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Indonesia Energy Sector and Strategic Program Assessment

February 28, 2013

FEBRUARY 2013
This publication was produced for review by the United States Agency for International Development.
It was prepared by Nexant, Inc. under Purchase Order US0375-PO-13-0226 to Tetra Tech under Prime Contract and Purchase Order No. EPP-I-00-03-00008-00, Task Order No. 11.

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Acronyms

ADB	Asian Development Bank
AFD	French Development Agency (*Agence Francaise de Developpement*)
AusAID	Australian Agency for International Development
BAPEDA	Regional Government Development Planning Agency (*Badan Perencanaan Pembangunan Daerah*)
BAPPENAS	Ministry of National Development Planning (*Badan Perencanaan dan Pembangunan Nasional*)
BAU	Business as usual
BNI	Bank Negara Indonesia
BOE	Barrels of Oil Equivalent
BPPT	Agency for Technology Assessment and Application (*Badan Pengkajian dan Penerapan Teknologi*)
BRT	Bus Rapid Transit
CAN	Climate Action Network
CDCS	Country Development Cooperation Strategy
CDM	Clean Development Mechanism
CED	Clean Energy Development
CFL	Compact fluorescent lamp
CIRCLE	Capacity for Indonesian Reduction of Carbon in Land Use and Energy
CNG	Compressed Natural Gas
COP	Conference of Parties
CPO	Crude palm oil
CTF	Clean Technology Fund
DCA	Development Credit Authority
DEN	National Energy Council (*Dewan Energi Nasional*)
DG	Directorate General
DKI Jakarta	Special Capital City District, Jakarta (*Daerah Khusus Ibukota, Jakarta*)
DNPI	Indonesian National Council on Climate Change (*Dewan Nasional Perubahan Iklim*)
DOC	Department of Commerce
DSM	Demand Side Management
EC-LEDS	Enhancing Capacity for Low Emissions Development Strategy
EE	Energy Efficiency
EMS	Energy Management Systems
ESCO	Energy Service Companies
ESDM	Ministry of Energy and Mineral Resources (*Energi dan Sumber Daya Mineral*)
ESMAP	Energy Sector Management Assistance Program
ESSV	Energy Self-Sufficient Villages
FIT	Feed in Tariff
FTP II	Fast Track Program

GDP	Gross Domestic Product
GHG	Greenhouse gas
GIZ	German Agency for International Cooperation (*Gesellschaft fur Internationale Zusammenarbeit*)
GOI	Government of Indonesia
GW	Gigawatt
HSD	High speed diesel
ICCTF	Indonesia Climate Change Trust Fund
ICED	Indonesia Clean Energy Development
IIF	Indonesia Infrastructure Finance
IndII	Indonesia Infrastructure Initiative
IPP	Independent Power Producers
IR	Intermediate Result
IRP	Integrated Resource Planning
ISPO	Indonesia Sustainable Palm Oil
ITB	Technology Institute of Bandung (*Institut Teknologi Bandung*)
IUWASH	Indonesia Urban Water, Sanitation, and Hygiene
JICA	Japan International Cooperation Agency
KfW	German government-owned development bank (*Kreditanstalt fur Wiederaufbau*)
KLH	Ministry of Environment (*Kementerian Lingkungan Hidup*)
LGV	Liquid Gas Vehicles
LIPI	Indonesian Institute of Sciences (*Lembaga Ilmu Pengetahuan Indonesia*)
LPG	Liquid Petroleum Gas
MCC	Millennium Challenge Corporation
MDB	Multilateral Development Bank
MFO	Marine fuel oil
MIT	Massachusetts Institute of Technology
MOF	Ministry of Finance
MOI	Ministry of Industry
MOU	Memorandum of Understanding
MP3EI	Acceleration and Expansion of Indonesia Economic Development Master Plan
MRT	Mass Rail Transit
Mt.CO2e	Million ton of CO_2 equivalent
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Actions
NBFI	Non-bank financial institution
NF2	Non-fossil oil
NGO	Non-governmental organization
NSF	National Science Foundation
OJK	Financial Services Authority (*Otoritas Jasa Keuangan*)
PACE	Partnership to Advance Clean Energy
PFAN	Private Financing Advisory Network

PIP	Indonesian Investment Agency (*Pusat Investasi Pemerintah*)
PLN	Indonesian State Electricity Company (*Perusahaan Listrik Negara*)
POME	Palm Oil Mill Effluent
PPA	Power Purchase Agreement
PPP	Public Private Partnership
PPU	Private Power Utilities
PT PEACE	Environmental consulting firm (*PT Pelangi Energi Abadi Citra Enviro*)
PT.SMI	Indonesian government-owned finance and infrastructure firm (*PT Sarana Multi Infrastruktur*)
R&D	Research and Development
RAD-GRK	Local Action Plan for Greenhouse Gas Emission Reduction (*Rencana Aksi Daerah penurunan emisi Gas Rumah Kaca*)
RAN-GRK	National Action Plan on Greenhouse Gas Emission Reduction (*Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca*)
RE	Renewable Energy
REN21	Renewable Energy Network 21
RUKD	Regional Public Power Plan (*Rencana Umum Ketenagalistrikan Daerah*)
RUKN	National Electricity General Plan (*Rencana Umum Ketenagalistrikan Nasional*)
RUPTL	Electricity Power Supply Business Plan (*Rencana Umum Penyediaan Tenaga Listrik*)
S&T	Science & Technology
SCADA	Supervisory Control and Data Acquisitions
SHS	Solar Home Systems
SOW	Scope of work
SWOT	Strengths, Weaknesses, Opportunities and Threats
TA	Technical assistance
TWh	Terawatt-hour
UNDP	United Nations Development Program
UP	University partnership
USAID	United States Agency for International Development
USC	University of Southern California
USD	United States Dollar
USDOE	United States Department of Energy
USG	United States Government
USTDA	United States Trade and Development Agency
WB	World Bank
WEC	World Energy Council

1 EXECUTIVE SUMMARY

Significant changes in Indonesia's energy sector in the past five years have resulted in an investment and policy environment conducive to an accelerated pace of clean energy deployment in Indonesia over the next decade. New legislation, a commitment at the highest levels of government to reduce greenhouse gas (GHG) emissions, the growth of the geothermal and hydropower industries, the acceleration of small renewable energy projects and ambitious goals to increase energy access are all positive indicators of progress towards a cleaner energy future.

However, real challenges remain to achieving a truly low emissions development path, including the rapid increase in energy demand as the Indonesian economy continues its strong economic growth trajectory, the lack of cost-reflective fuel and electricity prices due to Indonesia's huge energy subsidy, government plans to increase the use of coal-fired power plants to provide the bulk of the country's electricity, weak and inefficient planning and coordination among government ministries, a risk-averse financial community unfamiliar with clean energy investing, weak capacity at all levels of government to implement an ambitious national climate change mitigation agenda, and low levels of science and technology capacity and infrastructure to develop and deploy new clean energy technologies in the marketplace. In addition, the fact that millions of Indonesians are still without access to electricity limits the country's ability to achieve inclusive, sustainable economic growth.

The donor community is focused on many of these issues, but USAID has an opportunity to fill several gaps in donor assistance, leverage investments from the larger donors and development banks, and build on the relationships and credibility established from working in Indonesia's energy sector for over 30 years. This report analyzes the barriers to clean energy development in the next 5-10 years, considers USAID's comparative advantages within the donor community, and reviews the progress to date of the Mission's existing Clean Energy Development (CED) program portfolio, comprising: Indonesia Clean Energy Development (ICED), Capacity for Indonesian Reduction of Carbon in Land Use and Energy (CIRCLE), University Partnership – US-Indonesia Geothermal Education Capacity Building Program, as well as the ECO-Asia Private Financing Advisory Network (PFAN) project which concluded in 2011.

Recommendations. The result of these analyses is a set of recommendations for 1) mid-course adjustments of the existing mechanisms and 2) future USAID energy sector program for the Country Development Cooperation Strategy (CDCS) strategy period from 2015-2019.

1) **Current Programs**. Recommendations for the current USAID CED program include focusing on what they do best:

ICED – Continue the focus on transaction-level and institutional support in the financial community and with local governments – while engaging more actively with the Government of Indonesia (GOI) on the overarching energy subsidy policy issue by an initial foray into public awareness and communications with the Ministry of Finance's (MOF) Climate Change Finance Center. The current ICED scope of work is too broad, and interventions in transportation and

energy efficiency (EE) should be limited to laying the groundwork for the future strategy period rather than diluting existing resources and the limited time remaining in developing and implementing new interventions in these areas.

CIRCLE – Focus on technical assistance to the environmentally-certified palm oil mills – particularly in regards to linking them with proven, regional biogas-capturing technology not currently widely available in Indonesia. Not only are mills looking for means to reduce their energy input costs for palm oil production, but they are often located in remote parts of the country where Indonesian State Electricity Company/*Perusahaan Listrik Negara's* (PLN) connectivity is limited and electricity is in high demand.

University Partnership – US-Indonesia Geothermal Education Capacity Building Program - Focus on measurable results such as the number of new geothermal projects assisted; number of Technology Institute of Bandung/*Institut Teknologi Bandung* (ITB) graduates assisted through the project working in the geothermal subsector; number of geothermal pre-feasibility assessments conducted, and then determine what resources are needed to achieve those results. Follow through on the faculty and student exchanges planned with the University of Southern California (USC).

2) **Future Program – 2015-2019.** The assessment team recommends a guiding framework for USAID/Indonesia's future clean energy portfolio aligned with the global Enhancing Capacity for Low Emissions Development Strategy (EC-LEDS). This strategy provides both policy guidance and implementation measures for a sustainable, low GHG emissions development approach powered by clean energy technologies. Within the EC-LEDS framework, the team recommends three focal areas for capacity building to promote increased clean energy use throughout Indonesia:

   a. *Energy Sector Governance* to address the capacity/will of government to enhance public awareness of the impact of the energy subsidy; introduce integrated resource planning to the national utility; and provide a venue to improve communications and coordination among ministries tasked with clean energy development.

   b. *Clean Energy Investment Promotion and Private Sector Engagement* by providing transaction-level technical support, developer/investor matchmaking services, improve the technical capacity of financial institutions to assess clean energy projects, and explore credit guarantees (including USAID's Development Credit Authority, or DCA) and other innovative financial mechanisms. Engaging the US private sector and enhancing the financial knowledge of project developers are also recommended.

   c. *Increase Human Resources Capacity and Sustainable Deployment of Science & Technology (S&T).* This set of activities starts with an inventory of research and educational institutions and capabilities in Indonesia, establishment of S&T partnerships with US organizations, innovation and integration of clean energy technology development with other USAID programs and joining other donor efforts to increase access to clean energy. USAID has experience in and can add value by enhancing local

capacity to systematically map renewable energy resources to optimize the utilization of Indonesia's abundant geothermal, hydro, solar, and wind endowment.

The proposed interventions build on USAID's existing programs, capitalize on recent reforms, and synergize with the activities of other donors with consideration of USAID's comparative advantage. It is important to note that following the completion of the programmatic assessment and USAID/Indonesia's CDCS process, an energy sector program design will be required to further narrow and define program components to align with projected budgets, determine a geographic focus, if any, and investigate appropriate procurement and implementation mechanisms.

2 INTRODUCTION

The U.S. Agency for International Development (USAID) Mission in Indonesia commissioned an energy sector and strategic program assessment in Indonesia in early 2013. Several dozen interviews were conducted with energy experts and stakeholders (Annex A), field visits were made to USAID project sites, and extensive documentation was reviewed and analysed by an external assessment team (Annex C). This Final Report presents the findings and recommendations of the assessment team. The Annexes are presented in a companion document.

In 2008, USAID conducted a comprehensive assessment of Indonesia's energy sector in preparation for reengagement in the sector after a four year hiatus. The assessment formed the basis for the design of the USAID/Indonesia Mission's current energy portfolio, comprising the following projects:

Indonesia Clean Energy Development (ICED): ICED is a 3.5 year (March 2011 – September 2014) USD 16.25 million contract implemented by Tetra Tech ES Inc. ICED is focused on a wide range of clean energy development activities expected to increase the availability, efficiency, reliability and transparency of energy services and promote investment in the development of domestic clean energy sources, as well as support GHG emissions reductions. ICED's overall targets[1] over its 42-months period of performance are:

- 4 million tons of CO_2 equivalent avoided from the energy and transport sectors;
- 120 MW of installed electricity generating capacity from clean energy sources;
- At least USD 120 million in public and private funding leveraged;
- At least 20 small- to medium-scale renewable energy projects implemented;
- 1.2 million people with increased access to clean energy;
- A reduction of the electricity subsidy by at least USD 250 million from the replacement of diesel fuel and tariff increases from the 2009 level.

ICED also supports USAID/Indonesia's goal under the USAID Indonesia Strategy 2009-2014 of sustainable management of natural resources, and its intermediate result of increased access to clean energy. The project also responds to the Global Climate Change Initiative and Clean Energy Directive of the US Government.

Capacity for Indonesian Reduction of Carbon in Land use and Energy (CIRCLE): CIRCLE is a 3 year (Oct. 2011 – March 2014), USD 1.46 million Cooperative Agreement focused on reducing emissions from the palm oil sector through improved utilization of palm oil mill effluent (POME) for energy generation. The CIRCLE program is implemented by Winrock International. The principal goal of the CIRCLE project is to reduce GHG emissions from the oil palm industry via POME biogas projects at palm oil mills, including laying the foundation for greater emissions reductions through replication at many additional mills.

[1] ICED target results are the same as the USAID/Indonesia targets. It is expected that other USAID funded contracts and agreements will also contribute toward these results.

The CO_2 equivalent GHG Emissions Reductions Indicator target of 59,200 tons will be achieved through activities leading to the following outcomes:

1. POME biogas project model demonstrated through three (3) early adopter mills, with POME to bioenergy systems fully installed and operational;
2. POME biogas project model replicated through a pipeline of eight (8) additional POME projects under active development by mill owners and/or third party developers;
3. Increased commitment to support POME to bioenergy projects as demonstrated by increased lending and/or investments made by financial institutions and/or self-financing project development firms; and
4. Sustainability of the oil palm industry strengthened through increased awareness of the benefits of, and capacity to implement practices that contribute to environmental and economic sustainability.

University Partnership – US-Indonesia Geothermal Education Capacity Building Program: This project is a three year (2011-2014) USD 644,000 partnership between the ITB, USC and geothermal developer Star Energy. The program is focused on building capacity for the geothermal education program at ITB and other educational institutions. The university partnership goal is to increase the geothermal program graduates of ITB to 50 in five years, thereby satisfying the personnel requirements for the operation and maintenance of about 5,000 MW by the year 2015. The university partnership also has components for public outreach, and training of trainers to expand geothermal education to other institutions beside ITB.

Private Financing Advisory Network (PFAN):
To address the time gap after approval of the new USAID/Indonesia energy strategy and the start of the ICED project, USAID/Indonesia supported a 2-year ECO-Asia PFAN project that ran from 2009 through 2011. USAID/Indonesia provided USD 700,000 to an ongoing USAID regional program, creating total funding of approximately USD 1.5 million.

The PFAN-Indonesia activity started building a network of clean energy investors and financial consultants and advisors that has subsequently been expanded under ICED. By the end of the project in 2011, the PFAN project assisted financial closure of four clean energy projects, with total equity and debt financing of about USD 88.2 million for the development of 77.5 MW mini-hydro and biomass power projects and with estimated annual GHG savings of 281,700 tons/year. Additionally, the project conducted two capacity-building workshops for banks/financial institutions in October 2010 and June 2011; and created a Renewable Energy Toolkit, a package consisting of six analytical tools for helping banks and financial institutions in reviewing clean energy project proposals.

While the PFAN, ICED, and CIRCLE activities were designed and financed under the Mission's clean energy program, the University Partnership project between ITB and USC was designed under the USAID Higher Education Program and turned over to the USAID/Indonesia Environment Office to manage after the grant was awarded.

The objective of this document is to provide USAID with: (i) an updated assessment of the energy sector (including electricity, transportation, and industry sub-sectors) in Indonesia, particularly in regards to recent progress in the last 5 years and key challenges for the next 5-10 years; and (ii) an independent programmatic and strategic assessment of the design and progress to date of the current USAID CED program and its various mechanisms, in consideration of observed changes within the national energy sector. This report is intended to be used as input for the preparation of USAID/Indonesia's next CDCS for 2014-2018, which is currently underway.[2]

The Energy Sector Assessment portion of this report provides an overview of three major sub-sectors – electricity, transport, and industry – in relation to GOI's priorities, analysis of key changes in the sector in recent years, analysis of remaining challenges and emerging opportunities for the near future, and an overview of other donor programs and USAID's comparative advantages relative to them. The Programmatic and Strategic Assessment of USAID/Indonesia's current CED program is presented in the form of a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The final section of this report offers recommendations on how to enhance the effectiveness of ongoing projects within the CED portfolio, and potential areas of concentration for future programming in the sector.

3 ENERGY SECTOR ASSESSMENT

Indonesia is at a critical crossroad regarding its energy sector development. Over the past several years, the GOI has established aggressive targets, as well as the essential legal and regulatory framework for a low carbon development trajectory. If, with the support of its development partners, it is able to overcome the remaining technical, financial, planning and coordination, and human resources challenges these targets can be achieved. In the absence of such support, a heavier reliance on coal-fuelled power-generation - which has been the focus of the recent emergency power program - is likely to meet the energy demand of Indonesia's rapidly expanding economy, while continued reliance on expensive, decentralized diesel-fueled power generation will be prominent in reaching remote, underserved populations. Given the long lead time for development of larger hydropower and geothermal resources, and the technical, financial and human resource challenges associated with energy access projects, the next five years will be critical in determining which of these paths Indonesia pursues.

3.1 ENERGY SECTOR REVIEW

Indonesia's energy sector demands can be summarized through three inter-related priorities: (i) energy security, (ii) low carbon development, and (iii) energy access. Achieving any one of these objectives will be difficult; achieving all three will require extraordinary coordination, reform, investment, and development partner support. USAID's future support for the

[2] The complete Scope of Work for the assessments is in Annex B.

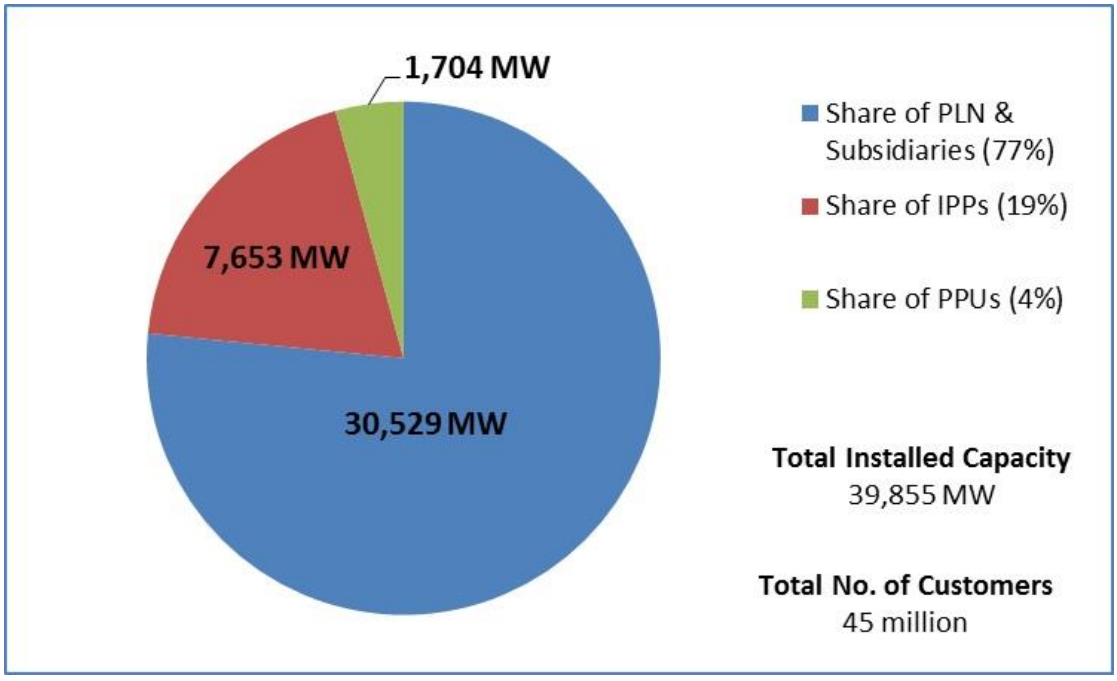
Indonesian energy sector – across the electricity, transportation, and industry sub-sectors – should be structured to address these GOI priorities.

3.1.1 Energy Security

With economic growth rates of 6-7 percent predicted for the near future, Indonesia will face both opportunities and challenges. A number of inputs are required to sustain such growth rates, including access to affordable, reliable energy services. Given the predominance of the electricity sub-sector in Indonesia's overall energy mix and its implications for energy security as well as greenhouse gas emissions and mitigation strategies, comparatively more focus is given to that sub-sector in this report than the transportation and industry sub-sectors.

(1) Electricity

***Current Capacity*:** The total installed capacity of power generation in 2011 was 39,855 MW serving some 45 million customers (Figure 1). The state-owned power company, PLN, dominates the electricity sector of Indonesia. Independent Power Producers (IPPs) and Private Power Utilities (PPU) own less than a quarter of total installed capacity.



Source: PLN Statistics, 2011

Figure 1: Indonesian Installed Capacity (by Supplier) and Customer Base

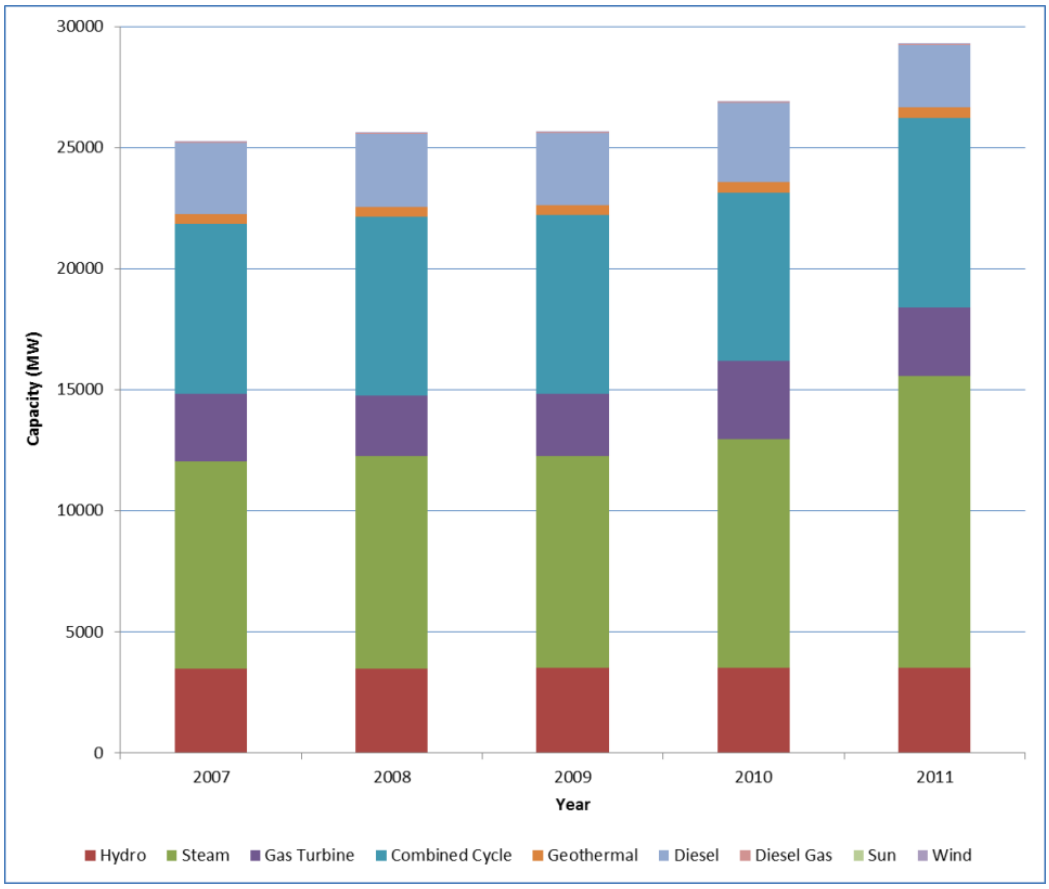
This current capacity represents significant investments on the part of both PLN and the private sector. PLN has invested heavily in building distribution and transmission lines and power generating units (Table 1). Figure 2 indicates that in terms of MW capacity, steam power plants (coal-fueled) dominate the sector, but in terms of numbers of units, diesel leads followed by hydro and gas. For small islands and other isolated off-grid areas, PLN has started building

centralized solar power plants or distributed Solar Home Systems (SHS), requiring a smaller investment per project.

Year	Hydro	Steam	Gas Turbine	Combined Cycle	Geothermal	Diesel	Diesel Gas	Sun	Wind
2007	196	45	54	60	9	4705	2		1
2008	189	48	58	61	9	4635	2		4
2009	201	49	63	59	9	4626	4		3
2010	199	55	73	50	11	4619	8	4	4
2011	213	59	71	61	10	4842	4	8	1

Source: PLN Statistics, 2011

Table 1: Number of PLN Generating Units

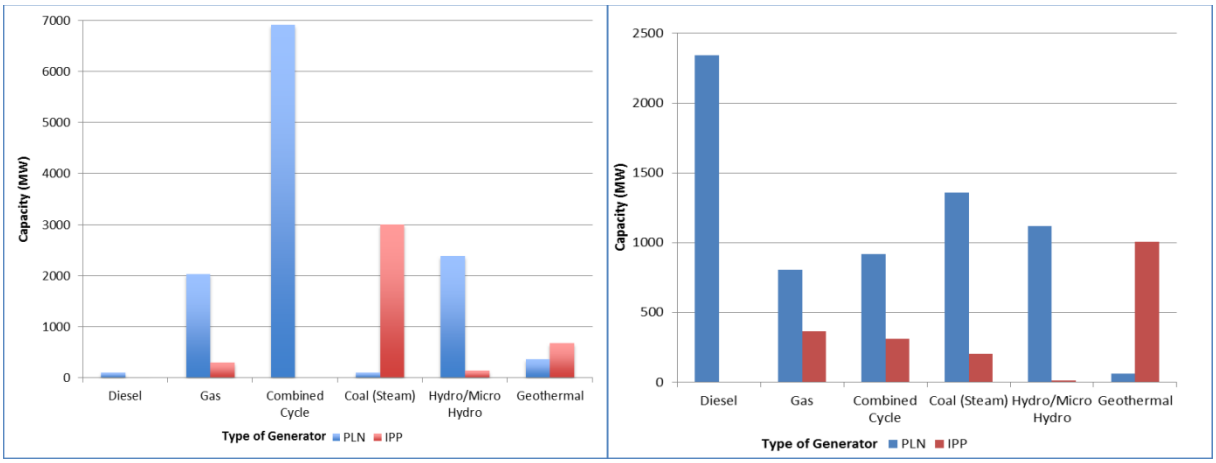


Source: PLN Statistics, 2011

Figure 2: PLN Installed Capacity in 2007-2011 (MW)

IPPs have also invested in the sector in order to: (i) supply electricity to PLN; (ii) rent power generation units to PLN; or (iii) to fulfill their own energy requirements (i.e. on-site power

generation for industrial purposes). Private companies have played a significant role in augmenting PLN's generation capacity, as shown in the following figures. Figure 3 indicates that until 2011, the private sector invested primarily in steam (coal-fueled) power plants in the Java-Bali region, but more in geothermal plants in the other regions.



Source: PLN Statistics, 2011

Figure 3: PLN & IPP Electricity Generator Capacity for Java-Bali (left) and regions outside Java-Bali (MW) (right).

Table 2 below indicates the electric power (MW) sold by IPPs to PLN, by fuel type and region. Note that the private sector does not supply diesel-generated power to PLN, but instead rents diesel generation units to PLN (see discussion below).

PLN Region	Type of Generator					
	Diesel	Gas	Combined Cycle	Coal (Steam)	Hydro/ Micro Hydro	Geothermal
Sumatera Utara	-	-	-	-	-	183
Sumatera Selatan	-	-	-	230	227	-
Kal Teng	-	-	-	-	11	-
Kal Tim	-	-	-	-	45	-
Sul Ut	-	-	-	-	-	3
Sul Teng	-	-	-	-	27	3
Sul Sel	-	60	60	135		12
Jawa-Bali	-	300		3,012	150	685
Total	**-**	**360**	**60**	**3,377**	**460**	**886**

Source: PLN Statistics, 2011

Table 2: IPP Electricity Supply (MW) to PLN by fuel type and region, in 2011

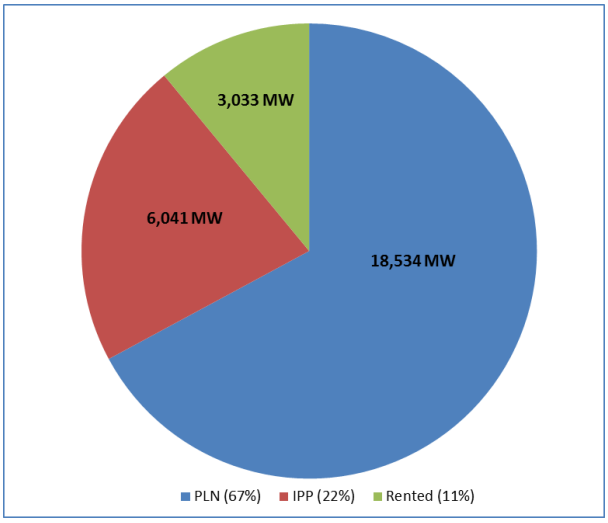
The private sector owns nearly 2,500 MW of capacity in diesel-powered generating units, in general through rental business scheme with annual contract. Under this scheme, PLN is still in charge of providing fuel supplies. Table 3 below shows the capacity of private sector-owned diesel generators, by province, which is rented to PLN.

