/CP/RE market. CTF resources are proposed to cover additional costs and risks including: (i) cost reduction of PCGs and risk-sharing facilities provided to commercial banks, (ii) additional cost for deployment of advanced technologies, e.g., co-generation and tri-generation systems; and (iii) interest rate buy-down to improve financial rates of return. Results indicators for the investment program are summarized in Table 5.

Table 5: Results Indicators for EE/CP/RE Investment Program

Indicators	Baseline	Investment Program Results
Installed EE/CP/RE systems in commercial and industrial subsectors	0	2.0 Mtoe energy savings
Estimated annual GHG emissions reductions	0	5.5 $MtCO_2e/y$
Replication toward GOI goal of 30 percent reduction in GHG emissions from efficiency gains by 2025	0	10 Mtoe energy savings per year

Source: CTF joint mission 2009

73. The *replication and scalability potential* is estimated at 2,500 MW of virtual power capacity from EE and new RE capacity of at least 1,000 MW by 2020. This would offset about 5.5 $MtCO_2e/y$ from new coal-fired power plants. Most of the professional services required for the investment program will be locally sourced, as well as a large portion of hardware (except for the principal equipment such as advanced co-generation and tri-generation sets).

74. The development impacts (*economic and social co-benefits)* include industrial development and jobs creation. EE in the industry and commercial sub-sectors will deliver direct benefits via reduced energy consumption. Investments in EE would have substantial direct and indirect impact on poor consumers by reducing household energy expenses, and reducing public sector energy expenses associated with energy subsidies and importation of expensive fuels, which will free up funds for other development initiatives. *Environmental co-benefits* will be realized in the form of reduced NOx, SO_2, and particulate emissions from avoided extraction and use of fossil fuels in industrial applications and avoided coal- and diesel-fired power generation. CP interventions will also reduce solid waste and wastewater generation.

75. The *additionality* of the investment program is (i) creation of new financial services for expansion of the EE/CP/RE market, and (ii) creation of virtual energy resources that will avoid the need for additional coal-fired power generation and reduce the intensity of other fossil fuel consumption. As the market expands, economies of scale can be expected via bulk procurement of equipment, improved investment analysis, and expanded local production of required equipment and materials. The proposed EE/CP/RE program is discussed in more detail in Annex 2.

V. ENABLING POLICY AND REGULATORY ENVIRONMENT

76. The enabling policy and regulatory framework that is relevant to the IP is summarized in Table 6 and discussed below.

Table 6: GOI Energy Policy Framework

Sector / Sub-sector	Key Policies	Expected Outcomes	Issues / Comments
Final Energy Mix	Electricity Law UU 30/2009 and Energy Law UU 30/2007 provide new legal framework for overall energy sector development	Restructuring of PLN to begin in 2010 Final energy mix by year 2025:	Electricity Law UU 30/2009 requires implementing rules and regulations GHG emissions will

Sector / Sub-sector	Key Policies	Expected Outcomes	Issues / Comments
	PerPres 5/2006 on National Energy Policy KepMen 2270 K/31/MEM/2006 on Supply and Liquid Coal Utilization PP 71/2006 on PLN assignment as executor of fast-track coal power program PP 72/2006 establishing coordinating team for fast-track program PP 86/2006 on GOI guarantee for fast-track program	Oil = 20% Gas = 30% Coal = 33% Geothermal = 5% Other RE = 12%	increase by 80% above current levels by year 2025-2030 Additional coal supplies may be constrained by transport bottlenecks. Mine-mouth coal power plants may face transmission system bottlenecks
Energy Efficiency	KepMen ESDM 002/2004 on Green Energy Policy InPres 10/2005 on Energy Efficiency PerMen 31/2005 on Energy Efficiency Implementation	Law UU 30/2007, Article 25 provides for incentives to be offered; implementing regulations to be drafted. Other decrees and regulations provide implementing instructions	EE still faces financing barriers partly due to the non-physical nature of the "assets" and limited information about its' opportunities
Renewable Energy	Law UU 27/2003 and PP 59/2007 on geothermal development KepMen ESDM 1122K/30/MEM/2002 on small distributed generation from renewable energy sources PerMen 002/2006 on medium scale distributed power from renewable energy InPres 1/2006 on biofuel supply and development	Framework supports addition of 8500 MW geothermal power by 2025 PLN will buy power from power plants < 1 MW and from plants between 1 and 10 MW on 10-year contract basis Tariff offered to small and medium power plants is 60% of PLN's average cost of production if	Tariff offered for geothermal by PLN is less than the cost of most geothermal developments and associated risks. Therefore, a pricing and incentive policy is necessary to mobilize investments and accelerate development. Tariff offered to small and medium power plants is

Sector / Sub-sector	Key Policies	Expected Outcomes	Issues / Comments
		connected to low voltage grid and 80% if connected to medium voltage grid	effectively lower than PLN's base cost of supply, which severely limits development of RE. Revised pricing policy is required to provide adequate incentives for RE development.

Source: GOI documents, CTF mission team

77. The Energy Blueprint 2005-2025 was developed to provide guidance on securing a sustainable energy supply; under the "Optimizing Energy Management" scenario, the projected primary energy supply in 2025 shows RE playing an increasingly important role, particularly for geothermal and biofuels. The potential for geothermal is large; the current policy objective is to expand geothermal to 5 percent of total energy supply by 2025. As discussed in previous sections, a pricing and incentive policy is required that would enable developers to secure a sufficient return on their investment commensurate with the risks they are taking, if there is to be rapid expansion of geothermal investment in order to meet the stated policy objective. The overall share of RE is projected to grow from the current 4.3 percent to 17 percent in 2025.

78. The GOI has set the target that, in the short term, small-scale RE will be developed to fulfill basic rural energy needs. According to 'Statistics Indonesia' (Badan Pusat Statistik), 19.5 percent of the rural population (22.7 million people) lived below the national poverty line of Indonesian Rupiah 117,000 per month in 2005. By improving access for the rural poor to modern forms of energy, in particular electricity, RE can play an important role in creating new economic activities.

79. The Government has intensified its efforts to revive and scale up geothermal development in the past few years. In 2003, the Geothermal Law (ref. 23/2003) was promulgated making this RE to be the only one governed by its own law. The Law, among other things, mandated that future geothermal fields must be transparently and competitively tendered for development. In 2004, the MEMR issued the "Blueprint for Geothermal Development in Indonesia" which was intended as a roadmap for at least the development of another 6,000 MW by 2020. Government regulations complementing the Law were only issued in 2007 (ref. PP-59/2007), while other regulations are still waiting to be finalized. Despite these efforts, Indonesia has still been struggling to attract commercial financing and the private sector to develop geothermal power. The pricing issue has remained contentious, and previously the tariff was tied to a maximum of 80 percent of the average production cost for the area where the geothermal development is

located. It did not provide sufficient incentives for increased investments in the sector. Now, the MEMR has issued a decree providing PLN with guidance to pay up to US$0.097 cents per kWh for geothermal power, but further formulation as to how these incremental costs will be covered is still under development.

