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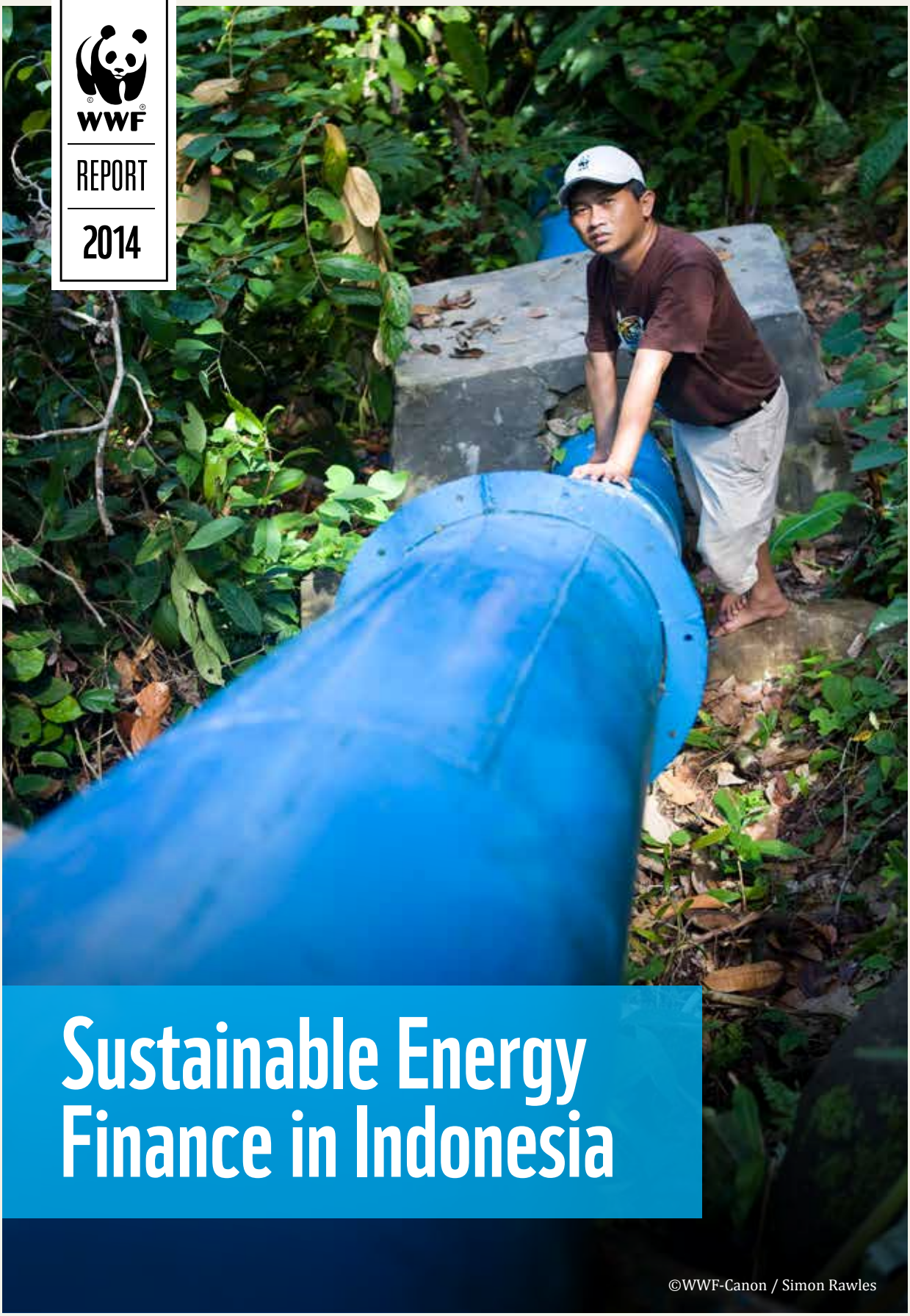
REPORT

2014



Sustainable Energy Finance in Indonesia

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Cover Picture	:	The pipe connecting the Long Pahangai village with the Micro Hydro Project building in East Kalimantan. Pictured: Arif Data Kusuma, WWF Kutai Barat Project Manager

Supported by:

Norad IESR WWF

ISBN: 978-979-1461-72-6

PREFACE

Despite the significant potential of sustainable energy resources, yet the development of renewable energy in Indonesia is lagging behind. Fossil fuels, especially oil fuels and coal still dominate current Indonesia's energy mix. Recently, energy demand in Indonesia has grown around 7% per year. In the past time experiences, energy demand growth usually comes around 3% higher from economic growth. The rapid increase in energy demand is incomparable to the domestic supply and as consequences Indonesia is heavily relied on imported fuels in particular oil fuels, that consequently become a financial burden in to the State Budget and hinder national effort to create energy security.

The government has prioritized energy security as an important issue in RPJMN 2015 – 2019. Improving transparency and good governance in energy sector become immediate action that highlighted by President Jokowi. The government has also taken a major breakthrough by reducing oil fuels and electricity subsidies to diminish the financial burden on the state budget, further improving energy efficiency and renewable energy development is prerequisite towards energy security in Indonesia.

As mention in Energy Sector White Paper developed by Bappenas and ADB, Indonesia economic growth aspirations hinge on its ability to secure access to reliable and cost effective sources of energy. Indonesia has huge potential of renewable energy sources but only 5% has been utilized. In the meantime, local financial institution found that investing in energy efficiency and renewable energy development is a high risk investment, for this happening Indonesians will pose a great challenge in shaping future energy resilience and achieving their future target on 23% of renewable energy shares by 2025.

WWF Indonesia collaborate with Institute for Essential Services Reform (IESR) conducted study on Sustainable Energy Finance in Indonesia. This study intend to elaborate and analysis sustainable financing policy framework and mechanism, mobilize finance to stimulate deeper penetration of renewable energy and energy efficiency in Indonesia.

Budi Wardhana

Director Policy, Sustainability and Transformation Directorate

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List of Abbreviation

A

ACE	: ASEAN Center of Energy
ADB	: Asian Development Bank
AfDB	: African Development Bank
AFD	: Agence Française de Développement
APBD	: Anggaran Pendapatan dan Belanja Daerah / Annual Local Budget and Expenditure
APBN	: Anggaran Pendapatan dan Belanja Negara / Annual State Budget and Expenditure
ASEAN	: Association of South East Asia Nations
AusAid	: Australian Agency for International Development

B

BANPRES	: Bantuan Presiden
Bappenas	: National Development and Planning Agency
BAU	: Business As Usual
BI	: Bank of Indonesia
BIRU	: Biogas Rumah
BLU	: Badan Layanan Umum / Public Service Agency
BMU	: The Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety
BMZ	: The Federal Ministry for Economic Cooperation and Development
BNI	: Bank Negara Indonesia
BOE	: Barrel Oil Equivalent
bpd	: barrel per day
BSM	: Bank Syariah Mandiri
BPPT	: Badan Pengkajian dan Penerapan Teknologi
BUMN	: Badan Usaha Milik Negara

C

CAPEX	: Capital Expenditure
CBO	: Community Based Organization
CFI	: Commercial Financial Institution
CIF	: Clean Investment Fund
CO2	: Carbon Dioxide
COD	: Commercial Operation Date
CPO	: Construction Partner Organization
CSI	: Clean Stove Initiative
CSR	: Corporate Social Responsibility
CSV	: Creating Shared Value
CTF	: Clean Technology Fund

D

DAK	: Dana Alokasi Khusus
DANIDA	: Danish International Development Agency
DAU	: Dana Alokasi Umum / General Allocation Fund
DB	: Deutsche Bank
DBH	: Revenue *Sharing* Fund
DEG	: Deutsche Investitions und Entwicklungs gesellschaft mbH
DFI	: Development Finance Institution
DFID	: Department for International Development
DG	: Directorate General
DGE	: Directorate General of Electricity
DGEEU	: Directorate General of Electricity and Energy Utilization
DGIS	: Netherland Ministry for Development Cooperation
DGNREEC	: Directorate General New Renewable and Energy Efficiency and Conservation
DIPA	: List of Government Program and Budget

E

EA	: Executing Agency
EEP Indonesia	: Energy and Environment Partnership Indonesia
EERF	: Energy Efficiency Revolving Fund
EIA	: Energy Information Administration
EnDev	: Energizing Development
ESMAP	: Energy Sector Management Assistance Program
ESP	: Environmental Support Program

F

FACET	: Finance for Access to Clean Energy Technology
FAME	: Fatty Acid Methyl Esters
FIP	: Forest Investment Program
FiT	: Feed in Tariff
FS	: Feasibility Study
FTP	: Fast Track Phase

G

GCPF	: Global Climate Partnership Fund
GDP	: Gross Domestic Product
GEF	: Global Environment Facility
GFF	: Geothermal Fund Facility
GHG	: Green House Gas
GIZ	: The Deutsche Gessellschaft für International Zusammenarbeit
GPPP	: Geothermal Power Plant Projects
GoF	: Government of Finland
GTZ	: German Agency for Technical Cooperation
GR	: Government Regulation
GW	: Giga Watt

H

HIVOS	: Humanistisch Instituut voor Ontwikkelingssamenwerking

I

IA	: Implementing Agency
IBRD	: International Bank for Reconstruction and Development
ICCTF	: Indonesia Climate Change Trust Fund
ICED	: Indonesia Clean Energy Development
ICI	: International Climate Initiative
ICSHP	: International Center on Small Hydro Power
IDB	: Inter-American Development Bank
IDBP	: Indonesia Domestic Biogas Program
IDCOL	: Infrastructure Development Company Limited
IFC	: International Finance Corporation
IFI	: International Financial Institution
IGA	: Investment Grade Audit
IIEE	: Institut Indonesia untuk Ekonomi Energi
IIF	: Indonesia Infrastructure
IIGF	: Indonesia Infrastructure Guarantee Fund / PT Penjaminan Infrastruktur Indonesia
IPP	: Independent Power Producer
IRENA	: The International Renewable Energy Agency
ISL	: Indonesia Solar Energy Lending (Program)
ISS	: International Institute of Social Studies
IUP	: Ijin Usaha Pertambangan

J

JICA	: Japan International Cooperation Agency

K

KfW	: Kreditanstalt für Wiederaufbau
kg	: kilogram
KUBE	: Ketentuan Umum bidang Energi
KUR	: Kredit Usaha Rakyat
kWh	: kilo Watt hour

L

LCORE-INDO	: Low Cost Renewable in Indonesia
LoA	: Letter of Agreement
LPG	: Liquefied Petroleum Gas
LV	: Low Voltage

M

m2	: meter square
m/s	: meter per second
MCA	: Millennium Challenge Account
MCC	: Millennium Challenge Corporation
MDB	: Multilateral Development Bank
MDR	: Ministry of Disadvantaged Region
MEMR	: Ministry of Energy and Mineral Resources
MFI	: Micro Finance Institution
MHPP	: Mini/Micro Hydro Power Project
MoF	: Ministry of Finance
MoU	: Memorandum of Understanding
MtCO2-eq	: Mega ton CO2 equivalent
MTOE	: Megatonne of oil equivalent
MV	: Medium Voltage
MW	: Mega Watt
MWp	: Mega Watt peak

N

NBPSO	: National Biogas Programme Support Office
NGO	: Non Governmental Organization
NTB	: Nusa Tenggara Barat
NTT	: Nusa Tenggara Timur

O

OBA	: Output Based Aid
ODA	: Overseas Development Assistance
OPEC	: Organization of the Petroleum Exporting Countries
OPEX	: Operational Expenditure

P

PBPO	: Provincial Biogas Programme Office
PFM	: Public Finance Mechanism
PGE	: Pertamina Geothermal energy
PIP	: Pusat Investasi Pemerintah / Indonesia Investment Agency
PKP2B	: Perjanjian Karya Pengusahaan Pertambangan Batubara
PLN	: Perusahaan Listrik Negara
PLTMH	: Pembangkit Listrik Tenaga Mikro Hidro
PMK	: Ministry of Finance Regulation
PNPM	: Program Nasional Pemberdayaan Mandiri
PPA	: Power Purchased Agreement
PPCR	: Pilot Program for Climate Resilience
PPP	: Public-Private Partnership
Pre-FS	: Pre-Feasibility Study
PSO	: Public Service Obligation
PUE	: Productive Use of Energy
PV	: Photo Voltaic

R

R&D	: Research and Development
RE	: Renewable Energy
REPP	: Renewable Energy Power Plant
RESCO	: Renewable Energy Company
RET	: Renewable Energy Technology
RIKEN	: Rencana Induk Konservasi Energi Nasional / Master Plan of Energy Conservation
ROE	: Return on Equity
Rp	: Indonesia Rupiah
RUPTL	: Rencana Umum Penyediaan Tenaga Listrik
RWI	: Rheinisch-Westfälisches Institut für Wirtschaftsforschung