PLN REGION	DIESEL	GAS	MINI GAS (GAS ENGINE)
ACEH	194		
SUMUT	12		
SUMBAR	29		
RIAU & KEPRI	113		
BABEL	77		
S2JB	22		
KIT SUMBAGSEL	135	424	51
KIT SUMBAGUT	407	46	
KALBAR	235		
KALSELTENG	205		
KALTIM	138	20	13
SULSELRABAR	352		
SULUTTENGGO	184		
MALUKU	80		
PAPUA	90		
NTB	147		
NTT	59		
TOTAL	**2479**	**490**	**64**

Source: PLN Statistics, 2011

Table 3: Private Sector-owned Diesel Generation (MW) Rented to PLN

Overall, the private sector contributes 33 percent of Indonesia's total electricity generation capital investment, consisting of power sold by IPPs (22 percent), and private companies renting diesel generators to PLN (11 percent). (Figure 4)

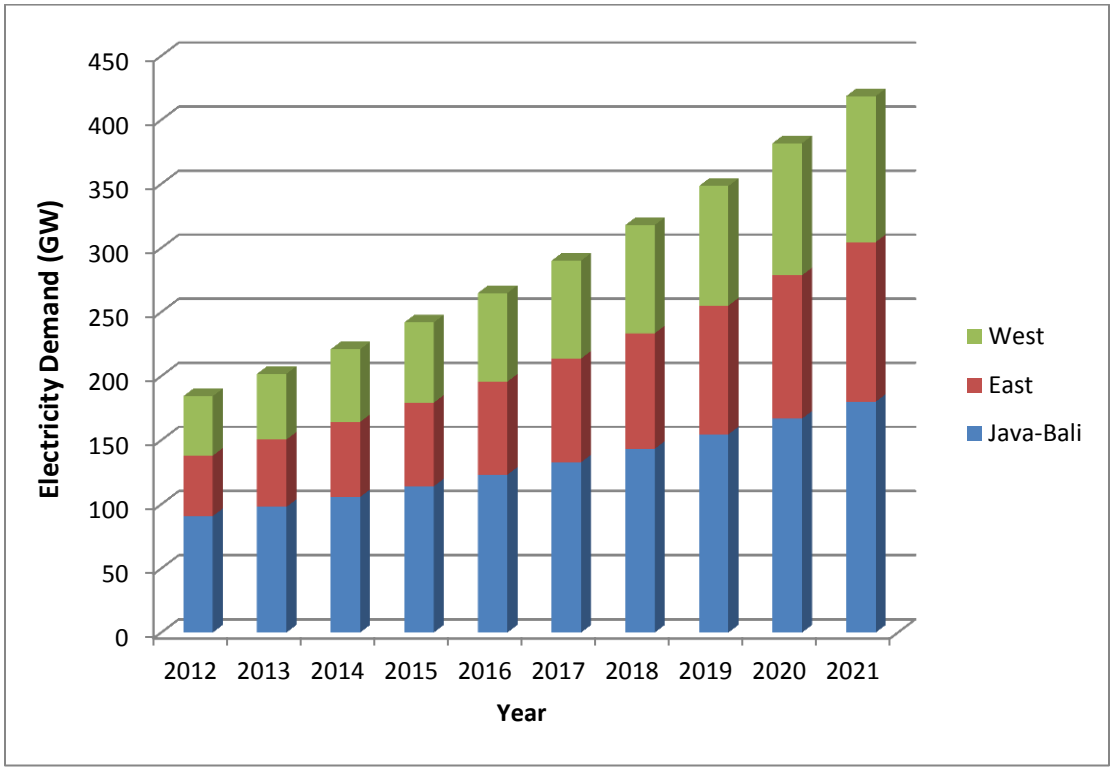


Source: PLN Statistics, 2011

Figure 4: Source of PLN Electricity Supply (MW)

Projected Growth: Based on the Ministry of Energy and Mineral Resources/*Energi dan Sumber Daya Mineral's (*ESDM) draft National Electricity General Plan/*Rencana Umum Ketenagalistrikan Nasional* (RUKN) 2012-2031, Indonesia's electricity demand is forecast to increase eight times over the next two decades - equivalent to an average annual increase of 10 percent. To meet this demand, an additional 237 GW capacity must be added, equally distributed into the Java-Bali and non-Java-Bali systems. Peak load is forecast to rise by the same amount.

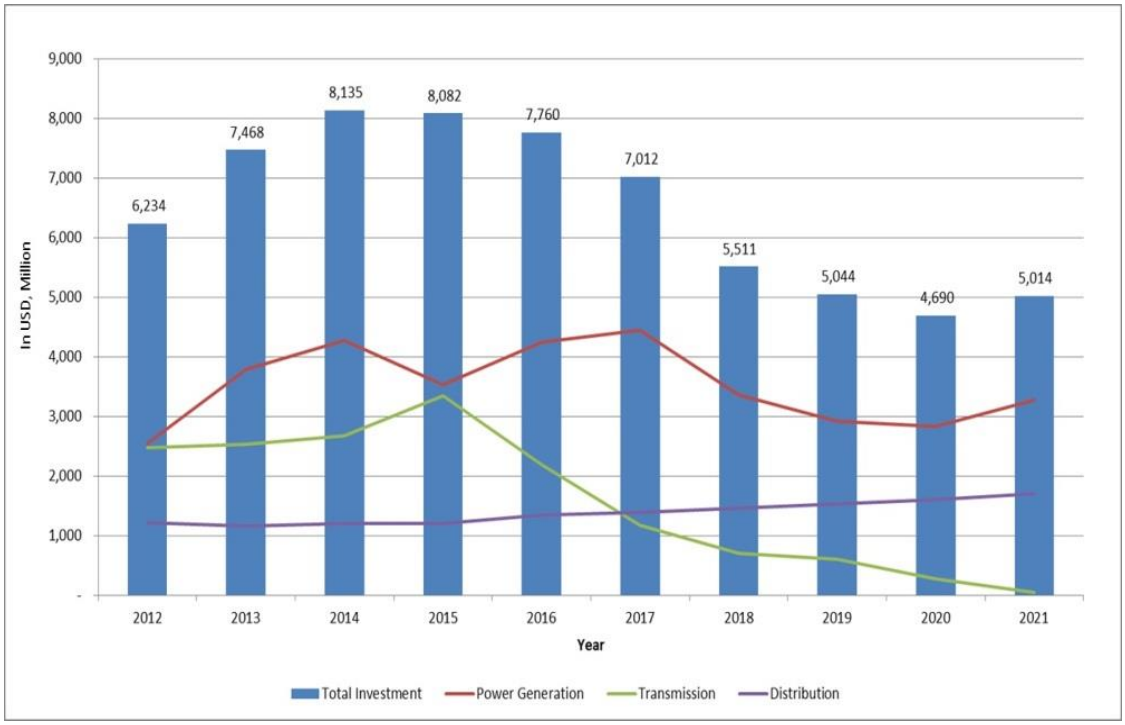
While in its recent statistic report, PLN has estimated that from 2012 to 2021, electricity demand in Java and Bali will grow around 7.9 percent per annum, and the eastern and western parts of Indonesia would grow 11.4 percent and 10.5 percent respectively. (Figure 5)



Source: PLN Statistics, 2011

Figure 5: Estimated Electricity Demand Forecast

To meet this demand – which will include the construction/installation of new power plants and transmission and distribution systems - PLN will need to invest approximately USD 8 billion a year. (Figure 6)



Source: PLN Statistics, 2011

Figure 6: Estimated Investment Required by PLN

IPPs will most likely continue to play a significant and growing role in Indonesia's electricity sub-sector over the next 5-10 years. To achieve its electricity targets, PLN needs private sector investments to build more power generation units (Table 4). PLN expects that the IPP investment requirement will continue to increase and reach a maximum in 2016, with more than USD 42 billion in investments projected from 2012 to 2021.

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Power Generation	1,283	2,359	5,221	7,155	8,011	7,320	5,757	3,267	1,404	398	42,175
Transmission	-	-	-	-	-	-	-	-	-	-	-
Distribution	-	-	-	-	-	-	-	-	-	-	-
Total	**1,283**	**2,359**	**5,221**	**7,155**	**8,011**	**7,320**	**5,757**	**3,260**	**1,404**	**398**	**42,168**

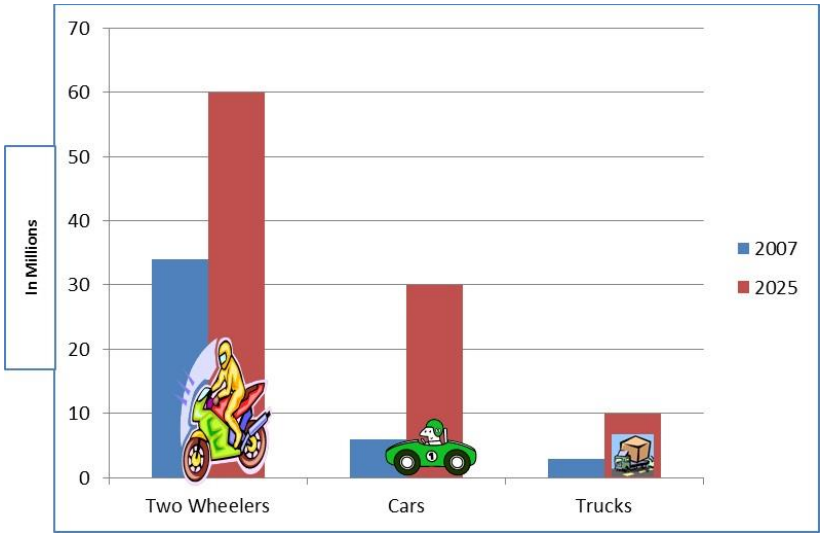
Source: PLN Statistics, 2011

Table 4: IPP Generation Investment Requirements, 2012-2012 (Million USD)

(2) Transportation

Road transport is the largest user of liquid fuel in Indonesia, due to rapid growth in the vehicle fleet and the low price of liquid fuel products for transportation. Low fuel prices (held down by government subsidies) mask improvements in vehicle efficiency that may be taking place over time. The vehicles comprising road transport are dominated by two-wheelers (motorcycles and scooters), with over 34 million in 2007, compared to almost six million cars and three million trucks.

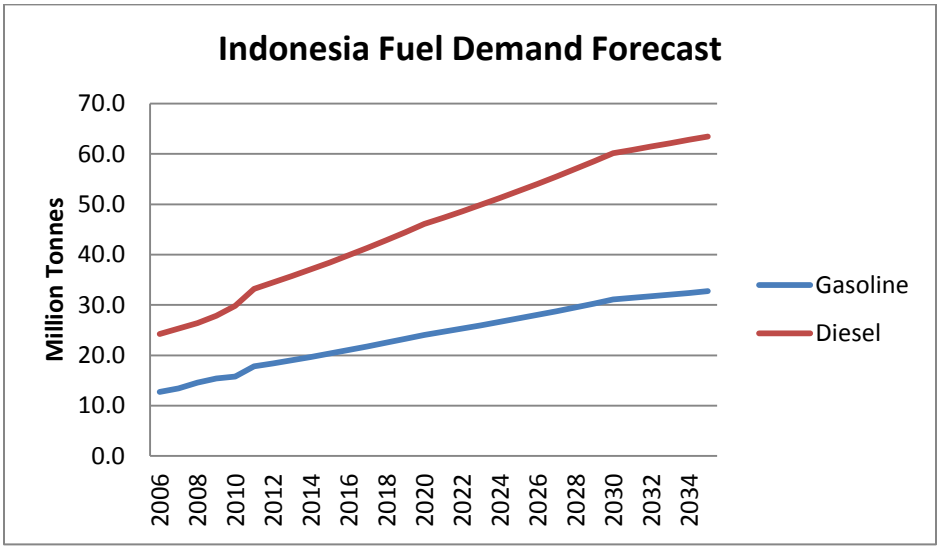
The number of two-wheelers in Indonesia is projected to grow to 60 million units by 2025. The Agency for Technology Assessment and Application/*Badan Pengkajian dan Penerapan Teknologi* (BPPT) and Ministry of Environment/*Kementerian Lingkungan Hidup* (KLH) project (2009) that four-wheel vehicle numbers could grow to 30 million cars and 10 million trucks by 2025 (Figure 7). Freight transport has been growing even faster than passenger traffic and is expected to continue to do so in Indonesia's rapidly growing economy.



Source: BPPT and KLH Statistics, 2009

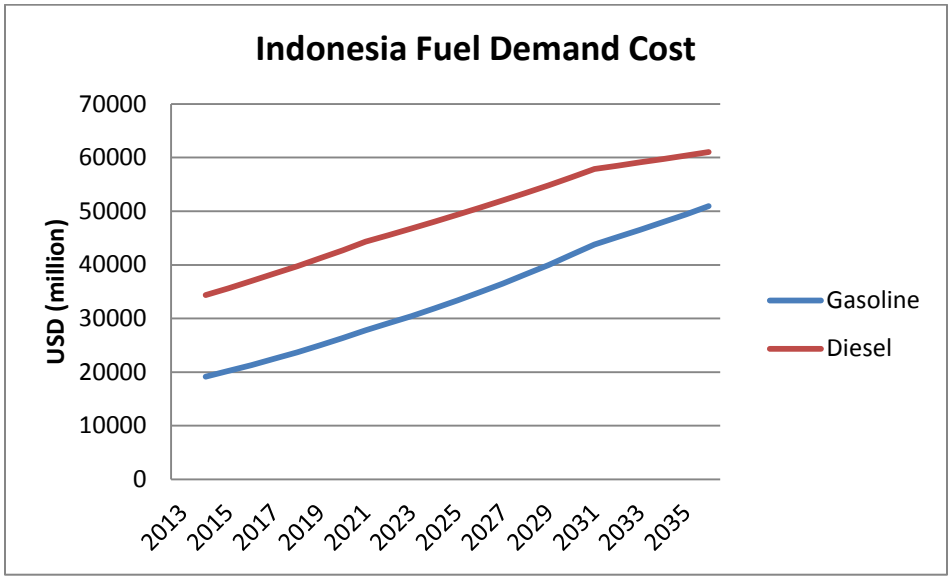
Figure 7: Growth projections for Indonesia's Vehicle Stock (2007 – 2025)

The demand for liquid fuel (gasoline and diesel) (Figure 8) and associated fuel demand costs (Figure 9) will increase as vehicle numbers rise over the next two decades in Indonesia.



Source: Nexant Asia, Bangkok

Figure 8: Indonesia fuel demand, forecast to 2035 (Numbers from 2006 to 2012 are actual figures).



Source: Nexant Asia, Bangkok

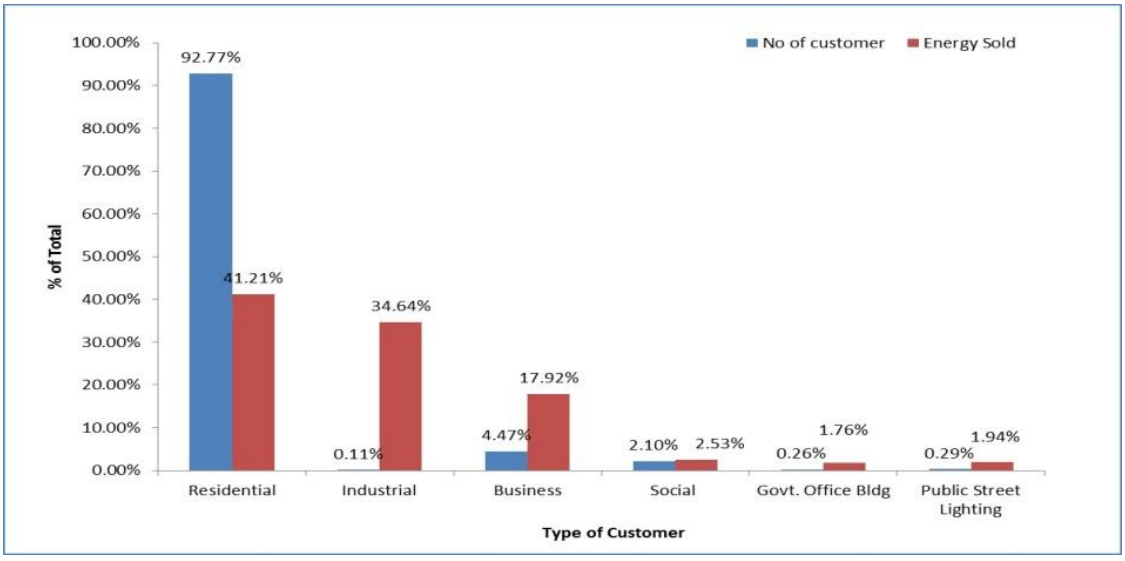
Figure 9: Cost of Indonesia fuel demand, forecast to 2035

(3) Industry

Indonesian manufacturing industries such as cement, pulp and paper, iron and steel, textile, food and beverages, petrochemical and fertilizer consume 80 percent of total electricity for non-oil and gas industry sectors. According to the Ministry of Industry (2010), there are 7,194 companies in those eight industry sub-sectors. In 2010, industry consumed 438 million barrels oil equivalent (BOE) energy or about 44 percent of total final energy consumption by sector (ESDM 2011).[3]

According to a study by Japan International Cooperation Agency (JICA) (2009), industrial energy intensity - expressed as the ratio of energy consumption to GDP of the manufacturing - fell from 1999 to 2005 but it was still well above the level of economy-wide energy intensity in 2006. This indicates that there are still many opportunities for EE and conservation in the manufacturing sector.

PLN Statistics in 2011 show that the major users of energy are Residential customers, followed by Industry and Commercial. However, in terms of number of users, the Industrial customers are the lowest (Figure 10). Therefore, implementing and promoting EE among industry users would likely be the most efficient and simple implementation strategy for realizing energy savings.



Source: PLN Statistics, 2011

Figure 10: Composition of PLN Customers and Energy Sold in 2011

3.1.2 Low Carbon Development

Indonesia is the third largest GHG emitter in the world. Emissions from the energy sector are experiencing the largest rate of growth and are projected to overtake those from deforestation as

[3] ESDM, 2011: 2011 Handbook of Energy and Economic Statistic of Indonesia

the single largest emitting sector by 2030[4]. In September 2009, President Yudhoyono of Indonesia made a commitment during the G-20 meeting in St. Petersburg to specific GHG emissions reduction targets, which were reiterated during the United Nations Framework Convention on Climate Change Conference of Parties (COP) 15 in Copenhagen. These included a goal to reduce GHG emissions to 26 percent below business as usual (BAU) scenarios by 2020 (up to 41 percent with international development partner support) and achieve 25 percent of installed capacity to come from renewable sources by the year 2025[5]. Studies indicate that achieving a 41 percent reduction would require USD 16 billion in investments each year.[6]

The main policy for GHG emission reduction was stipulated in Indonesian Presidential Decree No. 61/2011 that established targets for emission reductions by 2020 for five main sectors: (i) Forestry and Peat Land, (ii) Energy and Transport, (iii) Agriculture, (iv) Industry, and (v) Waste.[7]

The sectoral distribution of the 61/2011 targets is summarized in Table 5 below[8].

Sector	**GHG Emission Reduction Targets (GTon CO_2e)**	
	Scenario 1: 26 percent below BAU	**Scenario 2: 41 percent below BAU**
Forestry and Peat Land	0.672	1.039
Agriculture	0.008	0.011
Energy and Transportation	0.038	0.056
Industry	0.001	0.005
Waste	0.048	0.078
Total	0.767	1.189

Table 5: GHG Emission Reduction Targets by 2020 (GTon CO_2e)

[4] DNPI & McKinsey, 2010: Indonesia Greenhouse Gas Abatement Cost Curve

[5] See http://www.mitigationpartnership.net/newslettter-article-implementing-indonesian-national-action-plan-reduce-greenhouse-gas-emissions-ran

[6] KLH, 2010, Indonesia Second National Communication.

[7] See Annex E for a summary of recent policies and regulations on clean energy and climate change.

[8] Source: Presidential Regulation No 61/2011

(1) GHG Emissions in Electricity Sub-Sector

Coal is still the dominate fuel source for power plant generation in Indonesia, followed by natural gas, oil, hydro, geothermal and less than 1 percent by other renewables (Figure 11). The GOI currently plans[9] to increase coal shares in the energy mix by up to 65 percent, as well as increase geothermal, hydro and other renewables up to 17.6 percent and reduce natural gas to 19 percent and oil to less than 1 percent in 2021.[10]

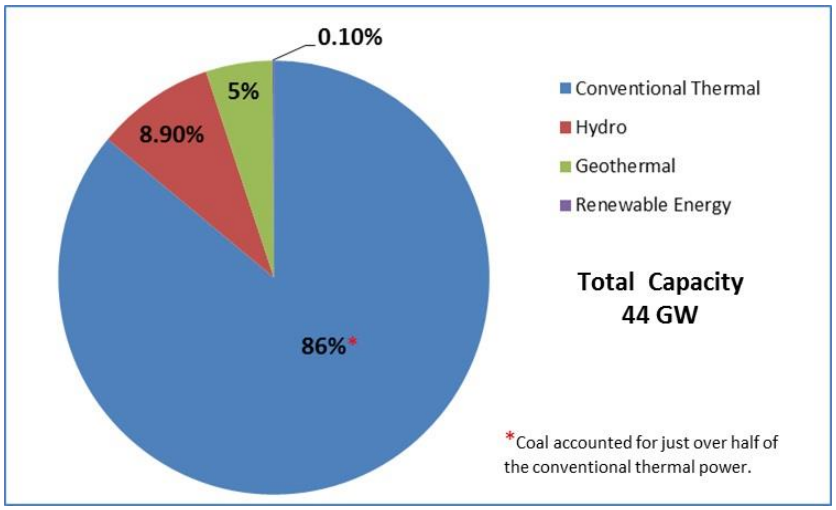


Figure 11: Indonesian Power Sector Fuel Mix

A study by McKinsey & Company and the Indonesian National Council on Climate Change/ *Dewan Nasional Perubahan Iklim* (DNPI) with the assumption that demand for electricity will increase from 137 TWh in 2005 to 970 TWh in 2030, has projected that GHG emissions from the power sector are expected to grow seven-fold by 2030 due to an increasing dependence on coal (Figure 12).

[9] Presidential Regulation No. 5/2006 on National Energy Policy

[10] See Annex D, Figure 1 for data on Indonesia's RE potential.

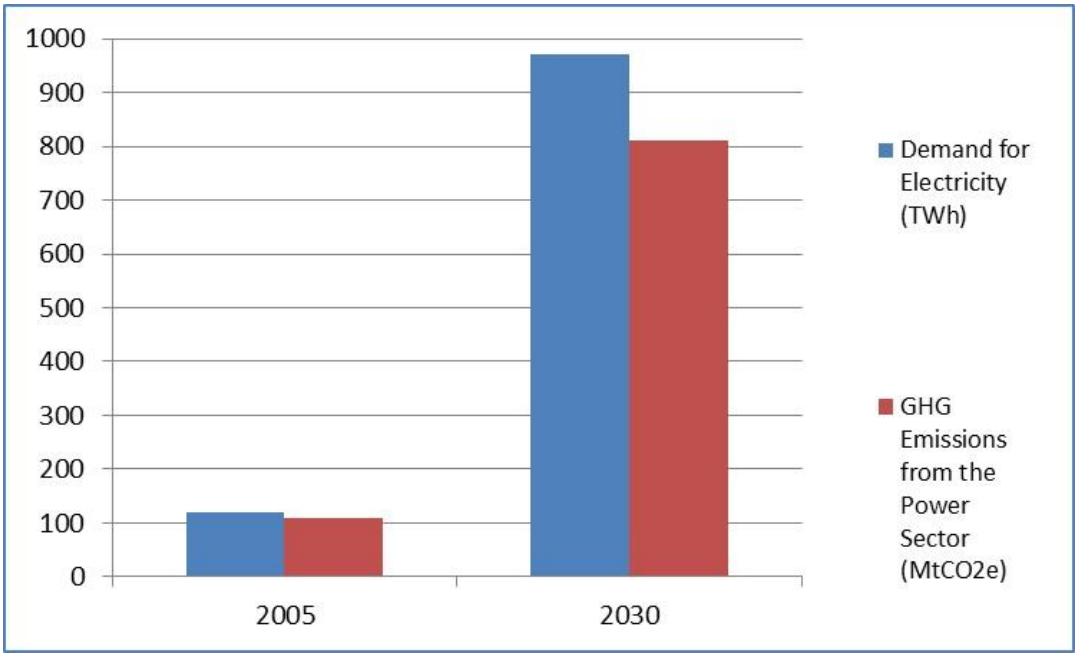


Figure 12: Indonesian Power Sector GHG Emissions Trends (2005 to 2030)

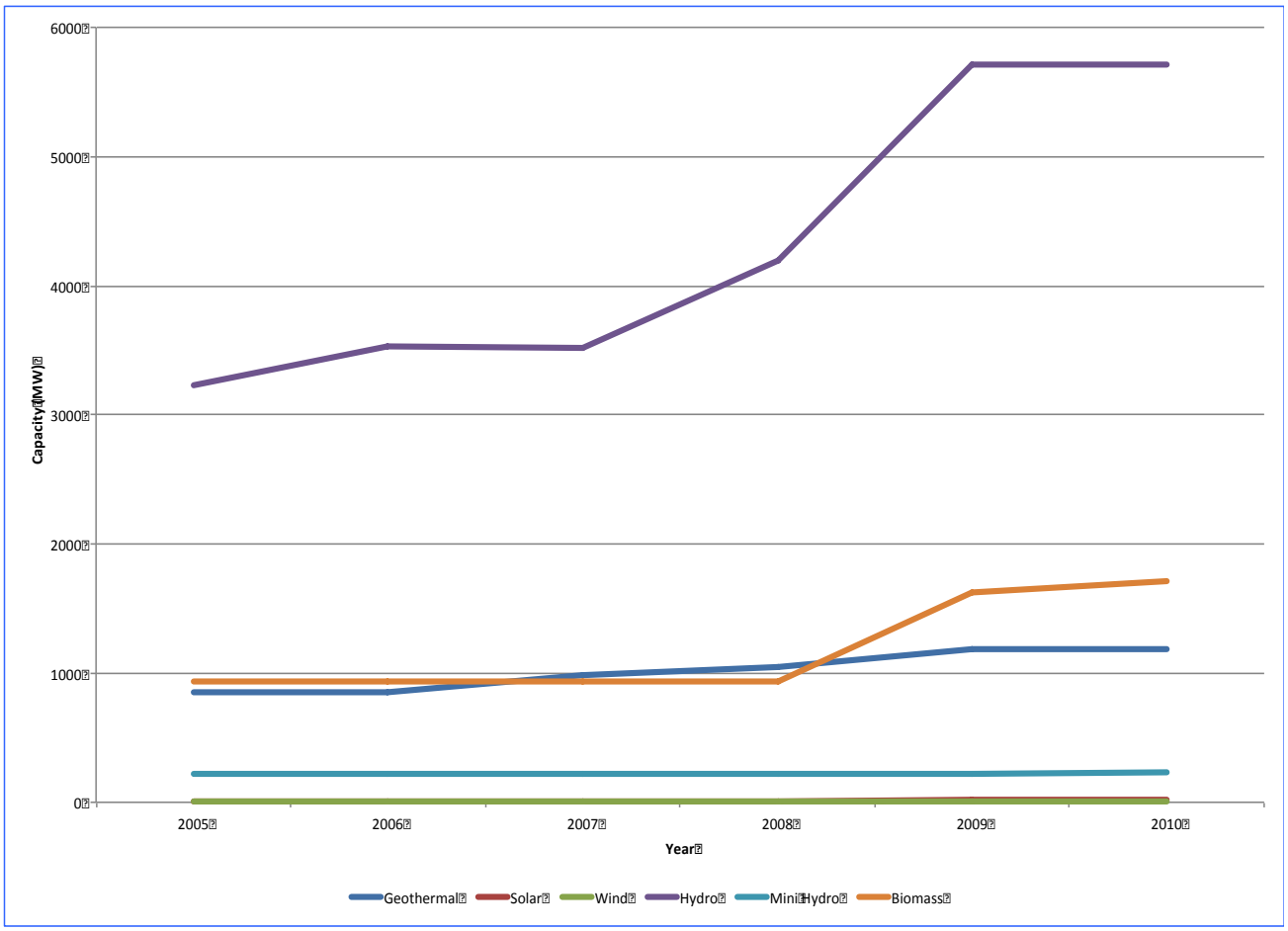
By 2025, GOI plans to achieve its 25 percent RE capacity target as follows:

Resource	Target in 2025
Hydropower	16,799 MW
Geothermal	9,500 MW
Mini/micro-hydro	500 MW
Biomass	8,149 MW
Biogas	611 MW
Solar	1,109 MW

Source:
1. ESDM, 2012. Realistic Development Target for New and Renewable Energy Until 2025.
2. Ipsos Business Consulting, 2012. Meeting the Energy Challenge in South East Asia.
3. ESDM News.

Table 6: RE Capacity Target in 2025 (MW)

This target will require a significant increase in investment. Figure 14 describes investment in RE, represented by installed capacity, from 2005-2010. The most significant development was in large hydropower. It should be noted, however, that this figure describes the total capacity both from public (state-owned companies) and the private sector (IPPs). As discussed previously, the bulk of the investments in large scale hydro are expected to come from the GOI through PLN.



Source: MEMR, 2011

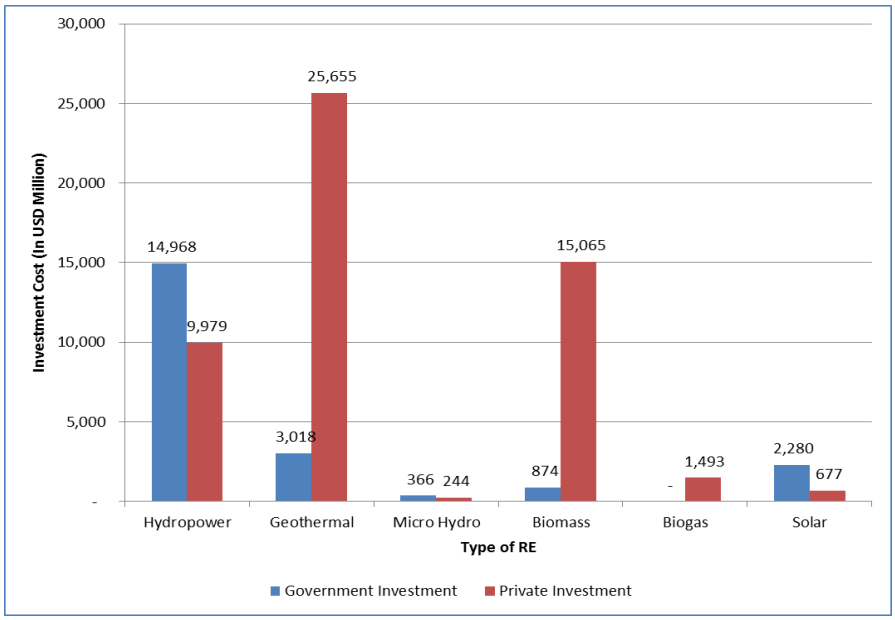
Figure 13: Installed Capacity of RE Projects (MW)

By 2025, PLN plans to develop 60 percent of its new large scale hydropower plant capacity itself and the rest through IPP.[11] For small-scale renewable energy, PLN plans to add mini hydro plants with a combined generating capacity of 1,488 MW and solar plants with a combined generating capacity of 855 MW by year 2021 through IPP scheme.[12]

In order to achieve the above 2025 RE target, an estimated USD 74.6 billion of investment will be required by both government and private sector (Figures 14 and 15).