80. Indonesia's 2003-2020 National Energy Policy includes an EE action plan with an economy-wide target of a 1 percent per year reduction in energy intensity. Operational elements include:

- Increasing use of energy saving equipment and appliance standards and labeling in households and commercial sectors;
- Promoting cogeneration and demand side management in industry; and
- Applying EE standards on motor vehicles.

81. This ambitious target may not be met in the near-term due to the need for improved energy delivery throughout the economy, the limited scale of EE efforts to date, and the remaining subsidies in the power sector. Industrial EE is expected to move more quickly, as the GOI further reforms and rationalizes its energy pricing and subsidy policies.

VI. IMPLEMENTATION POTENTIAL AND RISK ASSESSMENTS

82. The overall implementation risk is considered to be moderate. The geothermal project pipeline is mature with considerable reconnaissance related to fields already completed with extensive survey work undertaken related to the resources. Several of the fields under consideration have their resources already confirmed through exploratory drilling. Furthermore, geothermal technology that is being used (dry steam and flash generation systems), is mostly already commercialized and proven, whereby the technology risk is also manageable. In other cases, expansion of geothermal fields that are already producing power has relatively low technology and financial risk. With regards to EE, tailor-made financing program which include technical assistance will be provided to develop the investment program and to provide the necessary financing tools and also build the capacity of financial institutions to sufficiently market and also evaluate such projects. As for feasibility studies, engineering design, and project management support, there is sufficient private sector expertise to undertake them. With regards to geothermal, both the World Bank and ADB are mobilizing technical assistance facilities to prepare the investments and to begin strengthening the capacity within the SOEs. A summary of the Implementation Potential and Risks are included in Table 7.

Table 7: Implementation Potential and Risk Summary

RISK	MITIGATION	RESIDUAL RISK
Project Readiness	Geothermal projects totaling about 500 MW are in the government's Bluebook. The World Bank project is formally included in its lending pipeline and the ADB projects are in final	Low

RISK	MITIGATION	RESIDUAL RISK
	stages of discussions with GOI and PLN. TA is mobilized by World Bank and ADB to complete project preparation and loan processing. Substantial field work is already underway in the proposed fields, which should reduce technical drilling risks to a considerable extent. IFC has reached agreement with GOI regarding tenders and is in discussions with developers regarding financing opportunities. IFC/ADB have already been approached by interested commercial banks with regards to EE.	
Policy and Regulatory Framework Clarity of policies related to Geothermal, other RE, and EE/CP	GOI is preparing a pricing and incentive policy, which is being supported by the World Bank through a GEF funded grant. This is a critical risk that is expected to be reduced through the benchmark and performance information provided by the CTF funded projects. GOI is also attempting to further rationalize energy tariffs, which should increase incentives for EE and RE undertakings.	High
Implementation Capacity	Projects will be selected partly based on capacity of the project companies, which is considerable given their long experience in the sector. However, given the envisaged scale-up, TA will be provided during project preparation as well as during implementation to complement existing human resource capacity for engineering and other services.	Medium
Finance Commercial banks are reluctant to lend for EE/CP/RE	Innovative financial products will be utilized to address financial sector's reluctance to lend to EE/CP/RE proponents. Technical assistance will be provided as necessary to upgrade commercial bank capacity to assess and mitigate project risk.	Medium
Private Participation Private sector remains reluctant to invest in new geothermal fields at the necessary scale given as evidenced by recent history	Advisory services will be provided to sufficiently structure geothermal tenders so that they would be attractive to private developers. Successful conclusion of initial transactions will build confidence of private sector to further invest in future opportunities.	High

RISK	MITIGATION	RESIDUAL RISK
Scale-up and Replication	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. 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.	Medium
Safeguards Some geothermal prospects are located in environmentally sensitive areas	Project design will follow GOI and multilateral bank safeguards. Appropriate environmental management and social development measures will be incorporated into project design. TA is also being provided to upgrade and enhance domestic capacity to implement good practice safeguard measures in geothermal development.	Low

Source: CTF mission team

VII. FINANCING PLAN AND INSTRUMENTS

83. Financial instruments anticipated for the IP include grants, loans, and guarantees. Other innovative financing mechanisms may be developed for private sector projects. Grants will be utilized for project preparation covering feasibility studies, due diligence, and structuring of private sector projects e.g., power off-take guarantees. These preparation funds will be complemented by other donor funds from ADB, IBRD, the Government of the Netherlands, Japanese International Cooperation Agency (JICA), and others.

84. Loans will comprise the bulk of project and program financing, and could include project loans, and sector loans. Program loans may be employed in parallel to support policy development and implementation costs. Co-financing will be mobilized to the maximum extent possible from IBRD, ADB, IFC, as well as from JICA, KfW, the Governments of the Netherlands, United States, Australia and others, and private sector investors. The draft IP envisions US$400 million in CTF funding as shown in Table 8 below.

85. Guarantees, risk sharing facilities, and mezzanine financing may be used for private sector projects to mobilize commercial bank lending and project developers' equity. Guarantees may include PCGs, risk sharing, and other innovative forms depending on project structuring (e.g., new development risk reduction mechanism for geothermal prospecting).

7.1 World Bank/IBRD

86. IBRD/CTF will co-finance the geothermal component with the proposed Geothermal Power Generation Development Project. This investment aims to support PGE, a public leading Indonesia geothermal developer, to develop up to 260 MW of geothermal power generation capacity in several fields. The World Bank is now preparing an investment loan of up to US$500 million, complemented by the proposed US$125 million CTF investment. The CTF is proposed to (1) buy down the incremental costs of power generation from geothermal to cover part of the global environmental external costs; (2) buy down the incremental risks by cost-sharing exploitation costs for PGE to develop geothermal projects; and (3) help strengthen the capacity of PGE so that they can continue to develop resources under their control in a sustained manner. The exact design and structure of the project will be determined during project preparation. The requisite transmission infrastructure will be constructed by PLN based on its pending agreement with PGE.

87. In addition, IBRD is also designing a *Framework for Carbon Financing for Geothermal* as programmatic CDM to generate additional revenues to further improve the financial viability of geothermal projects (see Annex 1 for more details). Furthermore, IBRD is also assisting the government in developing and implementing such policy frameworks through a Global Environment Facility (GEF) project of *Geothermal Power Generation Development* (see Annex 1 for more details). Therefore, weaving these financing sources (GEF, IBRD, CTF, and Carbon Finance) can make a transformational impact on scaling up geothermal in Indonesia.

7.2 Asian Development Bank

88. ADB/CTF will co-finance the proposed Geothermal Sector Development Program with PLN through public sector project loans of up to US$500 million, complemented by the proposed US$125 million CTF contribution. The proposed investments include 4 geothermal power generation units and associated transmission lines that are expected to result in new generation capacity of up to 250 MW. CTF is proposed to enhance the overall financial viability of the geothermal power component of the program. ADB is initiating technical assistance to finalize feasibility analyses. ADB will support development of carbon finance opportunities through its Carbon Market Initiative and Future Carbon Fund. The exact design and structure of the project will be determined during project preparation.