S

SAF	: Special Allocation Fund
SAF-E	: Special Allocation Fund for Environment
SAF-RE	: Special Allocation Fund for Rural Energy
SC	: Steering Committee
SDC	: Swiss Agency for Development and Cooperation
SEFF	: Sustainable Energy Financing Facility
SEHEN	: Super Ekstra Hemat Energi
SHPP	: Small Hydro Power Plant
SHS	: Solar Home System
SME	: Small and Medium Enterprise
SMI	: (PT) Sarana Multi Infrastruktur
SNV	: Stichting Nederlandse Vrijwilligers / Netherlands Development Organization
SOE	: State Owned Enterprise
SREP	: Scaling Up Renewable Energy in Low Income Countries Program

T

TA	: Technical Assistance
TC	: Technical Committee
tCO2-eq	: ton carbon dioxide equivalent
TOE	: Tonnes Oil Equivalent
TPES	: Total Primary Energy Supply
TPF	: Third Party Financing
TWh	: Terra Watthour

U

UKM	: Usaha Kecil dan Menengah
UNDP	: United Nation Development Programme
UNEP	: United Nations Environment Programme
UNEP BNEF	: United Nations Environment Programme and Bloomberg New Energy Finance
UNEP FI	: United Nation Environment Programme Financing Initiative
USAID	: United States Agency for International Development
USD	: American Dollar
USPTO	: US Patent and Trademark Office

V

VAT	: Value Added Tax
VER	: Voluntary Emission Reduction

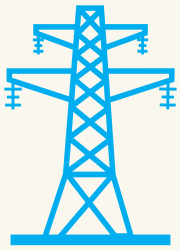
W

WhyP-Gen	: Wind Hybrid Power Generation
Wp	: Watt-peak

Y

YRE	: Yayasan Rumah Energi

1. OVERVIEW OF INDONESIA ENERGY SITUATION



Primary energy supply increased

70%

in a decade, from 724 million BOE in 2001 to 1236 million BOE in 2011

Indonesia has been encountered enormous challenges to supply energy required by the people and economy to grow in the past, today and in the future. The primary energy consumption grows significantly in past decade. Primary energy supply increased 70 percent in a decade, from 724 million BOE in 2001 to 1236 million BOE in 2011. At the same time, final energy consumption almost doubled from 484 million BOE to 834 million BOE (MEMR, 2012).

Oil still plays the role as dominant energy source. Oil consumption increased about 40% within 2000 – 2010, making daily oil consumption of 1.465 million barrels per day (bpd) by 2010. By 2012, oil consumption has reached 1.59 million bpd, and to fulfill that demand Indonesia has to import 0.615 million bpd of oil, both crude and refine products (EIA, 2014). The rising of oil import has caused trading imbalances and it contributes significantly to the current account deficit of the country (World Bank, 2013).

In the period of 2000-2009, demand for electricity of PLN's (Perusahaan Listrik Negara) consumer increased in average 6.07% but this is not comparable to development of the power

plant capacity that increased by 2.37% or equal to 5000 MW within the same period. Ideally, it should grow triple based on the increasing of demand only.[1] Lagging in power supply expansion and development, aging infrastructure, and rising demand have caused some regions, mostly outside Java-Bali, experienced power outages in a regular basis by that period. Power plant capacity growth rate had improved during 2009-2012 with average 7 percent per year or about 1900 MW per year in this period.

Despite significant potential of sustainable energy resources of the country, yet renewable energy development and utilization in Indonesia is still lagged behind the target

By the end of 2012, installed capacity of existing power plants has reached 45.25 GW, that consist of 33.2 GW PLN's plants and 12.03 GW non-PLN's plants (DGE, 2013). Despite the rising number of power plants capacity during those period, in some areas, particularly outside Java-Bali, electricity shortage occasionally occurs that cause regular brownouts or blackouts. Still natural electricity demand growth is in the rate of 8 to 10 percent per year that requires at least 4000 MW new installed capacity annually to meet increasing demand. PLN's medium term electricity supply plant on 2013-2022 indicates that if economy is expected to increase 7% per annum and 95% electricity ratio by the end of that period, Indonesia must fully pledged with 5000 MW to 5900 MW power plant capacity annually.[2]

Developing renewable energy and gaining improvement on energy efficiency are no longer alternative, but becomes a necessity for Indonesia to ensure its energy security. Renewable energy use for transport and electricity generation must be utilize to cope with increasing energy demand, declining of oil production, and depletion of oil resources. Despite significant potential of sustainable energy resources of the country , yet renewable energy development and utilization in Indonesia is still lagged behind the target that was set up at 17 percent by 2025 in National Energy Policy in 2006.[3] In the past, renewable energy development was slow, despite government effort to establish policy and regulatory framework to support renewables deployment. Although it shows a progressing development in the past decade, nevertheless, currently the contribution of renewable energy only reaches about 5 percent to the final energy mix (Hutapea, Maritje, "Mencapai target akses energi, energi terbarukan dan konservasi energi di Indonesia: Tantangan/ hambatan dan strategi" delivered at IESR's workshop on June 19th 2013, titled "Inisiatif energi berkelanjutan untuk semua: status kemajuan di Indonesia". Presentation can be downloaded at http://www.iesr.or.id/2013/06/dialog-publik-energi-berkelanjutan-untuk-semua-status-kemajuan-di-indonesia/).

Ministry of Energy and Mineral Resources claimed that by the end of 2013, there was about 10,700 MW total electricity capacity from new and renewable energy plant had been added; about 75% of that total is from hydro. 85% of this capacity is on-grid and 15% is off-grid (Table 1 1). Most of the hydro power plants are large dams that were built 20-30 years ago.

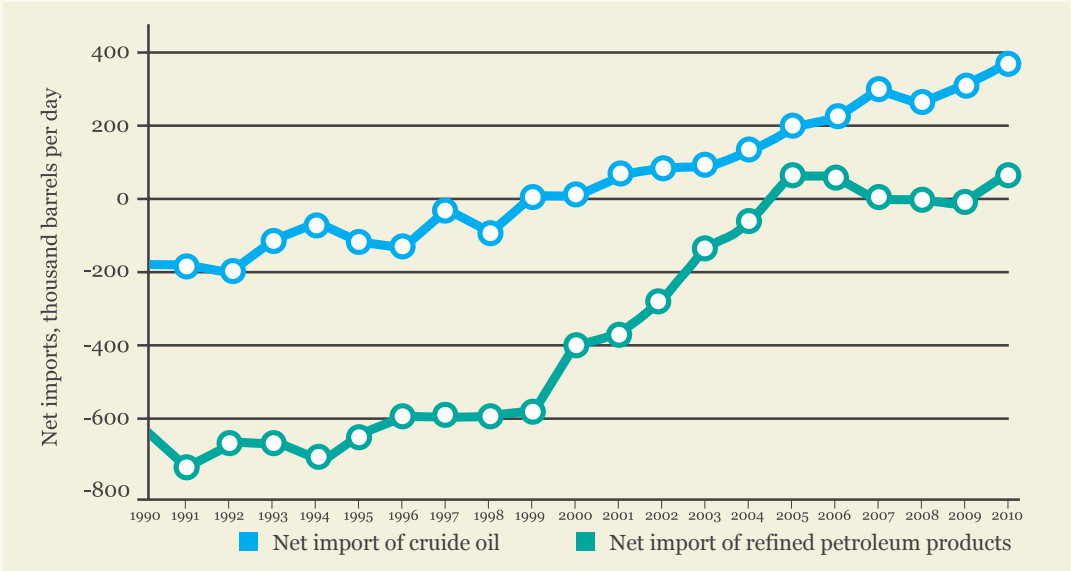
Table 1.1 Installed Capacity of Renewable Energy (as of end 2013)

Power Plant Type	Capacity Off-Grid (MW)	Capacity On-Grid (MW)
Geothermal	0	1343.5
Hydro	70	7503.3
Bioenergy	1.626	90.5
Solar	39.77	3
Wind	0	1.33
Hybrid	0.54	0
Total	1736.31	8941.63

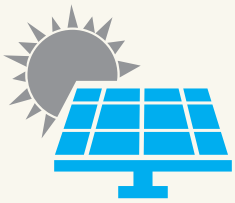
Source: Rida Mulyana (DGNREEC, 2014)

Securing energy supply in the future poses greater challenges for the country. Indonesia has been an oil importer country since late '90s. Indonesia has imported refined oil, and become net oil importer since 2005, as domestic crude production falls behind average annual oil consumption (Figure 1). Energy demand is predicted to grow higher in the future due to a rise in energy consumption, as a result of economic growth, population growth and improvement in energy access that will connect 60-70 million population or 12 to 14 million households that currently have no access to electricity and modern energy sources for cooking. It is anticipated that positive economic development trend will heighten energy needs in the future. Indonesia' National Energy Council predicted that energy consumption will increase 1.5 times than today's figure in 2025. Ministry of Energy and Mineral Resources predicted that by 2031 electrification ratio is expected to reach 100 percent and electricity demand could reach 1075 terra-watt hours (TWh), seven times higher than the 2012 figure (Nuzahar, 2013).[4]

Figure 1 1 Indonesia refined oil and crude import



Source: Vivid Economics (draft, 2014), EIA



Energy demand is predicted to grow higher in the future due to a rise in energy consumption as a result of economic growth, population growth and improvement in energy access that will connect 60-70 million population or 12-14 million households that currently have no access to electricity and modern energy sources for cooking.

As coal becomes important source for electricity generation and main export commodity, domestic coal production has been continuing to increase since past decades. In 2012, Indonesia produced 443 million tons, and exports 383 million tons or about 85% of total production that places Indonesia as the number 1 coal exporter in the world (World Coal Association, 2014).[5] Despite increasing demand of coal domestically, about 15% of total production or 60 million tons are being used, mostly for coal power plants. Despite slow increase in global production rate, Indonesia's coal production grew at the level of 9.4% in 2013 (BP, 2014). This massive production is somehow worrisome in regard to securing the domestic need for coal in the future due to the increase of domestic demand, while Indonesia's coal proven reserve only accounted for 3.1% of global coal reserve (BP, 2014).[6]

Government of Indonesia has been developing and implementing policies, regulatory framework, and conduct projects on the ground to stimulate deployment of renewable energy technology and private investment. To tap the country's vast potential of renewable energy resources (Table 1.2), Government of Indonesia (GoI) has been introducing various policy instruments and modalities to develop renewable energy market and attract investment from private sector in RE project. In category of policy instrument, GoI has issued some policies, among others: medium and long-term renewable energy policy target as stipulated in National Energy Policy, mandatory renewable energy use (in this case for biofuel), and supporting instruments such as fiscal incentives and feed in tariff, which have been introduced to foreign and domestic investors.

Table 1.2 Potential of renewable energy resources

Renewable power source	Resource potential	Installed capacity	Ratio capacity to resources (%)
Hydro	75 GW	6.8 GW	9.13
Geothermal	29 GW	1.3 GW	4.6
Biomass	50 GW	1.6 GW	3.3
Solar energy	4.8 kWh/m2/day	27 MW	-
Wind energy	3-6 m/s	1.4 MW	-
Ocean	49 GW	0.01 MW	0

Source: MEMR (2013)

Since 2002, pricing instrument to attract investment in renewable energy has been developed by MEMR, namely feed in Tariff (FiT) policy. FiTs are now available for almost all renewable energy technologies. FiTs policy have been revised over-time to meet investor demand and expectation, changing of macroeconomics indicators, as well as to give more comfort for investor. Embedded in the FiT policy is the requirement to PLN to purchase electricity

from renewable Independent power producers (IPPs). In addition to supporting policy, GoI has been developing de-risking instrument such as government guarantee and risk coverage instruments such as Geothermal Fund Facility that is intended to cover exploration risk of geothermal.

As the result of these policies, there is a growing trend of private investment in various renewable energy projects, e.g. geothermal, mini-hydro, biogas, and biomass power plants. In addition to the above mentioned supporting instruments, central and local government agencies also have numerous rural energy and electrification programs that utilized renewable resources available locally through budget mechanism such as rural energy development under Specific Allocation Fund (DAU) since 2011 and supports to renewable energy projects under various ministries' budget allocation..

Despite the instruments support for renewable energy, there are gaps in coherent policy framework and supporting instruments for energy efficiency. The recognition of energy efficiency importance is well documented in the existing national energy policy. The GoI requires energy intensive industries to implement energy conservation measures and has set ambitious target on energy intensity to be met in 2025 and 2050. Master Plan of Energy Conservation (RIKEN) indicates potential energy saving is set energy conservation target for each energy users to be met in 2025 (Table 1-3).

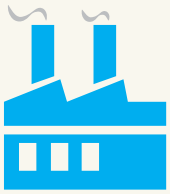
Indonesia energy efficiency market is still large and untapped. ReEx capital (2010) indicated that potential market for energy efficiency in industrial sector and commercial building in Indonesia is estimated as much as 1.4 billion dollars and could reach 9 billion dollars, if co-generation in the industry sector is included. Asian Development Bank (2009) estimated that at least 3 to 4 billion dollar investment are needed for energy efficiency alone. The level of development of energy efficiency potential is still far behind the renewable energy development. Recent study by IESR and MEMR (2014) of 500 energy audit reports carried out in 2009-2010 for industrial and building indicated potential investment of 1 trillion rupiah (USD 100 million) that can be quickly implemented through companies' internal fund and credit support from financial institutions. However, investment realization in this area remains slow and low. In addition, local financial institutions are still reluctant to fund energy efficiency project. The mandatory requirement set by regulation has not yet fully implemented, and there are fiscal and financial incentives absence and de-risking instrument to encourage private investment in energy efficiency projects.