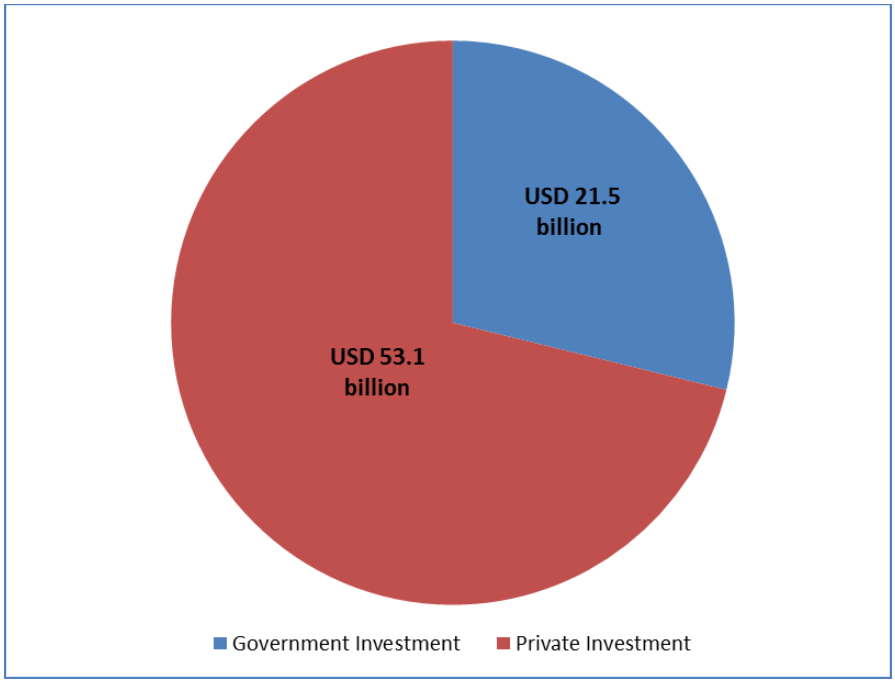
[11] ESDM News, January 27, 2012.

[12] PLN RUPTL (Long-term plan) 2012-2021



Source: PLN Statistics, 2011

Figure 14: Estimated Investment Cost by RE Type for 2025 RE Target



Source: PLN Statistics, 2011

Figure 15: Total Estimated Investment Cost for 2025 RE Target

(2) GHG Emissions in Transport Sub-Sector

Indonesia's transportation sector GHG emissions represent about 23 percent of the nation's total CO_2 emissions (Figure 16). In 2009, road transport accounted for approximately 88 percent of the GHG emissions in the sector; emissions from other forms of transport (i.e. air, sea, and railroad) account for much less (see below).[13] However, road transport in Indonesia makes up a larger share of overall transportation sector emissions than the global average. This highlights Indonesia's higher carbon intensity with a much lower fraction of the population served.

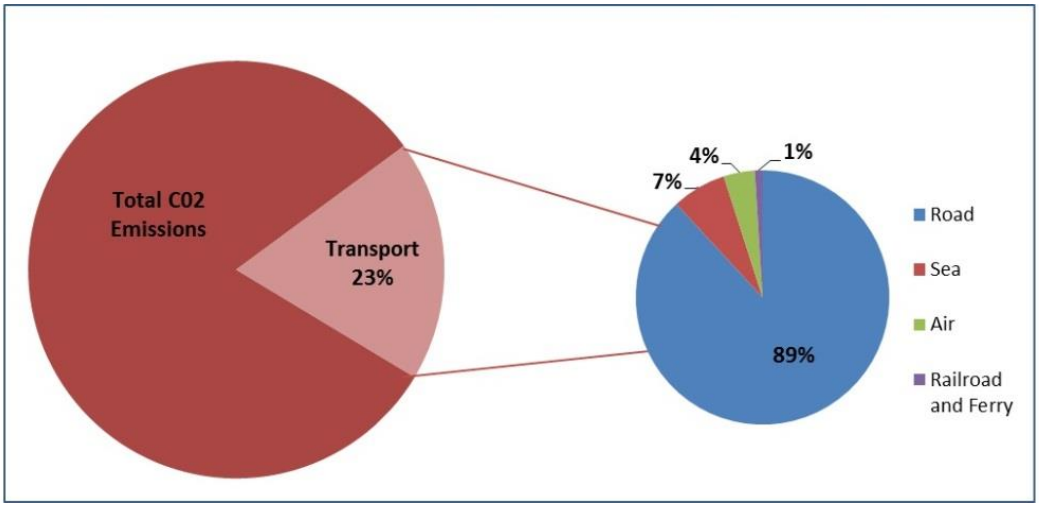


Figure 16: Transportation's Contribution to Indonesian Total CO2 Emissions

As demand for transportation grows rapidly in Indonesia, transport-related emissions are projected to double within the next 10 years. However, vehicle emissions do not directly correlate with vehicle numbers. Because of relative fuel efficiencies and differences in emissions, the smaller number of cars and trucks actually produce more emissions than the much larger number of motorcycles. The *Technology Needs Assessment for Climate Change* (BPPT and KLH report, 2009) estimates that car and truck emissions were about twice as high as motorcycle and bus emissions in 2005. By 2030, however, emissions could be 140 million tons per year from cars, with another 80 million tons per year from trucks, respectively six and four times the projected motorcycle emissions.

With increasing fuel prices, and resulting increases in fuel subsidies, building more energy efficient transport has become a priority government concern. Transjakarta buses, for example, use CNG to reduce the fuel expenses. This strategy has been implemented in several cities in Indonesia such as Yogyakarta, Solo, Bogor, and Palembang. The investments in the Bus Rapid Transit (BRT) system are largely done through cooperation of local governments using their budget, and technical assistance (e.g. GIZ) and loans from donors (i.e. IndII/AusAID, ADB).

[13] Source: World Bank (ESMAP) Transport study (2010) referencing Indonesia Technology Needs Assessment (BPPT and KLH, 2009)

Interconnections between regions are another government priority as part of the Acceleration and Expansion of Indonesia Economic Development Masterplan (MP3EI).[14] However, private sector investments in mass transportation infrastructure have been limited to construction or operation of public-private partnership (PPP) schemes such as toll roads and the TransJakarta bus operations. In the last five years, the largest local private sector investments in Indonesian transportation have been car and motorcycle manufacturing and the airline industry.

A plethora of GOI Ministries are involved in transport sector emissions reduction, including the DNPI as a focus for intra-governmental coordination, and other areas of technical assistance, outreach and capacity building. The DNPI has engaged with external partners and key stakeholders - including the MOF - on climate change adaptation and mitigation issues, including low carbon development. The Ministry of Transportation and Ministry of National Development Planning/*Badan Perencanaan dan Pembangunan Nasional* (BAPPENAS) set transport policy for the country, the Ministry of Public Works builds infrastructure, and the MOF is responsible for budgeting and produces low carbon development studies. The Ministries of Industry and Environment have identified important sectoral opportunities and BPPT has prepared a technology needs assessment for climate change mitigation.

(3) GHG Emissions in Industry Sub-Sector

A review of the GHG emissions from the manufacturing sector by Energy Sector Management Assistance Program (ESMAP, 2010) shows that the largest emitters are concentrated within just four sectors: non-metallic minerals (cement), textiles, basic metals, and food and beverage (Figure 17). Several additional significant emitters merit further analysis including garments, pulp and paper, porcelain, auto parts, fertilizer, and crumb rubber.

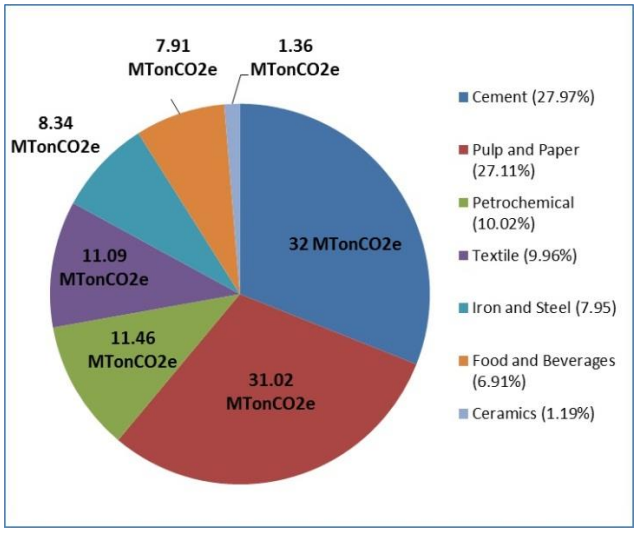


Figure 17: Indonesian Industrial Emissions, by Sub-sector

[14] See Acceleration and Expansion of Indonesia Economic Development Masterplan.

Indonesian industry produces over 114 MTons CO_2e (Table 7). The Ministry of Industry (MOI) has concentrated its focus on reduction of emissions in the cement industry. The MOI issued *Ministerial Regulation on the Road Map for GHG reduction in the Cement Industry* in 2012.[15] The regulation stipulates specific CO_2 emission reduction targets from a 2009 baseline. Industry must carry out voluntary and obligatory reductions by 2020 with a goal to achieve a 2 percent reduction of the total 41 percent target, as stipulated in Presidential Regulation 61/2011.

Industry Types	**CO2 Emissions (MTon CO2e)**	**Share of total Industrial Emissions (percent)**
Cement	32.00	27.97
Iron and Steel	8.34	7.29
Pulp and Paper	31.02	27.11
Textile	11.09	9.96
Petrochemical	11.46	10.02
Ceramics	1.36	1.19
Food and beverages	7.91	6.91
Total:	**114.41**	**100**

Source: Ministry of Industry (2012)[16]

Table 7: Indonesian Industrial CO2 Emissions

McKinsey and DNPI (2009) suggested that cement sector emissions could see a three-fold increase by 2030. This will be driven by significant growth in cement production in Indonesia during this period (Figure 18).

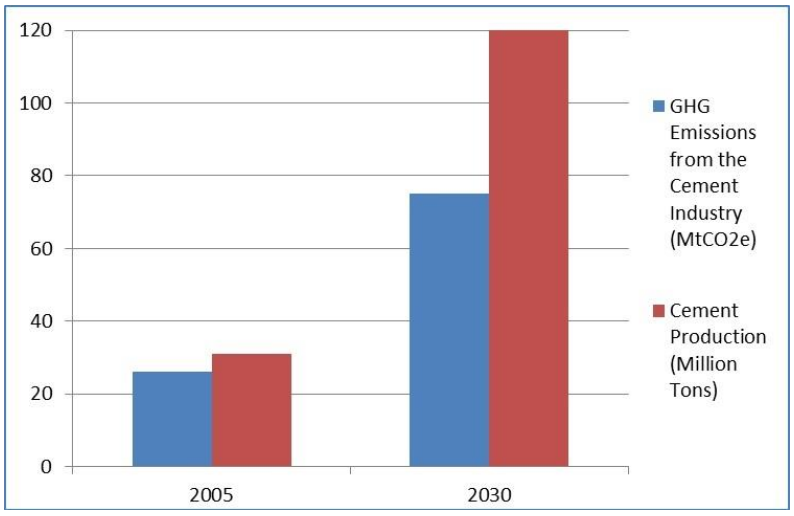


Figure 18: Cement Production and GHG Emissions

[15] Minister of Industry Regulation No. 12/M-IND/PER/1/2012

[16] Budiharti, Tri Reni (2012): GHGs Emissison Mitigation for Industrial Sector, http://www.sekretariat-rangrk.org/?start=6 accessed on 12 February 2013.

(4) Energy Access

Inclusive economic development will not be possible without expansion of energy services to un-served/under-served populations. However, the electrification rate of Indonesia is low compared to neighboring countries (Table 8).

Asian Country	Electrification rate (%)	Population without electricity (millions)
China	99.4	8.0
Brunei	99.7	0.0
Cambodia	24.0	11.3
Chinese Taipei	99.0	0.2
DPR Korea	26.0	17.7
East Timor	22.0	0.9
Indonesia	64.5	81.6
Malaysia	99.4	0.2
Mongolia	67.0	0.9
Myanmar	13.0	43.5
PDR Laos	55.0	2.6
Philippines	89.7	9.5
Singapore	100.0	0.0
Thailand	99.3	0.5
Vietnam	97.6	2.1
Other Asia	83.4	3.1
China & East Asia	**90.8**	**182.0**
Afghanistan	15.5	23.8
Bangladesh	41.0	95.7
India	75.0	288.8
Nepal	43.6	16.5
Pakistan	62.4	63.8
Sri Lanka	76.6	4.8
South Asia	**68.5**	**493.4**

Source: IEA, World Energy Outlook 2011

Table 8: Electricity access in 2009 – Asia

The geographic distribution of electrification (Figure 19) is heavily skewed towards Java and Bali (70 percent of total installed capacity). Millions of Indonesians still lack access to electricity, mostly in the eastern islands.

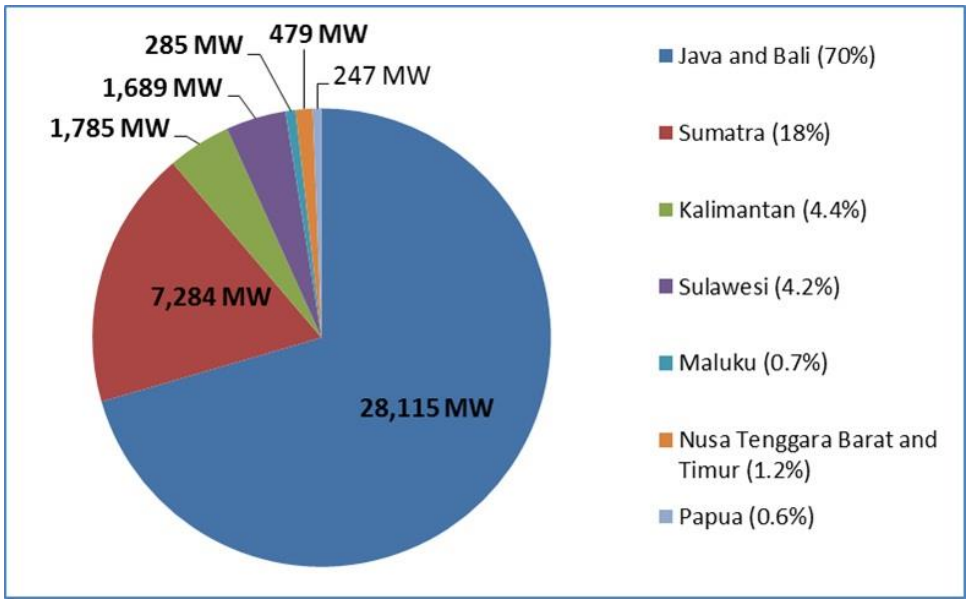


Figure 19: Geographic Distribution of Electrification in Indonesia

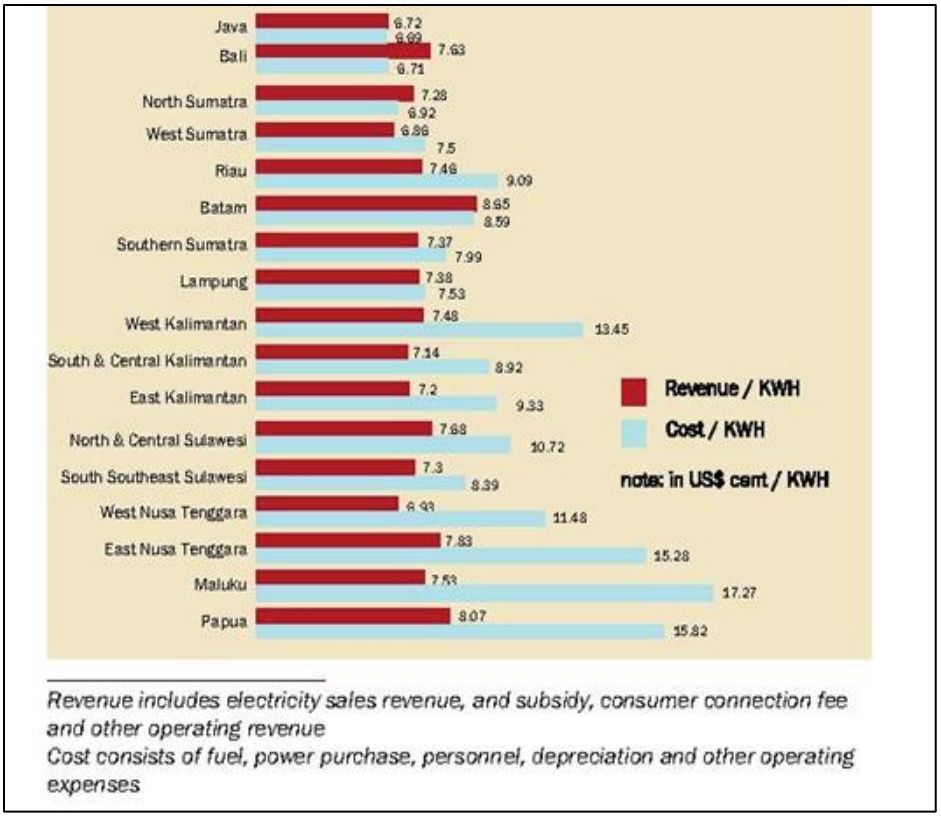
Indonesia has set an ambitious target to increase access to electricity to 90 percent of the population by 2025, from the current rate of 72 percent. Achieving this target will be challenging given the geographic nature of Indonesia, lack of a comprehensive rural electrification strategy, lack of coordinated programs, lack of a centralized rural electrification funds, absence of an oversight institution, a uniform national tariff and reliance on expensive diesel power for many rural and small island service areas. This latter challenge is particular relevant in Eastern Indonesia, which has the highest electricity demand growth projected to 2021 (11.7 percent), but is heavily reliant on expensive and polluting diesel generation plants, with over 800 MW installed. Table 9 below indicates that that the business as usual scenario of achieving increased access in Eastern Indonesia through diesel generation is costly and unsustainable.

Energy Access in Eastern Indonesia

1000 Island Renewable Energy Initiative

PLN has a plan to electrify and expand services to customers in hundreds of islands in the eastern part of Indonesia with stand-alone PV and hybrid PV systems, and mini-hydro to substitute for diesel power plants. The capacity of each power plant is less than 1 MW. PLN estimated that this project requires more than USD 600 million.

World Bank and KfW plan to finance the first phase of this project by providing in total USD 300 million loans to PLN. The project is likely to start in 2013 and first phase will be completed in 2018.



Source: Electricity-for-All: Options for Increasing Access in Indonesia. World Bank, 2005.

Table 9: PLN's Sales Revenues and Costs of Supply by Region (in US cents)

PLN has a mandate to reduce continued reliance on expensive diesel generation, having set a goal to reduce consumption of High Speed Diesel (HSD) oil and Marine Fuel Oil (MFO) for generating electricity by accelerating the development of renewable energy power plants in the eastern part of Indonesia. However, PLN requires substantial donor support to meet this goal. To this end, PLN has launched several initiatives such as the 1,000 Islands renewable energy project for 2014 to 2018, and the Non-Fossil Fuel (NF2) program in Sumba Island - in conjunction with the Sumba Iconic Island initiative. The 1,000 Islands Renewable Energy Initiative funded by KfW, AusAID and World Bank (see box on previous page), is a USD 600 million program to develop solar hybrid power plants to replace diesel generators.

3.1.3 Energy Policy and Regulatory Framework

Indonesia has passed a number of important policy and regulatory measures that collectively represent significant progress towards creating a more conducive environment for clean energy development. The most significant recent developments in the clean energy enabling environment include:

Government 10,000 MW Fast Track Program (FTP II, as stated in the Presidential Decree Number 4/2010): For FTP II, 66 percent of the targeted 10,000 MW power plants planned for construction will use renewable energy such as Geothermal (4,900 MW) and Hydro (1,753 MW) power plants.

Decentralized Tariff Setting: In service areas operated by an entity other than PLN (e.g. either a PLN subsidiary or other provider) provincial governments are granted authority over pricing under law 30/2009. PLN Batam and PLN Tarakan operate on their own tariff structure, and the PLN distribution unit in Bali has recently applied for approval of subsidiary status so they can apply their own tariff. This model could be a more politically viable means to move electricity tariffs towards cost reflective levels, although provincial government resistance to price increases is likely to persist.

Small Scale Renewable Energy Development: Electricity Law 2009, and implementing regulations ESDM 4.2012, the establishment of renewable energy feed in tariffs (FITs), the requirement for PLN to purchase power generated by IPPs under 10 MW, and standardization of the power purchase agreement (PPA) processes has transformed the IPP market for renewable energy generation facilities that produce less than10 MW.

However, the first FIT was set up to be the same for all RE sources (ESDM Regulation 4/2012), while the generation costs of different types of RE differ significantly. Under this standardized scenario, only hydro and biomass projects were profitable. As a result of this FIT structure, most RE project proposals received by banks and financial institutions from 2009 to 2012 were for hydro and biomass projects.[17] However, as solar and wind FITs are finalized (note that biomass, biogas, municipal waste and landfill gas FITs were established in 2012), projects are expected to proliferate in these technologies as well. This represents a significant change from 2008 when investments in RE projects were dominated by high-capacity and high-cost projects that could only be built by large companies, and when few small-scale IPP projects were under development.

In particular, the solar FIT offers unique opportunities. ESDM is still finalizing the regulation for a FIT for solar energy, which will be around USD 0.25–0.30 per kWh. Solar power plant development will be based on an annual capacity quota, which is targeted at 100 MW. The FIT level will also depend on the capacity of diesel power plants that can be replaced by solar plants in the same region. The right to develop solar power plants will be opened to both the public and

[17] According to interviews with representatives of financial institutions conducted during the assessment.

private sectors and award decisions will be made by a team consisting of central government, local government, and PLN personnel. ESDM plans to replace the use of diesel during daylight so that fuel consumption (and, ultimately, the fuel subsidy) can be reduced. In order to reduce the level of required investment and maintenance costs, the solar power plants comprising this scheme will not use battery storage. As such, the investment cost for this type of solar power plant is estimated at USD 2.7 million per MW. Indonesia's thousands of islands, which are mostly small and isolated, are ideally suited for solar power plants. With the lower investment and maintenance costs and higher FIT, this sector has the potential to be a profitable investment for the private sector to increase access to electricity for millions of un-served Indonesians.

Draft Energy Policy: A new energy policy has been drafted and is under review by the office of the President. Although the details of the policy have not been made public, indications suggest that it will reflect Indonesia's ambitious vision for a clean energy future and is likely to set a higher target for renewable energy. Once the policy is released there is likely to be action across the legal, regulatory, and financing space that could further strengthen the enabling environment for clean energy development.

Geothermal FIT and Exploration Cost-Sharing: The geothermal FIT established by Ministerial Regulation 22/2012, and Indonesian Investment Agency/*Pusat Investasi Pemerintah* (PIP) plan to provide concessional financing for exploration drilling provide a basis for accelerated geothermal development. Unfortunately, implementation of both of these measures has been delayed.

Mitigation Planning and Coordination

National Planning: In September 2011, Regulation No. 61/2011 - the National Action Plan for Greenhouse Gas Emissions Reductions (RAN – GRK) was issued with 49 core and 70 supporting mitigation activities across all major emitting sectors. Five measures were specified for energy and transport: (i) accelerated energy saving; (ii) utilization of cleaner fuel (fuel switching); (iii) utilization of new and renewable energy; (iv) utilization of cleaner technology for power generation and transport system; (v) development of mass transport systems nationwide.

Within these measures, the regulation lists 26 indicative action plans to be carried out from 2010 to 2020, nine of them directly linked to the energy sector, including power generation, and the remaining linked to the transport sector. For instance, ESDM has plans to implement energy management systems, and improve the efficiency rating of home appliances. They also plan to support development of RE power plants and Energy Self-Sufficient Villages (Table 11):

Implementation Plan	2010-2014	2015-2020
Micro Hydro	46.17 MW	84.23 MW
Mini Hydro	-	510 MW
Solar PV	102 MW	224.68MW
Wind	21.6 MW	37.53 MW
Biomass	0.4 MW	16.50 MW
Energy Self Sufficient Villages	250	400
Emission Target	**1.27 million ton CO_2e**	**3.13 million ton CO_2e**

Table 10: MEMR GHG Mitigation Implementation Plans

Most of the mitigation activities proposed in the National Action Plan on Climate Change, RAN-GRK (Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca/National Action Plan on Climate Change), were derived from indicative work plans of line ministries and have created favorable conditions to integrate these activities into ministry annual programs. The regulation required the preparation of regional action plans for GHG reductions (RAD-GRK). As of December 2012, there were 10 provinces whose RAD-GRK had been approved by its Provincial Governor and were ready to be implemented. Many stakeholders believe that the RAD-GRK plans present a unique opportunity to engage regional governments in climate mitigation planning and implementation in a manner well beyond current practice.

Sectoral Planning and Coordination: The GOI has created two institutions to improve clean energy sectoral planning and coordination. In 2010, the Directorate General for New, Renewable Energy and Energy Conservation under the ESDM was created. USAID has been coordinating closely with the Directorate General and they are the natural government institutional partner for any future energy sector program. In 2008, The National Energy Council/*Dewan Energi Nasional* (DEN) was established as a high level multi-stakeholder planning and coordination body chaired by the president. DEN has played an instrumental role in the development of the new draft energy policy, although its role and effectiveness moving forward was a question raised by several stakeholders.

PLN Planning: PLN's recently released Electricity Power Supply Business Plan/*Rencana Umum Penyediaan Tenga Listrik* (RUPTL), covering the period between 2012 and 2021, increases RE targets to 21 percent. The report calls for an additional 6,000 MW each of geothermal and

hydropower, developed on IPP, PPP, and direct ownership models. It also includes four strategies to address GHG mitigation[18] (Figure 20):

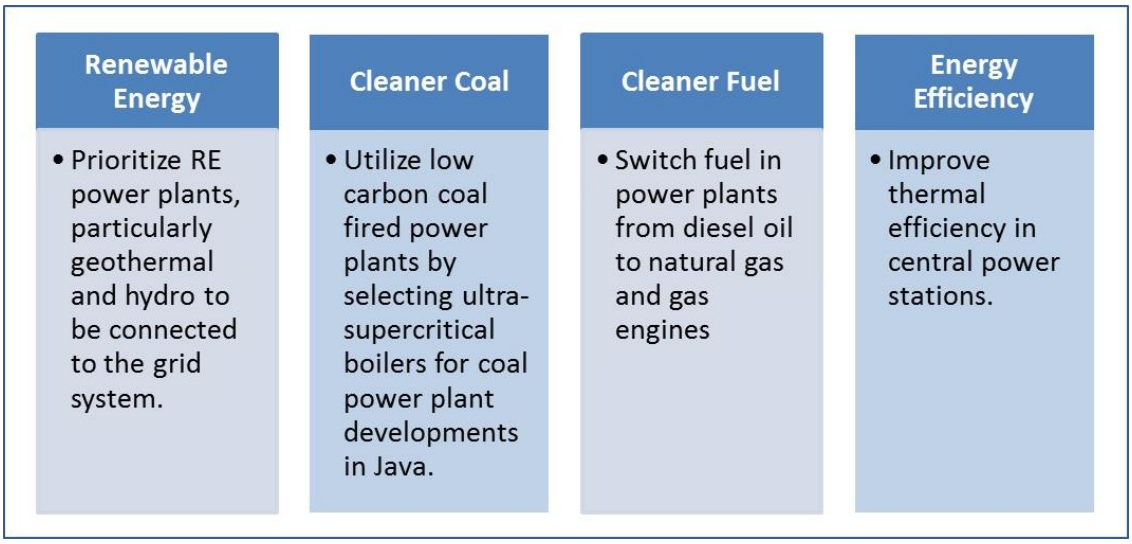


Figure 20: PLN GHG Mitigation Strategies (2012-2021)

PLN's rather limited demand side management (DSM) program seeks to trim or shift peak electricity demand given the supply capacity shortfall that leads to the inability to meet end-use demand during peak hours. The larger component of PLN's EE emphasis to date is focused on supply side EE activities designed to reduce technical system losses (Figure 21):

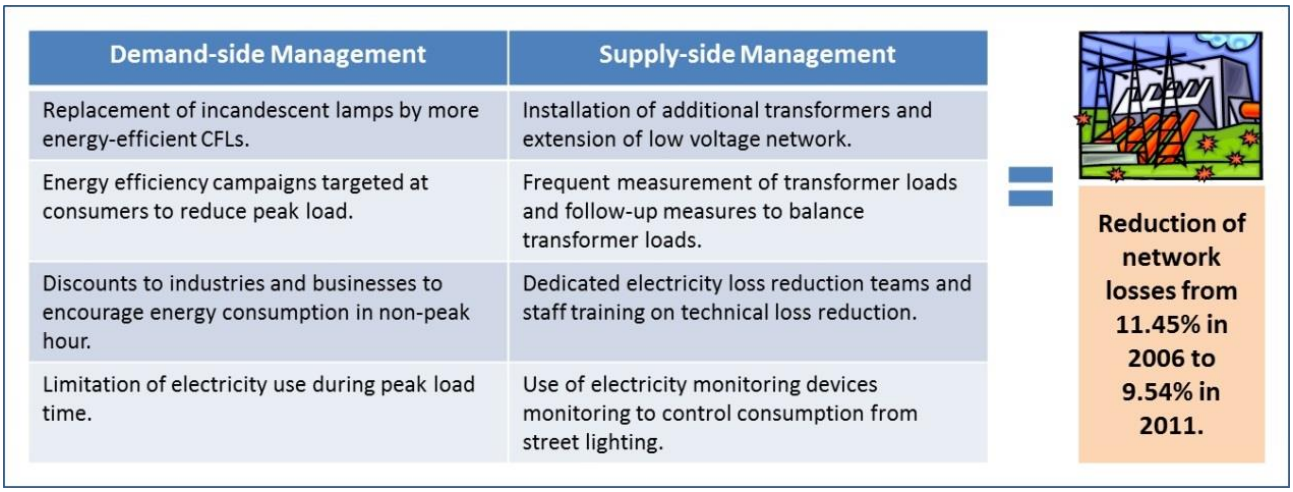


Figure 21: PLN End-Use and Supply-Side DSM Activities

[18] PT PLN (2012): Rencana Umum Penyediaan Tenaga Listrik 2012-2021 (Electricity Provision General Plan 2012-2021)

Achieving these objectives will be difficult[19], but their inclusion in PLN's development plans is an important first step. PLN has recently shifted significant planning responsibilities to their provincial units for projects connected to low-medium voltage networks, typically less than 10 MW.

3.1.4 Clean Energy Implementation and Investment

Emergency Power Program - In 2008, Indonesia suffered from chronic power shortages resulting in significant load shedding that led to the launch of a two stage emergency power program. The first stage focused primarily on the supplemental generation of coal-fueled power. The second stage is more evenly balanced between coal, hydropower, and geothermal. The additional generation capacity brought online as a result of the first phase of this program has helped to ease generation shortages in Indonesia. The second phase offers an opportunity to fast track some renewable energy projects.

Utility Operations - PLN is an essential player in the majority of clean energy development activities in Indonesia, and its continued evolution from a poorly managed state owned utility to a modern day more efficiently managed entity is critical. PLN's recent advancements in select service areas demonstrate the impressive capabilities of the institution. In Bali, for instance, total losses are 5.2 percent and customers experienced on average two blackouts in the past year averaging less than 45 minutes. These improved performance characteristics are the result of the following reforms:

- SCADA – The entire Java-Bali distribution network now utilizes a Supervisory Control and Data Acquisition (SCADA) system.
- Improved conductor insulation – over 50 percent of conductor wires are now insulated
- Service level agreements – All customer classes sign a service level agreement
- Automated outage monitoring – Automated call system immediately identifies outages and facilitates problem identification.