89. ADB/CTF will co-finance EE investments via financial intermediation through commercial banks (both state-owned and private). Initially, ADB will provide PCG to reduce overall financial risk and to enhance terms and conditions of the financing packages provided to the commercial banks' clients. CTF will be utilized to reduce the cost of the PCG and other enhancements. The EE investment program will include technical assistance provided through normal donor funding channels. The exact design and structure of the project will be determined during project preparation.

7.3 International Finance Corporation

90. In the area of EE/RE, IFC's objective is to catalyze commercial bank financing into firms' EE and RE projects, using CTF funds to support a tailor-made financing package, which could include first-loss risk coverage instruments. This is a model that has proven successful in leveraging commercial bank funding into EE/RE in Russia and China, and is now working in the Philippines. IFC Indonesia already has a Sustainable Energy Project underway that is demonstrating the potential for commercial financing of EE/RE. Several banks have been identified as possible partners for carrying out such a market-based initiative. The Indonesian banking sector, however, is highly risk-averse, and banks need tangible financial support, in addition to targeted technical assistance and capacity building, in order to commit themselves to this kind of long-term initiative that involves changing perceptions and behaviors. Furthermore, IFC is working with key stakeholders, including PLN, to promote the adoption of small-scale, off-grid RE generated from biomass amongst others. The exact design and structure of the project will be determined during project preparation.

91. Taking into account the limited interest of private investors in geothermal development in recent years and current financing constraints, a relatively small allocation of CTF funds is proposed for two or three private sector transactions that will seek to test and demonstrate business models for wider private sector participation. CTF allocation of up to US$50 million is requested to complement IFC/commercial bank financing specifically to cover part of the exploitation drilling and steam field development. The long tenor of CTF will provide additional incentive for commercial banks to finance such geothermal projects, where commercial financing is not yet available. The CTF funds could also be used to cover additional risks associated with technical drilling to confirm resources for up to three geothermal power projects in West Java where BAPPENAS has requested IFC to be the transaction advisor for competitively tendering the geothermal fields. Additional financial resources from CTF will play a critical role in reducing early stage drilling/exploration risks, which as previously explained can be a barrier to the entry of private companies in this sector. This risk-reduction activity will be Government-executed, and will effectively be the "public" component of a competitively tendered PPP project. This could be in the form of a revolving fund, subsidy or other mechanisms to help confirm geothermal resources prior to substantial field development being undertaken by the private sector. The exact design and structure of the project will be determined during project preparation.

Table 8: Financing Plan (all figures in US$ millions)

	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
Total	***3,110***	**400**	**1,575**	**35**	**1,100**

Source: CTF mission estimates

ANNEX 1: Renewable Geothermal Power Investment Program

Problem Statement

1. Since emerging from the East Asia financial crisis, Indonesia's power sector has struggled to keep up with the high electricity growth triggered by the economic recovery. The financial position of the national power company (PLN), already weakened by the crisis, further deteriorated due to the dramatic increase of oil prices on the international market from 2002 to 2008. The national company struggled to invest, requiring growing subsidies to maintain operations in a system highly dependent on petroleum products, while private sector investments also came to a halt. Current power supplies barely keep up with increasing demand, and brownouts and load shedding have become commonplace affecting economic growth and even ordinary consumers. In 2006, the Government of Indonesia (GOI) devised the "Fast-Track" program for the construction of 10,000 MW of coal-based power generation by PT. Perusahaan Listrik Negara (PLN), which is the only readily available solution for utilizing abundant domestic coal resources to displace high-cost generation units in an affordable manner. This decision, along with existing heavy use of diesel, will further increase the country's dependence on fossil fuels, exacerbating local and global environmental impacts: an additional 10,000 MW of coal-fired power will add an estimated 55 million tons of CO_2 per year. Overall, estimates suggest that the rapid expected expansion of coal-fired power generation would result in a several fold increase in CO_2 emissions from the power sector over the next two decades.

2. To keep up with electricity demand that is increasing in excess of 7 percent per year, in late 2008, the GOI launched a Second Fast-Track Program to develop another 10,000 MW of which 60 percent will be RE, with geothermal accounting for about 4,800 MW and hydropower accounting for most of the remaining renewable energy capacity. Geothermal power is one of the best options to diversify Indonesia's energy mix. It is a base load generation technology not subject to the intermittency and variability of most other RE options. As an indigenous energy source, it will also enhance the country's energy security and serve as a natural hedge against the volatility of fossil-based commodity prices. Geothermal can directly displace coal-fired power generation.

3. Indonesia has one of the largest geothermal resources in the world, with a potential of 27,000 MW, of which about 8,000-10,000 MW is considered to be economically justified at present (see Figure A1.2). Currently, only less than 4 percent of this potential, or 1,052 MW, has been exploited. Indonesia has added very little new geothermal capacity since the Asian Financial Crisis of the late 1990s. Indonesia has had difficulty in mobilizing financing even for more conventional power generation options such as coal given the investment climate both globally and within the country. Despite being regarded as a commercially viable RE technology, geothermal power development faces a number of significant barriers specific to the sector that is deterring investments. They include the following:

a. The levelized financial cost of electricity from geothermal power is more expensive than from coal-fired power plants. The current pricing and incentive

mechanism is unable to attract investors in geothermal projects. Enabling policies and regulations to support the implementation of the Geothermal Law are still under development.

b. Geothermal has high risks especially during the early stages of steam field exploration through drilling to confirm the resource availability and field capacity. Therefore, developers will require returns commensurate with these risks resulting in demand for even higher tariffs as compensation. In the absence of sufficient returns, developers have shied away from investing in geothermal all together;

c. Geothermal has higher upfront capital investment costs compared with other comparable conventional power generation options such as coal. This reflects the fact that the upstream steamfield (the "fuel") is developed at the same time as the power plant. As a result, the investment needs for achieving the GOI 2020 target are momentous, and is estimated to be as high as US$12 billion. In contrast, private investments in the entire power sector in Indonesia have only averaged about US$350 million over the past five years. With the current tightening credit market, financing power projects, particularly through private equity or debt, is likely to be more challenging, especially given the risks associated with the geothermal sector. Therefore, the GOI has decided to strengthen the capacity of designated state-owned geothermal developers so that they can lead the way and immediately scale-up the significant prospects in fields under their control;

d. Indonesia has limited institutional capability to properly plan geothermal development and sufficiently engage suitable developers, and weak domestic capacity in the areas of resource assessment, equipment manufacturing, construction, operation and maintenance of geothermal energy facilities.