Table 1.3 Energy Saving Potential and Energy Conservation Target

Sector	Energy Consumption (Million BOE, 2012)	Potential Energy Saving (%)	Energy Conservation Target (%)
Industries	305	10-30	17
Transportation	311	15-35	20
Households	92	15-30	15
Commercials	34	10-30	15
Others (Constructions, Agriculture, and Mining)	26	25	-

Source: Draft RIKEN (2013)

Access to finance remains a challenge for investor to deploy renewable energy and develop energy efficiency projects. Despite various policy supports and instruments to enable renewable energy investment and encourage energy efficiency implementation, access to finance remains an issue for companies, project developers and investors, as well as household. Financial institutions, particularly domestic, perceive renewable energy project as a risky investment; therefore they are reluctant to lend money for new and emerging technologies (US Trade, 2010). In some cases, bank is also reluctant to lend unless the investor has a strong financial guarantee by the company's main group or parent companies. Normally domestic financial institutions are hesitant to provide project finance, but lend corporate finance instead. This tendency limits the number of projects that reaches financial closure and creates dependency on foreign financing.



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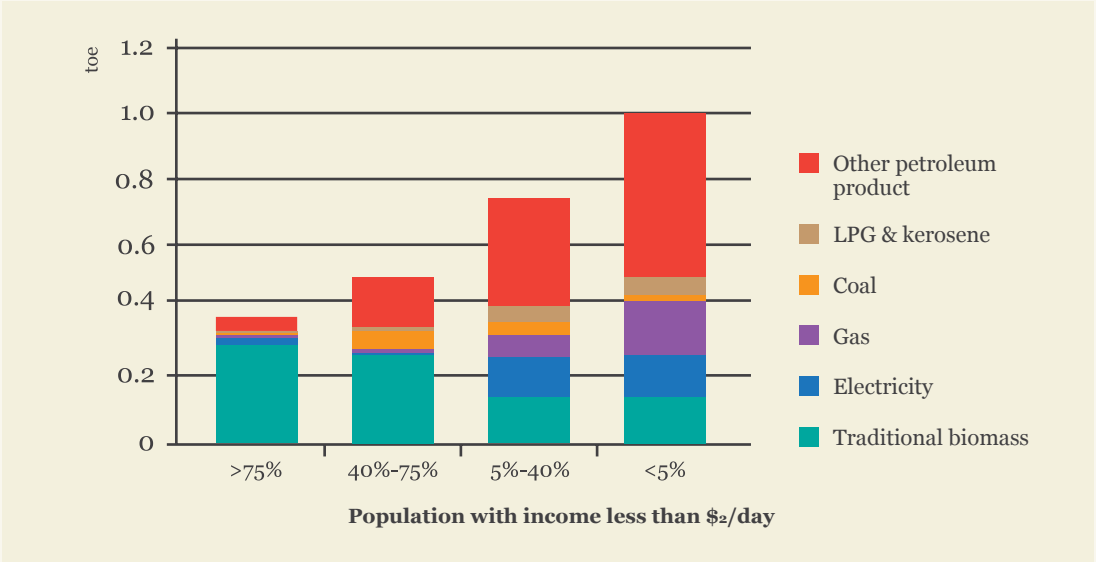
So far for renewable energy project, particularly those above 10 MW, is largely financed by foreign banks or international financial institution. Although some Indonesia banks have been involving in co-financing renewable project with its foreign partner, the number remains low, and they have concentrated on mature technology such as mini-hydro and biogas from palm oil waste. World Bank's database on private participation in renewable energy reported that in 2012 around 99 MW of renewable energy projects with private participation, have reached its financial closure in the country, with total project costs of USD 288 million, and 796 MW in the pipeline. Most of the 796 MW projects in the pipeline are largely geothermal. By looking closer to the projects that reach financial closure, all projects belong to international investors with main financiers are foreign banks or international financial companies.[7]

2. ENERGY AND DEVELOPMENT NEXUS IN INDONESIA

Human advancement during the twentieth century is closely bound with the level of energy consumption. Evidences from various studies on country level show the correlation of energy consumption and economic prosperity. Aggregate energy consumption has risen together with GDP (Elias and Victor, 2005). The utilization of fossil fuel as energy resources in nineteenth and twentieth century followed by technology innovation to use various forms of energy leads to economic development. Energy and poverty has close linkage and relation. A country with advance economic development has more energy and various fuels compare to countries with lower economic development. Table 2.1 suggests that developing country with more poor people determined by percentage of population living below USD2/day – use less energy and less type of fuels than other developing country with less poor people.

Table 2.1 Energy consumption and poverty in developing country



Source: IEA (2010)

The lack of access to modern energy services constrains the ability of the population to gain benefit and opportunities for economic development and to increase their living standards.

Access to modern form of energy is pre-requisite in poverty alleviation, economic growth, and human development. Access to modern energy is essential for clean water provision, sanitation, healthcare, as well as in providing great benefits of development through utilization of reliable and efficient lighting, heating, cooking, mechanical power, transport, and telecommunication services (IEA, 2010). Access to energy is not only important for a country's economy, but more importantly, it's a supporting factor that is essential for human development. The lack of access to modern energy services constrains the ability of the population to gain benefit and opportunities for economic development and to increase their living standards. According to a study by Barnes et al. (2010), increased access to cleaner and affordable energy options contributes to monetary gains among the poor and leads to better quality of life, such as an improved diet and amount of food intake, the ability to afford better health and education facilities. (Boardman and Kimani, 2012).

Although Indonesia's economy grew significantly since the past decade, Indonesia is lagging behind its peer countries in G-20, particularly in energy production and consumption. In today's world, Indonesia placed itself among the elite members of G-20, considered as "rich country club" that have highest income in the world. After its recovery from severe economic crisis in 1997/1998, Indonesia's economy grows steadily owing to natural resources extraction and strong domestic consumption. With GDP that reached USD 878 billion in 2012, Indonesia's economy is ranked 16th highest

in the world.[8] Indonesia's per-capita electricity consumption is lower than India and Turkey, which are G-20 members, and lower than Philippines and Thailand that are not G-20 members.

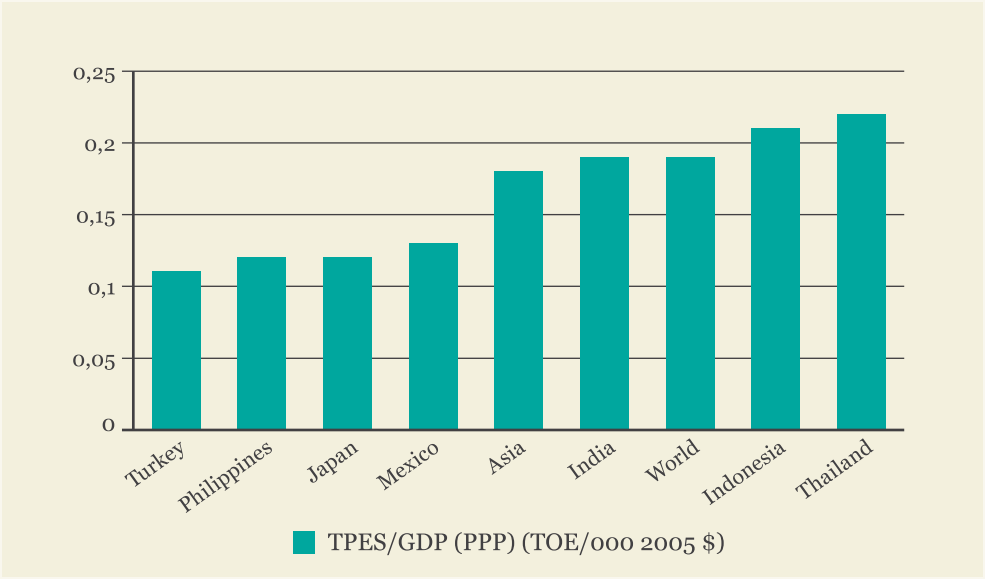
Table 2.2 Selected Energy Production, Consumption and Economic Indicator

Country	Population (Million)	GDP (PPP) (Billion 2005 USD)	TPES (Mtoe)	TPES/ Pop (toe/ cap)	TPES/ GDP (toe/000 2005 USD)	Electricity/Pop (KWh/cap.yr	CO2/GDP (PPP) (kgCO2/ USD)
Indonesia*	239.87	930.62	207.85	0.87	0.22	641	0.44
India*	1179.94	1246.73	692.69	0.59	0.18	644	0.43
Mexico*	108.29	1406.83	178.11	1.64	0.13	2085	0.30
Philippines	93.26	332.06	40.48	0.43	0.12	643	0.23
Thailand	69.12	530.37	117.43	1.70	0.22	2243	0.47
Turkey*	72.85	912.80	105.13	1.44	0.12	2474	0.29

Source: IEA (2013), *G-20 member

Indonesia's economy growth is less efficient in energy use compares to its peers. In terms of energy use per unit GDP, as a measure for energy intensity, Indonesia is less efficient than its peers, even higher than average World and Asia.[9] Indonesia's energy intensity is slightly better than Thailand.

Table 2.3 Selected Energy Intensity of G-20 and non-G-20 members



Source: IEA (2013)

Indonesia has significant population that is living under energy poverty conditions, those who mostly live in rural and remote areas of the country. According to IEA, in 2009 about 30 percent of Indonesia's population (about 80 million people) has no access to electricity. Ministry of Energy and Mineral Resources claimed that electrification ratio has reached more than 80 percent by the end of 2013.[10] This figure shows that there are still about 48 - 50 million people who have no access to electricity. Data from IEA and World Bank indicates that among those who have no access to electricity are people who live below USD 2 per day income (Table 2.4). There is a large number of populations that rely on solid fuel for cooking. Data suggested that there are 124 million people in Indonesia (approximately 55% of the population) are still using solid fuel for cooking (IEA 2011, WHO 2012).

Table 2.4 Poverty and Lack of Access to Energy in Developing Countries

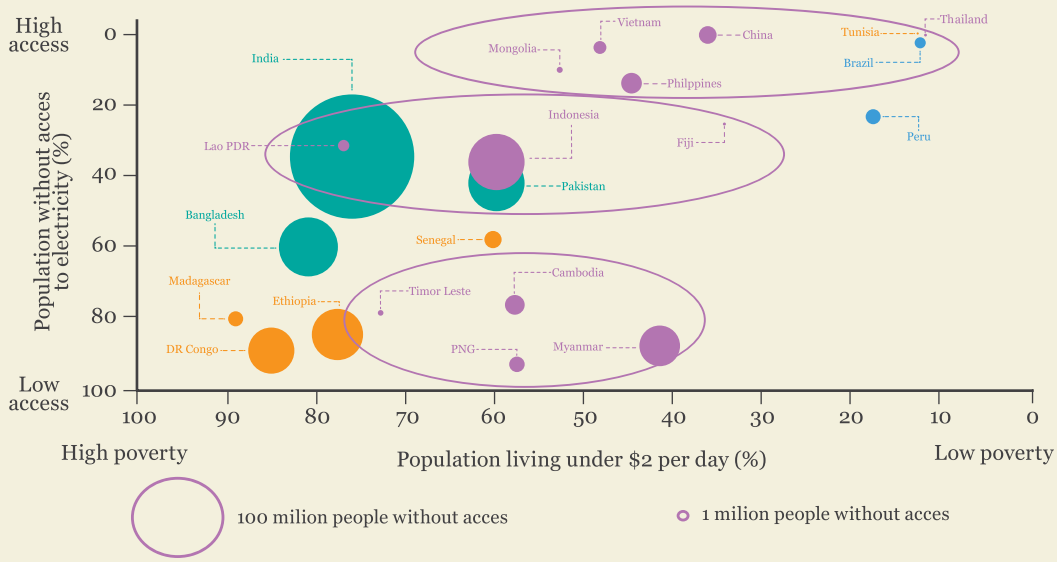
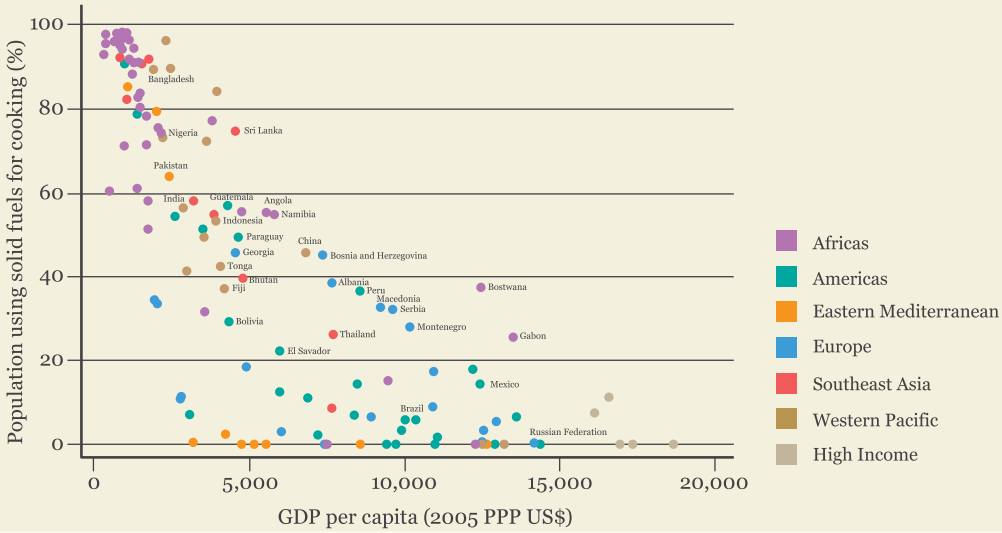