While the issues, infrastructure, capacity margins and demand growth in Java and Bali and the outer islands (Western and especially Eastern Indonesia) are very different, expansion of these innovations to other service areas holds potential for improving distribution system efficiency and reliability.

PLN has also showed commitment to improving its governance by establishing a Collective Action Initiative. Launched at the end of 2012 together with PLN's investment partners, vendors, and consultants, this initiative intends to prevent corruption in the PLN supply chains. Given that one reason for public opposition to the electricity tariff hike in the past was PLN's non-technical inefficiencies such as corruption, improving PLN's corporate governance may help reduce opposition for electricity tariff increases.

[19] For instance, the geothermal industries internal planning estimates the addition of a more modest 2,000MW of capacity by 2016.

3.2 REMAINING CHALLENGES AND EMERGING OPPORTUNITIES

Expanding this transformation to include larger geothermal and hydropower development, a more diverse set of renewable technologies for under 10 MW plants, and EE implementation will all be required to meet the GOI energy sector objectives. Despite significant advancements, Indonesia faces a number of substantial hurdles that must be overcome if its energy security, GHG mitigation, and energy access targets are to be achieved. The following barriers to change must be addressed in the next 5-10 years and may represent opportunities for future USAID programming.

(1) Energy Sector Governance

Energy Subsidy – Fuel and electricity subsidies remain a critical issue for fiscal sustainability, RE development, and EE in Indonesia. In 2012, the GOI spent over USD 30 billion for subsidizing fuel, electricity and LPG, which was almost a quarter of the total government budget. The GOI spends the same on energy subsidies, as it does on defence, education, health, and social security combined.

While many countries apply a surcharge on bulk or retail electricity tariffs to fund centralized rural electrification or clean energy development funds or incentives, Indonesia's uneconomic nation-wide electricity tariff [20]and fuel subsidy continues to consume significant public sector resources that are needed to meet government energy targets.

For example, one of the constraints to successful implementation of RAN-GRK and RAD-GRK is budget availability. According to MoF, if the current public budget allocated for mitigation remains at the same level, with a 0.767 $GTCO_2e$ emissions reduction target, only 16 percent of the target can be achieved. An additional 14 percent can be achieved if significant numbers of geothermal and RE power plants could reach the additional generating capacity targets by 2020. Private investment will not be able to meet this gap alone. Meeting PLN's RE energy production targets will require USD 74.6 billion in new investment. With the existing donors' fund for renewable energy around USD 4.5 billion, government and private sector still have to provide USD 70.5 billion. With the fuel subsidy reaching USD 30 billion per year, the target is only feasible if government reduces the fuel subsidy and reallocates it for investment in RE.

In addition to being a fiscal strain, the subsidized electricity tariff makes investing in EE economically unattractive. GOI has begun an number of EE initiatives for industry, including the machine revitalization program[21], establishing the Energy Efficiency and Conservation Clearing

[20] Indonesia's electricity tariffs are among the lowest in the region, see Annex D, Figure 3

[21] The Ministry of Industry has launched machine revitalization programs for state-owned textile, footwear, and sugar industries. The program covers 10 percent of total investments to upgrade the machines.21 Although this incentive is not directly targeted to energy efficiency, the purpose is to encourage the private sector in targeted industries to invest in more energy efficient equipment. The success of the program in encouraging private industry to invest in upgrades is yet to be seen.21 Until 2011, there were already seven state-owned sugar companies receiving government assistance with the value of Rp. 47.88 billion. The GOI also allocated new machines for six state-owned sugar companies.

House Indonesia (EECCHI)[22], a requirement for an energy manager position for buildings and industry that use 6,000 tons of oil equivalent energy annually,[23] and government-sponsored training, capacity building, and awareness campaigns have also been held to encourage industries to use energy more efficiently. However, the implementation of EE programs in industries has been largely unsuccessful, in large part due to artificially low tariffs resulting from the energy subsidy. Industries are still reluctant not only because the low electricity tariff makes the investment in EE have insignificant result in reducing their cost but also because they will lose income and opportunities when they stop their production to install new equipment. For strategic industries with limited players, such as fertilizer and cement, halting production can disrupt the market supply and deteriorate the price.

It is worth noting that the direct impact of the tariff on RE development has been somewhat mitigated since the 2008 assessment, when the bankability of a PPA with PLN was a major concern of clean energy developers and financial institutions.

The government has a stated goal to reduce energy subsidies gradually by 2014. However, political movement to that end has been limited. After 2009, the government began reducing consumption of subsidized gasoline and diesel, two main fuels for land transportation by setting annual quotas. Strong domestic consumption has pushed up the quota of subsidized fuel and costs have been driven up by the rise in Indonesian Rupiah-denominated fuel prices. The volume of subsidized fuel in 2012 increased almost 10 percent from 2011, and was 151 percent of the allocated budget. The government budget for 2013 has allocated almost USD 28 billion for energy subsidies, higher than capital expenditure, at USD 22 billion.

Increasing fuel prices as a measure to control fuel subsidy spending has largely failed due to a lack of political will. The government made an attempt to raise fuel prices in 2012 but it failed due to strong parliamentary opposition. Attempts by government to limit fuel distribution based on quota allocations has caused fuel shortages in a number of provinces outside Java and has faced opposition from a number of other provinces.

However for the 2013 budget, the government has been given a mandate to raise fuel prices if the limit of the subsidy budget is exceeded - without requiring approval from parliament. Earlier this year, the MoF warned of a high possibility that the earmarked budget for the energy subsidy will be surpassed again due to strong vehicle growth last year, and strong economic growth that will lead to higher consumption. Increases in international oil prices above the price set in the budget assumption would have a significant impact on the cost of the energy subsidy.

[22] Established Energy Efficiency and Conservation Clearing House Indonesia (EECCHI). The EECCHI clearinghouse provides guidance for energy conservation in buildings, houses and industry. Although some features, such as database of energy auditors and suppliers, are not available yet, it is an indicator of GOI willingness to implement energy conservation programs.

[23] Government Regulation Np.70/2009 and ESDM Regulation No. 14/2012

As a result, while the government has a stated goal to reduce energy subsidies, Indonesia will likely continue to struggle to find the political will to do so in the coming years, negatively impacting energy poverty and clean energy goals.

Independent Regulatory Authority – The politicization of Indonesia's energy subsidies, and challenges with licensing and permitting procedures, highlights why many countries have moved towards an independent regulatory authority. Establishing a national level independent electricity regulatory body is not authorized under the current electricity law and does not appear to be a near or medium term priority.

Sub-National Government Capacity – The movement to decentralize power has exposed a significant capacity gap at the provincial and district government levels across all sectors. This gap has manifested itself in a variety of ways within the energy sector:

- While PLN is responsible for a nationwide, detailed 10-year electricity plan, the Electricity Law gives authority to local governments, both provincial and regency/cities, to develop local Regional Public Power Plans/*Rencana Umum Ketenagalistrikan Daerah* (RUKD) and establish electricity service provision within its administrative boundaries. However, the wide range of responsibilities delegated to sub-national authorities under the Electricity Law has yet to be fully realized due to capacity constraints. Most local governments do not have the technical knowledge, resources and sufficient tools to carry out local electricity planning, and many are not even aware that they have this authority. This mismatch in mandate and capacity has inspired a number of donor activities in the past to develop capacity in local energy planning by carrying out intensive training for several local government and local institutions, such as the use of energy planning tools.[24]

- Indonesia has a national legal framework in place that mandates energy conservation, and is the main instrument to achieve emissions reduction targets in the electricity sector. The capacity to implement and enforce these measures throughout Indonesia to achieve these targets is limited, and the need for donor assistance to strengthen local capacity in this regard was a consistent and recurring theme in discussions with a variety of stakeholders.

- The capacity of local governments to formulate the local action plans on climate change, RAD-GRK, is weak and the quality of many RAD-GRK documents is poor, which will likely limit their impact on emission reduction targets. The provincial/district level government development planning agencies (BAPPEDAs) play a central role in local development planning and in allocating resources for the implementation of RAD-GRK activities. However, the BAPPEDAs themselves need to be strengthened to mainstream and integrate climate change mitigation and adaptation strategies into the provincial and/or regional development and budget planning process to ensure effective implementation.

[24] See Annex F for a listing of the main GOI ministries and civil society organizations involved in the sector

This support could come from the national planning body, BAPPENAS. BAPPENAS is likely to continue to support local governments to improve and develop their RAD-GRK and assist in implementation. BAPPENAS has been working to coordinate and mobilize donor agencies to support the implementation of RAN-GRK and RAD-GRK. BAPPENAS could benefit from donor assistance to develop a comprehensive capacity building program to improve the human resource capabilities of local institutions at the provincial and district level, perhaps in partnership with the Directorate General (DG) for Regional Development in the Ministry of Home Affairs.

Sector Coordination - USAID's 2008 energy sector assessment highlighted lack of policy/regulatory/implementation coordination as a major barrier to clean energy development and there was little evidence of improvement during the current assessment. Both institutions created to help address the coordination issues, DEN and DG for New, Renewable Energy and Energy Conservation within the ESDM, have demonstrated impressive development in a short period, but fall well short of the authority or capacity required to streamline many energy sector processes.

This lack of coordination also remains problematic on the sub-sector level. For example, the World Bank produced a recent paper on the transport sector[25] to identify a practical and coordinated approach to managing transportation sector emissions. The report focuses on a few key policy options (both within the MoF and other Ministries) that could start the GOI on a path to reduced carbon intensity for the transportation sector. However, as mentioned earlier, with so many governmental players involved, the political decision making process is complex and largely uncoordinated. Moreover, while transportation is the responsibility of the Ministry of Transport, donors that focus on the sector (i.e. GIZ) concluded that the Ministry of Transport has less power to initiate development of infrastructure for transportation systems compared to the Ministry of Public Works, emphasizing that results will not be achieved without increased coordination among all relevant government ministries.

Undeveloped policy, regulatory, and enforcement regimes for EE - National energy conservation is the responsibility of the GOI, regional government (provincial, regencies/cities) offices, business entities, and the community. Government regulation 70/2009 represents the most comprehensive government action on energy conservation. The law mandates energy conservation shall cover all phases of energy management, and grants provincial governments, and regencies/cities governments authority to establish regional regulations and energy conservation management policies that apply exclusively within their legal administrative boundary. The implementation of Government Regulation No. 70/2009 is regulated by legally binding Ministerial Regulations issued by the government authority on energy matters, the ESDM.

However, ESDM has not taken a programmatic approach to energy conservation and efficiency, and implementation of this regulation has been limited as a result of incomplete data identifying the large energy users and limited enforcement capability.

[25] Source: World Bank (ESMAP) Transport study (2010)

Similarly, Presidential Regulation No. 61/2011 approaches emission reduction in industry by promoting optimization of energy use. The main strategy for the industry sector has been limited to provide direct incentives (such as free energy audits) to intensive energy industries to improve efficiency.

Pursuant to the action plan of Presidential Regulation No. 61/2011, the Ministry of Industry set a target to establish energy management systems (EMS) in nine cement companies, 35 steel companies, and 15 pulp and paper companies in 2010 – 2014 with a projected reduction of 2.06 million tons of CO_2e emissions. In the period of 2015 – 2020, this measure will be expanded to other energy intensive industries: glass and ceramics, fertilizer, petrochemical, textile, and basic chemical resulting in a potential reduction of 2.75 million ton CO_2e.

However, the implementation of the EMS has been slow. The Ministry of Industry told assessment team members that this program has suffered from an incomplete registry of companies that must comply with the regulation, and there are no enforcement mechanisms. The Ministry of Industry does not have a comprehensive program to implement these plans but is dependent on support from donors and other development agencies to carry out EMS activities

Key Bottlenecks for Energy Efficiency (EE)

Energy efficiency (EE) improvements are often cited as the most cost effective option for reducing energy demand and energy sector carbon emissions. Nearly all of Indonesia's major industries are more energy intensive than competing countries. Energy efficiency has historically been a challenging sector in Indonesia, as a result of the following key constraints:

- Low electricity tariffs and high opportunity cost
- Undeveloped policy and regulatory regimes.
- Unreliable ESCO/EE implementers
- Lack of appropriate financing facilities.

The Ministry of Industry also has developed a Strategy for Energy Conservation and CO_2 Emission Reduction in the Industrial Sector for 2010-2020. The Strategy outlined four phases to establish emission reduction through energy conservation measures in the industrial sector, carry out pilot projects and establishment of ESCOs. The Ministry of Industry plans to conduct feasibility studies for three intensive energy industries in 2013: cement, steel, and pulp and paper. These studies, if completed, would give a better picture of real emission reduction measures for these three sub-sectors and their associated cost.

The Ministry of Industry (with support from GIZ) plans to have Nationally Appropriate Mitigation Actions (NAMAs) in cement, food and beverages, pulp and textile industries by the end of 2014 that are bankable and ready to be financed. A number of potential measures for NAMAs project such as improvement of management, undertake reconditioning or replacement, and modify input feedstock of boiler in pulp and paper industries.

The Ministry of Industry has adopted the concept of "Green Industry", which is an industrial development concept based on economic sustainability, social involvement, and environmental quality protection. This concept is implemented through sustainable processing industry such as cleaner production, energy efficiency, resource efficiency, eco-design, eco- products, the

recycling process, and low-carbon technology. The government has also started to formulate Eco-labels to be used by products that meet the environmentally friendly criteria. So far, some products such as detergent, leather, and textile have already been approved to use the Eco labels. In the future, the criteria may include the products produced with green or efficient energy.

Urban Transport Gridlock - The GOI and the public are increasingly aware of the importance of transport sector reforms to GHG mitigation, and to addressing gridlock in cities. In 2011, GOI targeted five main projects in train-based transportation to be accelerated: [26] developing Java interconnection railways using geothermal power, redesigning the Jakarta monorail, developing a circle line system for all rail systems, building the Mass Rail Transit (MRT) system in Jakarta with the first route from Lebak Bulus to Hotel Indonesia, and mass transport to Soekarno-Hatta Airport. But the shift from private transport (encouraged by the energy subsidy) to urban mass transit has been slow.

With increasing transport-related GHG emissions, as well as increasing fuel prices, and the resulting increases in government subsidies, building more energy efficient transport has become a priority GOI concern. Indonesia has an opportunity to pursue several key initial steps that will lay the groundwork for a comprehensive plan to address transportation sector emissions. Measures to address GHG emissions from transport should focus on the large and growing share of emissions from gasoline and diesel cars and trucks. Policy measures that encourage a shift away from privately owned vehicles to urban mass transit should be broadly supported by donors.

The USAID-supported TransJakarta bus system has had mixed reviews but the governor of Jakarta has reportedly recently purchased a new fleet of buses to increase its effectiveness. With support from GIZ and others, smaller cities are beginning to address the issue as well, but do not have strong planning capacity or infrastructure like Jakarta. The governor of Jakarta has also announced that the MRT is finally to begin construction in Jakarta in 2013, but improved planning and traffic management systems will also be important parts of the solution.

Indonesia's hosting of 7th Regional Environmentally Sustainable Transport Forum in Asia and the Global Meeting on Sustainable Transport on 23-25 April 2013[27] might have a positive impact on green transport through discussion of the model for regional cooperation in green transportation in Asia, creating a forum to coordinate among agencies, either national or international to facilitate partnership and collaboration among governments, development banks, international organization, NGO and bilateral and multilateral donors in implementing Bangkok 2020 Declaration.

[26] Vivanews, "5 Proyek Besar Transportasi Indonesia", February, 2011.

[27] Ministry of Transport, Pusdatin, March 3, 2012

(2) Clean Energy Investment

Facilitating private and public sector investments in RE and EE are critical if clean energy is to take hold in Indonesia. However, several factors are limiting investments in RE and EE:

Inadequate Targeting of GOI and Donor Funds: The GOI has encouraged the development of clean energy by requiring some government-owned institutions to invest in the sector. The GOI has mandated the PIP, Sarana Multi Infrastuktur (PT. SMI), and Indonesia Infrastructure Finance (IIF) to channel government funding to infrastructure projects including RE projects. PT. SMI has been involved in providing financing to several hydropower projects. PIP and IIF are also mandated to channel the Geothermal Investment Fund to local governments and private sector firms. Although they can only invest to RE project with minimum value of Rp.100 billion (approximately USD 10.2 million) the initiative has shown the GOI willingness to encourage the development in RE sector.

However, these and several GOI and donor supported climate financing mechanisms, such as the Climate Change Programme Loan, Indonesia Climate Change Trust Fund, Indonesia Green Investment Fund, and Clean Technology Fund (CTF)[28], have failed to reach their potential.[29] Possible causes include low quality projects and that the CTF implementers are still targeting larger-scale projects, which have already been saturated by donors and investors. More financing opportunities exist in small-scale projects since they are still having difficulty in getting financing from banks. Addressing this challenge will require regulatory changes at the PIP, and evaluation of how CTF and other donor funds channel their funding and streamlining loan procedures.

Lack of familiarity and technical expertise of the Indonesian financial sector: The initial RE projects financed by banks in the past decade were primarily hydropower projects proposed by existing clients or well-known companies. Due to banks' lack of knowledge of the risks involved and inability to perform adequate due diligence, most of the bank loans to hydro projects became non-performing. As a result, banks have become hesitant to channel their funds to any RE projects. The difficulty in getting financing from banks and equity investors is that they tend to be new to the sector. Due largely to donor (including USAID) and central bank efforts (with

[28] Indonesia is tapping USD 400 million from the Clean Technology Fund (CTF) to develop approximately 800MW new geothermal generation supply at three sites, and to create risk sharing and finance facilities designed to accelerate investments in energy efficiency and renewable energy. Indonesia's CTF investment plan was designed under the leadership of the government, in coordination with the Asian Development Bank (ADB), members of the World Bank Group (IBRD, IFC), and key Indonesian stakeholders. The investment plan will mobilize an additional USD 2.6 billion in public and private financing to address a number of key barriers inhibiting the scaled-up development of Indonesia's technically and economically viable renewable energy and energy efficiency potential, and is expected to initiate a transformative shift toward a lower-carbon economy.

Source: https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_Indonesia.pdf)

[29] A good overview of government and donor climate financing schemes can be found in: "Establishing a Low Carbon Financing Mechanism within the Indonesia Investment Agency", PT PricewaterhouseCoopers, 2012

ICED assistance) to promote and introduce RE, as well as to provide capacity building to identify and mitigate RE risk, the appetite of the banks is gradually changing.

Lack of Project Financing & Innovative Financing Mechanisms for RE projects: Local commercial banks are still using corporate financing (collateral-based) schemes and they are only willing to finance small RE projects from their existing customers such as owners of palm oil plantations/mills, or small RE projects that have already been operating successfully (refinancing from other banks) to minimize their perceived risk. In fact, banks are limited in their ability to offer limited and non-recourse financing without government guarantees. Most banks require corporate financing and project developers are required to provide more equity than they have or are willing to invest.

Currently, Islamic/Syariah banks (such as BRI Syariah) are more aggressive in funding small to medium-size RE projects, largely due to early exposure to small hydropower projects, but also to meet internal mandates to serve environmentally friendly projects. For existing clients with good performance, they sometimes make exceptions for less collateral; hence these are considered as semi-project finance loans. Bank Syariah Mandiri has become active in funding RE projects since it cooperated with KLH in a Debt-for-Nature Swap program with the German government through KfW)with € 6.25 million (approximately USD $8.1 million) channeled to environment-related investments between 2006-2010.[30] However, until 2011 the market share of Islamic banks was only 4 percent of total bank assets in Indonesia.[31]

Nonetheless, innovative financing can work to break down RE financing barriers faced by small-scale projects. A successful project financing scheme was introduced by USAID in one of the hydro projects in the PFAN pipeline, Lubuk Gadang. This innovative scheme consisted of joint financing between the project developer, a foreign investor (mezzanine loan) and PT. SMI (loan). However, this kind of transaction has proven difficult to replicate in commercial banks, particularly the privately-owned banks. SMI was able to conduct this transaction because they have a mandate from GOI to invest in the sector and they do not have to follow Bank Indonesia regulations regarding collateral and the capital adequacy ratio requirements. Project developers and financial institutions/investors need assistance to be more creative in designing appropriate financing schemes.

Lack of clear regulation for Green Banking: The Indonesian Central Bank (Bank Indonesia) planned to release its Green Banking regulation in July 2012. However, under government Law No.21 2011, the authority to regulate and monitor all financial institutions in Indonesia, including banks, has been shifted to a new institution, Financial Services Authority/*Otoritas Jasa Keuangan* (OJK). 2011-2014 are the transition years from Bank Indonesia to OJK. Therefore, Bank Indonesia has not moved forward on all major banking regulations, including for Green Banking. However, Bank Indonesia has sought to encourage commercial banks to increase

[30] KLH News, 2006. 'Program Debt to Nature Swap Untuk Investasi Lingkungan kepada Usaha Mikro dan Kecil.

[31] Purwata, H., 2012. 'Target Market Share Bank Syariah 2013 Sebesar 5 Persen' in Republika Online, 05 November 2012.

investment in RE even prior to issuing the new regulation. Bank Indonesia has, with the support of ICED, begun to organize training to commercial banks as an interim measure to encourage "green lending."

Brokers/Unqualified Developers: The finalization of FIT for a variety of technologies is likely to generate significant interest in RE development from serious project developers and brokers/unqualified developers. Indonesia has struggled with this challenge in the past, and a significant number of geothermal licenses are still held by brokers that won a concession based on the lowest bid but have no intent or capacity to develop the site. Several stakeholders commented that financial institutions are struggling with an increasing number of poorly conducted small-scale hydropower feasibility studies and inexperienced developers with limited experience structuring deals. Many developers are new to the sector and many are brokers offering RE projects that they do not actually own, hence creating a more complicated process for investors/banks to conduct analysis and data verification. The quality of feasibility studies for RE is also varied across project developers as there is no national standard for RE feasibility studies, making investors unsure of the quality of the project. Large investors usually request for another feasibility study to be conducted by their own trusted consultant, therefore creating more costs. This can be addressed through specialized training for consultants and improved screening processes for PPA applications.

In addition to these general challenges in the sector, specific RE technologies face their own particular constraints and opportunities:

Geothermal Development: Indonesia will not reach its stated RE targets without rapidly accelerating geothermal development. Unfortunately, a number of challenges continue to hamper development of this resource. Several stakeholders believe that there is a good chance that these challenges will be resolved in the near/medium term, providing an acceleration of geothermal development. But the industry consensus is that the GOI targets for geothermal development are not achievable. Challenges include:

- Under the current law (27/2003), geothermal development activities are categorized as mining, and thus development is prohibited in protected areas. Over 40 percent (14,000 MW) of Indonesia's proven geothermal resources are located in these protected areas, greatly hampering efforts to develop this renewable resource. Efforts are underway to draft a revised law that would no longer classify geothermal as a mining activity.[32]

- The geothermal FIT established under Ministerial Regulation No. 22/2012 was designed to provide a more attractive price for geothermal generation and to eliminate problems with unqualified winning concessionaires based on the least cost tender mechanism that was in place under Government Regulation 59/2007. However, inconsistency between the two regulations and concern from the MOF on the fiscal impact of the proposed feed in tariff has delayed implementation of the regulation and added to continued concerns among geothermal developers regarding the instability of the legal, regulatory, and

[32] See: http://thinkgeoenergy.com/archives/14496

pricing regimes. Within the next five years, it is expected that the contradiction of fixed feed-in tariffs and tariffs set by the lowest price in tender will be resolved and the classification of geothermal as a mining activity will be changed (facilitating development in forest areas where the bulk of geothermal resources exist).

- The capacity for local governments to carry out the required tender and bidding processes for geothermal projects is generally weak.

- Concessional financing for geothermal exploration under PIP has failed to materialize as a result of the Agency's legislative categorization as a Public Service Unit that limits its ability to take risk.

- Although a Geothermal Revolving Fund was established in the last few years, the procedure for using it has proven difficult for local private companies. They still have to bear the hefty exploration costs even if they fail. Therefore, geothermal projects are still dominated by foreign companies in the oil and gas sector (such as Chevron and Star Energy) which have sophisticated mining technology, sufficient capital and human resources to shoulder the high costs and minimize the risk in the exploration stage. These large companies are primarily interested in large-scale geothermal projects. This continues to hamper the ability to develop small-scale geothermal resources.

Biomass: Feedstock Supply and Price: Key constraints to biomass power project development include uncertainty about the price and long term feedstock supply. Many palm oil mills began using biomass from palm oil shell and fiber for their own electricity supply. However, as these waste products are increasingly viewed as a productive commodity, some biomass power plant owners have requested government to regulate the sales of shell to other locations or limit the export of shell in order to solve the problems currently encountered due to an inadequate supply of shell feedstock. The competition to secure feedstock will likely increase in the future since other plantations (such as rubber) have started to turn to shell as a replacement for coal. Strong logistics and transportation systems are also required to secure feedstock. As a result, unless the feedstock is supplied by the same company that owns the power plan, there is a higher risk of working under capacity for high capacity power plants. This increased risk has encouraged the development of primarily small scale plants.

Hydro -- Watershed Management/Water Rights: To date, a unified regulation that clarifies water use rights does not exist in Indonesia hampering hydropower development. Initial efforts by the ESDM to draft such regulations have been suspended, and the path forward remains unclear. ESDM stopped its work because they are not the lead institution. The Ministry of Public Works and Ministry of Agriculture are given more authority as water use for electricity is lower priority.

Energy Efficiency

- Unreliable ESCO/EE implementers: Currently, there are no real ESCOs in Indonesia that can implement EE projects. There is little or no experience with performance-based contracting and no standard mechanism to protect the parties involved in implementing EE projects, including the building owner, the lender (bank/financial institution), or the ESCO. Government (with donor assistance) has an opportunity to assist and facilitate the design and establishment of such mechanisms.

- Lack of appropriate financing facilities: The ADB is lending for an EE program through a government-owned company, the Export Financing Agency (Indonesia's Exim Bank). Grants will support trade finance product development, staff training, and capacity building for risk sharing with commercial banks. However, Indonesia Exim Bank is a state-owned company, not a commercial bank, established based on Law No.2/2009 and mandated to provide financing services with different terms and conditions from ordinary loans and credit based on export transactions. As a result, similar loan mechanisms for EE may not be applicable for Indonesian conventional banks.

- An Energy Efficient Revolving Fund, which is now under discussion in the MOF, should also take the factors discussed above into consideration as its EE investment strategy is developed. A programmatic approach to energy efficiency, e.g., motor replacement, would allow for more focused and effective government initiatives. Investments to improve productivity are more appealing than energy efficiency, but often result in energy savings. The mechanism to access the fund should also be feasible for private industrial firms.

(3) Human Resource Capacity & Technological Challenges

Clean Energy Technical and Managerial Capacity – The most consistent challenge raised by private and public sector officials was the lack of skilled technical and managerial staff across the full spectrum of clean energy fields. PLN has initiated a Renewable Academy in Ujung Pandang, South Sulawesi. The academy, which is under Education and Training unit of PLN, will provide basic and advanced training for PLN's staff in planning, design, operation and maintenance of renewable power plants, and integration of renewable systems to the grid. In 2013, the Academy will prioritize solar and mini-hydro and support for the 1,000 Island project, with plans to later extend the program to other technologies, including biomass, geothermal and wind. Similarly, the geothermal association is considering establishing technical training centres to meet its projected demand for 1,500 professionals in the next four years. With projected increases in biogas and hydro power plants, the demand for technicians and operators should also be anticipated. These efforts will need to be expanded and supported to meet Indonesia's clean energy sector manpower requirements. Other training needs include those for consultants performing feasibility studies and investment grade energy audits.[33]

[33] See Annex D, Figure 2 for data on training needs for clean energy development.

RE Technology Development and Cost – The dramatic reduction in solar panel costs in the past year are rapidly making grid connected solar projects cost competitive with other renewable and traditional energy sources. Improvements in LED lighting technology, and simultaneous cost reduction, has also had a dramatic impact, particularly on small scale RE powered household systems. Commercialization of low temperature smaller scale geothermal systems holds significant promise for Indonesia if exploration and drilling costs can be reduced.
Hydro is another example, where some local manufacturers, such as in Bandung and Malang, can produce turbines for micro hydro projects with competitive pricing and good quality, which could bring the investment and maintenance costs down. Since most RE project developers are new players, there are also learning costs from unanticipated problems during project construction and implementation. As these players gain experience, they will become more adept at anticipating the problems and mitigating them, hence reducing the cost.

Opportunity for Local Manufacturing for RE & EE equipment – Most of Indonesia's RE and EE equipment is still imported, keeping prices relatively high. The increasing development of RE and EE in Indonesia will generate more demand for such equipment, opening an opportunity to invest in local manufacturing of such equipment. For example, Pertamina plans to develop a solar module manufacturing plant in Indonesia. There is an opportunity for other state-owned companies (and private firms) to follow the same strategy.

Limited Knowledge of Technologies – A lack of knowledge and an emphasis on price versus performance of technology options has also hindered the development of RE projects. Project developers are still facing difficulty in determining the right technology with the right price. Some project developers, particularly those in the hydro and biomass sectors, have failed to achieve their targeted production/profit because they chose technology based only on their investment price. The chosen technologies often turn out to have high maintenance cost, low efficiency, or even operational failure. At the end, it affects their ability to payback their loan and lowers their investment return.

Similarly, lack of knowledge has led to hesitancy to adopt and adapt technologies proven elsewhere to Indonesia. The Palm Oil Industry launched the Indonesia Sustainable Palm Oil system (ISPO) in 2011 (active in March 2012)[34] encouraging palm oil plantation/mill owners to capture and utilize the methane produced from wastewater effluent (POME). However, there has not been significant adoption of POME for biogas as the technology, though successfully employed in neighboring countries, has not been commonly used in Indonesia. This is beginning to change; CIRCLE has successfully introduced Malaysian and Thai POME technology and PTPN V is the first state-owned plantation to use POME for electricity, with plans to increase the capacity this year and sell the excess power to PLN.

Renewable Energy Integration – Integration of RE resources, particularly intermittent sources such as wind, solar, or seasonal hydro or biomass, is challenging at any scale. However, as the system size decreases, or the penetration rate of renewables increases, these challenges are often magnified. Currently, PLN averages losses of USD $0.20/kWH delivering primarily diesel

[34] Interview with DG Plantation and Riau Plantation Agency.

generated power to Indonesia's 600 small grid systems. Reducing these costs with increased reliance on renewables will require innovate solutions, hybrid and duel fuel systems, integrated hybrid system controllers, and load balancing measures.