Proposed Transformation

4. It is proposed that the CTF support the transformation of Indonesia's geothermal sector by co-financing about 800 MW of new installed capacity, thereby doubling current installed capacity. The scale of the investment program would establish operational and cost benchmarks that will inform the policy and regulatory reform process that is already underway and is necessary for sustained expansion of the sector. It would also create the conditions for replication by building capacity in key public and private sector entities for investments at scale. The program would also, over time, reduce costs through institutional learning, generating economies of scale, and encouraging local manufacture.

5. To encourage geothermal development, PLN, the national power company, towards end 2008, established a subsidiary known as PLN-Geothermal (PLN-G) and several prospective projects have already been identified which will be financed by PLN itself. PLN is currently preparing a formal Heads of Agreement with PT. Pertamina Geothermal Energy (PGE), who will undertake the upstream development and sell steam while PLN will develop the downstream power plant. On the basis of these discussions, PLN, with the endorsement of the National Planning and Development Agency

(BAPPENAS), seeks ADB financing to develop several (downstream) geothermal fields up to 250 MW of capacity and its associated transmission lines under the proposed *Geothermal Sector Development Project.*

6. The World Bank (IBRD) has been actively engaged in the geothermal subsector and is now preparing a loan of up to US$500 million for PGE to develop as much as 260 MW of geothermal power generation capacity in several fields where PGE has secured development rights. The World Bank also expects to help PGE strengthen its technical and managerial capacity through the project so that the company will be well positioned for scaling up the remainder of the resources under its control. The exact scale of the proposed *Geothermal Clean Energy Investment Project* will be determined after feasibility studies[41] that are currently underway are completed and a final agreement with PGE is reached.

7. The combined program supported by ADB and IBRD would finance about 500 MW of new geothermal capacity, which is estimated to result in GHG emissions of about 3.2 million ton CO_2 per year ($MtCO_2e/y$).[42] Local air pollution would be reduced by about 490 tons per year (t/y) of particulate matter, 5,000 t/y of SO_2, and 1,300 t/y of NOx.

8. As previously noted, there have been little private investments in geothermal development in Indonesia in recent years. Furthermore, the decline in overall private funding for even conventional power sources provides an indication as to the limitations that the geothermal sector is likely to face in terms of attracting financing. In fact, the Government has tendered several batches of geothermal working areas for private development over the past couple of years, but these offers have attracted limited interest from developers and none of them have reached financial closure. Once pricing and other reforms are in place, geothermal tenders are expected to be more "bankable" to private investors, but the sheer magnitude of the financing requirements and recent history dictates a more measured approach to scaling up private participation with realistic expectations. It is expected that once a small number of geothermal fields are successfully awarded to developers, it can serve as a demonstration for potential business models for progressively increasing private participation in the sector over the longer term. Therefore, the GOI is keen to begin preparing several well structured transactions to tender new (unallocated) geothermal working areas (fields) with the intention of attracting some credible and qualified private developers. To this end, IFC is providing advisory services through BAPPENAS to help the GOI prepare several competitive tenders to be offered for either sole private development or as a part of a public-private partnership (PPP). If two of these tenders achieve financial closure, it could result in the initial development of about 200 MW of geothermal capacity. As a part of structuring these investments, consideration would be given to the demonstration of possible revolving fund or other mechanisms that can reduce the technical drilling risks and help towards confirmation of geothermal resources which would reduce the risks faced by private developers before they undertake substantial field development. IFC is also in dialogue with a private sector developer who is considering expanding the development

[41] The World Bank has facilitated a grant from the Government of the Netherlands of about US$2.5 million to PGE towards completing the feasibility studies and other preparation work for the proposed project.
[42] GHG reduction is estimated as follows: 500 MW x 8000 hours/year x 0.8 tCO_2e/MWh = 3.2 $MtCO_2e/y$

of a geothermal field where they already have a concession. This could yield an additional 100 MW of geothermal capacity financed by the private sector if these projects are structured to be viable for commercial financing. In total, the private sector support could lead to the development of up to 300 MW of capacity, which would generate as much as 2,400 GWh of base-load power per year, directly offsetting coal-fired generation. The resulting GHG reductions are estimated at about 1.9 $MtCO_2e/y$, which would result in *cumulative emissions savings* of about 38 million tons over a 20-year plant life.[43]

9. In addition, IBRD is also helping MEMR design a *Framework for Carbon Financing for Geothermal* that will facilitate the programmatic application of the Clean Development Mechanism (CDM) to generate additional revenues to further improve the financial viability of geothermal projects in Indonesia (see Figure A1.1). The framework approach can streamline and simplify the procedures for (i) accessing the CDM and (ii) undertaking due diligence of geothermal projects. It is also being designed to enhance the cash benefits to geothermal developers by enabling them to sell their emission reductions beyond the current Kyoto Protocol commitment period ending in 2012 (including in other applicable international agreement under the UNFCCC). Although the future structure of the carbon markets are difficult to predict especially with the absence of a successor to the current global agreement, based on prices of emission reductions in recent carbon finance transactions, revenues in the order of US$0.005/kWh – US$0.01/kWh can be generated through the sale of emission reductions. As a result, carbon finance provides a useful source of funds that can be utilized to bridge the incremental costs associated with geothermal development in Indonesia and an important option to consider as a part of a comprehensive pricing policy.

10. Ultimately, enabling policy and regulatory frameworks that will improve the investment climate for geothermal development are required to ensure program sustainability and future scale-up beyond this investment. To this end, the World Bank is assisting the government in developing and implementing such policy frameworks through the Global Environment Facility funded *Geothermal Power Generation Development Project* (see Figure A1.1). The proposed reforms being supported by this project include: 1) assistance to GoI to develop an adequate pricing and incentive policy including the identification and design of compensation mechanism (s) to address incremental costs and associated risks, 2) explore systemic ways in which geothermal risks could be mitigated, 3) help prepare transactions for scaling-up investments in both brownfields (fields already allocated to developers) and greenfields (new competitive tenders in line with Geothermal Law)[44], and 4) develop a strategy for long-term domestic capacity building. This project is already under implementation and is supporting the ongoing reform effort.