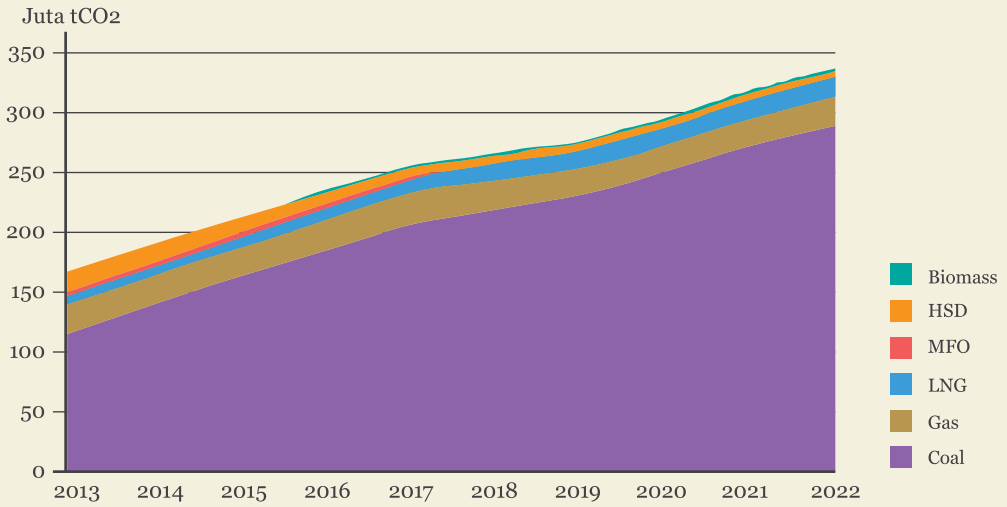
Table 2.5 Percentage of population using solid fuels as main cooking fuel versus gross domestic product (GDP) per capita, 2010



Source: Bonjour, et al (2013)

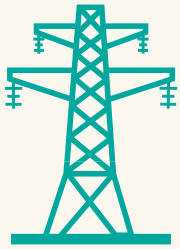
At current stage, Indonesia generates less CO2 emission from power sector compare to other developing countries. But greenhouse gasses (GHG) emission will increase rapidly in the near future as Indonesia's energy pathway is dominated by fossil fuel. PLN estimated that in 2013 CO2 emission for power sector based on existing energy mix was 165 million tons. Under existing plan, about 85% of electricity production in 2022 will be generated by fossil fuels, namely coal, natural gas and diesel oil. This will make CO2 emission doubled from 165 million tons in 2013 to 335 million tons in 2022, where about 294 million tons (86%) of the emission will come from coal combustion (PLN, 2014). Improvement of emission factor in the grid is determined by the composition of power plant that is connected to the system. Hence reducing emission from power sector can be done only if share of non-fossil fuel power plant in the grid is increased.

Figure 2.1 Projection of CO2 emission from fuel combustion in power sector (2013-2022) based on projected energy mix



Source: PLN (2014)

The abatement cost study conducted by National Council on Climate Change (2014) shows that the increasing trajectory price of coal and decreasing cost for renewable energy development that will occur after 2009, will lower the abatement cost in energy sector. This will happen even with the coal power plant expansion plan that will reach five times in number by 2030, with possible GHG reduction at the level of 280 MtCO2-eq. The prediction was developed by using PLN's Electricity Supply Plan that clearly shows the direction



Most electricity infrastructure need to be built as decentralized, small-scale and off-grid renewable energy type solutions to meet geographical and demographic distribution challenges.

of having five times coal power plant capacity. The study stated that the electricity sector could reduce up to 300 MtCO2-eq from the reduction potential in 2030 with average price of USD 9/tCO2-eq. This can be achieved through implementation of demand side management (energy efficiency) and accelerating the growth of renewable energy; with a small note, that the estimation was also considering the utilization of nuclear power plant.

More financing is required to ensure energy security in meeting the increasing energy demand and improving access to energy services in a sustainable manner. To ensure progressing in human development and narrowing the gap of economic development inequality, Indonesia needs to ensure equal access to basic energy services particularly for the poor, and ensuring sufficient energy supply in the near future. Improving level of access to energy and its quality requires massive development of energy infrastructure. Most electricity infrastructure need to be built as decentralized, small-scale and off-grid renewable energy type solutions to meet geographical and demographic distribution challenges. It will compliment the centralized system to ensure the security of supply for highly density and mature electricity market in Java, Bali and Sumatra.

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3. SUSTAINABLE ENERGY POLICIES AND INCENTIVES

3.1. Key Policy and Incentives

Development and deployment of sustainable energy technologies have become key priorities for Government of Indonesia's energy sector to meet basic energy needs of its people as well as to support its economic growth. The Law No. 30/2007 concerning Energy stipulates the importance of energy for Indonesia's development. Its preamble says that energy is highly crucial for economic activities in Indonesia, as well as national security. Therefore, it is important to undertake a comprehensive energy management that covers the issue of supply, consumption, and its utilization, to be conducted in an equal, sustainable, rational

and optimal manners, as well as good coordination among related stakeholders. The law recognizes that Indonesia has limited reserve of conventional energy, which brings the importance of energy resources diversification in securing the supply of energy, both to meet the basic needs of people and enabling condition for economic growth.

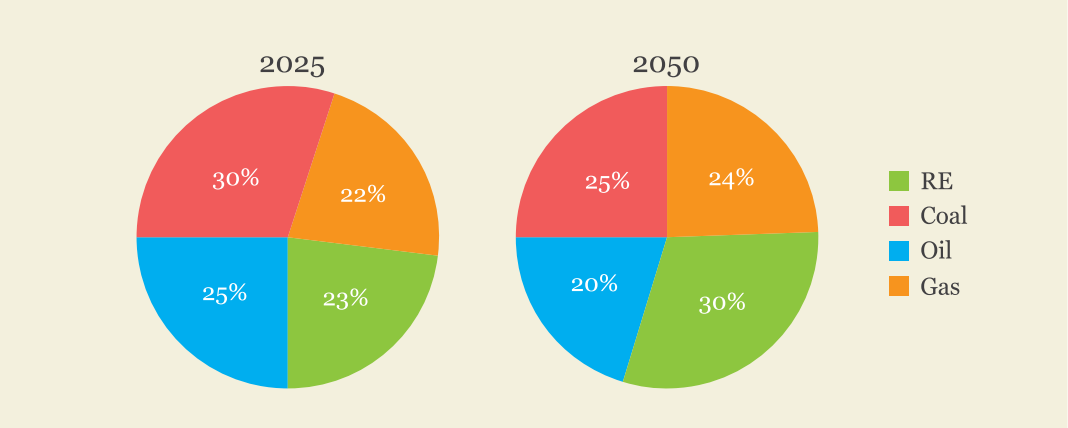
The above circumstances trigger the law to endorse activities that are related to not only exploration but also utilization of alternative energy from sustainable energy resources, inter alia: geothermal, wind, bioenergy, solar, water (both the run-off river and waterfall), as well as the movement and/or the temperature difference of sea-water. The law also highly emphasizes the use of local energy sources and prioritize renewable energy, especially in the least developed, isolated, and rural areas. This should be done by the central government and local government in accordance to their respective authorities. The law also mention that central and local government will have to provide incentives for all activities related to energy provision through new and renewable resources, both by private sectors and individuals.

Renewable energy plays important role in meeting the need of energy of the nation. MEMR projected that new and renewable energy will supply 49 MTOE or 17% of primary energy mix in 2020 and beyond. As per national electrification policy, GoI is planning to provide electricity for 90% of population in 2020, and 95% in 2025, renewable energy technologies will be instrumental to increase access to energy of people living in rural and remote areas since its energy resources (solar, biomass, hydro) are available across the country. Biofuel is expected to substitute and reducing demand for petroleum for transportation and power generation.

MEMR also conducts several pilot projects for technologies that has not progressed yet to commercial stage in Indonesia, like wind power, wave and current power to heighten its commercialization. Through these pilot projects, MEMR could map risks associated with these technologies, learn how to mitigate the risks, and gain information and knowledge on the costs and economic aspects of these technologies deployment.

National energy policy placed an ambitious target to increase renewable energy shares in energy mix and more efficient use of energy. Presidential Regulation No. 5/2006 sets an ambitious target of 15% renewable energy contribution in the national energy mix by 2025.[11] This number is expanded to 23% by 2025 in the Government Regulation No. 79/2014 and 31 percent by 2050. The policy aims at gaining energy elasticity less than 1, and energy intensity declines by 1 percent per year.

Figure 3.1 National Energy Policy Direction Target by 2025 and 2050



Source: National Energy Policy (2014)

The National Action Plan for Greenhouse Gases' Reduction (RAN-GRK) also envisages significant renewable capacity addition.[12] Although the role of renewables in RAN-GRK is relatively small compare to the emission reductions sought elsewhere, it still implies significant capacity additions:

- 822 MW of mini and micro hydro;
- 326 MW of solar;
- 59 MW of wind; and
- 17 MW of biomass.

Government of Indonesia has provided various incentives to encourage private investment in renewable energy. As renewable energy becomes important, GoI encourages private investment through policy de-risking instruments to remove underlying barriers that are root causes of risks, this includes renewable policy support and target, and access to the grid connection, resources measurement (wind and solar); and financial de-risking instruments to reduce and shift investment to public actors. Financial de-risking instrument for investment in renewable energy is categorized in four: first, financial incentives, which provide loans and loan guarantees below-market rates; second, fiscal incentives such as tax exemptions and other tax-related subsidies; third, access to services below-market rates; and fourth, market price support and regulation, which provide above-market prices or demand when renewable energy is produced and sold (Damuri and Atje, 2012).

Table 3.1 Incentives Scheme for Renewable Energy

Incentive Scheme	Regulation	Remark
Financial Incentives		
Indonesia Infrastructure Guarantee Fund (IIGF)	MOF Regulation No. 26/2010	IIGF provides guarantee to attract private capital investment in infrastructure development.
The Geothermal Fund Facility	MOF Regulation No. 3/2012	Provide finance for geothermal exploration; it can only be paid if sites are proved to be productive. Currently managed by Pusat Investasi Pemerintah (PIP)
Development credits for biofuel and plantation revitalization	MoF Regulation No. 117/2006, MoF Regulation No. 79/2007	Low cost loans (interest rate subsidy) for farmer and group of farmers that plant energy crops
Government Guarantee	MoF Regulation No. 139/2011	Government guarantee for the financial viability of PLN for building power plants (coal, hydro and geothermal) in the form of IPP
Fiscal Incentives		
Import duty and tax exemption	MoF Regulation No. 21/2010	Import duty exemption on machinery and capital for development of power plants. Exemption from VAT on importation of taxable goods.
Income tax reduction	MoF Regulation No. 21/2010, MoF Regulation No. 130/2011	Reduction and various facilities for income tax on energy development projects, including net income reduction, accelerated depreciation, dividends reduced for foreign investors and compensation for losses.
Provision of Good and Services below market value		
Mandatory biofuel use for industry	MEMR Regulation No. 32/2008, MEMR Regulation No. 25/2013	Mandatory use of biofuel for industry and transportation.
Market Price Support		
Feed-in-Tariff (FiT)	MEMR Regulation No. 17/2014, MEMR Regulation No. 4/2012, 22/2012, MEMR Regulation No. 17/2013, MEMR Regulation No. 31/2009	Feed in Tariff (FiT) for mini/small hydro, biomass, solar PV, geothermal, waste.
Biofuel Purchasing Price	MEMR Decree No. 0219/2010, MEMR Decree No. 2185/2014	Market price index for biofuel (FAME) to be blended with other fuels.

Source: Damuri and Atje (2012), Author's research

Feed in Tariff is the most successful policy instrument for speeding the comparatively low cost deployment of renewable energy.