Bio-fuel Development – The GOI has implemented a number of regulations encouraging the use of biofuels. As an implementation of MEMR Regulation No. 32/2008 regarding allocation, use, and trade rules of biofuel as an alternative fuel, there is now a minimum requirement of 7.5 percent of biodiesel in subsidized diesel fuel distributed by Pertamina.[35] In July 2012, GOI has obliged minimum of 2 percent of biofuel in non-subsidized fuel in mineral and coal mining industry, and starting in 2013, the government will require the steel and iron industries to use biofuel, with plans to move the requirement gradually into other industries, such as plantation and electricity. Combined with the drop in Crude Palm Oil (CPO) prices in recent years resulting from rising output in Southeast Asia and oversupply,[36] there exists the opportunity to use the CPO for biofuel. This would both to keep the price stable, and since the market is already oversupplied, there is minimum risk to disturb food security. For example, Pertamina has just signed a MoU with the Toyota Motor Corporation (February 15, 2013) to conduct a joint two-year study on developing and using environmentally friendly alternative fuels in Indonesia. The focus of the study is to conduct research and development in biofuels, CNG, and oil fuel with Euro 4 standards for land transportation (EBTKE, 2013). This could be an opportunity for both palm oil plantation/mill owners and Pertamina to work together to develop biofuel from Crude Palm Oil (CPO).

Key Bottlenecks for Small-scale RE

Small scale RE projects (1-10 MW) have proliferated following the introduction of FITs. However, a number of constraints still hamper project development:

- Better targeting of donor and GOI funding is needed
- High cost of grid integration
- Mismatch in investor and project developer requirements and capabilities.
- Lack of clear regulation for Green Banking.
- Reluctance to invest in new technology.

3.3 DONOR MAPPING: INDONESIA'S CLEAN ENERGY SECTOR

Indonesia benefits from significant donor support for the energy sector. A recent effort by the climate change donor coordination group led by GIZ identified over 50 donor supported programs/investments in clean energy activities, with investments exceeding USD 4 billion. The GOI itself has a dedicated USD 2.1 billion infrastructure fund of its own – of which USD 1 billion is for clean energy investments (Figure 22).

[35] MEMR, DG New & Renewable Energy News, February 11, 2013.

[36] From various sources such as from Reuters, SINDOnews, and The Jakarta Post.

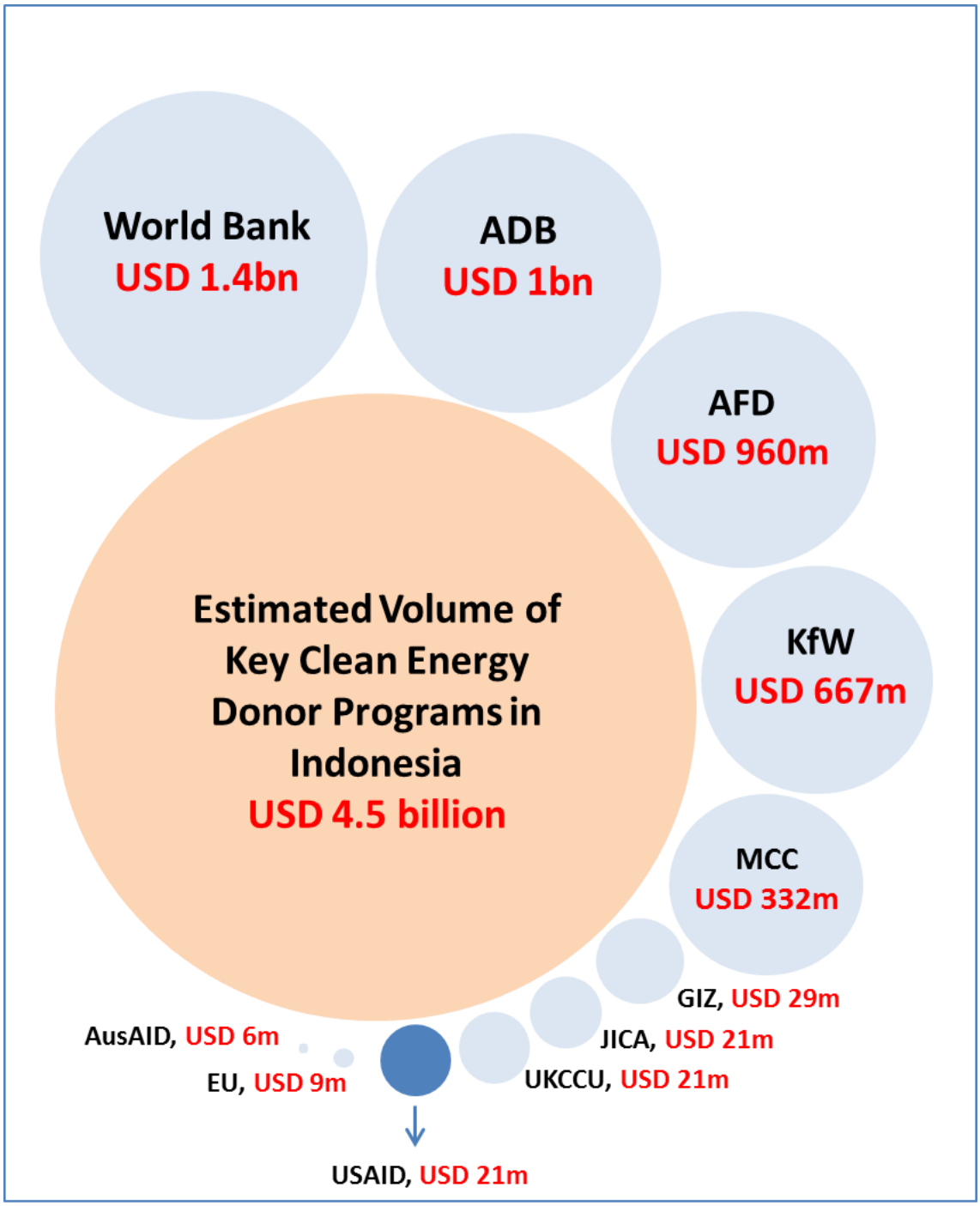


Figure 22: Relative size of donor-funded clean energy programs in Indonesia

The bulk of donor assistance is in the form of development loans, complemented by targeted technical assistance and capacity building activities. A snapshot of current donor assistance in the clean energy sector is provided below in Table 12.[37]

While donor activities touch on all aspects of clean energy development in Indonesia, there are gaps in three main areas:

1) A mismatch between current donor technical assistance and the scale of capacity building needs at both the national and especially the local government levels, particulary in terms of planning, policy and coordination for clean energy development and GHG mitigation;

2) Project level, transaction-based clean energy honest brokering and capacity building among project developers and financiers; and

3) Science and Technology capacity building for development and deployment of new clean energy technologies in Indonesia.

Furthermore, most large donors tend to focus on the Java and Bali population centers, with some work on Energy Access off the main islands (1,000 Islands and Sumba Iconic Island projects).

[37] Please see Annex H for more details on donor funded projects in Indonesia.

Donor	Clean Energy Portfolio as of Feb 2013	Type of Aid
World Bank	GCC mitigation, Geothermal, other RE, National Planning, T&D, EE, Energy Access	Loan and Technical Assistance (TA)
ADB	Geothermal, Hydro, T&D, EE, Energy Access, Public Transport	Loan and TA
AFD	GCC mitigation, EE, long-term RE lending, private sector loans, local bank LOCs, some TA for project sponsors and bankers, waste incinerator, T&D	Loan and TA
KfW	Geothermal, RE, EE, Hydro, Waste Management, Industrial EE with SMEs, Energy Access	Loan
GIZ	Climate Policy, Adaptation, Hydro, Industry and Transport, strong interest in transport fuel subsidy issues, embedded TA in ministries for capacity building	TA only
JICA	GCC adaptation and mitigation and related capacity building, Clean Coal, Geothermal, Hydro, Other RE, Urban Transport	Loan and TA
UKCCU	Energy Efficiency in Industry, Low Carbon Development, RE	Grant and TA
USAID	Clean Energy Finance and Policy	TA , Capacity Building, DCA
EU	Energy Efficiency	TA only
AusAID	Environmental Awareness, Geothermal, infrastructure	Grant and TA

Table 11: Donor-funded Clean Energy Programs and Gaps

3.3.1 USAID Comparative Advantages

Continued USAID engagement in the energy sector must be justified both by opportunities for catalytic reform and by a clearly defined comparative advantage to current players in the energy sector. Historical analysis suggests that the size of a given donor program in Indonesia is not necessarily commensurate with impact, so it is important not to view USAID's comparatively modest energy sector investments as a negative determining factor. The following factors argue for continued USAID engagement in the energy sector:

Continuity of Programming – Before ending its energy sector support activities in 2004, USAID had been engaged in the energy sector in Indonesia for over 30 years. The cumulative results of that engagement are evident throughout the sector – from the major pieces of legislation governing the sector, to USAID-built power plants, to the plethora of senior energy sector officials trained through USAID supported programs. USAID has had a lasting impact in the sector and is very well regarded by all major stakeholders. USAID's reengagement in the sector in 2010 has begun to revitalize many of these important relationships with key ministry, utility, and private sector partners. Continued USAID engagement in the energy sector can draw on these renewed and strengthening relationships. The long time period typically required to establish relationships and address sectoral challenges is not conducive to a short duration engagement in the sector.

Flexibility to work with a variety of stakeholders – Several of the major energy sector donors are restricted to providing loans or TA directly to national government entities. USAID's flexibility to work directly with sub-national governments, NGOs, private sector developers, financial institutions and other key energy sector stakeholders provides a significant advantage to craft solutions to Indonesia's energy sector challenges. The ability of USAID's current programs to serve as independent brokers between these different stakeholders is a clear strength to be built upon.

For example, in 2012, ICED worked closely with provincial planning office (BAPPEDA) in North Sumatra and the Japan International Cooperation Agency (JICA) to develop the energy portion the Local Action Plan for GHG Emissions Reductions (RAD-GRK). Their work was recognized by the national planning agency (BAPPENAS), and ICED was called to assist the national Energy Task Forces in supporting the RAD-GRK development in six additional provinces. Other examples of USAID's effective donor coordination include micro hydro training with GIZ, bioenergy project development in Riau with EEP, water utility EE with IUWASH and energy project demonstrations with UNDP. ICED has also demonstrated an ability to coordinate constructive discourse among RE project developers, provincial MEMR offices, PLN, and local governments to ensure projects are properly planned and responsive to local energy needs.

Development Partner – Indonesia is rapidly developing into an advanced developing country with significant internal capacity and financial resources. Traditional development models must be updated to reflect this reality. Discussions with several project developers and financial institutions demonstrated limited interest in utilizing multilateral financing mechanisms, and purely grant funded projects have struggled in the past with sustainability. The primary request

for assistance from ministry, utility, and private sector stakeholders was for technical assistance partnerships on areas of known U.S. expertise in clean energy development. USAID is well suited to support this type of development partnership activity, and can draw on the expertise of the U.S. public and private sector through a variety of well-established partnership mechanisms.

Geographical Flexibility – Many large donor supported energy programs are focused on improving operations on the central Java-Bali grid. USAID's willingness to focus on other islands compliments these efforts and could provide much needed support to historically neglected systems with high operating costs, poor efficiency, and significant renewable energy potential.

3.3.2 USG Engagement in Energy Sector

Recent years have seen an increase in the number of USG agencies implementing and/or planning to implement clean energy development activities in Indonesia. For example, the Millennium Challenge Corporation (MCC) represents a significant new USG investment in the sector which must be reflected in the design of future USAID energy sector programming. USAID's existing programs and relationships in the energy sector helped to pave the way for the development of the MCC program, and MCC's planned investments could potentially accelerate and scale a sub-section of USAID supported projects. Table 10 below provides a summary of other USG agencies currently engaged in Indonesia's energy sector.

USG Agency	Clean Energy Activities in Indonesia
Millennium Challenge Corporation (MCC)	The MCC's proposed USD 332 million investments in the Green Prosperity Project, of which an estimated 60% will be used to support small scale clean energy development. As currently envisioned, MCC support will target a narrow cross section of clean energy projects that can demonstrate an economic rate of return of at least 10% to local communities and that are located in the initial pilot provinces of Jambi and Sulawesi Barat. Many of the details of the MCC program remain to be determined.
Department of Commerce (DOC)	US DOC has recently (2012) approved two proposals to support the GOI (Ministry of Industry and Economic Affairs) and the Indonesia Energy Services Company (ESCO) Association in terms of: (i) capacity building for energy management, and (ii) pilot projects in industrial sector energy efficiency (EE).
National Science Foundation (NSF)	NSF is engaging with the Indonesian Institute of Sciences/*Lembaga Ilmu Pengetahuan Indonesia* (LIPI), a non-departmental research institution that reports to the President, and is coordinated by the Minister of Research and Technology.
Department of Energy (DOE)	DOE is providing support PLN on renewable integration issues for small island systems
U.S. Trade and Development Agency (USTDA)	USTDA supports geothermal study tours and feasibility studies

Table 12: Select USG Energy Programs in Indonesia

4 STRATEGIC CED PROGRAM EVALUATION

4.1 CED PROGRAM SWOT ANALYSIS

This section identifies the following Strengths, Weaknesses, Opportunities, and Threats (SWOT) of the CED portfolio given the current status of the energy sector in Indonesia, as analysed in the energy sector assessment.

As the SWOT analysis (Table 13) suggests, there are notable opportunities to build on the CED portfolio's alignment with EC-LEDS and the accomplishments to date in supporting: (i) Policy, planning and coordination; (ii) Private sector engagement and investment in CE projects; and (iii) Clean Energy Science and Technology (S&T) development and international transfer.

Strengths	**Weaknesses**
Support for Small/Medium (1-10 MW) Renewable Energy Projects. Regional and Local Coordination and Planning. Renewable Energy Knowledge Management and Dissemination. Replication Potential of POME Power Generation Business Model University Partnership Model for Private Sector Engagement. Alignment with EC-LEDS.	National Energy Policy Reform. Insufficient Emphasis on Energy Efficiency (EE). Insufficient Emphasis on Transportation. Too Broad a Project Scope. Stretched Capacity of University Partnership.
Opportunities	**Threats**
Expanded Focus on Project Financing to Support 10-50MW RE Facilities. Promotion of 'Regional Champions'. Complementary Clean Energy activities with other USG/USAID projects and sectors. Replication of University Partnership model to focus on additional clean energy technologies.	Uncertainty in Energy Policies/Regulations Designation of strong GOI counterpart. Environmental Concerns Associated with the Palm Oil Industry.

Table 13: CED Summary SWOT Analysis

STRENGTHS – Those elements of the CED portfolio which have demonstrated effectiveness in contributing to positive impacts within the energy sector, and in achieving the clean energy objectives of Indonesia and USAID include:

1. **Support for the Development of Small/Medium (1-10 MW) Renewable Energy Projects.** The Mission's Environment Office has embraced a strategy focused on supporting small/medium-scale renewable IPPs – those with a generating capacity of 1-10 MW. Donor mapping exercises have indicated that there is: (i) notable investment support (though of

questionable accessibility) for large scale renewable energy projects (primarily hydro and geothermal); and (ii) sustained interest in supporting micro rural electrification/household systems (primarily micro-hydro, biogas, solar) of less than 1 MW. However, the Mission's focus on renewable power generation of 1-10MW remains to be a rather uncrowded space for donor interventions, and a space attracting increasing level of attention from the private sector. A primary driver behind growth in this size of project is the requirement of PLN to purchase at standard rates all electricity that is produced by IPPs of less than 10MW generating capacity. Though it is possible for IPPs of larger generating capacity to negotiate rates with the PLN, the process for securing Power Purchase Agreements (PPAs) for facilities less-than 10MW is more streamlined and thus more attractive to project developers.

ICED and CIRCLE have demonstrated an ability to work closely with project developers to review technical plans of new projects, navigate relevant policies/regulations, coordinate implementation plans with PLN/local government/community representatives, and link them with potential lenders. Beyond providing TA to project developers, ICED is also supporting projects of this size through its provision of technical support to commercial banks in reviewing project proposals and assistance to PLN in standardizing Power Purchase and interconnection procedures.

2. **Regional and Local Coordination and Planning**. Within Indonesia's energy sector there is a growing trend of decentralization, authorizing increased planning and operational responsibilities to regional and local offices. Law No. 30/2007 on Energy, and Law No. 30/2009 on Electricity, require provincial and district/municipal government to formulate Regional Energy Plans and Regional Electricity Development Plans. As with any country, the capacity, will, and resources of regional/local offices (regardless of the sector) vary significantly. Given its 30+ years supporting the energy sector in Indonesia, USAID has a strong reputation in the industry for its ability to serve as a facilitator, catalyst, and independent advisor providing assistance to a diverse range of stakeholders among public, private, and civil society entities – as well as the international donor community. This reputation is reinforced today through the Mission's CED work at the local/regional level. This is perhaps the greatest value that ICED has provided, bringing different sectors together (e.g., energy and agriculture), government and private sector, national and local government, or PLN and local government. It is an important role that donors can provide given the traditionally jurisdictional approach to planning and program implementation.

3. **Renewable Energy Knowledge Management and Dissemination.** ICED has been adept in documenting pertinent changes in the energy sector that have implications on RE growth. With the multiple changes in policies over the past recent years, ICED has been effective in not only reviewing relevant laws, regulations, and directives, but communicating these findings to local government representatives, potential/actual RE project developers, and financial institutions. This assistance is particular valuable in the context of both: (i) The expected increase of IPPs needed to meet the GOI's energy/emission reduction targets; and (ii) Increased decentralization of planning and operations within the energy sector. Through cataloguing and communicating applicable policies and developing roadmaps for the negotiations of PPAs, the work of ICED can be instrumental in addressing knowledge gaps within the private and public sector that may hinder the expansion of IPPs.

4. **Replication Potential of POME Power Generation Business Model.** Although CIRCLE is only working to identify 11 palm oil mills on which to develop POME biogas power generation facilities, the potential for replicating this business model is significant. The technical assistance provided by CIRCLE to the environmentally-certified mills is in high demand – particularly in regards to linking them with biogas-capturing technology not readily available in Indonesia. Not only are mills looking for means to reduce their energy input costs for palm oil production, but they are often located in remote parts of the country where PLN connectivity is limited and electricity is in demand. Another challenge is convincing the mills to develop projects for other than captive use of the power generated. The Indonesia Sustainable Palm (ISPO) is likely to be the biggest driver to methane capture and use from POME.

5. **University Partnership Model for Private Sector Engagement.** Over the past three years, USAID/Indonesia has funded 11 assistance projects designed to support the Missions' development strategy in various sectors through partnership activities between US and Indonesian institutions of higher learning. The partnership between the USC and ITB's work on the University Partnership – US-Indonesia Geothermal Education Capacity Building Program is notable for additional – and significant - engagement with the private sector. There is enormous untapped potential for geothermal power production in Indonesia – yet it is likely to be largely unmet due (in part) to a dearth of Master's level managers and qualified technicians in the sub-sector. Through close engagement with the private sector geothermal project developers, ITB is directly informed of the skills that are in demand and can cater their curriculum development approach accordingly. Further, the university partnership model can serve as effective vehicles within the energy sector for enhancing awareness of, and disseminating emerging technologies necessary for clean energy growth.

6. **Alignment with EC-LEDS.** As part of the Global Climate Change Initiative, and in support of one of USAID's Core Development Objectives to 'Reduce Climate Change Impacts and Promote Low Emissions Growth', the Agency has launched the Enhancing Capacity for Low Emissions Development Strategies (EC-LEDS) program in 20 countries worldwide. In 2012, USG and GOI laid the foundation for a joint work program to collectively accelerate EC-LEDS in Indonesia. The Mission's CED portfolio is directly aligned with and supportive of the four primary elements of EC-LEDS in Indonesia:

   - National-level policies and actions to develop and implement LEDS
   - Sub-national level policies and actions to develop and implement LEDS
   - Private sector engagement and investment in low carbon growth
   - Integration of low emission development efforts across national and sub-national scales.

   Within the EC-LEDS work program, both the efforts of ICED and CIRCLE are emphasized for their contributions to the initiative. The EC-LEDs work program specifically highlights the CED projects' activities focused on developing national (RAN-GRK) and local (RAD-GRK) GHG emission reduction action plans; cataloging/geo-referecing a public inventory of actual/potential RE projects; provision of TA to local government offices and PLN in energy

profiling and planning; environmental certification of and GHG emissions reduction in palm oil mills; and significant engagement with the private sector in RE project development.

WEAKNESSES – Elements or approaches of the current CED portfolio that appear limited in their ability to have a positive impact in Indonesia's new sector environment:

1. **National Energy Policy Reform.** On the local/regional level, the implementing partners have demonstrated some ability to coordinate energy-planning activities and to communicate changes to relevant national policies and regulations. However, there remain a number of larger, national policy issues of which the CED partners have limited effectiveness in addressing. The most notable national policy issue which affects all aspects of the energy sector – and indeed the economy at large – is of course the persistent national support for fuel and electricity subsidies. Countless analyses have been conducted illustrating the economic, social, and environmental hazards of energy subsidies. The MOF has articulated that reducing the energy subsidy is their top priority. However, the political willingness to change at the topmost levels of government has been lacking to date.

   ICED, as a subtask, plans to address an analysis of the impact on subsidies in the power sector, and increasing public awareness of subsidy reduction in the power sector. However, there is little indication that these efforts unto themselves will have much impact in addressing or monitoring national subsidy policy reform. Nonetheless, the centrality of the subsidy issue to all aspects of expanding clean energy in Indonesia should not be ignored by donors, including USAID. A focused, strategic approach to raising public awareness of the impact of the subsidies, coordinated with the donor community and allies in the GOI (such as MoF), and exploring alternative implementation modalities should be considered by USAID for future programming.

   The MOF intends to use donor assistance for outreach and public awareness building, and capacity building for communications on the subsidy issue, and has expressed interested in USAID assistance through the ICED project. Specifically, the Climate Change Finance Center of the Fiscal Policy Agency of the MOF is seeking support as they explore new ideas to swap the fuel subsidy budget with direct budget support for urban infrastructure and mass urban transport system development in return for local government policies limiting or prohibiting the distribution of subsidized fuel.

2. **Too Broad a Project Scope.** Although ICED has had some notable accomplishments, it appears as if it may be getting pulled in too many directions. By design the project's scope is extremely broad, and runs the risk of being treated as a 'catch-all' intervention for the entire clean energy sub-sector. It is to ICED's credit that the GOI has looked towards the project for expanding activities into new geographic locations and technical areas. ICED activities are evaluated based on their relative contribution to the overall ICED goal and target results. Many requests have not been undertaken because they would not likely contribute to ICED results. It is ICED's ability to respond to the changing needs and increasing requests that they have been able to continue to add value in a dynamic environment. Nonetheless, the project runs the risk of having a diluted impact on areas where it has a comparative advantage when it is persistently called to allocate resources in a reactive response to stakeholder requests.

Future programming should consider splitting USAID interventions into separate RE, EE, and possibly Transport projects in order to give each the attention and focus required for significant impact and results.

3. **Stretched Capacity of University Partnership.** Although there are certainly merits of the university partnership model, there are also limitations that should be recognized by the Mission. ITB has made significant headway in its scholarship program and in its work with the Geothermal Advisory Board. However, ITB representatives have indicated that they are currently stretched to their capacity in terms of human resources. For example, one of the project's components was to arrange a faculty exchange between ITB and USC – yet, given the time demands of their staff they have not been able to engage in this activity. As the Mission proceeds with reviewing the extension proposal recently received from ITB/USC, frank discussions should be had with the implementers to realistically gauge their ability to manage additional activities. It is advised that the implementers focus on measurable results (i.e. Number of new geothermal projects assisted; Number of ITB graduates working in the geothermal subsector; Number of geothermal pre-feasibility assessments conducted etc.) they would like to achieve through their interventions, and then determine what resources are needed to achieve those results.

OPPORTUNITIES – Additional/expanded areas that could potentially result in significant positive impact should CED portfolio resources be dedicated to them.

1. **Expanded Focus on Project Financing to Support 10-50 MW RE Facilities**. Within its database of potential clean energy projects, ICED has identified a handful of RE projects with the productive capacities that exceed 10MW. Discussions with project developers have indicated that in many feasibility assessments they have identified RE sites with the potential of generating more than 10MW, but they opt to construct 10MW facilities instead because of the ease in negotiating PPAs with the PLN (Or, they may build two separate facilities at the same site, each not exceeding 10MW). Additionally, the larger the project, the more associated risk from a lender's perspective – and thus fewer avenues for financing. However, building on ICED/CIRCLE's accomplishments in supporting small/medium power generating facilities, there may be future opportunities to expand the provision of TA to support the design of and investments in larger projects.

2. **Promotion of 'Regional Champions'**. In the era of increasing decentralization in Indonesia's energy sector, a key to the sustainability of RE IPP development will be extensive coordination among the private sector, local government offices, PLN, and communities. USAID's CED portfolio has demonstrated strengths in such coordination at the local/regional level. In an effort to support Indonesia's energy expansion goals and GHG emission reduction targets, there is an opportunity for ICED to showcase 'Regional Champions' where concerted planning and coordination efforts have led to notable benefits among multiple stakeholders. Future USAID CED interventions could geographically target those locations where a similar collective will to collaborate is expressed by regional stakeholders. The ideal targets would be more remote locations faced with high electricity

costs due to use of expensive diesel power generation and where small loads exist. These areas represent strong potential markets for RE.

3. **Complementary Clean Energy activities with other USG/USAID projects and sectors**. The Mission's CED projects are far from being the only donor-funded – or even the only USG-funded – CE initiatives in Indonesia. Throughout the sector, multiple donors are looking for areas where they have a comparative advantage and can leverage their funds to have the most substantial impact. Although often complex to negotiate roles and points of engagement, there are areas that can be explored to identify possibilities for future collaboration.

4. **Replication of University Partnership model to focus on additional clean energy technologies**. Though performing satisfactorily, the ITB and USC partnership is on the verge of reaching its managerial capacity. Although continued support of this particular UP is encouraged through 2014 – particularly if private sector contributions can be enhanced – it is not reasonable to expect that ITB can take on any more activities beyond those in which they are currently engaged, and those presented in their proposal. However, there is a notable opportunity to replicate the UP model to support other technical areas that are pertinent to the energy sector.

5. **Increased focus on Energy Efficiency**. The EE market has huge potential. ADB (2009) estimated that the EE market potential is USD 4 billion for commercial buildings and industry. MEMR has supported 800 energy audits over the past 8 years. In 2011/2012, the Ministry of Industry with support from ICCTF conducted energy audit in 50 iron and steel, and pulp and paper industries. Four main obstacles to unlock potential market of EE: (i) poor regulatory capacity; (ii) fuel subsidy; (iii) level of ESCO development or capacity of ESCO to perform services relatively low; (iv) the absence of financial instrument to finance development of EE projects.

   The GOI investment arm (PIP) told the assessment team that they want to pursue EE investments as well, but that they don't have the in-house capacity to assess projects and conduct due diligence. PIP is interested in creating a private financing facility for EE which would be easier to access than government funding, with more flexibility and lower costs for collateral and insurance currently required. PLN indicated that they would like to integrate EE and RE into their planning systems and move to an Integrated Resource Planning (IRP) approach in line with global best practices. At present, they do not have the capacity for this.

   ICED staff report that their decision to de-emphasize EE was due to the multitude of donors working in the sector, lack of private sector interest in government programs, and limited likelihood of its contribution to ICED target results. ICED has entered into an agreement with one of the most promising EE initiatives of the Indonesia Export Import Bank, expecting approximately 25 MW equivalent from industrial EE projects. If successful, this would be an opportunity for continuing support into the new strategy period.

THREATS – External factors outside the control of the CED portfolio that may have an adverse effect on the impact of interventions.

1. **Uncertainty in Energy Policies/Regulations**. It is reasonable to expect that energy policies in Indonesia will continue to evolve. Although stakeholders usually know prior to enactment the tenants of new policies, there persists a level of uncertainty regarding the timing and implications of new policies. This uncertainty will complicate the design and implementation of CED projects. Beyond the aforementioned issue associated with energy subsidies, there are also ongoing concerns about the status of: the GOI's new Energy Policy; standardization of FITs/PPAs; regulations pertaining to geothermal drilling in protected areas; and the GOI's stance on 'Green Banking'. Even once these policies/regulations are in place, there remains the complicated matter of enforcing them.

2. **Subsidies**. Indonesia's huge energy subsidy (described previously) remains a threat to the ability of the CED portfolio to achieve its objectives, by limiting incentives for energy conservation and maintaining fossil fuels as the least cost resource through non-cost recoverable tariffs, which also limits the attractiveness of renewables.

3. **Designation of strong GOI counterpart**. Currently, the Mission's GOI counterpart for the CED portfolio is the Coordinating Ministry for People's Welfare (Menko Kesra). Menko Kesra is also the GOI counterpart for many other USAID-funded activities – both within and outside the Environment Office. Given the extensive amount of coordination that is necessary to forward CE initiatives through the country, it is important to have a strong government counterpart – ideally one that has significant authority within the energy sector. Although Menko Kesra has been a good counterpart for USAID at large, it has little influence with MEMR, Bank of Indonesia, PLN, or local governments. It is understood that the Mission is currently in discussion with the GOI about what entity should be the primary counterpart should be in the implementation of its projects. It should be noted that USAID's CED interventions would be most effective when its counterpart has a strong technical knowledge in and/or a vested interest in bolstering the energy sector, such as MEMR.

4. **Environmental Concerns Associated with the Palm Oil Industry**. There is notable potential to expand on CIRCLE's biogas power generation work within the palm oil industry. However, the industry is constantly under environmental scrutiny, and USAID is limited in its ability to support the industry due to concerns related to deforestation and biodiversity loss. If work is to be continued on POME facilities, then environmental safeguards must be held to the utmost importance. The ICED approach has been to facilitate compliance with ISPO, thereby meeting dual energy and environmental objectives.

5 RECOMMENDATIONS FOR USAID INVESTMENTS IN CLEAN ENERGY

The assessment team has developed program recommendations for 1) mid-course adjustments of the existing mechanisms and 2) future USAID energy sector program for the CDCS strategy period from 2015-2019.

5.1 CURRENT CED PROGRAM

Recommendations for the current USAID Clean Energy Development (CED) program include building on what the current projects do best:

ICED – Continue the focus on transaction-level and institutional support in the financial community and with local governments. To complement this work, ICED should engage more actively with the GOI on the overarching energy subsidy policy issue by an initial foray into public awareness and communications, possibly in cooperation with the Ministry of Finance's Center for Climate Change Financing or civil society organizations. On transportation and EE, ICED should limit its work to identifying the building blocks and planning for the future strategy period, as the current ICED scope of work is too broad. Rather than diluting existing resources and the limited time remaining, ICED should focus on delivering on the current areas of intervention.

CIRCLE – Focus on technical assistance to the environmentally-certified mills – particularly in regards to linking them with proven, regional biogas-capturing technology not widely available in Indonesia. Not only are mills looking for means to reduce their energy input costs for palm oil production, but they are often located in remote parts of the country where PLN connectivity is limited and electricity is in high demand.

University Partnership – US-Indonesia Geothermal Education Capacity Building Program - Focus on measurable results such as the number of new geothermal projects assisted; number of ITB graduates working in the geothermal subsector; number of geothermal pre-feasibility assessments conducted etc. that they would like to achieve, and then determine what resources are needed to achieve those results for discussion with USAID and the private sector partners. Follow through on the faculty and student exchanges planned with the University of Southern California.