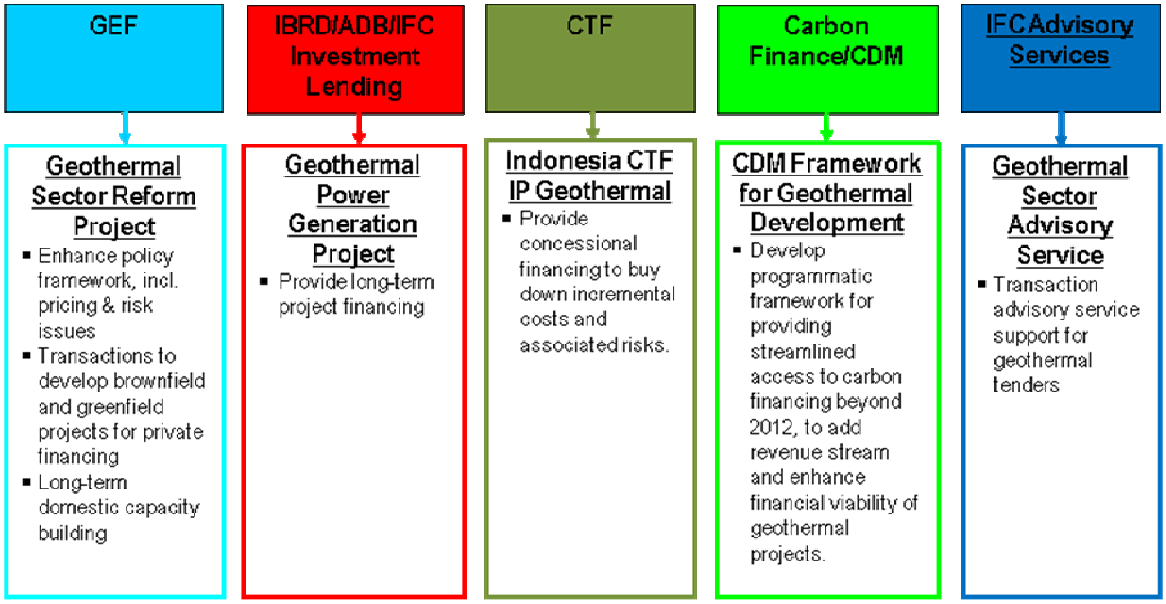
11. It is important to recognize that the GoI is receiving various forms of assistance utilizing a number of financing sources (GEF, IBRD, IFC, ADB,CTF, and carbon

[43] GHG reduction is estimated as follows: 300 MW x 8000 hours per year operation = 2.4 million MWh per year. This offsets coal-fired emissions at 0.8 tCO_2e/MWh = 1.9 $MtCO_2e/y$ reduction .

[44] The transaction advisory work under this project will complement the engagement by IFC to provide similar support to the GOI for maximum impact.

finance) to help promote its geothermal development agenda (see Figure A1.1). . These are strategic interventions in areas where the GoI is looking to enhance its expertise and complement its capacity to achieve its development objectives. The specific support efforts and funding sources are weaved together to form a comprehensive reforms package that will provide the necessary short-term boost while at the same time facilitating the sustained development of the geothermal sector in Indonesia, ultimately resulting in a transformational impact in the sector.

Figure A1.1: Weaving financing sources together can make a transformational impact



12. It should also be noted that the GOI is receiving assistance to develop the geothermal sector from a number of other bi-lateral sources. These efforts are strategically aligned and are being coordinated by the GOI in order to minimize overlap and avoid conflicts. The objective is to concertedly channel all available resources to maximize the impact on geothermal development. Several of these other supports to the GOI in its development efforts in the sector are summarized below:

- Germany – The Reconstruction Credit Institute of Germany (KfW) is helping develop the Suleweh Agam geothermal field in Aceh with a EUR 7 million grant for exploration of the working are, and a proposal is currently under consideration for a loan of about EUR 110 million to finance the development of the field. Furthermore, KfW is exploring to support the GOI in formulating a risk mitigation instrument to address a key barrier in the sector.

- The Netherlands – The Government of The Netherlands has already provided a grant of about US$2.5 million through the World Bank to PGE to support the preparation of a number of geothermal fields, and have also provided technical assistance to BAPPENAS to facilitate sector reforms and development.

- Japan - The Government of Japan has a long history of supporting geothermal sector development in Indonesia. More recently in 2007, the Japanese International Cooperation Agency (JICA) conducted a technical assessment of geothermal resources which contributed to the GOI's Road Map and Master Plan for Geothermal Power Development. JICA is also financing geothermal investments for PGE and PLN. Through the "*Hatoyama Initiative,"* Japan will continue to provide financial and technical assistance to countries such as Indonesia to address issues related to climate change by supporting sectors such as geothermal.

- The United States – The United States Agency for International Development (USAID) will provide parallel grant financing that will support the implementation of CTF under the *USAID Indonesia Clean Energy Development (ICED) Program.* Several key initiatives aim to help GOI implement the newly passed Electricity Law and assist with the development of RE projects.

- France – The Agence Française de Développement (AFD) is presently in discussions with the GOI, exploring ways in which they can assist the development of geothermal in Indonesia.

- Australia – The Australian Treasury assisted the Indonesian Ministry of Finance prepare its *Green Paper* on addressing climate change with one specific area of focus being geothermal development.

Rationale for CTF Funding

13. The proposed project is transformational due to the following reasons:

- Indonesia has the world's largest geothermal potential of over 27,000 MW, this proposed intervention is a key strategic opportunity for tapping CTF to scale up the use of this renewable resource of global significance.
- Geothermal is one of the only "24/7" base-load RE resources which can directly displace coal-fired power plants. Therefore, it is the best renewable resource in Indonesia with respect to GHG reductions.
- The proposed investments of up to 800 MW will help the GOI begin the scale-up of geothermal development towards reaching the Government established target of 4,700 MW by 2014 and 9,500 MW by 2025. This would be over a nine-fold increase from the country's current capacity of 1,052 MW. Nearly 3,000 MW of geothermal potential remain with SOEs, which will need to continue to play a key role in developing the resource if Indonesia is to achieve its target. The remainder will need to be progressively developed through increasing private participation to the extent possible.
- By displacing coal-fired power, the fuel source that has seen the greatest growth in Indonesia's power sector over the past decade, large-scale deployment of geothermal technology as part of the Second Fast-Track Program would help achieve GOI's ambitious goal of reducing GHG emissions by 26 percent by 2020, significantly bending the GHG emissions growth curve.

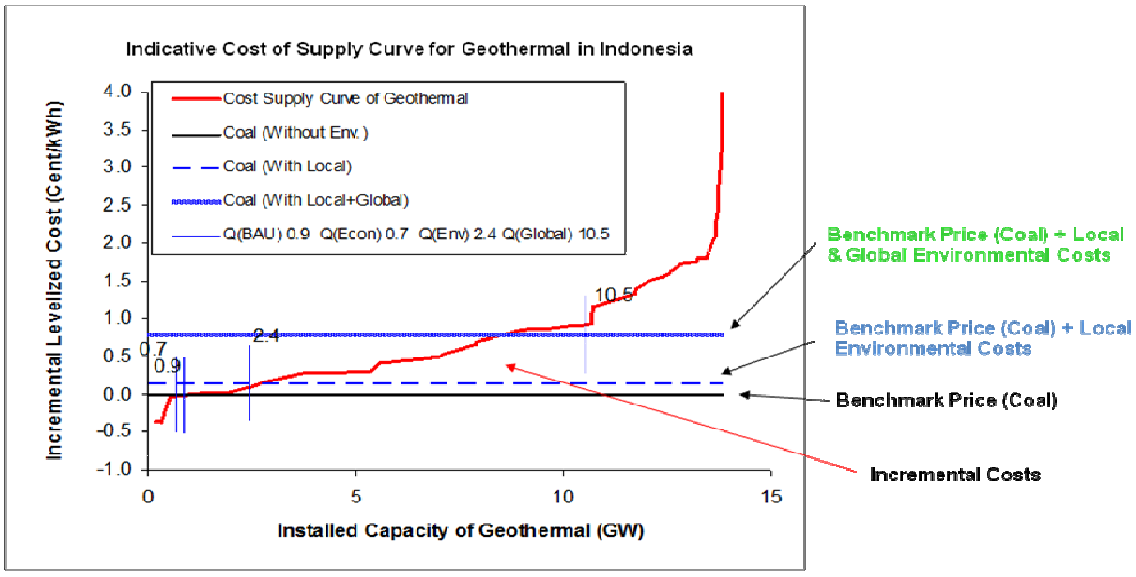
- To ensure program sustainability and replication, the World Bank Group is assisting the government in developing and implementing enabling policy frameworks including addressing pricing and risk issues, preparing credible transactions, as well as other reforms. The CTF supported investments will provide key benchmarks related to geothermal development costs and other factors, which are expected to contribute towards enhancing the policy reforms that the GOI is presently undertaking. The GOI is also building capacity within the sector enabling the public sector to not only undertake the proposed project but to also continue to scale-up the development of geothermal resources on a sustained basis.