Key policy instrument to drive renewable energy technology deployment and private investment in electricity generation is feed-in-tariff (FiT) that covers almost all types of renewable technology. Feed in Tariff is the most successful policy instrument yet devised for speeding the comparatively low cost deployment of renewable energy (Mendoca, 2007). FiT is considered as a very popular policy that is now implemented in more than 50 countries in various forms (UNEP, 2012). FiT policy was introduced in 2002 when MEMR issued a regulation of purchasing tariff for small-scale renewable energy power plant below or equal to 1 MW. The tariff was set at 60% and 80% of the basic production cost of PLN for low voltage and middle voltage connection. The FiT was used for 12 powers purchased agreements (PPA) in total of 5.5 MW, all from hydro power plant (Madjedi and Wahjosudibyo, 2014).

Indonesia's FiTs have no single approach for their design and calculation, and have been through various stages and revisions over time to adjust with the market dynamics and investor demands. For instance, until 2014 FiT for geothermal has been revised four times since 2009. Some FiTs are currently being revised. Some key revisions include the level of tariff and condition for the project developers/investors in the form of maximum commercial date operation as well as financial guarantee of project to deposit in escrow account. In the new FiTs regulations, government tries to limit the risk of projects delay upon PPA signing that is caused by the investor's lacking in financial credibility or technical capacity.

Table 3.2 Feed in Tariff for various renewable energy technologies

Renewable Technology	Tarif	Regulation	Remarks
Geothermal	11.8 – 29.6 cents USD/kWh	MEMR Regulation No. 17/2014	Ceiling prices based on commercial operation date (COD) and region.
Mini and Small hydro power (up to 10 MW)	MV (up to 10 MW): Rp. 880/kWh x F LV (up to 250 kW): Rp. 970/kWh x F F = 1.1 – 1.6	MEMR Regulation No. 12/2014	Price based on connection grid voltage connection (Medium or Low Voltage), 6 regional index (F factor).
Waste - Sanitary Landfill	MV: Rp. 1250/kWh (up to 10 MW) LV: Rp. 1598/kWh	MEMR Regulation No. 19/2013	COD is maximum 36 months after PPA is signed.
Waste - Zero Waste	MV: Rp. 1458/kWh (up to 10 MW LV: Rp. 1798/kWh (up to 10 MW)	MEMR Regulation No. 19/2013	COD is maximum 36 months after PPA is signed.
Biomass and biogas	MV (up to 10 MW): Rp. 975/kWh x F LV (up to 10 MW): Rp. 1.325/kWh x F	MEMR Regulation No. 4/2012	Price based on connection grid voltage connection (Medium or Low Voltage), 4 regional indexation (F factor).
Photovoltaic	25 – 30 cents USD/kWh	MEMR Regulation No. 17/2013	Ceiling price based on quota allocation in specific location, higher tariff is allowable depending on local content in the power plant (min. 40%).
General renewable energy with the capacity of 10 MW or excess power	MV: Rp. 656/kWh x F LV: Rp. 1.004/kWh x F	MEMR Regulation No. 4/2012	Price based on connection grid voltage connection (Medium or Low Voltage), 4 regional indexation (F factor).

Source: Authors' research

Energy conservation is one of the key features in energy policy. Provision in the Law No. 30/2007 has strongly enforced the energy conservation activities. The Law states that the national energy conservation activities are the responsibility of the government, local government, business entities, and wider societies. The scope of energy conservation that is mentioned in the Law shall be conducted all phases of energy provision. The National Energy Policy (Government Regulation No. 79/2014) sets two targets related to energy conservation: to lower energy elasticity to be less than 1 and declining of energy intensity by 1 percent per year by 2025. Implementation plan to meet this target is elaborated in the upcoming National Energy Conservation Master Plan (RIKEN) that lays out strategies and measures in various sectors. RIKEN sets target for 17% energy saving from BAU in 2025 and 22% in 2050 (Table 3.3)

Table 3.3 Energy Conservation Roadmap

		2010	2015	2020	2025	2030	2040	2050
Final Energy								
BAU Scenario	MTOE	102	150	220	295	390	610	820
Efficient Scenario	MTOE	102	140	190	245	310	480	640
Energy Saving	MTOE	0	10	30	40	80	130	180
Energy Saving	%		7%	14%	17%	21%	21%	22%

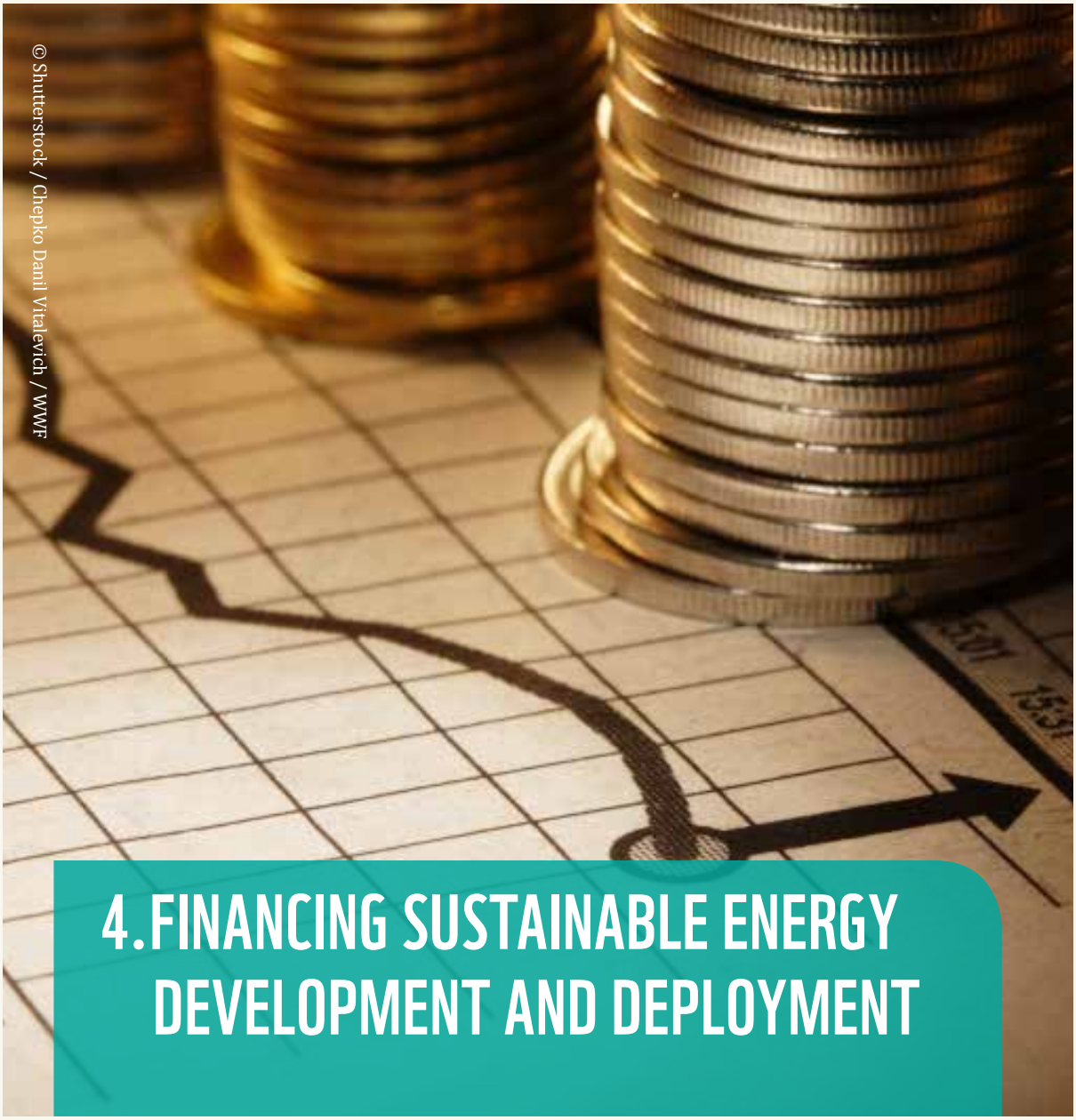
Source: Draft RIKEN (MEMR, 2013)

Government urged energy intensive industry to implement energy management. The Government Regulation (GR) No. 70/2009 stipulates that energy users that consume equal to or more than 6000 TOE per year is obliged to implement energy management that includes the application of energy conservation measures, and requirement to report annually to the government. Energy user who is failed to do the prescribed measures, is subject to penalties as stipulated in the Law. According to MEMR, there are 600 companies that are required to do these measures. However, the reporting and monitoring system have not been in place yet, nor the penalty system.

Financial incentives for industry that is willing to implement energy conservation measures are not yet in place. The Government Regulation No. 70/2009 specified that incentives shall be granted to energy users, that use equal to or more than 6000 TOE per year, which are successful to implement energy conservation measures in certain period of time. Government Regulation No. 70/2009 listed a few fiscal incentives: tax facility for purchasing energy efficient technology by industries, local tax holiday, excise of import duty for energy efficient technology, low rate interest loan,

and energy audit paid by Government. However, the implementation of these incentives require specific regulations and the one with authority to issue financial related policy is Ministry of Finance.

The only incentive that available until 2014 was free energy audit for interested industry and commercial building under energy partnership program. Energy audit has been conducted regularly every year since 2003 by various consultant firms, funded by MEMR's budget. Until 2013, energy audit had been conducted in 974 industries and buildings. MEMR plans to conduct pilot project for Investment Grade Audit (IGA) in 2014 or 2015 as a mean to improve energy audit quality in meeting bankable criteria of energy efficiency projects for industry and commercial building.



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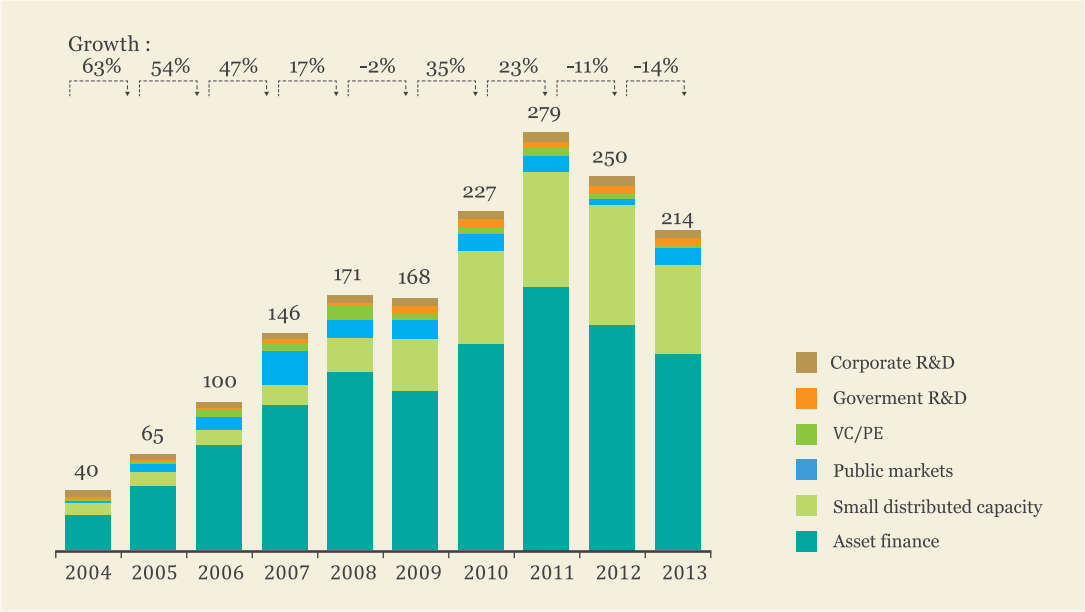
4. FINANCING SUSTAINABLE ENERGY DEVELOPMENT AND DEPLOYMENT

Global investment in renewable energy has shown positive trends since the past decade. In 2013 renewable energy excluding large hydro project accounted for 41.3% of new generating capacity installed worldwide, raising its share of world electricity generation from 7.8% in 2012 to 8.5% (UNEP BNEF, 2014). Investment in renewable energy excluding large hydroelectric project reaches USD 214 billion in 2013, declining 14% than investment in 2012, totaling 23% since 2011. The decline was caused by two factors: investors are worried about future policy that delays investment decisions, and reduction in technology costs. Overall the declining of renewable energy investment was actually improving the fundamental of renewable energy market (UNEP BNEF, 2014).

Figure 4.1 Global New Investment in Renewable Energy by Asset Class, 2004-2013, in USD billion



Source: UNEP, BNEF 2014

Strong private financing for renewable energy investment in some countries is supported by public finance mechanism in the form of government subsidies. UNEP Bloomberg's New Energy Finance report shows that the increasing investment for small-scale renewable investment in Japan in 2013 that reaches USD 23 billion was due to subsidies that were introduced by the government to replace nuclear capacity shut down in the form of capital expenditure. The 10 – 10,000 kW commercial sector earns USD 0.38 per kWh of subsidy, while residential sector receives USD 0.20 per Watt, and another additional of USD 0.35 per kWh for any surplus electricity in the next 10 years. Strong growth in the US is also due to fiscal incentive given by the Government, in form of investment tax credit (UNEP BNEF 2014).