5.2 FUTURE PROGRAM RECOMMENDATIONS (2015-2019)

USAID has an opportunity to fill current gaps in donor assistance while building on the successes of the CED program as it considers its 2015-2019 strategy and program design in the energy sector.

The assessment team recommends a mission energy strategy for 2015-2019 guided by the *Enhancing Capacity for Low Emissions Development Strategies* (EC-LEDS) framework. The global EC-LEDS framework includes both policy and implementation elements and aligns with USAID's climate change strategy and the USG-Indonesia EC-LEDS partnership proposed at the

September 2012 U.S.-Indonesia Comprehensive Partnership meeting. USAID's clean energy development programs are proposed by the USG as critical deliverables of the EC-LEDS agreement. The focus of EC-LEDS is capacity building, which is in high demand in Indonesia's clean energy sector and for which USAID has strong experience and comparative advantage compared with many other donors.

Future interventions should focus on three inter-related themes under the EC-LEDS umbrella: (i) Energy Sector Governance, (ii) Clean Energy Investment Promotion through Private Sector Engagement, and (iii) Increase Human Resources Capacity and Sustainable Deployment of Science & Technology (S&T).

The keys to a clean energy, low emissions future for Indonesia include fostering the regulatory capacity of the GOI and local governments for development of technologies for widespread deployment, and creating an enabling environment for private sector investment in clean energy. Tackling the thorny issue of the unsustainable energy subsidy over time is the essential element in an enabling policy environment for sustainable clean energy growth in the country. Redirecting subsidies to more productive investments will benefit society at large and has the potential to make the Mission's investments in other sectors more effective as GOI resources become less locked into the energy sector.

The recommended interventions below focus on opportunities for USAID to utilize its limited funds to support programs that could accelerate catalytic changes in clean energy development in Indonesia. They have been selected to directly address the primary barriers to clean energy development in Indonesia by achieving on-the-ground results and getting the policy environment on the right track. The proposed interventions build on USAID's existing programs, capitalize on recent reforms, and synergize with the activities of other donors utilizing USAID's comparative advantages.

USAID can also usefully leverage other USG initiatives in the clean energy space in Indonesia in line with the Whole of Government approach. The assessment team recommends that an internal USG coordination function be formalized within one of the future clean energy contract vehicles. A contractor-led secretariat can be formed to organize regularly scheduled (quarterly is sufficient) interagency clean energy meetings at the Mission to share information between USAID and the other agencies at post active in clean energy, and seek ways to work productively together.

The assessment team's findings suggest a geographic focus for implementation activities beyond the Java-Bali grid to increase energy access to more Indonesians. USAID's flexibility to work throughout the country provides an opportunity to focus on those areas where future demand for clean energy will be greatest. Electricity demand is projected to grow more in eastern and western Indonesia than in Java and Bali. These are areas of less access to electricity and high use of costly and highly polluting local diesel power plants. The assessment team recommends focusing future investments in eastern Indonesia where access to electricity is the least and the opportunity to replace diesel power plants with renewable energy options is the greatest.

Illustrative activities in each of these thematic areas are as follows:

1. ENERGY SECTOR GOVERNANCE

The assessment team found that while current energy programs (ICED, CIRCLE, UP Geothermal and PFAN in the past) are appreciated and generally well-implemented, they are limited in their strategic development impact as they tend to be heavily transaction oriented. Building on the successes of these programs, the team recommends that future programming include a stronger policy and public awareness building component to address the larger LEDS and subsidy issues affecting the energy sector overall. Policy, planning and coordination efforts should be linked to implementation activities.

Strategic engagement in energy subsidies issues**.** The huge energy subsidy is the central barrier to climate change mitigation through clean energy deployment in Indonesia and is an increasingly major constraint to the GOI's ability to provide critical services to its citizenry. The team recommends supporting new GOI counterparts (e.g. MEMR and/or MoF Center for Climate Change Financing) and work with other donors and civil society organizations to systematically raise public awareness of the energy subsidy policy issue and alternative methods of implementation to redirect subsidy resources to improve public transit and urban infrastructure. This should be done by working through the ICED mechanism now and expanding the effort under the new country strategy.

Capacity Building in Mitigation Action Planning and Implementation. Continue and strengthen successful ICED efforts to provide technical assistance and capacity building to local governments tasked with implementing national (RAN-GRK) and local (RAD-GRK) climate change mitigation action plans. ICED has indicated the opportunity to assist the National Planning Agency (BAPPENAS) and local governments in the implementation phase (monitoring, evaluation and reporting) of the action plans. For example, USAID should consider designing integrated capacity building support for EE to the GOI for regulatory issues, PIP, banks and NBFIs on financing issues and on technical and contractual matters to the private sector, including ESCO association members. The most effective assistance would include focused, pragmatic topics using case studies, and possibly support for joint EE pilot projects. USAID should explore technical assistance opportunities to GOI and local governments for transportation policy reform to encourage the transition from private vehicles to mass urban transit in Indonesia's major cities.

Integrated Energy Sector Planning. Establish coordination mechanisms between PLN's regional offices and local governments at provincial and district level for near and medium term integrated energy sector planning, and introduce modern concepts of Integrated Resource Planning (IRP) centered on lowest cost supply options, including EE. This may also include support to the Central Government's indicative efforts (through MEMR or BAPPENAS) to build energy sector planning capacity in provincial governments for development of regional energy sector master plans. To link planning to implementation, USAID should consider technical assistance and training support for MEMR and PLN to incorporate EE as a resource ("negawatts"), along with RE, small scale geothermal, mini-hydro, as well as trends in technology and associated costs into their planning processes.

Energy Efficiency. USAID should consider designing integrated capacity building support on EE to the GOI for regulatory issues, MOF, PIP, banks and NBFIs on financing issues and on technical and contractual matters to the private sector, including ESCO association members. USAID can tap extensive US expertise to establish the enabling environment for implementation of Standards and Labeling and DSM in Indonesia. This could entail capacity building for the regulator (DG NREEC of MEMR), and training programs for establishing an energy Standards and Labeling framework for on-the-ground implementation of standards and labeling. Technical assistance is needed to set up a compliance mechanism for monitoring and supervision of standard and labeling, including a regular testing program for energy performance of end-use appliances, an incentive scheme to promote EE appliances and equipment, and to assist the DG NREEC of MEMR to set up monitoring for the implementation of EE measures, including an online reporting system, registry and development of a database for compliance.

USAID has an opportunity to get in on the ground floor of PLN's interest in establishing a comprehensive DSM program integrated with standards and labeling, integrated resource planning, and incentives for energy savings. Capacity building for the burgeoning ESCO market can be supported by providing technical assistance for performance-based contracting, capacity building for new ESCOs, establishing the parameters of ESCO schemes in managing energy efficiency in buildings and industries, including government buildings. Assistance is also needed to introduce investment grade audit principles and energy savings monitoring tools for industry and buildings (e.g. software for automatic energy audit/monitoring). Another area of interest may be Smart Grid systems to support DSM.

Transport. Historically, USAID has had limited engagement in the transport sector (e.g. support for Jakarta dedicated bus lanes), so identifying high impact activities, donor assistant gaps, and USAID comparative advantage will be essential to justify engagement in the transport sector. The assessment team reviewed relevant documents, including a World Bank (ESMAP, 2010) study on the transport sector in Indonesia, and interviewed ICED's newly hired transportation specialist and the GIZ transportation team in Jakarta. Given the rapid uncontrolled emissions growth from Indonesia's transport sector, in part due to the energy subsidy, donor support (GIZ in particular) and largely uncoordinated efforts from the GOI, there may be opportunities for USAID to assist planning for the transition from private vehicles to efficient urban mass transit systems and improved traffic management.

Knowledge Sharing. Support the Ministry of Energy in cataloguing, communicating, and coordinating community scale renewable energy development. Establish coordinated funding mechanisms, standards, and operations and maintenance schemes. Building on ICED successes, catalogue and communicate applicable policies and develop roadmaps for the negotiations of PPAs, thereby addressing knowledge gaps within the private and public sector that may hinder the expansion of IPPs. Share success stories from CIRCLE with other palm oil plantation owners in order to market and replicate the POME business model more broadly. Offer technical assistance to access POME technologies and link project developers with investors. It would be valuable to explore the merits of establishing new University Partnerships (UPs) that focus on (for example): Hydropower, Biomass, Biogas, EE, and Transportation Emissions Reductions. Through additional UPs, USAID can further engage with private-sector industry leaders, and

identify effective means to facilitate knowledge transfer to address obstacles to further clean energy development.

2. *CLEAN ENERGY INVESTMENT PROMOTION THROUGH PRIVATE SECTOR ENGAGEMENT*

A key element of the proposed USG work program for EC-LEDS in Indonesia is to strengthen private sector engagement and investment in low carbon growth. It is important to note that EC-LEDS does not only support the planning for low-carbon growth (as described above in 1.), but also involves the implementation of activities that drive the strategies forward. As such, future interventions can benefit from the CED projects' strength in working closely with private sector entities to increase private sector investments in CE. Such interventions could include:

Clean Energy Transaction and Deployment Support. Build on and expand ICED/CIRCLE's accomplishments in supporting RE power generating facilities smaller than 10 MW. Expand the provision of TA to support the design of and investments in larger RE projects in the 10-50MW range. Possible associated activities to support this expanded focus could include:

- Working with PLN/regional power purchasers to streamline PPA negotiation procedures for larger RE projects.
- Actively identify and promote creative mechanisms that are suitable for project financing of this scale – including, mezzanine financing and Development Credit Authority (DCA).
- Continued planning work with MEMR, BAPPEDA, and PLN on a local/regional level to identify those areas that could benefit from facilities of this scale while concurrently contributing to local/regional GHG emission reduction goals.
- Intensified provision of TA to Bank Indonesia and commercial lenders to increase their ability to effectively review RE project proposals. Emphasis should be placed on those commercial banks that have subscribed to 'Green Banking' pledges.

Where possible, link the implementation support described above to large multilateral donor clean energy project lending (WB, ADB, AFD, KfW) with parallel technical assistance and capacity building support for both project developers and commercial lenders and investors.

Other possible activities in support of clean energy deployment include providing technical assistance to PLN to expand distribution efficiency projects beyond their current pilot service areas and help build national and provincial capacity for structuring PPP clean energy transactions. Banks and investors are often faced with poor quality feasibility studies for RE projects given the many new, inexperienced players entering the market. USAID can provide support to create "standardized" feasibility studies for small scale renewable projects.

Clean Energy Finance Support. Provide training for bank technical staff and institutionalize technical support services for banks making clean energy investments. Enhance the financial knowledge of project developers to improve their ability to deal with potential lenders and equity investors. Facilitate knowledge sharing and foster dialogue between successful project developers and new project developers, and among project developers, lenders, equity investors,

and policy makers in order to break down barriers impeding clean energy financing. Provide technical assistance for financial institutions and the industrial sector to increase the viability and attractiveness of energy conservation program financing. USAID can provide support to expand EE benchmarking or consumption standards in key commercial and industrial sectors and also assist PLN in the formulation of possible incentive schemes for demand-side energy management programs in the industrial and commercial sectors.

USAID should also explore the use of credit guarantees through the Development Credit Authority (DCA) to incentivize a transition to innovative financing schemes for clean energy projects, such as mezzanine financing.

3. INCREASE HUMAN RESOURCES CAPACITY AND SUSTAINABLE DEPLOYMENT OF SCIENCE & TECHNOLOGY (S&T)

The Mission has recognized the human resources capacity development needs through its CED program activities, including technology transfer for biogas from palm oil mills through CIRCLE and graduate-level training in the University Partnership – US-Indonesia Geothermal Education Capacity Building Program. The assessment team recommends building on these efforts by providing expanded support for clean energy science and technology (S&T) capacity building. This can be done by assessing S&T capacity building resources for clean energy, establishing new clean energy technology partnerships between both governmental and private sector institutions in Indonesia and the United States, seeking innovative ways of integrating clean energy in other USAID programs, and providing targeted support to renewable energy resource mapping, a gap that is critical to fill if Indonesia's hydropower, geothermal and other renewable resources are to be fully exploited. See Annex G for more detailed information on the current state of S&T capacity in Indonesia.

S&T Capacity Building Resource Assessment. A first step to improving Indonesia's S&T capabilities is to assess the existing relevant training and capacity building resources by mapping the skills needed to develop clean, maintain and operate clean energy facilities. Next, conduct an inventory of the existing educational/training programs with the basic facilities and faculty to provide training in specific clean energy technology use and maintenance. USAID can work with existing schools to develop their clean energy curriculum such as the Akademi Kesehatan Lingkungan (Environmental Health Academy) which has some knowledge and capacity to process waste from palm oil mills, Lembaga Pendidikan Perkebunan (Educational Institute for Plantations), or Sekolah Tinggi Kejuruan (Vocational School) which specializes in Machinery and Electronics.

Higher educational and training institutions should then be identified that have capacity to develop and offer new degree or certificate programs in clean energy fields. An important part of this effort will be the identification of key stakeholder institutions to serve as partners for such capacity building programs (e.g. MEMR, Ministry of Education, Ministry of Industry, and industry leaders).

USAID should also support creation of a database of RE technology options, and contact information of equipment suppliers with an analysis of pluses and minuses of each technology in order to help project developers to make better decisions for their projects.

S&T Partnerships. In 2015, the Mission should reconsider continued support for geothermal capacity building given the large investments already being made by the private sector, GOI and multilateral donors in the geothermal sector. The assessment team recommends that USAID instead builds on the Mission's University Partnership model to engage new U.S. and Indonesian partners in the universities, national technology and energy laboratories, and the private sector to expand from geothermal to other EE and RE technologies to address clean energy human resource constraints at the managerial and technical levels, and possibly create technology-specific research centers or centers of excellence.

USAID should work with PLN to provide targeted support for their research and development unit and focus on small hydro, biomass, biogas and EE technology development. USAID can also partner with PLN to strengthen the clean energy curriculum development at its education and training institute (Pusdiklat PLN). Other useful topics for capacity building within PLN include renewable integration issues, small island systems, and hybrid systems operation (building on successes and lessons learned from a DOE-supported pilot project).

Another possible S&T partner may be LIPI. The National Science Foundation (NSF) is reportedly engaging with LIPI, which is a potential opportunity for USAID to leverage.

Linking S&T Development with Deployment. A potentially powerful program approach in the next strategy period is linking new, market-ready clean energy technologies to deployment in the market place. USAID can link the U.S. and Indonesian S&T partners described above to develop clean energy technologies appropriate for Indonesian conditions and then use the PFAN and ICED matchmaking models to bring project developers together with interested investors to deploy projects using these technologies. USAID/India is using a similar approach in its Partnership to Advance Clean Energy (PACE) program.

Innovation and Integration. USAID should seek to improve energy access to Indonesia's thousands of small islands through the deployment of appropriate clean energy technology, and seek ways to integrate clean energy technology solutions into other aspects of the Mission's portfolio. USAID can leverage the 1,000 Islands Initiative and support innovation challenges to identify appropriate business models and technologies for Indonesia's small island systems. (e.g. storage, solar PV and solar-diesel hybrid systems, hybrid control systems, smaller scale geothermal technologies, etc). Other Mission programs (i.e. health, education, marine/fisheries, forestry) should be identified that can benefit through increased access to and integration of RE services.

Resource Mapping. Donors and government entities have supported a variety of resource mapping activities in the past, although connecting these efforts with potential project developers has not been very successful. The status of resource mapping for key sectors including geothermal and hydropower remains weak. For example, in the hydropower sector project developers often misunderstand the potential of a given hydropower site and waste the existing

hydro resources by building plants below the site's potential capacity. Training in best practices such as aerial surveys will improve feasibility studies. Improved awareness of the benefits of better resource mapping, even at additional cost, can help project developers understand that this kind of upfront expense and effort can greatly reduce their risk of failure. USAID should further assess the gaps in resource mapping efforts and capacity, leverage other donor investments and identify potential linkages with USDOE national laboratories or the U.S. private sector with remote sensing and other resource mapping capabilities. The 1,000 Islands initiative also includes technical assistance for least cost rural electrification planning. This effort is linked to World Bank ESMAP-supported resource mapping. Census data will be merged with resource maps to determine least cost options for rural populations. Three pilot provinces were selected for this project but it is just getting started. If successful KfW has indicated that the donors will consider expanding the program to USD 600 million.

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Indonesia Energy Sector and Strategic Program Assessment

Annexes

February 28, 2013

FEBRUARY 2013
This publication was produced for review by the United States Agency for International Development.
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Annex A INTERVIEWEES AND DOCUMENTS REVIEWED

Table A-1: Business Card Listing followed by Business Card Copies

Name	Title	Agency/Company
Adam Jung	Monitoring & Evaluation Officer, Program Office	USAID/Indonesia
Kishori Kedlaya	Private Enterprise Officer	USAID/Indonesia
John F. Hansen	Director, Environmental Office	USAID/Indonesia
Retno Setianingsih	Energy Program Specialist, Environment Office	USAID/Indonesia
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Lieviana Yohanna Ketaren	Office Manager Medan	USAID ICED (Indonesia Clean Energy Development)
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Hari Yuwono	Deputy Chief of Party	Winrock International
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Dhiah Karsiwulan	Finance and GHG Expert	Winrock International
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Haru Ohtsuka	Investment Officer, Environment & Social Development Dept.	International Finance Corporation
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Jiwan Acharya	Senior Climate Change Specialist (Clean Energy)	Asia Development Bank
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Sophie Saloman	Senior Project Officer	Agence Francaise Development
Dan Johnson	Commercial Finance Facility Lead, Green Prosperity	Embassy of the United States of America

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ATTACHMENT A

STATEMENT OF WORK

OBJECTIVE

The objective of this assessment is to provide USAID/Indonesia (USAID) with (1) an updated assessment of the energy sector (including electricity, transportation, and industry subsectors) in Indonesia ("Energy Sector Assessment"), particularly recent progress in the last 5 years and key challenges for next 5-10 years and (2) an independent programmatic and strategic evaluation of the design and progress to date of the current USAID clean energy development program and its various mechanisms ("clean energy portfolio"), in light of changes to the sector found in the updated sector assessment ("Strategic Program Evaluation"). The assessment report is intended to be used as input to the preparation of USAID Indonesia's next Country Development Cooperation Strategy for 2015 to 2019 period, which is currently underway.

Energy Sector Assessment

The updated assessment of Indonesia energy sector should cover the three major energy sub-sectors as classified by the Government of Indonesia under its National Plan for GHG Emission Reduction, -- electricity/power, industry and transportation -- and should consider clean energy as deployment of both renewable energy ("RE") and energy efficiency ("EE") applications.

The evaluators shall conduct comprehensive analysis to address the following questions:

- What is the profile of each of the energy sub-sectors (electricity, transportation and industry) with respect to scale, growth and GHG emissions, and what are the GOI's current policies, regulations and implementation plans to achieve the target of emission reduction in each sub-sector? What is the role of relevant Ministries and local governments in achieving the targets? Have local capacity and resources needed to support actual implementation been adequately developed?
- Have there been any "game changers" within those sub-sectors during the last 5 years leading to catalytic effect(s) on investment in renewable energy and energy efficiency? Are there similar catalytic changes expected to take place in next 5 years?
- What are the trends in the last 5 years and what trends can we expect during next 5 to 10 years, in term of investment scale from the local private sector and government owned-institutions across the clean energy sub-sectors?
- What are the existing and anticipated bottlenecks to a faster growth of investment in small scale renewable energy and energy efficiency?
- What is the current mapping of donor activities in clean energy sector? How do the activities from donor organizations contribute to development of clean energy sector compared to GOI's own investment? What are strategic strengths of USAID compared to other donors or partners of GOI and expected roles from current USAID counterparts?

Strategic Program Evaluation

The strategic programmatic evaluation of the design and effectiveness of current mechanisms under the CED program should be structured to reflect the changes on the clean energy landscape identified by the above Energy Sector Assessment. Evaluators should identify which elements of

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the CED program are having/are likely to have the greatest impact in this new energy sector environment, which elements are not, which aspects of the design need to be modified to generate impacts, and what areas should be considered for continuation or expansion under possible future USAID funding.

Questions to be addressed should include:

- How have the key assumptions identified in the previous assessment for successful CED program changed over the last 5 years around specific issues such as the energy subsidy, political willingness for change, institutional willingness for change, support from PLN and public support for change? How do these changes affect the implementation of CED program and existing mechanisms?
- How does the CED program manage to address the existing and anticipated key bottlenecks to clean energy development and capitalize on new and emerging opportunities, as identified in the Energy Sector Assessment?
- How do the implementation approaches and management of CED program affect the ability to achieve expected results (outputs, outcomes and strategic impacts) effectively, and what constraints are limiting its effectiveness? In addressing this question, the following aspects must be considered: project management approach, relationship with stakeholders, human resources availability, geographic focus, and local versus national stakeholder engagement.
- Which intervention components and/or approaches should be considered for continuation, modification and/or expansion by USAID Indonesia for the current and future investment in clean energy sector, within USAID's strengths and manageable interests?

Methodology

The evaluators should consider a range of possible methods and approaches for collecting and analyzing the information required to conduct sector assessment and strategic program evaluation. The methodology will be discussed with and approved by the USAID team as part of the larger work plan once the team starts to engage in subcontract agreement with Tetra Tech ES as USAID's Implementing Partner for ICED project. The Evaluation team is expected to review documents, contracts, and reports relevant to the sector assessment and program evaluation, including documents from the implementers of each mechanism. They will interview USAID staffs, partners, and stakeholders of each mechanism. They will also interview relevant GOI staffs and private sector actors. The following is a list of possible resources for this assessment:

- Ministry of Energy & Mineral Resources
- Other GOI institutions at the national and local levels (including PLN)
- Project developers, financial institutions and private sector representatives
- International and regional donor organizations
- USAID implementing partners
- USAID and other USG agencies

Field/Site Visits

The Evaluation team is expected to travel to a number of selected field sites to gain ground view of program implementation. Site selection will be made based on cost effectiveness and practicality to get substantial knowledge and information about the sector and program implementation under the current mechanisms without sacrificing the quality and validity of data. Site selection will be discussed prior to preparation of work plan.

For Energy Sector Assessment, field visit will be mainly conducted to gain an overall picture of sector dynamics and important areas where USAID is currently not active but other donors and/or U.S. Agencies are. For Strategic Program Evaluation, field visit should focus on selected sites from the CED's current or recent intervention areas. Examples include ICED's geographic focus (Aceh, North Sumatera, Riau), CIRCLE's main activities in Central and South Kalimantan, and Bandung for UP Geothermal.

Deliverables

1. A work plan for the assessment including the design/framework) and time-frame
2. Presentation of preliminary findings to USAID
3. Draft Evaluation Report (tentative outline):
    a. Executive Summary
    b. Description of the final methodology and scope undertaken
    c. Energy Sector Assesament
    d. Strategic CED Program Evaluation
    e. Recommendations for current and future USAID's investments in clean energy
    f. Summary of the findings, conclusions and recommendations
4. Final Report
5. Executive Briefing (PowerPoint Presentation) to USAID

Resources, Procedure, and Schedule

A. Data Sources

For the Energy Sector Assesament, USAID and/or ICED team will provide the following documents to the Evaluation team as basis for the review and analysis:

- GOI's National Energy Blueprint 2006, Energy Law 2007, Geothermal Law 2003, Electricity Law 2009 and subsequent government regulations.
- Presidential Decree on National Action Plan for GHG Emission Reduction 2011 and subsequent regulations.
- Ministry of Energy & Mineral Resource's Strategic Planning 2009-2014 (RENSTRA) and relevant policies/regulations.
- USAID/Indonesia ICED Report on Clean Energy Policy in Indonesia, December 2011.
- USAID/Indonesia ICED Report on Preliminary Analysis of Indonesia's Energy Efficiency Policies and Programs, January 2012.
- USAID/Indonesia ICED Draft Report on the Role of PLN in Clean Energy Development: Current Status and Future Directions, July 2012.
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- World Bank and AusAID, "Winds of Change: East Asia's Sustainable Energy Future", 2010.
- World Bank, "Energizing the Power Sector, Indonesia Rising: Policy Priorities for 2010 and Beyond" paper 53474, 2010.
- International Institute for Sustainable Development, "A Citizens' Guide to Energy Subsidies in Indonesia", 2011.

In addition to the above, for the Strategic Program Evaluation, the team will also review the relevant program documents for ICED, CIRCLE, PFAN and UP Geothermal. This will include, among others:

- Scope of Work of the Contracts or Agreements
- Annual Work Plans
- Annual and Quarterly Reports
- Performance Management Plans
- Other key documents

USAID will brief the team at the start of the assessment. Upon the signing of subcontract, the team will be introduced to the key leaders of each mechanism, who will then provide recommendation for and assist in arranging the schedule for interviews and visits to selected stakeholders and project sites. Meetings and interviews with priority government partners, stakeholders, community groups, private sector partners, and experts/consultants will be set during the first few days of the assessment period.

B. Methods of Data Collection

Copies of the most relevant documents will be provided in advance by USAID and/or ICED team to the Evaluation team upon signing of subcontract agreement. The team will prepare a draft of their itinerary and finalize it in their work plan immediately after the initial in-country planning meeting with USAID. The work plan will include a sector assessment and strategic program evaluation design ("assessment framework"), interview plans, and travel plans. USAID and ICED will help ensure timely access to key individuals to be interviewed. All questions and clarifications about the assessment should be addressed on the first days of meetings.

C. Duration and Timing of the Assessment

The Energy Sector Assessment and Strategic Program Evaluation will be conducted during the period between January 9 and February 28, 2012. Following the preliminary Energy Sector Assessment carried out by an USAID internal team from January 10 to 24 , during which the USAID team conducted meetings with several key stakeholders (DG NREEC of MEMR, PLN Head Office, BAPPENAS, MCC, UNDP, GIZ, and IFC), as well as a field visit to the Sumba Iconic Island project and PLN Distribution Office for East Bali area, and discussion with the implementing partner of the Geothermal University Partnership program, the Evaluation team would focus on conducting interviews with other relevant stakeholders, both at national and local level, to further address the highlights and gaps identified from the preliminary Energy Sector Assessment and carry out programmatic evaluation of the current USAID Clean Energy Development Program. An illustrative schedule for the Evaluation Team is shown below:

Activity	Duration
• First briefing with USAID, discussion of key highlights from the preliminary Energy Sector Assessment, preparation and submission of Work Plan for Strategic Program Evaluation.	Jan. 28-29
• Energy Sector Assessment: Meetings with other relevant stakeholders at national level, as necessary.	Jan. 29 – Feb. 15
• Strategic Program Evaluation: Data gathering, including stakeholder interviews and site visits to ICED and CIRCLE sites, as necessary.	
• Work Plan	Jan. 30
• Presentation of preliminary findings with USAID.	Feb. 11-13
• Draft Report	Feb. 18
• Final Report	Feb. 28
• Executive Briefing with USAID	March 1

Annex C TEAM AND METHODOLOGY

1.1 THE TEAM

The assessment team comprised of three Indonesian experts and an American Team Leader - Nexant Vice President, Dick Edwards. Mr. Edwards is a former USAID officer and experienced consultant who has assessed, evaluated, and designed major USAID energy and climate change programs in South Asia, China, and Haiti in the last three years. Mr. Fabby Tumiwa was the team's Institutional/Policy Specialist with extensive energy and climate change policy experience, and associated networks in Indonesia. He has worked on a variety of relevant Indonesian, regional and global projects ranging from REN 21, WEC, PT PEACE, CAN, the Sumba Iconic Island Project, and others. Ms. Berliana Yusuf has strong USAID renewable energy finance experience from her work on the Private Finance Advisory Network (PFAN) project, and an extensive Indonesian financial sector network; she served as the team's Technical/Financial Specialist. Mrs. Isna Marifa was the Regional Energy Specialist, with specific experience in the environment, industry, and transport sectors. As a former USAID/Indonesia staff member with degrees from MIT and Bryn Mawr College, she has broad experience in conducting sector assessments, program evaluations, and climate change mitigation/adaptation analyses.

USAID/Washington energy specialist Jeff Haeni visited Jakarta just prior to the evaluation team's arrival and conducted his own interviews and research. His findings are incorporated throughout this document. Furthermore, USAID/Washington energy advisor Jeremy Foster accompanied the Nexant evaluation team to most interviews in Jakarta and to the site visits in Medan and Bangka-Belitung Island and provided a SWOT analysis of USAID's current CED portfolio. USAID/Jakarta Environment Office experts led by Retno Setianingsih and Kishori Kedlaya likewise attended most of the meetings in Jakarta and accompanied the team on the site visits to Riau and Bangka-Belitung.

1.2 METHODOLOGY

The team used a variety of methods and sources to collect and analyze data for both the energy sector and strategic program assessments. The team was briefed by ICED and CIRCLE staff and attended an advisory board meeting of the University Partnership – US-Indonesia Geothermal Education Capacity Building Program in Jakarta. The team conducted field visits to ICED project-related sites in Pekan Baru, Riau and Medan, North Sumatera, and a CIRCLE biogas POME project site on Bangka-Belitung Island. They interviewed project beneficiaries and local government officials, and toured biomass and bio-gas power plants currently receiving USAID technical assistance.

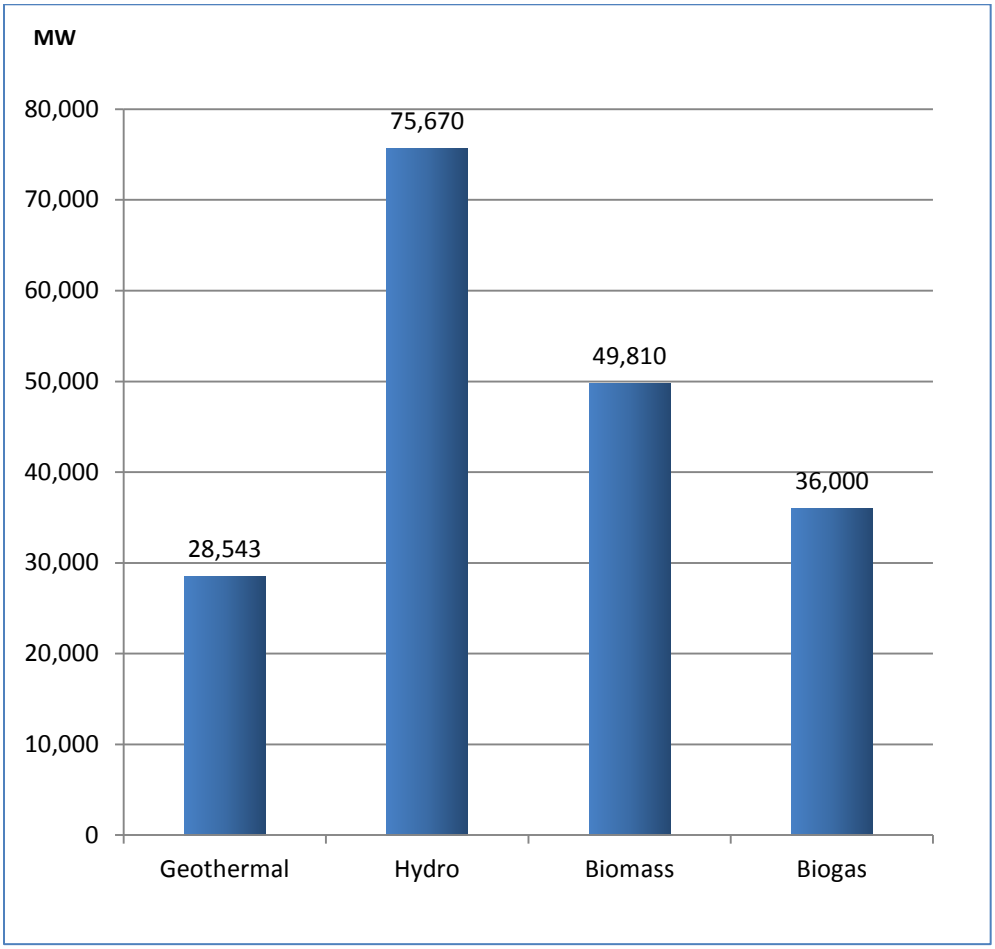
The team also reviewed relevant documents, scopes of work (SOW) of the USAID energy projects, and reports relevant to the sector assessment and program evaluation, including documents/progress reports produced as outputs from the active projects. The team interviewed USAID/Indonesia and USAID/Washington staff, USAID partners, major international donors working in the energy sector, and stakeholders of each project. The team conducted in-depth

interviews with relevant Government of Indonesia (GOI) ministry staff, private sector project developers, industry association representatives, and other actors. The interviews were broad-ranging, but included specific questions on how the sector had changed in the past five years, how the interviewees envisioned it evolving in the next 5-10 years, how the existing USAID clean energy development (CED) portfolio of projects had been helpful to beneficiaries, and what kind of assistance they would consider most useful from USAID going forward.