14. As shown in Figure A1.2, it is estimated that nearly 10 GW of geothermal in Indonesia can be economically justified, when local and global environmental externality costs are considered. However, most of these investments are currently not financially viable when compared with financial costs of coal-fired power plants. Although financial costs can vary and depend on specific field conditions and developer preferences, preliminary estimates indicate that geothermal costs in Indonesia range from about US$0.067/kWh to US$0.078/kWh, although some estimates suggest it could be even higher when developing certain fields[45]. In comparison, the cost of coal-based power is estimated to be around US$0.05/kWh in financial terms, again, based on specific assumptions including the cost of coal supplies. Additionally, geothermal projects also face additional risks associated with early stage resource exploitation, compared to fossil fuel power plants, which result in higher expected costs. Therefore, CTF funds of US$300 million are requested to address the additional costs and risk premiums in order to enhance the financial viability of the proposed projects. 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 undertake the proposed rapid expansion.

Figure A1.2: Geothermal is economically competitive with coal, but not financially viable[46]

[45] These figures are based on preliminary estimates utilizing a number of assumptions. Other studies and estimates utilizing different assumptions may conclude price ranges that are different, However, there is general consensus that the perceived cost of geothermal development in Indonesia is higher than that of alternatives such as coal, whereby higher tariffs are required by developers before undertaking investments.

[46] Note that the figure is an indicative representation of economic costs for geothermal development in Indonesia, and illustrates that there are associated incremental costs. The actual financial incremental costs, however, would vary due to, among other things, the application of taxes and cost of capital (i.e. discount rates) commensurate with respective developers' appetite for risks, which are not reflected in the economic cost of supply curve depicted in the figure. Therefore, the actual financial incremental costs are likely to be higher.


Indicative Cost of Supply Curve for Geothermal in Indonesia
Cost Supply Curve of Geothermal
Coal (Without Env.)
Coal (With Local)
Coal (With Local+Global)
Q(BAU) 0.9 Q(Econ) 0.7 Q(Env) 2.4 Q(Global) 10.5
Incremental Levellized Cost (Cent/kWh)
Installed Capacity of Geothermal (GW)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
0
5
10
15
0.7
0.9
2.4
10.5
Benchmark Price (Coal) + Local & Global Environmental Costs
Benchmark Price (Coal) + Local Environmental Costs
Benchmark Price (Coal)
Incremental Costs

Implementation Readiness

15. In 2003, the GOI issued a Geothermal Law (Law 27/2003), making geothermal the only RE governed by its own law. The Law, among other things, shifted regulatory authority of the sector that was previously delegated to the national oil company back to the GOI (Ministry of Energy and Mineral Resources - MEMR); mandated that geothermal fields that are not allocated by Presidential Decree No. 45/1991 be transparently and competitively tendered for development; and, to be consistent with the decentralization law, enhanced the role of local governments in developing the geothermal resources within their jurisdiction. The Law also "grandfathered" the rights to fields that were already allocated under Presidential Decree No. 45/1991. In order to better handle its increased oversight responsibilities over sector development, MEMR established a dedicated directorate for geothermal. The directorate prepared a Geothermal Blueprint, adopted by the government, to progressively develop a total of 6,000 MW of geothermal capacity by 2020. If the target is achieved as planned, then the geothermal sector is expected to fuel more than seven percent of the overall power generation capacity at the time. In addition, the government is undertaking activities to prepare pricing and incentive policies, although successful implementation of such policies can take time before reforms take hold. Finally, geothermal power generation is based on proven and commercially available technology, with a global installed capacity of 10 GW.

16. The proposed ADB and IBRD projects are included in the GOI "Bluebook" for external financing. ADB has proposed a project preparation technical assistance (PPTA) grant of about US$1.5 million set to commence in 2010. The PPTA can be completed within a period of 9 months after which the loan can be taken to the ADB Board for approval sometime during the middle of 2011.

17. The World Bank has formally included the *Geothermal Clean Energy Investment Project* in its loan pipeline to Indonesia, and has concluded a Memorandum of Understanding with the GOI to provide a loan of up to US$500 million in this regard. The IBRD has obtained grant funds from the Government of the Netherlands to extend to PGE so that they can complete the remaining project preparation work including feasibility studies and the requisite environmental and social impact assessments. The World Bank project is expected to be appraised in July, 2010 and the approval by the World Bank Board is planned for October 2010.

18. The IFC has been requested by the GOI to provide advisory services to carry out several geothermal tenders to be competitively offered to interested private developers. These transactions are at the preliminary stages of structuring and design. Additionally, IFC is in discussions to help finance the expansion of a geothermal field that has already been allocated to a private sector developer. This agreement is expected to be finalized in 2010.

Financing Plan

19. The indicative costs for the geothermal investment program are summarized in Table A1.1.

Table A1.1: Financing Plan for Geothermal Sector Development Project (US$ Million)

Financing Source	ADB	IBRD	IFC / ADB	*Totals*
CTF	125	125	50	*300*
MDB	500	500	75	*1,075*
GOI	5[a]	30[b]	0	*35*
Co-financing / Private Sector[c]	0	0	600	*600*
Totals	***630***	***655***	***725***	***2,010***

Source: CTF mission estimates

Notes: [a] Contribution from PLN

[b] Contribution from PGE

[c] Commercial bank co-financing

ANNEX 2: Financial Sector Transformation for Energy Efficiency and Renewable Energy

Problem Statement

1. The NAP (2007) and TNA (2009) analyses indicate there are considerable opportunities for improvement in end use efficiency (EE), combined with cleaner production (CP) and renewable energy (RE). The peak electricity demand reduction realized through EE alone could amount to 2500 MW[47] of virtual power per annum, or roughly equivalent to the existing electricity shortfall identified by PLN. The huge biomass energy potential (see main text Table 3) is amenable to smaller-scale RE applications, typically in the range of 5 – 10 MW.[48]

2. ADB market assessments conducted during 2009 conservatively estimates Indonesia's EE retrofit requirements to amount to US$3 billion of which: US$1.1 billion for EE improvements in electrical equipment, US$1.0 billion in EE improvements in existing coal-fired systems, and US$0.9 billion in EE improvements in diesel-fired plants.[49] An additional US$1 billion (US$800 million in electrical equipment retrofits and US$200 million in operating efficiency improvements) is required to finance the building retrofit requirements of shopping malls, office buildings, and hotels. Most of the US$4 billion can be funded through commercial lending at 3-6 year terms for equipment with an average 8-10 year life, to realize energy savings of 15-30 percent/year (based on recent energy audits conducted in ADB DMCs). IFC has independently assessed the EE/CP/RE market potential at around US$5 billion for EE, and an additional US$5 billion for RE such as biomass (most of which is currently disposed as solid waste).