Constraints or barriers of renewable energy development can be classified into three categories: supply side, demand side, and framework conditions

Renewable energy technology encounters constraints for further development and deployment particularly in developing countries. There are still a number of significant factors in developing countries as barriers for renewable energy development. These are: first, capital-intensive of renewable energy; second, continuous provision of fossil fuel subsidies which leads to short term renewable technologies deployment, this circumstance causes renewable energy becomes a costly and difficult alternative to implement compare to conventional fossil fuel power generation; and third, quality of public policy that supports sustainable energy. Some of these factors create barriers for sustainable energy development and deployment. Constraints or barriers of renewable energy development can be classified into three categories (KfW 2005):

- Supply side: renewable energy development has difficulties due to its own technical and economic characteristics, type of project sponsor, and shortcomings in commercialization.
- Demand side: awareness and willingness of individual consumers/users, and level of network operator (utility). Size of demand and electricity consumption determined economic feasibility of the project.
- Framework conditions: policy and regulatory framework affects renewable energy and energy efficiency sectors, availability of financing for renewable energy and energy efficiency projects.

Table 4.1 Barriers for Renewable Energy Development

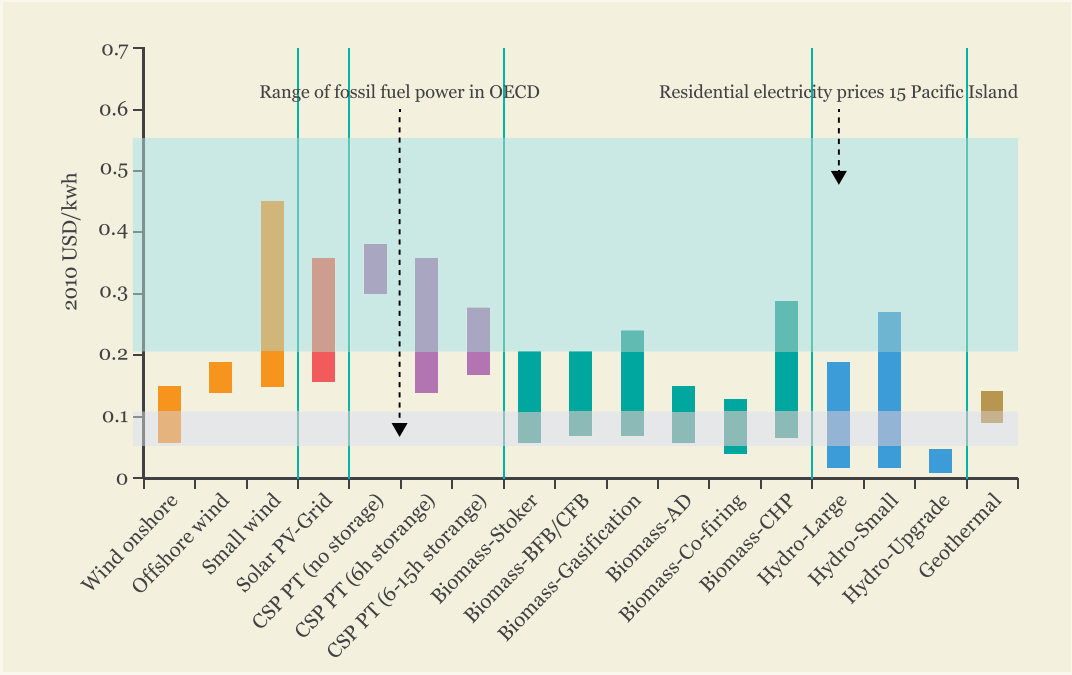
Supply	RE characteristics	• Newer technologies, higher operating risk • Smaller project size, higher transaction cost • Longer lead times, higher development cost • Higher ratio of capital cost to operating cost • Need for longer-term financing at reasonable rates • Present technologies, not yet fully competitive
	RE project sponsor	• Less experience sponsors, higher competition and operating risks • Low level of own fund for investment cost contribution (equity)
	Commercialization and Marketing	• Commercialization barriers encountered by new technologies against mature technology • Lack of commercial business models • Lack of established infrastructure of some renewable technologies
Demand	Awareness and Willingness	• Society is lacking of awareness or familiarity with renewable energy practices • Limited cultural acceptance of renewable energy technologies • Power grid operators are reluctant to deal with decentralized suppliers of energy • Electricity consumption is too low for financial sustainability (not enough for productive use)
	Adequacy and cost	• Low demand at relatively high initial cost for individual investor-clients • Low demand from power grids on base of actual Long Range Marginal Cost (LRMC) level

Framework Conditions	Policy and legal framework	• Transmission access and pricing rules may be penalizing smaller and/or intermittent renewable energy sources. Utilities may set burdensome interconnection requirement. • Permitting requirements and siting restriction may be excessive • Requirement for liability insurance may be excessive
	Energy sector competition and bias	• Low cost of energy for conventional resources • Price distortions from existing subsidies and unequal tax burdens between renewable and other energy sources.
	Market performance	• Failure of the market to value the public benefits of renewables • Lack of environmental externality cost in the current price of fossil fuels • Market barriers such as inadequate information on RE
	Financing	• RE is unfamiliar to financiers due to lack of information • RE is often considered as not attractive due to its high risk without adequate risk compensation in form of risk coverage instruments or higher return • Financing is hardly available for projects and *customer*s due to lack of funds and/or lack of instruments.

Source: Adapted from KfW (2005)

Figure 4.2 shows relative cost of renewable energy technologies compare to fossil fuel in OECD countries. It is true that some renewable energy costs have dropped significantly in recent years due to improvement in efficiency and increased deployment. However a large number of renewable energy technologies (excluding large hydro) are slightly more expensive and have a wider cost range than fossil fuels. In developing countries where the deployment of renewable energy is still low, the levelized cost of renewable energy cannot compete with conventional fossil fuel due to its higher capital investment.

Figure 4.2 Levelized Cost of Renewable Energy Technologies



Source: IRENA (2013)

In developing countries where the deployment of renewable energy is still low, the levelized cost of renewable energy cannot compete with conventional fossil fuel due to its higher capital investment.

Despite a rising trend in private financing for renewable energy, getting the right financing support is still one of key barriers for the development of sustainable energy in developing countries. This issue occurs in both renewable energy and energy efficiency projects. As Government argues about its limitation to provide capital to build energy infrastructure, there is a need to scale up investment from private investors. However many developing countries don't have adequate enabling factors to attract private investment. Investors or financiers confidence on the project is critical to attract financing that is determined by the ability of a project to deliver an attractive commercial return over the risks taken.

From risk perspectives, renewable energy market in developing countries has not yet matured. Therefore project development and technology acquisition cost, and risks associated with technology

utilization are high. As the result, investors or financial institutions perceive renewable energy project as a risky business. Investor tends to expect short term investment payback and higher return to cover these risks. In the absence of the right financial incentives, investor tends to see renewable energy project in developing countries unattractive. This perception exists due to limited information on technology and lack of domestic reference projects. In the case where research and development program for RE technologies are limited in number and have poor quality, the commercialization of renewable technologies is rather slow, and when it comes to deployment, it must compete with conventional technologies that leads to the competition for conventional financing.

Financing for renewable energy projects is hardly available due to lack of funds, financial modalities/instruments or financing arrangements that fit to the characteristic of renewable energy investment. For instance, investment and cost characteristic of renewable energy technologies requires high up front capital and longer payback period, more than 8 or 10 years in some cases. In the other side, bank prefers loan repayment to be made within 5 to 7 years. This may require mezzanine finance or sub-ordinated debt type finance to make the project financially viable and bankable. Most of case, small renewable projects may not financially viable for loans with commercial rate. Therefore, it will require loans with low interest rate or other form of patience capital that are not always available domestically.

The immaturity of renewable energy market in developing countries has resulted the investors or financial institutions perceive renewable energy project as a risky business.

Energy efficiency projects encounter similar challenges. Banks typically only offer asset-based lending limited to 70-75% of the capital cost, which requires 25-30% equity and 100 percent collateral/guarantee. In this case, potential energy savings that can be generated by the project cannot be accepted by bank as collateral. Business model such as Energy Service Performance Contract (ESPC) offered by Energy Service Company (ESCO) that helps business owner to gain energy savings by implementing energy efficiency measures, has not yet understood by banks and other financial institutions. Shortage of credible Energy Service Company (ESCO), limited information on energy saving technologies and their performances, as well as reliable project reference have caused difficulties for financial institutions to acquire credible information and assess risks related to business model and technology implementation.

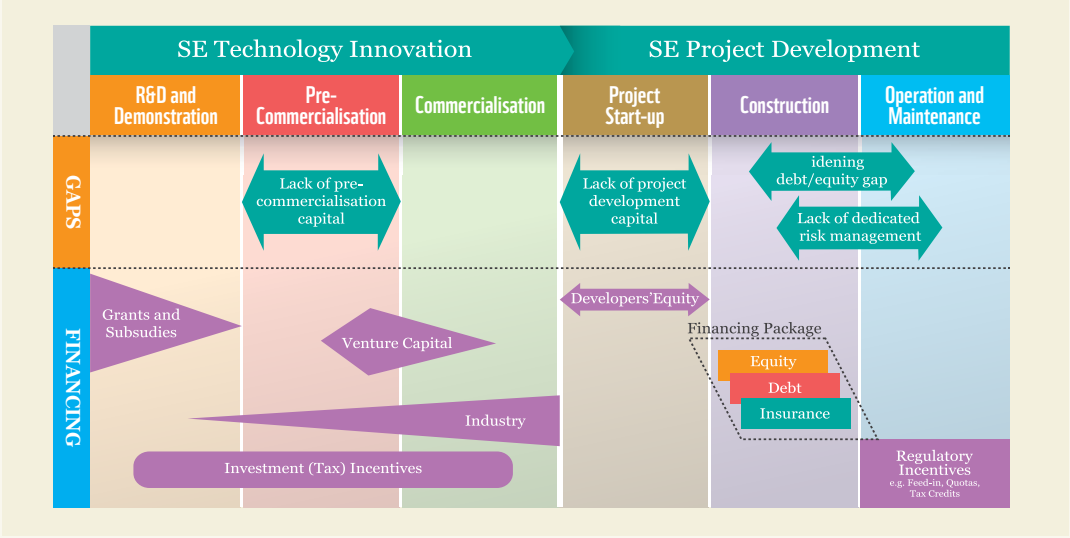
Financing sustainable energy is determined by internal and external factors. Internal/intrinsic factor related to characteristic of renewable energy resources and technology as well as project sponsors, while external factors are related to enabling environment, including policy and regulatory framework as well as financing. Both factors are closely intertwined that could affect each other's performance. From the perspective of financial and economic financing renewable energy projects faces three main barriers (KfW 2005):

1. On demand side, RE finance barriers occur due to the characteristic of renewable energy projects, and project sponsors that have consequences for financing. Some key characteristics of renewable energy projects:
    - RE can have higher cost for project development and investment, very different cost-structure with high up-front share and usually low operational cost.
    - RE project is capital intensive, they are extremely sensitive to the structure and condition of capital cost financing.
    - Insufficient data for prudent project analysis, due to limited accurate reports on the supply of "fuel" at the specific site, that could lead to difficulty in creating risk profile with an elevated ratio of high risk factors. This could lead to difficulty in guaranteeing cash flow.
    - Due to their time horizon, RE has a very long exposure period of risk.
    - RE project needs cash-flow adequate terms: long to extra long maturities, and interest rates in the lower range of the market.
2. The framework conditions for the project within energy sector may include substantial burden and barriers for RE finance. Some policy and regulatory factors could affect competitiveness of RE, sometimes in a way that the economically viable RE projects are financially not viable ones.
    - Regulatory and policy, which favor conventional energy types or hamper renewable energy development, e.g. fossil fuel subsidies.
    - Energy market deficiencies, including lack of infrastructure to connect renewable energy generation to the grid.
    - Lack of reliable partners for take-off contracts/feed in laws.
3. Supply side: difficulties in accessing finance, and shortcomings of supply of finance in the financial sector. Access and supply of finance are determined by the maturity of domestic financial markets and the availability of financial instruments. Some related constraints at the supply side are:
    - Lack of funds and/or
    - Improper financial conditions, especially the maturity of credits and the requirement of collateral
    - Lack of instruments and shortcomings of local financial institutions
    - Lack of sector's know-how and willingness to invest in RE, low level of awareness and understanding of RE as well as insufficient information for prudent investment analysis.

Access and supply of finance are determined by the maturity of domestic financial markets and the availability of financial instruments.

Given the conditions and barriers faced by renewable energy projects (which in many ways quite similar to energy efficiency projects) in getting finance, a combination of financial instruments (mix finance) for sustainable energy project will highly depend on its financial feasibility. The financial combination is an adequate formula of fund in every stages of sustainable energy project, from preparation, development/construction as well as operation and maintenance. Sustainable energy financing requires extra efforts in structuring the finance to address specific demand at each stage. Instrument to provide risk guarantee is equally important, based on the risks profile of different renewable technologies and its applications (on-grid or off-grid/micro-grid or large-grid connected), risks perception of investors and risks allocation of project developers, government/regulator and utility. This renewable energy finance is not only different for each type of renewable energy technology but also much more segmented by types and sizes of projects, as well as the type of debtors: consumer and micro-finance, corporate finance, and project finance.