USAID and Assessment Team visit to CIRCLE POME site on Bangka Island, February 2013.

Annex D FIGURES

Figure 1: Estimated RE Potential (MW) in Indonesia



Sources: Ministry of Energy and Mineral Resources (2010) and Yudiarto

Figure 2: Estimated Number of Trained Resources Required to Tap the RE Potential in Indonesia

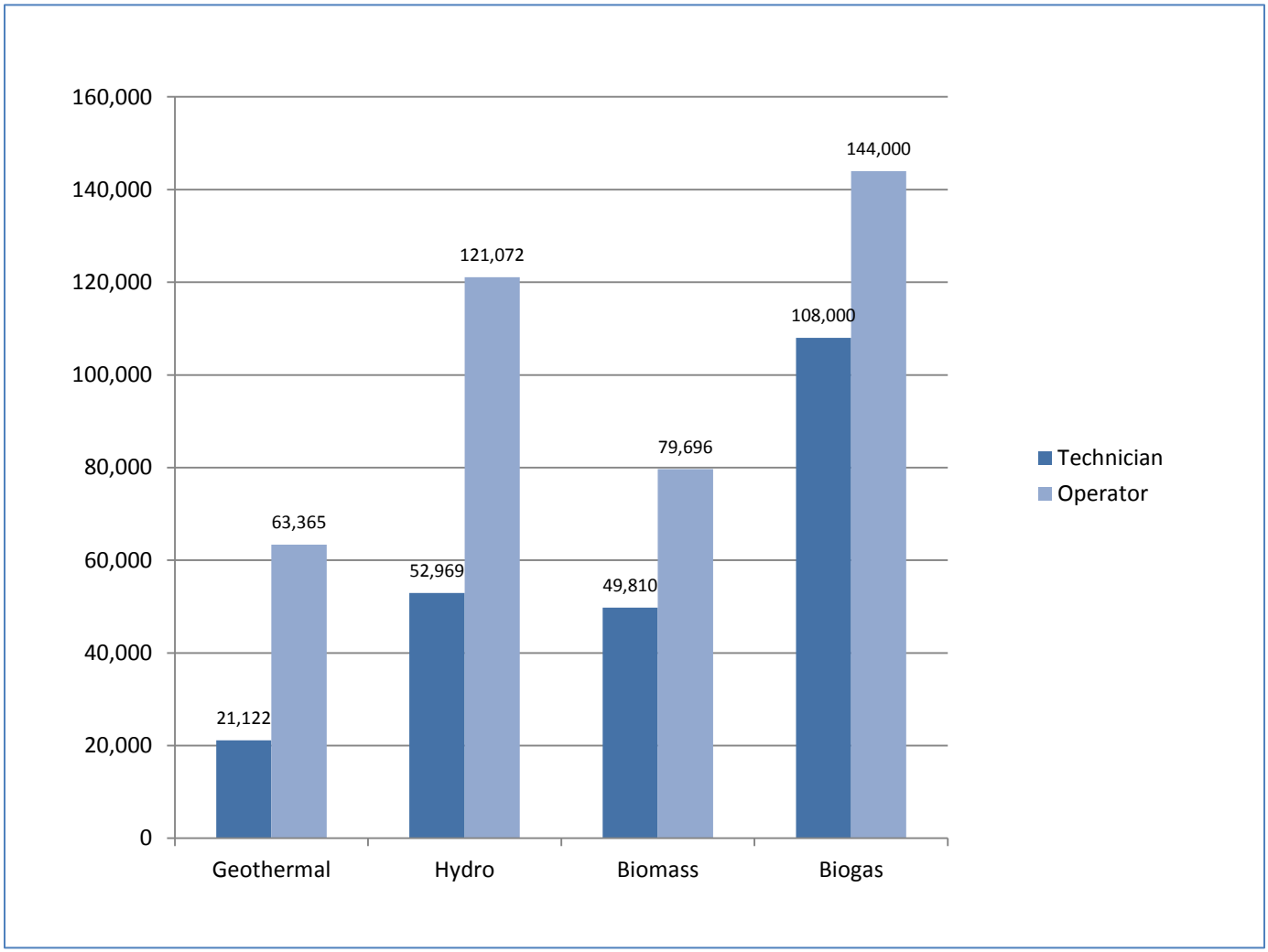


Figure 3: Commercial Electricity Tariff, Indonesia and ASEAN Countries

Singapore

High Tension Small (HTS) Supplies
Peak period: SGD 23.56 (IDR 183,930)/kWh
Off-peak period: SGD 14.48 (IDR 113,041)/kWh
High Tension Large (HTL) Supplies
Peak period: SGD 23.40 (IDR 182,673)/kWh
Off-peak period: SGD 14.47 (IDR 112,964)/kWh
Extra High Tension (EHT) Supplies
Peak period: SGD 22.33 (IDR 174,321)/kWh
Off-peak period: SGD 14.29 (IDR 111,555)/kWh

Low Tension Supplies, Domestic & Non-Domestic
Without GST: SGD 28.08 (IDR 219,206)/kWh
With 7% GST: SGD 30.05 (IDR 234,587)/Kwh

High Tension Small (HTS) Supplies
Contracted Capacity Charge
Without GST: SGD 6.96 (IDR 54,333)/kWh
With 7% GST: SGD 7.45 (IDR 58,159)/kWh

Un-contracted Capacity Charge
Without GST: SGD 10.44 (IDR 81,500)/chargeable kW/month
With 7% GST: SGD 11.17 (IDR 87,210)/chargeable kW/month

kWh Charge
Peak Period
Without GST: SGD 26.65 (IDR 208,002)/kWh
With 7% GST: SGD 28.52 (INR 222,592)/kWh
Off-peak Period
Without GST: SGD 16.27 (IDR 126,991)/kWh
With 7% GST: SGD 17.41 (IDR 135,889)/kWh

Reactive Power Charge
Without GST: SGD 0.59 (IDR 4,605)/chargeable kVARh
With 7% GST: SGD 0.63 (IDR 4,917)/chargeable kVARh

Vietnam

Transformer capacity below 6 kV:
Off-peak hour: VND 1,846 (IDR 856)/kWh
Peak hour: VND 3,193 (IDR 1,480)/kWh
Lower hour: VND 1,065 (IDR 494)/kWh
Transformer capacity from 6 kV to 22 kV:
Off-peak hour: VND 1,766 (INR 819)/kWh
Peak hour: VND 3,028 (IDR 1,404)/kWh
Lower hour: VND 1,037 (IDR 481)/kWh
Transformer capacity from 22 kV and above:
Off-peak hour: VND 1,648 (IDR 764)/kWh
Peak hour: VND 2,943 (IDR 1,364)/kWh
Lower hour: VND 902 (IDR 418)/kWh
Transformer capacity below 6 kV:
Off-peak hour: VND 1,205(IDR 559)/kWh
Peak hour: VND 3,369 (IDR 1,562)/kWh
Normal period: VND 1,808 (IDR 838)/kWh
Transformer capacity from 6 kV to 22 kV:
Off-peak hour: VND 1,153 (IDR 534)/kWh
Peak hour: VND 3,226 (IDR 1,496)/kWh
Normal period: VND 1,939 (IDR 899)/kWh
Transformer capacity from 22 kV and above:
Off-peak hour: VND 1,022 (IDR 474)/kWh
Peak hour: VND 3,117 (IDR 1,445)/kWh
Normal hour: VND 1,808 (IDR 838)/kWh

Transformer capacity below 6 kV:
Off-peak hour: VND 1,205 (INR 559)/kWh
Peak hour: VND 3,369 (IDR 1,562)/kWh
Normal period: VND 1,808(IDR 838)/kWh
Transformer capacity from 6 kV to 22 kV:
Off-peak hour: VND 1,153 (IDR 534)/kWh
Peak hour: VND 3,226 (IDR 1,496)/kWh
Normal period: VND 1,939 (IDR 899)/kWh
Transformer capacity from 22kV and above:
Off-peak hour: VND 1,022 (IDR 474)/kWh
Peak hour: VND 3,117 (IDR 1,444)/kWh
Normal period: VND 1,808 (IDR 838)/kWh

Figure 5a: Composition of PLN Customers in 2011

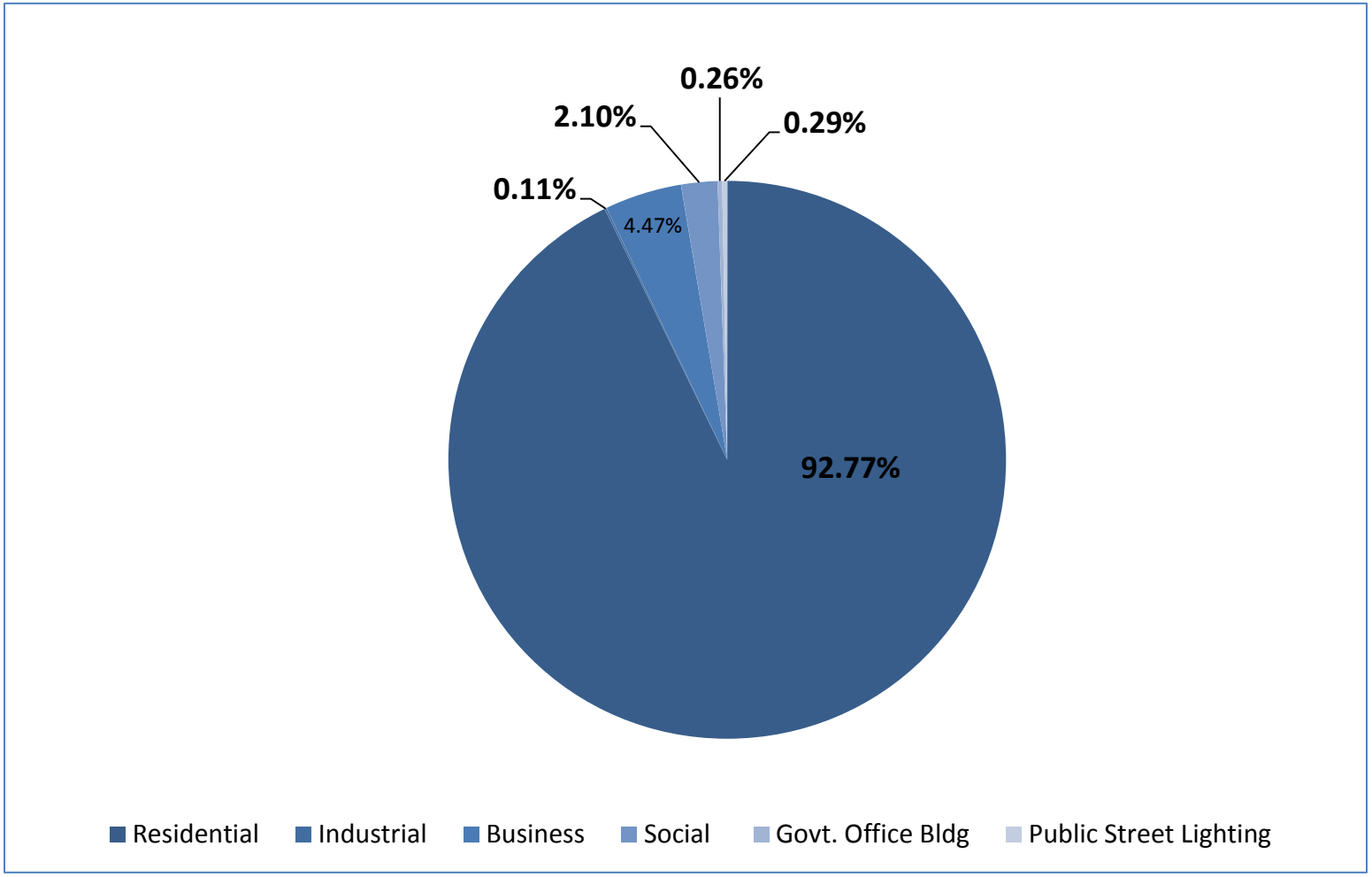
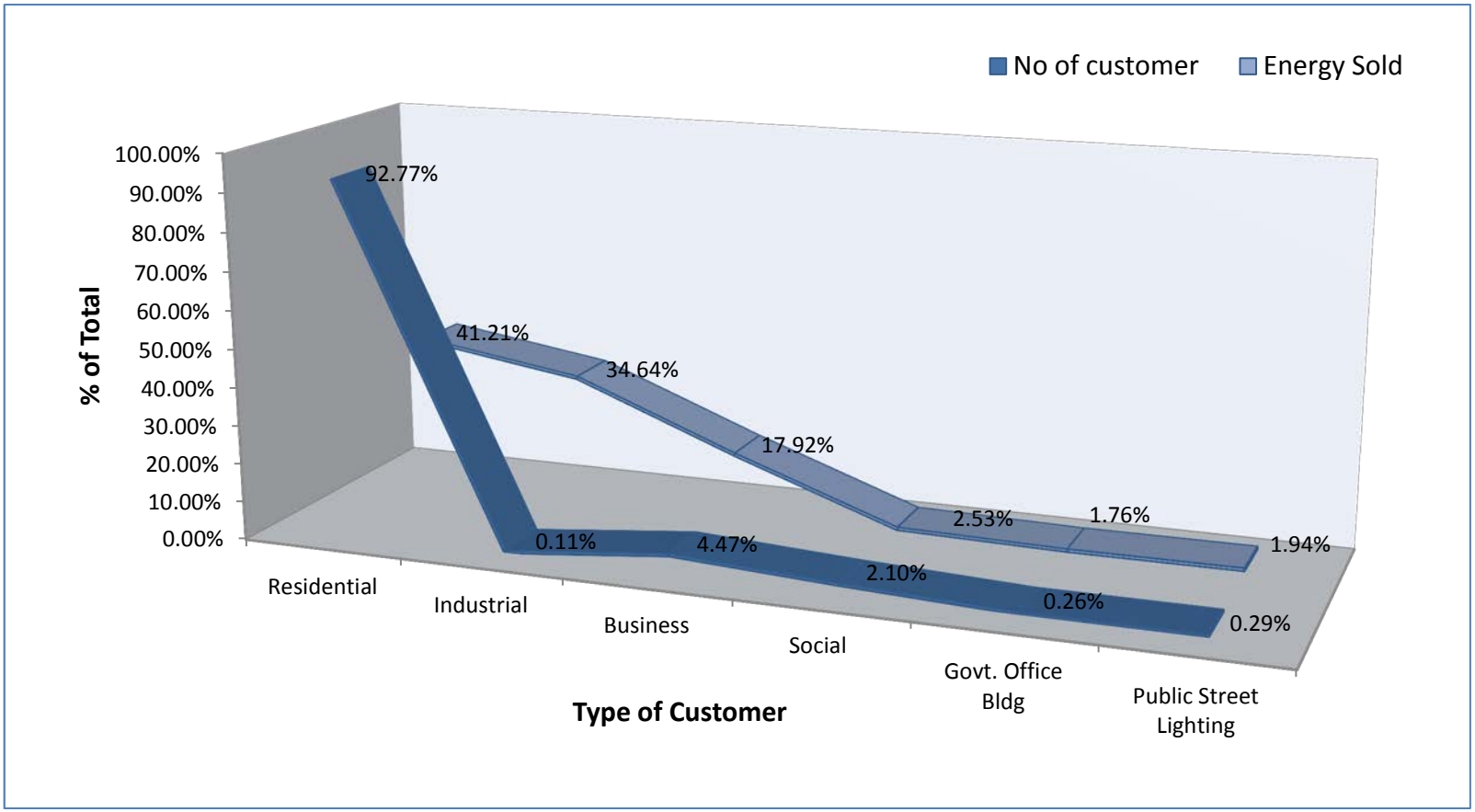


Figure 5b: Composition of PLN Customers and Energy Sold in 2011



Annex E RECENT POLICIES AND REGULATIONS

Summary of Recent Policy and Regulation to Support Clean Energy Development and Energy Efficiency, and Industrial GHG Emission Reduction

Policy	Summary of Content
Law and to Support Clean Energy Development	
Presidential Regulation No. 5/2006 on National Energy Policy	It set national targets for the optimal energy mix in 2025, i.e.: (i) less than 20 percent from oil; (ii) more than 30 percent from gas; (iii) more than 33 percent from coal; (iv) more than 5 percent from biofuel; (v) more than 5 percent from geothermal; (vi) more than 5 percent from other renewable sources, especially biomass, nuclear, micro-hydro, solar and wind; and (vi) more than 2 percent from liquefied coal. In addition, a national target was established to reduce energy elasticity to less than 1.
Law No. 27/2003 on Geothermal	This law: (i) provides for the award of new geothermal working areas on the basis of competitive tendering for areas defined by the central government, (ii) treats state- owned and private companies the same with respect to participation in geothermal business activities, and (iii) establishes the respective roles of the central and regional governments for the tendering of new geothermal working areas and issuing of geothermal licenses. It provides an integrated view of geothermal development, governing five stages: Preliminary Survey, Exploration, Feasibility Study, Exploitation, and Utilization. Any data obtained under a geothermal license is owned by the State.

Law No. 30/2007 on Energy	The first energy law for Indonesia. The establishment of National Energy Council (or DEN), chaired by President, and member comprised of sectoral ministers and representation from industry, scholar, and consumer. DEN is responsible to develop and formulate National Energy Policy, in which the consultation with House of Representative (DPR). All level of government (national and local) has role and responsibility in energy planning. Central Government has mandate to develop General Plan of National Energy Development based on National Energy Policy, and local government to prepare General Plan of National Energy Development. Government must utilize renewable energy resources. The government shall provide incentives to business, community and individual for renewable energy development and utilization. Energy conservation is one of the key themes. The Law stipulated that central and local government and energy users are responsible to energy conservation. The government shall provide incentives for energy conservation.
Law No. 30/2009 on Electricity	This law replaced UU No. 15/1985 on Electricity, and revoked UU No. 20/2002 on Electricity. The law sets provision for electricity planning, electricity business, standard and code, resource utilization for electricity generation, environmental consideration, and role of national

	and local government in electricity provision. The law mandated the optimal utilization of primary energy sources with priority should be given to the new and renewable energy.
Presidential Regulation No. 4/2010 on the assignment to PT PLN (State-owned Electricity Company) to Conduct Acceleration of Power Plant Development using Renewable Energy, Coal and Gas	This was issued on January 8th 2010 and valid until 31 December 2014. This regulation intends to accelerate the diversification of energy mix in power sector. It gives an opportunity to the utility (PLN) to build power plants that are using renewable energy, coal and natural gas as fuel through joint cooperation with private sector, using power-purchasing scheme. During engineering, procurement and construction of the power plant and its transmission line, the Government will guarantee the feasibility of the business according to the existing regulation. Facilities such as free import tax of the equipment and others will be given under the Minister of Finance jurisdiction.
Ministerial Regulation of Minister of Energy and Mineral Resources No. 15/2010 on The List of Renewable, Coal and Natural Gas Acceleration and Related Transmission Projects	This regulation listed all projects of geothermal, hydro (large-scale), coal and gas power projects for the acceleration program set by Presidential Regulation No. 4/2010. It also listed all related transmission project to connect all power plants to the main grid.

<table>
<tr><td colspan="2">Specific Regulation on Feed in Tariff</td></tr>
<tr><td>Ministerial Regulation of Minister of Energy and Mineral Resources

No. 4/2012 on the Price of Electricity PLN Pays for Small and Medium Scale Renewable Energy Power Plant and Excess Power.</td><td>It replaced the previous Ministerial Regulation No. 31/2009. It stipulates obligation for PLN to purchase electricity from renewable power plant with capacity less than 10 MW owned by SOE, local government owned companies, cooperative, and private, or excess power.

The purchasing prices set by the regulation are varies, depending on technology, connection point to the grid (medium or low voltage) and location.

<table>
<tr><td>Technology</td><td>Price

(Rp/kWh)</td><td>F-factor (multiplier)</td></tr>
<tr><td>General</td><td>MV: 656 x F

LV: 1004 x F</td><td>Java and Bali: F = 1

Sumatra and Sulawesi: F = 1.2

Kalimantan, NTB & NTT: F = 1.3

Maluku & Papua: F = 1.5</td></tr>
<tr><td>Biomass and biogas</td><td>MV: 975 x F

LV: 1325 x F</td><td>Java, Madura, Bali, Sumatra: F = 1

Sulawesi, NTB and</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>NTT: F = 1.2

Maluku and Papua: F = 1.3</td></tr>
<tr><td>Zero Waste</td><td>MV: 1050

LV: 1398</td><td>No F-factor applies</td></tr>
<tr><td>Urban Waste Sanitary Landfill</td><td>MV: 850

LV: 1198</td><td>No F-factor applies</td></tr>
</table>

The law also allows PLN to purchase electricity from renewable power plants and excess above the set prices, based on PLN’s own estimate cost and required the approval of the Minister of Energy and Mineral Resources.</td></tr>
<tr><td>Ministerial Regulation of Minister of Energy and Mineral Resources No. 22/2012 on Assignment of PLN to Purchase Electricity from Geothermal Power Plants and the Price of Electricity PLN Pays for Geothermal Electricity Purchases</td><td>It replaced the previous Ministerial Regulation No. 2/2011. This regulation assigned PLN to purchase electricity from geothermal power plants owned by state owned enterprises, local government owned companies, and private (IPP) and cooperatives. The power purchased price varies depending on location (islands and specific provinces) and connection points (high voltage, medium voltage).

<table>
<tr><td rowspan="2">Location</td><td colspan="2">Price ($ cents/kWh)</td></tr>
<tr><td>High Voltage</td><td>Medium Voltage</td></tr>
</table>
</td></tr>
</table>

	Sumatra	10	11.5
	Jawa, Madura, Bali	11	12.5
	South Sulawesi, West Sulawesi, Southeast Sulawesi	12	13.5
	North Sulawesi, Central Sulawesi, and Gorontalo	13	14.5
	NTB and NTT	15	16.5
	Maluku & Papua	17	18.5

Specific Regulation for Greenhouse Gasses (GHG) emission mitigation	
Government Regulation No. 61/2011 on National Action Plan on GHGs Emission Reduction	This regulation was issued to implement national emission reduction target of 26% and 41% from business as usual set by the President of Indonesia. The regulation stipulates National GHGs Emission Reduction Plan (RAN-GRK) for 5 sectors: agriculture, forestry and peat land, energy and transport, industry, and waste. The period of implementation is 2010-2014 and 2015-2020. The RAN-GRK is reference for line ministries to conduct planning, implementation, monitoring and evaluation of emission reduction; and reference for the development of Local Emission Reduction Plan (RAD-GRK).

Specific Regulation on Energy Efficiency	
Government Regulation No. 70/2009 on Energy Conservation	This is an implementing regulation of Law No. 30/2007 on Energy. This regulates the responsibility and the role of the central government, regional government, private sector and communities on energy efficiency, standardization and labeling, and implementation of energy efficiency. This also mandates the development of General Plan of Energy Conservation (RIKEN) as the guideline for the stakeholders to implement energy efficiency and conservation in Indonesia. This regulation obliges the large energy consumer with minimum energy consumption of 6000 TOE/year to implement energy management through (a) appointment of energy manager; (b) develop energy conservation program within the company; (c) conduct regular energy audit; (d) implement energy audit recommendation (e) report the result of the energy management program to the authorities. It stipulates the obligation for procedures or importer of energy appliances to implement energy efficiency labeling. It specifies numerous incentives to be provided to users, such as free energy audit, and fiscal incentives (tax exemption, etc) for energy users. Those who failed to carry out energy conservation as required by this regulation will face sanctions.

Presidential Instruction No. 13/2011 on Energy and Water Savings	This instruction replaced Presidential Instruction No. 2/2008 on Energy and Water Savings. It instructs all Government Institutions and agencies, state-owned enterprises, local government owned enterprise to promote and implement energy and water efficiency efforts. It also initiates the establishment of the National Committee for energy and water efficiency. This Implementing Committee is responsible for developing policies related to energy and water efficiency and evaluating the implementation of those policies; formulating strategies and programs; monitoring; conducting inventory and assessment of activities on energy and water savings, conducting cooperation with stakeholders to create public awareness; organizing assessment and formulating financial support for implementing energy and water.
Ministerial Regulation of Minister of Energy and Mineral Resources No. 13/2012 on Power Savings	This regulation set provision for power savings on all state-owned, state-owned enterprises owned, local government owned companies owned buildings, official resident, street lightning and commercial ad facility. It put target to reduce 20% of electricity consumption or to reduce the electricity consumption to reach efficient level criteria by six months after the regulation passed (November 2012).

	The regulation also sets specific power savings measures and standard to be applied in the building. Regular reporting for every agencies/institutions to the Minister conducted twice a year for evaluation.
Ministerial Regulation of Minister of Energy and Mineral Resources No. 14/2012 on Energy Management	This regulation is implementation regulation of Government Regulation No. 70/2009 on Energy Conservation. It stipulates the mandatory requirement for energy users with annual consumption is more than 6000 TOE, and request for user with annual consumption less than 6000 TOE to carry out implementation of energy management activities. The energy management covers activities: (i) employ energy manager; (ii) develop energy conservation program; (iii) carry out regular energy audit; (iv) reporting to the minister, governor, regent/major according to their relevant responsibility. This regulation also set reporting format and template for energy management implemented by users, and set annual reporting submission period from 1 January to 31 March.
Regulation for Industrial GHGs Emission Reduction	

Ministerial Regulation of Minister of Industry No. 2/M-IND/PER/1/2012 on Roadmap of GHG Emission Reduction on Cement Industry	This regulation set a roadmap for cement industry to implement emission reduction. The target is to reduce CO2 emission specific by 2% in 2011-2015 as voluntary effort, and mandatory reduction of 3% in 2016-2020. The roadmap listed number of measures to be applied: utilization of renewable energy, fuel switching, alternative material, application of energy management system, etc.

Annex F RELEVANT GOI AND NGO INSTITUTIONS

List of Key Government Institutions and NGOs related to clean energy development and climate change mitigation

1. Government Institutions

National Council on Climate Change (Dewan Nasional Perubahan Iklim – DNPI)	The National Council on Climate Change (DNPI) is established through Presidential Regulation of the Republic of Indonesia Number 46/2008. Under the regulation, DNPI has role and responsibility as follow: (i) formulating national policies, strategies, programs and activities to control climate change; (ii) coordinate activities in climate change control duties which include adaptation, mitigation, technology transfer and financing; (iii) formulate policy setting mechanism and procedures of carbon trading; (iv) implement monitoring and evaluation of the implementation of the climate change policy; (v) strengthen the position of Indonesia in the international climate negotiation.
National Energy Council (Dewan Energi National)	DEN is established under the Law No. 30/2009. The main task is to: (i) design and formulate national energy policy to be approved by Government upon approval of parliament (DPR); (ii) to determine General National Energy Plan (RUEN); (iii) to determine strategy and preparation to address energy emergency situation; (iv) supervise implementation of energy policy across the sector. DEN is high-level coordination body, chaired by President of Indonesia, vice-chaired by Vice President, and daily chairman is Minister of Energy. It has 15 members, 7 are minister from line ministries, and 8 members representing the public and consumers.
Coordinating Ministry of Economic Affairs (Kementerian Koordinator Bidang Perekonomian)	Coordinating ministry to coordinate all ministries with economic portfolio (energy, industry, trade, finance, agriculture, investment, forestry). The coordination includes policy formulation, policy implementation, and national program and projects implementation. Coordinating Ministry of Economic Affairs has specific deputyship of energy, mineral and forestry, who responsible to undertake coordination with specific directorate generals.
Ministry of Energy and Mineral Resources (MEMR)	Responsible for energy sector development, develop and formulate policy and regulation, program implementation, and supervision related to energy sector activities. MEMR has specific Directorate General to address sub-sector (oil and gas, coal and mineral, electricity; and new, renewable energy and

	energy conservation.
Directorate General of New, Renewable Energy and Energy Conservation (DGNREED/Ditjen EBTKE)	DGNREEC was setup under MEMR in 2010. There are four (4) directorates under DGNREEC: (i) Directorate Geothermal Energy; (ii) Directorate of Bio-energy; (iii) Directorate of Energy Conservation; (iv) Directorate of New and Various Renewable Energy. DGNREEC main tasks in the field of new, renewable energy and energy conservation are: (i) formulate and implement policy; (ii) preparing norms, standards, procedures, and criteria; (iii) provide technical guidance and evaluation; (iv) submit evaluation report and provide advice/recommendation to the Minister; (v) promote clean energy utilization through internal organization, capacity building, networking and public outreach.
Directorate General of Electricity (DGE/DJ Ketenagalistrikan)	DGE main activities are focused in: Formulation and implementation electricity policy; development of norms, standard, procedures and criteria in electricity sector; Provision of technical support/advice and monitoring/evaluation in electricity sector. DGE is responsible to develop General Planning of National Electricity (Rencana Umum Ketenagalistrikan Nasional – RUKN) that serves as reference for electricity development planning by utilities, more importantly for PLN's mid-term Electricity Development Plan (RUPTL). DGE also function as quasi-regulatory agency for electricity utilities, including for the state-owned power company, PT PLN.
Agency of Education and Training of MEMR	Responsible for education, training and capacity building for Ministry of Energy and Mineral Resources (MEMR). This agency has 6 training unit: (i) Center for Geological Education and Training; (ii) Center for Mineral and Coal Technology Education and Training; (iii) Center for Oil and Gas Education and Training; (iv) Education and Training House for Underground mining; (v) Center for Electricity and Renewable Energy Education and Training; (vi) Oil and Gas Academy (Akamigas).
National Planning Agency (BAPPENAS) Deputyship of Environment and Natural Resources	The Environment and Natural Resources Deputyship tasks cover: food and agriculture, marine and fisheries; forestry, conservation of water resources, energy resources, minerals and mining, and environment. Its responsibility includes: preparing the formulation of national development planning policies (NDP); review, conduct consultation with the program director of the sectoral ministry/DG/Head of regions regarding their proposed institutional work plan and budget. This consultation is also in coordination with DG Budgeting at the ministry of Finance; coordinate and synchronizes, and consolidate the NDP and its implementation.