3. There is an overall gap in the delivery of market based financial solutions. Commercial banks have very limited exposure to EE financing solutions developed internationally, and little capacity to analyze or evaluate their clients' EE projects. Energy service companies, for their part are few and their services not widely understood or valued. There are no advisory links between energy service companies (ESCOs) and commercial banks. Equipment providers have not as yet developed partnership alliances with banks or ESCOs to facilitate EE financing solutions.

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[47] Sadiq Zaidi, Senior Energy Advisor (ADB), Bappenas under RETA 6392: Supporting the Implementation of the Energy Efficiency Initiative in Developing Member Countries. ADB's EE market assessment in Indonesia (concluded in 2008), indicates the industrial sector consumes 40.42 MMToe/y (41.3 percent in coal, 25.4 percent in natural gas, 20.8 percent in kerosene/diesel, 11.4 percent in electricity, and 1.1 percent in LPG).

[48] Larger biomass power plants are possible, e.g., up to 50 MW, but are limited in practice by the "catchment area" of feedstock, typically about 35-50 kilometer radius from the project site.

[49] ADB (A. Ablaza) estimates the EE potential in the Indonesian industrial sector (at 30percent participation rate) as follows:

- Potential annual savings in MMTOE: 0.96 MMToe/y (0.21 MMToe/yr in electricity, 0.50 in coal-fired, 0.25 in kerosene/diesel-fed)
- Potential annual savings in US$: US$738 million/yr (US$362 million in electricity, US$205 million in coal-fired, US$171 million in kerosene/diesel-fed)

ADB's EE market assessment in Indonesia (concluded in 2008), indicates the industrial sector consumes 40.42 MMToe/y (41.3 percent in coal, 25.4 percent in natural gas, 20.8 percent in kerosene/diesel, 11.4 percent in electricity, and 1.1 percent in LPG).

4. There are a number of barriers to widespread take-up of EE by industry, including a fragmented array of products and end-users covering hundreds of thousands of buildings and millions of devices, project transaction costs, and a lack of awareness that efficiency exists as a "fuel source" itself. IFC's key finding from EE work around the world is that firms consistently underestimate potential savings from EE. Barriers to RE, in particular biomass, mainly arise due to lack of biomass feedstock mapping which presents feedstock supply risks, low wholesale tariffs offered by PLN for grid-connected biomass and other small-scale RE power plants, and lack of commercial financing.

5. The dispersed nature of EE opportunities requires mechanisms for market aggregation. The financial sector, commercial banks in particular, provide an efficient common entry point for firms and industries seeking EE solutions, all of which require some financial outlay. EE projects would likely use existing, proven technologies, they are by nature low-risk (i.e., cost efficiencies, and therefore costs savings, are reasonably predictable). Firms therefore have a strong incentive to use financial leverage to boost financial returns from EE projects, and this imperative provides a clear opportunity for banks boost their lending activities — starting with their existing clients. In addition, technical assistance in EE is essential, both for banks and for firms, because enterprise-level solutions must use appropriate technologies tailored to various end users' requirements, spanning various sub-sectors, all of which have pose different challenges and offer unique opportunities, for example:

- Labor-intensive industries such as the textile, garment, shoe manufacturing as well as the food and beverage industry and ceramics industry are also the largest employers and thus fulfill national policy objectives on regional development, as well as with respect to income generation for semi-skilled workers and new entrants into the labor force. The larger exporting enterprises will also need to improve compliance with new international standards related to deployment of energy efficient technologies. In 2011, the International Standards Organization (ISO) will introduce ISO 50001, an energy management standard that will foster long-term increases in EE.[50] Indonesia's industrial exporters will also be required to introduce ensure compliance measures and begin upgrading industrial processes according to the benchmark in order to remain part of international supply chains.
- Industrial estates, particularly with large foreign-invested enterprises, have an interest in demonstrating Corporate Social Responsibility and showcasing new systems such as co-generation and tri-generation.
- Residential EE solutions, in particular the reduced monthly energy bills through improved and upgraded appliances (refrigerator, plasma TV, etc) require specific consumer tailored finance products and verification of manufacturers' standards on "white goods" and electronic devices.

[50] Based on broad applicability across national economic sectors, the standard could influence up to 60 percent of the world's energy demand. Corporations, supply chain partnerships, utilities, energy service companies, and others are expected to use ISO 50001 as a tool to reduce energy intensity use and carbon emissions in their own facilities (as well as those belonging to their customers or suppliers) and to benchmark their achievements.

6. At present, commercial banks, ESCOs and industry associations have a significant need to improve awareness of 1) the opportunity that exists to increase commercial financing for EE, and 2) the risk offsets and financial packages that have been introduced in other major middle income countries. ADB has been evaluating the EE market and exploring opportunities to facilitate EE financing by Indonesia's commercial banking sector, particularly among state-owned banks. IFC is also building awareness through its client network in the banking sector following the successful commercial projects ongoing in Russia, China, and other countries. Based on interactions to date, commercial banks are keen to service this potentially large market, provided appropriate concessional financing and technical support are made available to build capacity of staff to analyze the financial viability and risk profile of EE and RE projects, create partnership alliances with appropriate technology suppliers, and improve coordination with ESCOs who can conduct energy audits for existing and new bank clients.

Proposed Transformations

7. These proposed interventions are designed to meet the needs in different sectors of the market. The proposals of private sector projects in Indonesia will retain the flexibility to respond to dynamic market conditions and unidentified market opportunities. The proposed interventions will therefore be illustrative only, with more implementation details to be developed as each project is processed.

8. In order to facilitate EE market penetration, ADB proposes to focus first on the most commercially viable EE projects in order to create a demonstration effect for commercial banks and for industry on the net benefits resulting from basic EE technology (operations and management cost benefits resulting from using one large piece of equipment such as a new chiller or boiler, as opposed to an entire industry process upgrade). ADB's EE activity will therefore address the EE retrofit requirements of commercial building owners and operators, government buildings that are in arrears with payment of energy bills, commercial buildings, and industrial parks (heat conversion).