Figure 4.3 Sustainable Finance Continuum



Source: UNEP (2005)

Typical financing instruments for renewable energy have similar structure with other large-scale renewable energy projects but there are fewer instruments for small-scale projects. Financing for renewable energy project construction, operation and maintenance, particularly larger project has similar instruments and structures with other large-scale energy projects. The typical or classical financing instruments and structure consist of:

- Equity finance provided by project developers or companies involved in this project

- Loan or debt finance provided through corporate or project-financed loan from financial institutions (commercial banks, investment banks) or institutional investors. Depends on the scale of the debt, a syndication of banks and investors can also provide finance to the project
- Risk capital that comes from venture capitalist, private equity fund or strategic investors (e.g. manufacturers).
- Insurance to cover some specific operation risks provided by insurance companies
- Guarantee provided by export credit agency or specialized guarantee agency available in the country to cover some specific cross-border risks.

Alternative financing options to the conventional financial package for renewable energy projects in this stage are:

- Mezzanine finance mechanism. Mezzanine financing is basically debt capital that gives the lender the rights to convert the ownership or equity interest in the company, if the loan is not fully paid back in time. It is generally subordinated to debt provided by senior lenders such as banks and venture capital companies. For renewable energy project, mezzanine finance is cheaper and faster than other types in equity market. Mezzanine finance does not usually change control of the company and can be used to raise capital to meet the equity requirement. Mezzanine finance can be extended around 8-12 years, so it could meet payback period time of a number of renewable projects. Public funds can buy down the risks for commercial investors and/or lenders, by closing debt-equity gap, buy up return for project developers.
- Third party financing (TPF) is a type of off-balance sheet financing that is used to place debt financing. TPF provides capital to project developer to construct renewable energy power plant or to install energy efficiency equipment, and after the plant generates its revenue (or cost-savings), TPF can start to recover its investment plus cost of its services.

For small-scale or off-grid project, financial options are usually limited to:

- Grants from public sector or donor organizations, provided for local community, NGO or local cooperative.
- Consumer finance is often provided to rural clients in the form of micro-loan or micro-finance to finance small systems e.g. SHS, pico-hydro, solar lamps, etc.
- Participation finance is debt that comes from several investors to fund small to medium scale projects, for instance micro or mini-hydro power plants cooperative.

In emerging economies with growing fiscal space to allow financial support provision for sustainable energy, public finance can be a powerful instrument to address financing barriers and promote investment in renewable energy and energy efficiency. Supporting regulatory and tax incentives are key drivers for development and financing new technologies. However, these macro instruments are not always enough to create enabling environment for sustainable energy, particularly in large scale projects (UNEP 2005). In developing countries, public finance mechanisms (PFMs) have mostly been used to support technologies that are in the later stage of innovation but are still facing significant market barriers that hinder their deployment. In developed countries some mechanisms are also targeting investment in pre-commercial technologies that have yet to enter the market. If PFMs are well managed, it can bring down the existing market barriers, bridge gap, and share risk with private sector (UNEP 2008). Public money can also be used to leverage private investment. Different models of PFMs show that a typical leverage ratios range from 3:1 to 15:1 (UNEP 2008).

Having a solid preparation stage is important for viable and bankable renewable energy projects.

Public Finance Mechanisms (PFMs) could play as vital instrument to mobilize finance to support sustainable energy, both technology and project development. Public money can be used to:

- Demonstrate renewable technologies where policies are not in place,
- Provide long-term tenure or long-term financing, to overcome gap of short-term tenure and long-term pay back,
- Increase high up-front cost of renewable consumer products (e.g. SHS, solar lantern/lamp, Solar Water Heater).
- Increase financing access for SMEs (e.g. credit facility for SME, equity financing, etc.).
- Increase return or reduce risk; is an efficient way of mobilizing private capital

Public finance is also suitable to support off-grid/on-grid projects for rural electrification through grant and/or soft loan to community or local cooperatives or NGOs.

Public Finance Mechanisms (PFMs) play important role to finance various stages of sustainable energy technology innovation and sustainable energy project development. PFMs can be used to bring technology forward from lab-scale to the commercialization stage (see Figure 4.3). R&D has been traditionally a principal focus of government industrial policy to spur innovation and technology development. Traditionally, R&D is supported by Government's grants and subsidies that are given to academia, Government and university research centers, and research center

of large corporation. Capital requirement at prototype testing and construction are relatively higher than the one required for R&D. Once technologies enter the commercialization stage, industrial investor or venture capital will step in to finance this stage. The financing gap is actually for pre-commercialization phase after the technology moves from laboratory to be tested on the ground. Government can support this by creating innovative financing mechanism such as business incubator, contingent grants, soft and convertible loans, and public backed venture capital (UNEP 2005).

Figure 4.4 Example of PFMs in Supporting Sustainable Technology Innovation

Country	R&D Innovation	Demonstration	Deployment	Diffusion
UK*	Carbon Trust Incubator			
Canada*		SDTC SD Tech Funds		
reland*		SEAI Ocean Energy Grants and Prototype Fund		
Chile*			CORFO Credit line	
Germany*			KfW renewable energy loan facilities	
France*				FIDEME public private mezzanine fund
China				IFC CHUEE partial loan guarantee
Brazil*	CIETEC Incubator			

*UNEP SEF Alliance members

Source: UNEP (2011)

Project development finance continuum consists of three stages: project preparation, construction, and operation and maintenance. There are two major areas where financing gaps occur: first, lack of project development capital in the preparatory stages; second, the lack debt-equity and appropriate risk instrument that hamper financial structuring for the whole project (see Figure 4 6).

Project preparation stage consists of at least three stages:

- Pre-feasibility study that covers resource mapping and measurement,
- Feasibility study that covers full-scale technical analysis, financial modeling, resource and financial assessments, technology selection, public consultations; and
- Process to obtain power purchase agreement (PPA) and initial permits (locations, environment, and etc.).

Figure 4.5 The Sustainable Energy Technology Innovation Finance Continuum

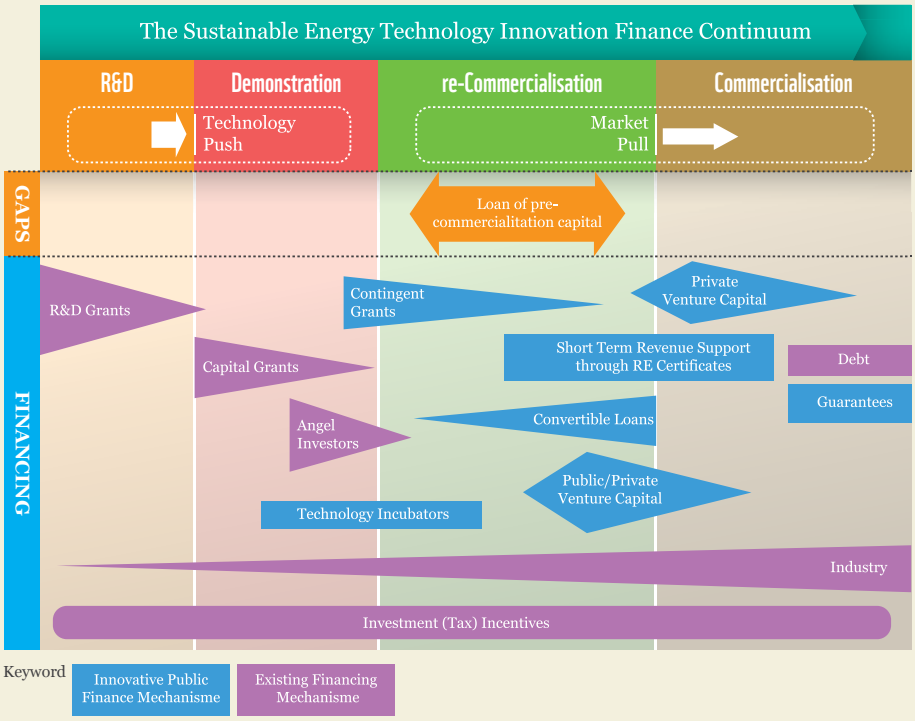
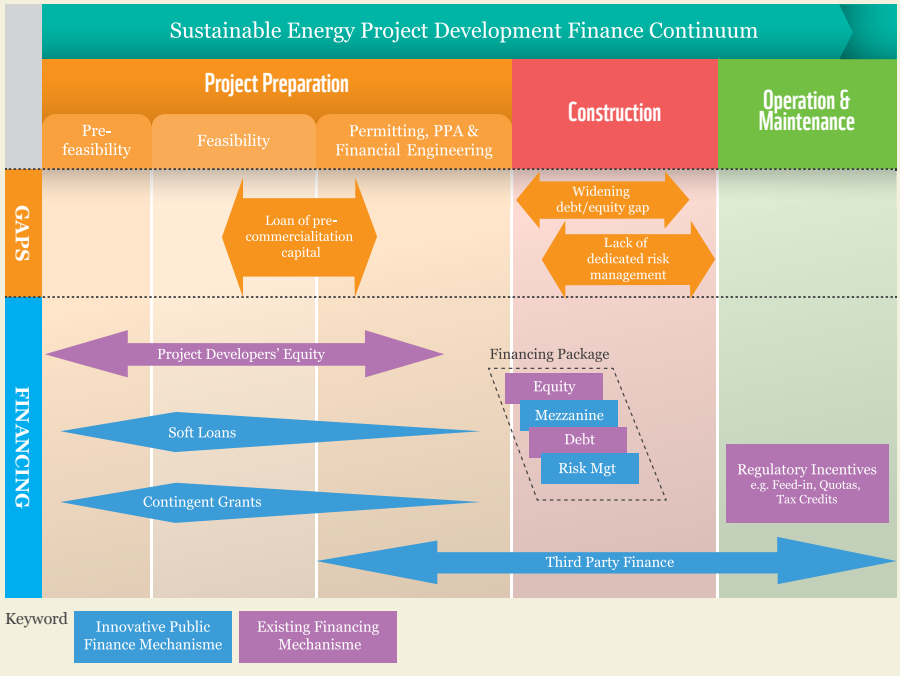


Figure 4.6 The Sustainable Energy Project Development Finance Continuum



Source: UNEP (2005)

Project preparation stage is extremely important because it could determine the technical and economic viability of the renewable project, and later on its financial viability. Information and data obtained during project preparation are vital to identify risks and structure risk *sharing* mechanism that determines project's cash flow in the future. Having a solid preparation stage is important for viable and bankable renewable energy projects.

For on-grid projects, the project preparation is carried out by companies (IPPs or utility) or project developer. The company uses their own equity to finance the respected preparation stage. In this stage, project developers could face cash-strapped situation in the short-term during the completion of all necessary preparations. For off-grid project that is usually smaller than on-grid ones, project preparation is carried out by smaller companies or SMEs or in most cases, by NGOs and community organisation. Limited financial capacity to finance project preparation sometimes lead to poor quality of information and data related to the quality of resources, feasibility study, and local community preparation.

Figure 4.7 Activities Under Each Stage of Sustainable Energy Project Development

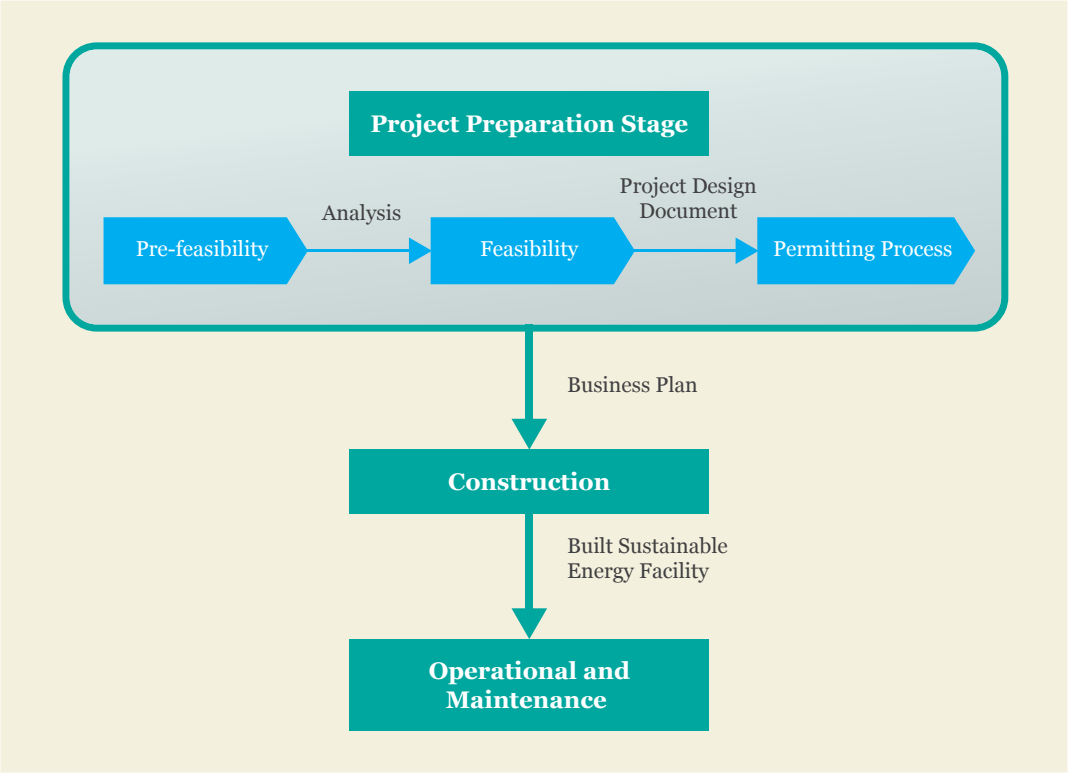
Preparation Stage			Construction	Operation and Maintenance
Pre-feasibility	**Feasibility**	**Permitting, PPA, Financial engineering**		
Analysis on a site; Resource potential; Access to the grid (if it is for electricity); Expected power purchase price; Others related	Full-scale technical and financial modeling; Bussines plan preparation; Resource and environmental assesment; Stakeholders consultations; Others related	Permitting process The grid-interconnection and off-take agreements; The financial engineering; Fundraising; Others related	Physical construction of the energy facility; Others related	Operational of the facilities; Maintenance procedure of the facilities; Others related

Author analysis

PFMs could provide instruments such as soft-loans and contingent grants to assist project developers in this stage to complete the preparation toward financial closure. Public sector grant can be targeted to specific activities during preparations stage, for instance, data, information and resource mapping. Some conditions can be applied to avoid "moral hazard". For instance, in return to the grant, public institutions that provide the grant can share the ownership

of basic data and information obtained during pre-FS for public purposes or resource mapping. Soft-loans can be provided to pay the permit and licensing fees. Soft loans offered to defer debt service and interest free grace period. The repayment can be done after the project generates revenues.