	The Environment and Natural Deputyship hosting the RAN-GRK secretariat, and coordinate the preparation and development of RAD-GRK, and monitor its implementation. It also serves as the secretariat of Indonesia Climate Change Trust Fund (ICCTF).
Center for Green Industry Assessment and Environment Agency for Assessment of Policy, Climate and Quality of Industry, Ministry of Industry	Center for Green Industry Assessment and Environment main task is to conduct study and assessment of green industry and environment. Since 2007 became focal point for the Ministry of Industry for the development of GHGs emission reduction strategy for industrial sector. The center conducted energy audit for 50 intensive energy industries (iron and steel, pulp and paper) in 2011-2012.
Center for Climate Change Financing and Multilateral Policy, Fiscal Policy Agency, Ministry of Finance	Established in 2011, the Center for Climate Change Financing and Multilateral sits under the Fiscal Policy Agency of the Ministry of Finance. The center has four unit: (i) forestry and land-based climate change financing; (ii) energy and transport climate change financing; (iii) multilateral development banks and institutions; (iv) G-20. The first two units are responsible to assess and formulate policy and regulation to support climate change mitigation through fiscal incentives. Non-forestry climate change mitigation including renewable energy, energy efficiency, industrial process efficiency and transportation.

2. Non-Governmental Organizations

Institute Bisnis dan Ekonomi Kerakyatan (IBEKA)	NGO specialize in development and construction renewable energy projects mainly on micro and mini-hydro projects both on-grid and off-grid. Recently IBEKA started to installed small-scale wind turbine (500 Wp) in Sumba island, NTT.
Indonesia Institute on Energy Economics (IIEE)	NGO specialize in energy policy studies and energy modeling. In the past 3 years has been developing a number of pico-hydro projects, and recently is preparing biomass power plant from rice husk.
Institute for Essential Services Reform (IESR)	NGO specialize in energy policy studies and advocacy. Since 2011 has working with Directorate of Energy Conservation of DGNREEC to develop formulation energy efficiency policy and regulations to strengthen ESCO and energy efficiency financing. It also conducts energy audit for small hotel, and implements energy efficiency measures in hotel and restaurant. It has started to develop community based micro-hydro project. It advises MoF on fiscal policy to support renewable energy and energy efficiency.
WWF Indonesia	WWF has been working to develop renewable energy project in its conservation area. Recent activities include development of RE projects in Papua.

Yayasan Dian Desa	NGO based in Yogyakarta. It has been running project to promote and develop efficient/improved cook stove and more efficient use of traditional biomass.
HIVOS	A Netherland development organization working on developmental projects. Since 2008 develop and build household biogas (BIRU) program in cooperation with Directorate Bio-Energy, DGNREEC, MEMR. BIRU has target to build 8000 small biogas units (6 cu.m^2) by the end 2013. It works with numerous small NGO in targeted provinces to install and monitor biogas plants. Since 2010 initiate the Sumba Iconic Island project with cooperation with DGNREEC-MEMR, and currently serves as secretariat of the project. This initiative aims to provide energy to Sumba population from 100% renewable resources in 2025.
Indonesia Renewable Energy Society (IRES)	An association of business, NGOs, experts, academes and government who concern about renewable energy development. IRES assists policymakers to develop renewable policy and has become the main counterpart of government in policy formulation.

Annex G INDONESIAN S&T CAPACITY

Capacity of Indonesian human resources and institutions regarding clean energy (RE/EE) is limited. Many practitioners have observed that involvement of government institutions in clean energy is fragmented and dispersed and only weakly coordinated. Even where there is institutional capacity regarding clean energy, the number of people with experience and qualifications in clean energy is very small. Outside the government, there are NGOs, universities arms and private companies that work in clean energy, but they tend to be small in size.

The lack of capacity is an outcome of past indifference and weak policy framework towards clean energy. Without a clean energy industry to use and market clean energy technology and knowledge, there has been little effort and resources allocated to develop capacity in clean energy, and even less for science and technology research.

This situation also shows Indonesia's long and enduring history of poor development in science and technology. Compared to other developing economies, Indonesia falls far behind in terms of research intensity, government expenditure on R&D, and number of scientific researchers[1]. A recent study points there are 11,000 scientific researchers in Indonesia, compared to 1.4 million in the US[2]. Indonesia only invests 0.1 percent of GDP in higher education research and development, compared to 2.6 percent average in East Asia.[3]

With limited time, this assessment makes a very cursory look at Indonesia's science and technology in the area of clean energy. It identifies key institutions with capacity in clean energy, and shows the limitations to cover the vastness of the country and all clean energy opportunities. With the limited time available to conduct the assessment, it was not possible to conduct a detailed investigation into all types of clean energy. Therefore, the findings and discussion in this report are generic; only where there is available information of a particular type of clean energy, it will be specified as such.

Research & Development on Clean Energy

There are a number of institutions involved in research and development on clean energy. However, the capacity is limited, and the range of research is not extensive. Referring to R&D indicators from a German study in 2002, it is likely that the level of R&D conducted in Indonesia

[1] Scott Guggenheim, "Indonesia's Quiet Springtime: Knowledge, Policy and Reform", in Indonesia Rising: The Repositioning of Asia's Third Giant, edited by Anthony Reid, Indonesia Update Series, The Australian National University, 2012.

[2] USAID Indonesia, Partnership for Enhanced Engagement in Research (PEER) Fact Sheet, May 2012.

[3] Ibid.

is limited to 'applied research'.[4] There is likely very little or no basic research and experimental development in clean energy. However, further assessment of this matter is necessary.

Several Government institutions have mandate to conduct in applied research in clean energy. These include the following:

- BPPT's[5] Energy Technology Center (B2TE), located in Serpong, Tangerang. The entire center has 135 staff, and only 12 people with Doctorates, and 27 people with Master's degree. The center conducts research, provides services to outside companies and government institutions, and produces an energy journal. For clean energy, the center has a two relevant units:
    - Renewable Energy, which is divided into Thermal and Mechanical sub-unit, and Photovoltaic and Electrochemical sub-unit.
    - Energy Efficiency, which is divided into Energy Analysis & Optimization sub-unit; and Instrumentation & Calibration sub-unit. This unit has 21 energy auditors with expertise in energy efficiency for building and industrial plants.[6]
- LIPI[7]'s research on RE is sporadic, and not well coordinated[8]. One researcher is at the Center for Appropriate Technology Development (Subang, West Java); but another LIPI center, namely the Electricity and Mechatronics Research Center (Bandung, West Java) also conducts some research on RE, depending on the interests of the researchers.
- Ministry of Energy and Mineral Resources (MEMR) also has a R&D arm, which houses a center for research on electricity, new and renewable energy and energy conservation technology. This center is less known than the oil/gas research center (*Lemigas*). Not enough information was obtained in this assessment about the type and intensity of research on renewables and energy conservation.

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[4] Ministry of Research and Technology and Bundesminsterium fur Bildung und Forshung (BMB+F), "Evaluation of the Indonesian Science, Research and Technology Landscape to Strengthen the National Innovation System", Edited by Kai Mertins, May 2002. This study uses a framework of important indicators, which consists of: Input Indicators (R&D expenditures, R&D personnel, graduates, ICT infrastructure), Throughput Indicators (basic research, applied research, experimental development - leading to scientific publications, patent applications), and Output and Performance Indicators (external trade and production).

[5] BPPT is the Agency for Technology Assessment and Application, under the Minister of Research and Technology.

[6] Based on interview with Sudirman Palaloi, B2TE, BPPT.

[7] LIPI is the Indonesian Institute of Sciences, a non-departmental research institution that reports to the President, and is coordinated by the Minister of Research and Technology.

[8] Based on phone interview with Ms. Rislima Sitompul, researcher at the Appropriate Technology Center, Subang.

- Ministry of Agriculture has a R&D arm, which has done some research on biofuels (jatropha and candlenut) for avtur use.[9]

Many issues surround government research centers. Among them are human resources (few have PhD or equivalent degrees, constraints in recruitment, employment structure), lack of research budgets, limited equipment, and lack of meaningful incentives to conduct research.[10] Although there has been much discussion on how to reform the research sector in Indonesia, not much progress has been made. In 2012, one of the Directors for LIPI was quoted in the media that their research budget was cut by nine percent because the Government anticipated a rise in oil prices (and thus fuel subsidies).[11]

Outside of the Government, a number of NGOs have been involved in applied research and/or development of appropriate technologies. These include the following[12]:

- IBEKA, an organization that has extensive experience in providing community-based micro-hydro, and has obtained funding from and cooperated with various national and international organizations and corporations.
- YBUL (*Yayasan Bina Usaha Lingkungan*), an organization that has a long history of work in appropriate technologies, including solar power, biomass, wind power. This organization has also obtained support from various international organizations.
- IIEE (Indonesian Institute for Energy Economics), has recently begun to develop and promote pico-hydro to very remote communities, mainly with CSR funds from various corporations. This activity complements their work on energy economics and policy analysis.

The *Institut Teknologi Bandung* (ITB) has a Sustainable Energy Research Center, which has done a variety of research projects on biofuels, solar energy, wind, pico-hydro, and nuclear energy. However, not enough information was obtained to gauge the strength of the program or the use of the research results.

Education & Training on Clean Energy

[9] Based on interview Dr. Herdradjat, Directorate for Post-Harvest, DG Plantations, Ministry of Agriculture.

[10] Ministry of Research and Technology and Bundesminsterium fur Bildung und Forshung (BMB+F), "Evaluation of the Indonesian Science, Research and Technology Landscape to Strengthen the National Innovation System", Edited by Kai Mertins, May 2002.

[11] www.tempo.co.id, "Anggaran Riset Dipotong untuk Dana Kompensasi BBM", March 2012.

[12] The Green PNPM with Danish funding (under Environmental Sector Programme Phase 2) produced a database of renewable energy service providers in the country. It includes some NGOs which have been active in promoting renewable energy.

Education on clean energy refers to development of graduates who are knowledgeable and skilled to enter professional positions related to clean energy. Training refers to development of (new) skills for professionals active in clean energy-related fields.

Formal education related to geothermal technology is the being supported by the University Partnership program, involving ITB and University of Southern California.

Some new educational programs exist covering other clean energy (wind, solar/PV, biomass, biofuel, and micro-hydro). A capacity development program funded by the Netherlands Government (known as Casindo[13]) succeeded in garnering interest in five universities to develop educational programs for sustainable energy[14]. At the end of the project, five universities are documented as launching new certificate or masters programs related to sustainable energy. These are:

- *Universitas Muhammadiyah*, Yogyakarta: certificate program involving three Faculties, namely Engineering, Economics and Agriculture. In addition, the Mechanical Engineering program added a new renewable energy course as mandatory requirement.
- *Universitas Mataram*, Lombok, West Nusa Tenggara: certificate program as elective for fourth year students in the engineering bachelor's degree program.
- *Universitas Cendrawasih*, Papua: offers an integrated course on biofuels, biomass, renewable energy sources, and micro-hydro technology for students doing bachelor's in engineering.
- *Universitas Diponegoro*, Semarang, Central Java: Master's program in energy planning, involving Faculty of Engineering and Faculty of Mathematics and Natural Sciences; and a certificate program involving the Mechanical Engineering and Chemical Engineering Departments.
- *Universitas Sumatra Utara*, Medan, North Sumatra: Master's program (one of three specialization areas) under Department of Mechanical Engineering.

Due to limited time in this assessment, it was not possible to investigate the progress of the above programs, and the number of students taking them.

A quick assessment of programs in other universities shows the following:

- *Institut Teknologi Bandung (ITB)*, Bandung, West Java: Mechanical Engineering major (in the Mechanical and Aeronautical Engineering Faculty) covers power plants using renewable energy source;
- *Institut Pertanian Bogor (IPB)*, Bogor, West Java: Mechanical and Biosystem Engineering major offers course entitled: Renewable Energy Conversion Techniques;

[13] Full title is: Capacity Development and Strengthening for Energy Policy Formulation and Implementation of Sustainable Energy Projects in Indonesia. The Casindo program ran between June 2009 and 31 December 2011. The program was financed by SenterNovem and is part of a bilateral energy co-operation Indonesia and Netherlands. The program co-ordination is shared between Energy Research Center of the Netherlands and the Indonesian Ministry of Energy and Mineral Resources

[14] Casindo, Deliverable No. 17: Development of Education Programs in Indonesian Universities, August 2011.

- *Universitas Jember*, Jember, East Java: offers a major in Renewable Energy (4 years), in the Faculty of Agriculture Technology, which includes laboratory/workshop at the Politeknik Negeri Jember.
- *Institut Teknologi 10 November Surabaya (ITS)*, Surabaya, East Java: Physical Engineering major (in Industrial Engineering Faculty) covers renewable energy topics.

In addition, some polytechnic schools cover subjects relevant to renewables. One example is the *Politeknik Negeri Bandung*, which offers a diploma program (DIII) on Energy Conversion (*Teknik Konversi Energi*), which covers renewables and does some research and community service on renewables.[15] Technical high-schools (SMK's) may also have relevant programs, but due to time limitations, this assessment did not look into this matter.[16]

Regarding training, the MEMR's Training & Education Center covers training on new and renewable energy and energy conservation. However, government training centers usually cater to the needs of primarily, government entities. The capacity of this center for clean energy is limited, although with the establishment of a separate Directorate General for New and Renewable Energy and Energy Conservation, this topic has received added attention.

The Danish funded ESP2 (Component 2 supporting Energy Efficiency) provided technical assistance to the Directorate for Energy Conservation (in MEMR) and, to some extent, the Ministry's Training & Education Center. The program conducted training for energy auditors, and energy managers, assessors for energy auditor certification, and also local government officials in nine provinces[17]. This training effort complements assistance for the Directorate towards developing and running an Energy Efficiency Clearinghouse. The clearinghouse was handed over to the Ministry early 2013.[18]

In the plantations sector, there are some courses offered by independent training institutions. For example, Lembaga Pendidikan Perkebunan (LPP, or Plantations Education Institute) in Yogyakarta offer introductory courses on bioenergy. There is potential to strengthen this program.[19]

'Game-changers' in S/T in clean energy

[15] www.polban.ac.id. Research includes micro-hydro, solar PV, wind, etc.

[16] Quick internet browsing show media articles that cover RE innovations in technical high schools. This should be researched further.

[17] The program also supported development of a certification scheme for energy auditors. However, at the end of the program, December 2012, the scheme had not been approved by the Ministry of Manpower and Transmigration.

[18] Based on interview with Mogens Krighaar, member of consultant team implementing the energy efficiency portion of the ESP2.

[19] Based on interview Dr. Herdradjat, Directorate for Post-Harvest, DG Plantations, Ministry of Agriculture.

There does not appear to be any new major Government initiative to develop capacity in the S/T aspect of clean energy. Although most donor programs have capacity building activities, it is unclear whether any of them have significantly changed the landscape of S/Tdevelopment in clean energy in Indonesia.

The fact that the clean energy sector is being energized in the last few years, since the Government announced its new targets and many international parties are entering the field, the S/T and capacity building will have to catch up quickly. Otherwise, there will be a shortage of qualified individuals with capacity to perform various jobs related to clean energy.[20]

In particular, many stakeholders have expressed concern about the capacity of project developers and service providers. For example, experience of ICED and financial institutions shows that the quality of surveys and engineering design of micro/mini-hydro projects often require technical quality control from independent parties to ensure that the design is technically and environmentally sound. With limited individuals having first-hand experience in developing CE projects, many project developers (ie entrepreneurs) do not necessarily get the best technical support. If viable CE projects are expected to increase substantially in the future, the technical capacity of project developers and service providers need to be improved significantly.

Recommendations for consideration

Opportunities for USAID involvement in the future are as follows:

- Develop enabling environment for S/T and capacity building in clean energy. This may include review of policies, institutions, funding structures, and potential involvement of private sector. This might also include facilitating dialog between practitioners, project developers (entrepreneurs), research institutions, education/ training institutions, etc.
- Develop a capacity building strategy for clean energy. This may include:
    - Mapping of skills needed to develop clean energy facilities, maintain and operate (O/M) facilities;
    - Inventory of existing educational/training programs that can be linked to specific tasks for clean energy development or O/M. This should include technical high schools/ vocational schools, polytechnic schools and universities;

[20] A similar pattern was experienced by the sanitation sector. The Government launched a program to accelerate sanitation development throughout the country in 2009. Many international donors and NGOs supported the Government program, but by 2010, it became clear that there were not enough people with necessary qualifications to be employed. In 2011, Bappenas, with World Bank support, commissioned a study to identify the demand for sanitation personnel in the short- and medium-term.

    - Mapping of educational and training institutions that have capacity to develop and offer new programs;
    - Identification of key institutions to serve as initiators of a capacity building program (eg. MEMR, Ministry of Education, industry leaders).
- Provide technical assistance and financial support for implementations of the capacity building strategy or portions of it.

Should USAID, in the future, support capacity development for CE and/or science and technology for CE, a more in-depth assessment should be made.

References:

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Asian Development Bank (ADB). The ADB's energy loan portfolio currently totals USD 675 million and they are active across a broad cross-section of the Indonesian energy sector.

ADB is one of the donors supporting the multi-lateral Clean Technology Fund (CTF) in Indonesia, along with World Bank (IBRD and IFC), JICA, the French AFD, and the German KfW. The CTF has been funded in two tranches. ADB's participation in Part 1 included investments in utility scale geothermal project development, other renewable energy project development, grid interconnection projects including the new Java-Bali interconnection and others, hydro development in Java.

ADB's CTF investments in geothermal include capacity building for new clients and working with the Ministry of Finance to support a geothermal risk mitigation fund. They provide technical assistance support to upgrade resource data at greenfield sites which will be available to bidders (bidders are required to pay back to the fund). ADB indicated that the GOI did not readily accept suggestions on using global best practices, and the uptake of the CTF by the central government and commercial banks has been lagging. ADB may start lending to local governments instead. The CTF donors are all finding that local commercial banks are reluctant to borrow as they are adverse to the complexity of multilateral lending practices and don't actually need the funds today in Indonesia's vibrantly growing economic environment.

ADB plans a USD100 million investment in Part II of the CTF which will focus on energy efficiency and renewable energy financial transformation. They have concluded that the best approach is to work with project aggregators representing higher demand, and more attractive to local banks and non-bank financial institutions to lend to a portfolio of up to 20 projects rather than dealing with individual small-scale borrowers. They plan to co-finance these portfolios with KfW, German govt, World Band, and AFD, and are currently working to move from concept to implementation by 2014. To complement this effort, ADB has a current loan to Indonesia's Export-Import Bank of USD100 million plus TA funding to develop a project pipeline and provide consultants to do industrial investment grade audits (primarily in steel and cement plants) and identify waste heat recovery projects and equipment upgrade opportunities to conserve energy.

ADB staff expressed interest in USAID's Development Credit Authority (DCA) and indicated that USAID's technical assistance and DCA mechanisms would be a valuable complement to ADB lending in Indonesia. They requested a meeting with the DCA representative based in Singapore.

ADB expressed some concern that financing for EE and RE projects may exceed demand, with AFD's USD100 million loan portfolio and MCC's USD300 million planned program.

ADB is also providing USD1-3 million TA to support the Sumba Iconic Island small-scale energy access program with resource surveys, energy planning, IPP project preparation support, and to help the GoI deliver its energy access program delivery. ADB consultants will be on the ground in April and they intend to expand the program to neighboring islands once the project proves successful on Sumba (2013-15 period).

ADB is planning to lend for transport (mass rapid transit, rail projects) in Surabaya and are providing technical assistance (TA) now to start with. ADB is also providing TA to AusAID's Indonesia Infrastructure Initiative (IndII) covering urban, railway, airport, and transport projects (see below).

In order to meet Indonesia's growing demand for power the current 25,000 MW needs to go to 80,000 MW by 2020, necessitating power trade and inter-island linkages. ADB has several ongoing transmission and distribution projects in Indonesia, improving 150 KVA line in Java, and in Kalimantan to develop a line from central and west to the south. They support the West Kalimantan – Sarawak Malaysia interconnection to bring in cheaper hydropower from Sarawak to replace more expensive oil in Kalimantan. This is a power exchange agreement so can sell power both ways. Further ADB loans are planned for the Java-Bali crossing – overhead over the channel – which will build the tallest transmission towers on earth (392 meters). ADB will support the link up to the towers on both sides of the channel. They also are discussing a Malacca – Sumatera interlink and Sumatera-Java-Bali interconnections, requiring pump storage in Java. They are also proving support for building a SCADA system for West Kalimantan and a USD100 million loan to PLN for the Java and Bali Distribution Project including GIS, underground cable, and improving small transformers.

ADB is also active in the oil and gas sector. Most Indonesia gas fields are high CO_2 fields and present both climate change and technical challenges. ADB just finished a carbon capture and storage (CCS) study and is planning a pilot CCS project in West Java.

World Bank. The World Bank has been supporting clean energy and clean development in Indonesia since the mid-1990s. WB's energy sector portfolio is currently USD900 million and is one of the most active donors in the sector.

In 2010 the World Bank announced a power sector strategy following three major themes:

1) Financing public sector power infrastructure projects to sustain economic growth and increase electricity access to the poor, 2) Reforming the tariff and subsidy system, and improving the efficiency of the national power companies, and 3) Moving the sector towards an environmentally friendly and low-carbon development path.

The World Bank is one of the major participants in the Clean Technology Fund (CTF). World Bank officials expressed considerable frustration with the lack of demand for the CTF in Indonesia, indicating that as long as fuel is heavily subsidized there will be a lack of demand. They also expressed that the rigid structure and low/no risk tolerance of local banks, coupled with the fact that they have their own funds make moving the finance market towards investments in EE and RE very difficult. The mandate for such green investments must come from top management if it is to succeed. Possible areas of investment include Smart Grid (reducing losses) which shows strong potential and GHG savings through a technology-driven approach rather than relying on policy reform alone. They also said that investments in thermal power plant efficiency may be the easiest way to reduce emissions – but the Bank faces several political issues with working on fossil fuel projects (like with the USG). As an alternative to CTF, the Bank has plans to establish its own Geothermal Fund and is discussing the options with Indonesian counterparts.

The World Bank is also supporting technical assistance for a renewable energy least-cost survey including mapping and digitizing existing power grids and analyzing least cost options to deliver energy in selected geographies. The coverage area includes the Sumba Iconic Island. ADB plans to use this data as well catalyze investments on the ground.

International Finance Corporation (IFC). The IFC provides financing and advisory services to climate change initiatives, clean energy development, and energy efficiency options. As part of the World Bank Group, IFC provides funding for the Clean Technology Fund in Indonesia, including USD 50 million for Part 1 which currently supports 2-3 geothermal project developers, but they anticipate more interest now that the geothermal FiT is in place. They have earmarked USD25 million for Part II, in order to support smaller transactions working with Indonesian banks with SME clients for energy efficiency lending. The objective is to help increase the comfort level of local banks for energy efficiency lending. In the past IFC has supported the "Indonesia Sustainable Energy Finance Program," and has assisted the Government and PLN in operationalizing the public-private partnership (PPP) framework through the preparation and execution of Central Java IPP in 2008 and 2009. The new IPP was prepared to serve as a model for future IPP projects as project structure and availability of government support is made in accordance with the new PPP regulation.

KfW. KfW is the German development bank and makes government to government loans. Their daughter company is DEG, which lends to the private sector. KfW's lending to the energy sector has changed over time. In the 1990s they had a large energy portfolio with PLN, but were not active for the past 10 years due to political reasons. This is changing again now as KfW's top priority is now climate change lending, including for forestry, energy efficiency, renewable energy and waste management projects. They are also working

on private sector development and vocational training with GiZ. Energy sector lending under the climate change umbrella include a 2008-09 commitment for the geothermal sector in the form of USD7.7 million in grant funds. In 2010-2011 they agreed to provide Euro 295 million for low interest loans. Therefore their geothermal portfolio is well over USD300 million. They are also working on hydropower and rural electrification, including feasibility studies in North Sumatera for medium-size hydropower projects of 40 MW each.

KfW is cofinancing (with the World Bank and AusAID) the PLN 1000 islands rural electrification project for remote areas. This program totals USD600 million, of which USD300 million is from KfW to fund 170 solar/hydro hybrid projects and other renewables projects. Large solar systems require diesel back up as a better alternative than huge battery banks, but PLN has a no-diesel policy in place. KfW is working with PLN to overcome this constraint to large solar development. The project focuses on small projects less than 1MW in size. The overall electrification target of the islands is 95% by 2025.

Agence Francaise de Développement (AFD). AFD is a development Bank similar to KfW primarily providing loans and some technical assistance (TA). The energy sector is a priority, but only for EE or RE and with a minimum loan size of USD30 million. They have three ways to work with GOI, including:

1. Loans to the Ministry of Finance (MOF)

2. Direct loans to state-owned enterprises without requesting a government guarantee – an approach different from other lenders. They offer higher interest rates as the loans are considered more risky without a government guarantee.

3. Credit lines to local banks – this modality is very important to the energy sector in Indonesia – a direct loan without a government guarantee is much more attractive to the private sector small scale IPP RE projects below 10 MW, which can benefit from FiT.

   This modality allows AFD to pursue an approach similar to ICED – they work at the sponsor level to improve quality of feasibility studies, and at the bank level to raise awareness of renewable technologies and to lend on a project basis rather than a corporate basis (CEO signature plus collateral usually at 150%). Nonetheless it has been a real challenge to move these funds because they don't want donor money as it is perceived to be too complicated. They plan to provide advisors to show them benefits, and create pilots to convince them it can be profitable. Their intention is to seed the clean energy market, demonstrate, and then hope the market will take over. Similar schemes are being pursued by ADB, WB, KfW, and JICA (mostly for EE).

   Another distinguishing factor for AFD loans is that they are always long-term, typically 15 years with a 5 year grace period. This provides something that doesn't exist in the country

and in fact for geothermal projects they may provide 20 year loans with an additional grace period.

The AFD pipeline includes USD1 billion in loans since 2007 in Indonesia. The current project portfolio includes USD400 million, of which USD300 million is for energy. Their Mandiri Bank credit line of USD100 million was fully disbursed last year, and now have two others now totaling USDUS 150 million, all for small scale renewable energy projects. They also have T&D loans to PLN (with ADB) – one is in W. Kalimantan to bring hydropower in Malaysia to Indonesia, worth USD100 million. AFD also finances the Java-Bali distribution project replacing transformers, lines, medium-low voltage lines. They also have some biomass and other renewable projects with bank Mandiri way to establish a relationship, start discussing their understanding and goals in the clean energy sector, sort out which is marketing ("greenwash") and which is real investment interest. A second line has been approved for Mandiri – USD100 million. Their local bank partners are experiencing defaults in the hydropower sector, and as a result are reluctant to lend again to the sector – local banks are proving to be extremely risk adverse and don't need to lend in the clean energy sector to maintain their financial sustainability. CEO-level support for green lending may be the only way local banks (as part of CSR or marketing) will continue to lend in the sector in the short term.

AFD is collaborating with DfID where they provide TA in parallel with AFD loans, and was interested in potential collaboration with USAID in this way. At present ICED is providing TA to 57 projects in Aceh, North Sumatera, and Riau. They screened 130 projects to get 57 and have a good process in place to identify projects from many sources including PLN, project developers, and banks. ICED screening process includes determining if they have a feasibility study, signed PPA, and other criteria and on that basis provide TA. Because ICED has to hit their MW indicator targets by 2014, they tend to limit assistance to better projects. They want to work on more but must give higher priority to those that have a reasonable chance of completion by 2014. Information on all the projects screened could be good information for other development agencies and lenders like AFD with a longer time horizon.

JICA. JICA is providing USD1.8 billion for Indonesia's electricity sector, focusing primarily on financing coal-fired power plants as ADB and WB can't finance due to political concerns impacting their climate change mitigation – related lending policies. They provide loans for transmission and distributino construction projects among which is the planned grid interconnection between South Sumatera and Bogor. Other areas of technical assistance include hydropower resource mapping, transport sector studies, and direct loans to local banks for energy efficiency projects. JICA also supports the Ministry of Finance to develop technical studies and a research program in support of climate change and low carbon issues for the MoF inter-ministerial working group.

In the past JICA has supported the GOI in its clean energy development via several important projects. These include a National Geothermal Power Development Plan for Indonesia, a study on Optimal Electric Power Development in Sulawesi and a Study on the Improvement of Utilization of Electric Power Facilities in the Java-Bali Region.

GIZ. GiZ is a leader among donors in the transportation arena. Their approach is to move Indonesia's cities from private vehicles to urban mass transit. They work on policy issues at the national level – Ministry of Transportation and BAPPENAS, and at the municipal level in four cities including Jogjakarta, Palembang, Jokjosola, and Bogor. They work with the Bappedas, local governments and the DISUP city transport offices in these cities.

Their current project has been ongoing since 2011 is expected to be extended to 2016. It's a 4 yr project, USD6M providing technical assistance only. They have embedded consultants in the ministry and seek to address policy, technical and coordination issues. They are drafting the Grand Design White Paper to become the primary policy for transport for all Indonesia. Their focus is sustainable urban transport, shifting from private to public transport.

In their view the key is subsidies and fuel prices because it is now cheaper to be on a motorbike than ride a bus. They realize this is a very sensitive political issue, but they believe that all donors should work together on a sustained awareness campaign to prepare the public for reductions in subsidies through media, civil society, schools, etc. They are now working now with a Presidential think tank which may design such a campaign with their support. GiZ is also working on transport NAMAS.

GIZ expressed strong interest in working with USAID on energy and transport policy issues.

DFID/British Embassy. The British government is also a major contributor to the Clean Technology Fund and is facing similar frustrations to those expressed by other donors on the lack of uptake for the CTF. They are also experiencing political resistance in the UK as Indonesia moves to middle income status and provides huge counterproductive energy subsidies – British taxpayers are questioning why their money is being spent on energy infrastructure when the Indonesians are choosing to use their own resources in this way. They have embedded consultants in the Ministry of Finance and are supporting green growth and development strategies.

AusAID. AusAID has a large infrastructure portfolio in Indonesia, centered on the large IndII program, with USD80 million allocated per year. IndII was established by AusAID to facilitate work that identified by Indonesian partners as high priority. IndII has three components of strategic focus, including water and sanitation, transport (principally by road, rail, and sea), and infrastructure policy and investment. IndII is currently in its second program phase, which will finish end-June 2015. ADB also supports a complementary urban program to reduce fuel consumption overall.

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[21] Used as a demonstration for how an office can be energy efficient. Involved major renovations and installation of new electrical and air conditioning equipment. This center is open to the public.

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