9. IFC’s program will focus on developing tailor-made financial instruments and supporting capacity of commercial bank partners to lend to clients for EE (agro-processing, textile industry, amongst others) and RE (in particular, biomass). IFC, together with CTF, can provide various financing instruments in order to transform banks’ behavior and build commercial banks’ portfolios of EE and RE loans. Indonesia’s commercial banks, particularly its private commercial banks have liquidity, are well capitalized, and are capable of expanding their lending into new sectors. Banks are conservative, however, and highly risk-averse, and bank personnel are not generally skilled in technical analysis of EE or RE. IFC’s approach in Russia, China, and other countries has been to help banks to target initially their existing clients particularly those with a high level of commitment to EE and RE. In addition, on the RE side, IFC has uncovered significant opportunities for RE project such as in palm oil mills that can switch from traditional diesel fuel to biogas for their gensets and vehicles, of which biogas can be sourced from their own waste biomass (primarily palm oil mill effluent, or POME, but also from fiber and shells, and empty fruit bunches or EFTs). Most of these mill operators have existing banking relationships, but their banks do not have sufficient

capacity to understand the dynamics of EE projects, and therefore believe them to be risky, which is in fact not the case. Furthermore, there is an opportunity, should PLN's pricing for RE from biomass be made more attractive, for these mills to supply any excess electricity that they produce to the grid. IFC estimates that the market for financing new equipment to support widespread fuel switching in the palm oil milling and rice milling industries is approximately US$3 billion. The value of equipment financing to support equipment upgrades to be able to use existing biomass feedstock to produce a maximum amount of energy--assuming the excess could be supplied to PLN--is estimated at US$2 billion. IFC has projected that the market for equipment financing related to EE is US$5 billion. The amount of potential financing needed to take advantage of existing EE and available biomass RE opportunities, therefore, is US$10 billion.[51] In overall, IFC is targeting to generate 200 projects from the EE/RE sectors. Based on IFC scoping study, each EE/RE project could potentially reduce 10,000 of GHG emission per annum. Hence, total GHG emission reduction would be 2 million tons of GHG reduction per annum.

10. Each CTF project proposal will detail the barriers to be addressed with CTF funds, and estimate the direct GHG emissions reduction impact from the project. The program will address the question of additionality (supporting the lowest cost, most qualified producer) by either supporting successful bidders or by supporting developers and financiers that meet specified, transparent credit criteria established by the Multilateral Development Banks (MDBs).

Rationale for CTF Financing

11. CTF co-financing is proposed to provide tailor-made financing packages and improve the capacity of commercial banks to analyze and invest in EE and RE projects, develop an EE and RE project pipeline and build capacity on EE assessment among the industry groups, industrial parks, and technology providers thus building the EE knowledge network. The EE/CP/RE investment program will include the following activities:

1) Facilitate coordinated Technical Assistance across commercial banks, industry associations, ESCOs, and equipment provider to create a "knowledge network" on EE finance solutions and the supporting financing instruments.
2) Undertake due diligence of ESCOs in order to assess debt or equity financing to improve the ESCOs financial leverage and its ability to scale up performance bond issuance over the medium-term;
3) Work with pre-screened commercial banks with large portfolio exposures in the commercial building sector in order to "scale-up" EE financing for commercial building owners, operators, and other businesses with EE opportunities in need of financing;
4) Engage major industry associations into knowledge networks that can enhance understanding of specific industry upgrade technologies and create linkages with major international equipment suppliers;

[51] Calculations developed by IFC Sustainable Energy Finance Project team in Jakarta, October 2009, supported by findings of *Scoping Study on Clean Technology Opportunities and Barriers in Indonesian Palm Oil Mill and Rice Mill Industries: Final Report*, prepared by IRG Philippines for IFC, Jakarta, March 2009.

5) Determine the need to offset risk for term loans of longer than 3 years through ADB Partial Credit Guarantee facility to offset and mitigate term exposure by commercial banks;
6) Scale up EE financing activities with the commercial banks across major industrial sectors and assess options to partner with ongoing Government incentives on e.g. VAT exempt equipment import to facilitate industry process upgrading;
7) Undertake due diligence (financial and energy audit) on major SOEs to facilitate debt finance for EE upgrades –particularly in the cement, fertilizer and iron and steel sector.

12. CTF will provide critical financing to create and implement new financial intermediation and risk reduction measures and to mobilize commercial financing for the EE/CP/RE market coupled with advisory services components. CTF resources are proposed to cover additional costs and risks including: (i) cost reduction of partial credit guarantees and risk-sharing facilities provided to commercial banks, (ii) additional cost for deployment of advanced co-generation and tri-generation technologies; and (iii) interest rate buy-down to improve financial rates of return.

Implementation Readiness

13. ADB is in final stage of discussions with one of the major state-owned commercial banks to provide nonsovereign (NSO) financing, with piggy-backed technical assistance for ADB Board approval in July 2010. The loan would come to support financing of imported EE equipment for use in the manufacturing sector and for finished product export. This is the first in a series of scalable financing activities with commercial banks in Indonesia.

14. The ADB project will provide a loan with a 5 year term while the capacity building technical assistance (TA) (funded with other ADB funds or bilateral funds) is for a period of 3 years.

15. IFC will provide tailor-made financing package of investment and advisory services to a select group of private sector commercial banks. Several local financial institutions have expressed strong interest in participating in the program. Based upon IFC's experience in other countries, from 2 to 4 banks will be signed up to participate in IFC's program to expand lending for EE/CP/RE. IFC, in the normal course of business, carries out a robust due diligence process in the selection of bank partners. IFC is targeting only those banks with whom it has already done business or with whom it deems likely to meet IFC's stringent investment criteria. IFC's target banks generally enjoy high liquidity, measured in terms of their Loan-to-Deposits ratios. In other words, they have sufficient funds available to use for expanding loans to clients for EE and RE. IFC's proposal to agree on risk-sharing facilities with banks, however, will allow banks to share the risk of a portfolio of loans that meet certain basic criteria, but that are underwritten by the bank according to their own credit standards--funded from the banks' own resources. There are a number of private sector EE/CP/RE projects that could be implemented during 2010/2011 with the appropriate financial and risk incentives. Many

of these companies, with a majority of them being in the industries considered as the largest CO_2 emitters such as agro-processing and textile, have approached IFC for assistance in obtaining financing on terms that would make the project feasible. The project is expected to be approved by the Board by July 2010.

Financing Plan

16. The indicative financing plan is presented in Table A2.1.

Table A2.1: Financing Plan for EE and RE Sector (US$ Million)

Funding Source	ADB	IFC	*Totals*
CTF	50	50	*100*
MDB	250	250	*500*
GOI	0	0	*0*
Co-financing / Commercial Banks	250	250	*500*
Totals	***550***	***550***	***1,100***

Source: CTF Mission estimates

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