Figure 4.8 Process flow of project development stages



Author analysis

5. SUSTAINABLE ENERGY FINANCE IN INDONESIA

5.1. Pre-2000 Period

Government of Indonesia (GoI) started to realize the importance of diversifying energy sources after experiencing the oil shocks in the 1970s. Development of renewable energy as alternative energy to oil was the implementation of energy diversification and conservation of oil strategy stipulated in the National Policy on Energy Sector in 1981. As one of major oil producers and members of OPEC, Indonesia once was heavily relied upon petroleum to supply domestic commercial energy needs and as export commodity (World Bank 1981). After the oil shocks in 1970s, GoI has established an energy policy to reduce dependency on petroleum (oil) and ensure the optimal utilization of energy resources. As Indonesia was heavily relied upon revenues from petroleum export, this condition endorsed GoI to adopt measures to conserve petroleum reserve and prolong the availability of an exportable surplus by developing alternative energy that can provide economic substitution to oil (World Bank 1987).

Government of Indonesia introduced energy intensification, diversification and conservation strategy as stipulated in the 1981 National Policy on Energy Sector (Ketentuan Umum Bidang Energi/ KUBE) and its update afterwards. Under the energy diversification strategy, the policy intends to develop non-oil based energy such as coal, natural gas, and renewable energy sources, mainly hydro and geothermal. The policy determined coal as the main primary energy source for power plants and cement industries, to replace oil, as well as geothermal and hydro-power. World Bank's assessment on Indonesia's situation in 1983 suggested to diversify electricity generation by utilizing geothermal, mini-hydro and biomass, such as rice husk (World Bank 1983). Geothermal and hydropower had significant potential to be exploited;[13] it is so potential that the development of Geothermal has attracted foreign investor to invest.

Most Official Development Assistances (ODA) for renewable energy funded fixed capital asset and much smaller cost for maintenance and less than 10% was spent to build national capacity. Similar approach was also being used in the promotion of renewable in Indonesia.

Small-scale renewable energy has been developing since 1970s, supported and funded by development agencies, including in Indonesia. In 1970s and 1980s, many development assistance agencies attempted to promote small-scale renewable energy technologies, such as biogas, cooking-stoves, solar heaters, and wind turbines in developing countries (Martinot, et al, 2002). Most of these, which carried out in rural or village level, focused on technical demonstration of certain technologies or on projects that narrowly sustained. In Indonesia, development assistance in energy sector in late 1970s to 1990s attempted to develop renewable energy applications for cooking and electricity in rural and semi-urban areas, mostly small scale, except for geothermal power that is large scale. For instance, for solar photovoltaic system, projects were conducted in various phases: (1) experimental, (2) pilot projects, (3) multiple pilot projects, and (4) semi-commercial phase.[14] Development of renewable based power plant in rural areas also attempted to reduce the use of diesel generator.

Funding for small-scale renewable energy projects in rural areas are mostly in the form of grants for technical assistance or for project's capital investment that were provided by ODA and private companies. Globally, development assistance for renewables was first recognized as international priority at the United Nations Nairobi Conference on New and Renewable Sources of Energy. The outcome of the conference was an action plan for five broad areas, and called for USD 5 billion for non-hydropower renewable only for feasibility study (Kozloff and Shobowale 1994). Most Official Development Assistances (ODA) for renewable energy funded fixed capital asset and much smaller cost for maintenance and less than 10% was spent to build national capacity (Kozloff and Shobowale 1994). Similar approach was also being used in the promotion of renewable in Indonesia. One of the flagships of rural electrification based on photovoltaic (PV) was Sukatani Solar Home System Project that is implemented by BPPT (Badan Pengkajian dan Penerapan Teknologi) and R&S, a Dutch PV company. The project installed 85 units of solar home system (SHS) and 15 solar street

lightings started in 1988. The system is managed by local cooperative, which also provided credit service and monthly fee collection. The Netherland Ministry of Foreign Affairs and R&S provided the initial investment of this project. Villagers had to pay the down payment, followed by monthly contributions (Forsyth 1999).

In the earlier stage of small-scale renewable energy deployment, the Government of Indonesia built rural electrification project based on revolving fund model. Sukatani model was considered successful, that had inspired President Soeharto to establish Presidential Aid Program (BANPRES), which used the revolving fund scheme, for further deployment of solar home system (SHS). BANPRES provided interest of free credit for more than 3500 SHS to villagers. Users purchased the unit and paid it through monthly installment for 8 to 10 years. One of the key features of this model was the role of local cooperative. The cooperatives collect down payments and monthly installments, and employ technicians to provide maintenance services (World Bank 1996).[15] Technology maintenance was assured by keeping small percentage of payments for contributions to the local cooperative that undertook all repair works (Forsyth 1999). In addition to BANPRES, some donor institutions such as Ausaid, USAID, Novem (The Netherland), Bavarian State Matching Fund, have also funded SHS for rural electrification projects aiming for 1 million households in the period of 1989 – 1996 using the similar revolving fund model (Witjaksana 2005).

ODA

The change of donor's attitude was largely influenced by the change in ODA's policy related to Indonesia or specifically related to energy sector.

Mini/small hydropower development in Indonesia was constructed by PLN, NGOs, and government with financial support from government and donor/development agencies for various activities: resources assessment, technical assistance, Training, and strategy planning. Indonesia began to develop hydro in 1960s in order to accelerate electrification in rural areas. Initial pilot project was built by government. Until 1979, 22 sites were constructed with total capacity of 3,350 kW, which were managed by PLN. PLN built most of the turbines of small hydro plants that were installed after 1969. Community managed mini hydro power plants started in the 1980s, where NGOs started building these plants in remote rural areas, funded by international donor agencies. This was after PLN agreed to allow other agencies to build small hydropower below 1 MW capacity (Adkins 1984). Government funding for micro hydro projects were also provided through the Department of Cooperative.

One successful and long-term technical cooperation for micro-hydro development was Mini-Hydro Power Project (MHPP) funded by Germany and The Netherlands government through GTZ, in cooperation with Directorate General of Electricity and Energy Utilization (DGEEU). This program was started in 1991 focusing on technology transfer, turbine manufacturing, and project implementation. GTZ also made partnership with an Indonesia NGO, notably Yayasan Mandiri that had developed micro-hydro project since 1980s (ICSHP 2013, Raharjo 2011).

5.2. Post 2000 – to date

Donors' interests to support rural energy delivery or rural electrification through grants for pilot projects are slowly declined in the 2000s. By early 2000s, the electrification ratio was more than 55%, and almost 90% of villages were electrified. Government and PLN have better capacity and financial resources to finance rural energy project. Although there are still few international donors that provide grants, most of the grants are in form of technical assistance, capacity building and policy reform. Some of these assistances were given merely to create an enabling condition for private investment to exploit renewable potentials. The change of donor's attitude was largely influenced by the change in ODA's policy related to Indonesia or specifically related to energy. For instance, Japan's ODA has different approach on the support of energy sector in Indonesia under its 2005 Medium Term Policy, compare to its 1999's policy (JICA 2006).

Although funding for renewable energy projects is increasing, it is mostly allocated for implementation stage, and mainly for capital investment. As result to this approach, in many cases the funded project cannot be operated for longer period.

Government of Indonesia has been able to allocate funding for construction of renewable energy technology, mostly rural electrification, through various ministerial budgets. Since early 1990s government of Indonesia has supported rural electrification through grid expansion, installation of diesel power generator, and utilization of renewable energy technologies, particularly for remote areas that could not be reached by grid extension. Since mid-2000s, as petroleum price increased, the provision of diesel generator was no longer considered as a viable strategy. Renewable energy technology provision to the local community or individual households have been funded by national government budget. Some programs related to renewable energy were :

1. Ministry of Energy:
    - Rural Electricity Program and Efficient and Affordable Electricity Program. The budget was posted under MEMR which is allocated to build transmission and distribution lines, managed by PT PLN, and to fund free of charge electricity connection for poor households.
    - Funding allocation for building renewable energy plants: centralized PV system, SHS, micro-hydro power plants, biogas/bio-digester. Once the plants were built, MEMR would hand them over to provincial/local government.
    - Special Allocation Fund (DAK) for Rural Energy Development. DAK for rural electrification based on renewable energy was provided since 2011. DAK is transferred to local government to develop renewable energy projects based on local priority, the availability of energy resources and the readiness of district/regency. The amount of DAK allocated for rural energy development is increasing.

- Partnership program for free energy audit for industry and commercial building. The program has been established since 2004, and to date, MEMR has conducted approximately 800 energy audits.

2. Ministry of Disadvantaged Regions (MDR):
    - The funds are allocated for developing various types of renewable energy power plants in disadvantaged regions under Rural Infrastructure Development Program. The types of power plant were mainly centralized PV system, micro-hydro plants and SHS. In 2006-2008 alone, MDR built more than 29.000 (twenty nine thousand) 50 Wp SHS, 72 PV centralized plants, and 35 micro hydro plants in 713 villages (Dasuki, 2009).
3. Ministry of Cooperative and SMEs:
    - Since 1996 to 2013, the Ministry had built 41 micro-hydro power plants, in 27 districts in 14 provinces. The total capacity is 1.8 MW which connects 7396 households to electricity.[16]
    - Ministry's Medium Term Development Plant 2010-2014 planned to build 80 MHPP between 2010-2014.

Public funding for renewable energy development through government budget is more available and increasing, but its effectiveness to address financial needs for the quality of renewable is low. Although funding for renewable energy projects is increasing, it is mostly allocated for implementation stage, and mainly for capital investment. As result to this approach, in many cases the funded project cannot be operated for longer period. Some challenges are:

- The sustainability of new and renewable energy power plants is relatively low. Three main factors that caused this are:
    - √ First, in many cases, funding is limited for initial investment only, there is no fund allocated for institutional set up, nor Operational & Maintenance of the plants upon commissioning;
    - √ Second, quality of work and equipment does not always meet the best technology standards. This causes the sustainability level of government's funded project is relatively low. However, starting 2014, MEMR has released an Operational and Implementation Standard, including standard for technology and civil work for Special Allocation Fund;
    - √ Third, in many cases local governments do not have resources as well as technical capacity to operate and maintain power plants that were handed over to them from the central government.

- Government funding sources are not flexible or discouraged for multi-years small-scale renewable plants to complete the whole cycle of a project, which consists of feasibility study, design engineering, community preparation and institutional development, installation and post-operation. In many cases, renewable power plants that were built do not have robust FS, community preparation, and technical support for post installation.
- In general, the capacity of local community to administer, operate and manage small scale, off-grid power plant, is far from excellent and need improvement through capacity building program, mentoring and technical assistance.

PLN plays a role in supporting renewable energy development. **PLN has been building RE plants to substitute diesel generator, especially in off-grid and remote areas. PLN also plays a role as the off-taker for electricity that was generated from renewable power plant constructed by IPPs.** In 2010-2013, PLN started an off-grid renewable energy solution through SEHEN project that distributed thousands of 20 Wp solar PV with 3 lamps for households in the eastern part of Indonesia.[17] The unit was not intended to provide the items for free, but recipient has to pay both capital and service costs ranging from 35 to 40 thousand Rupiah. The initial cost of the project came from PLN's internal funding. Nevertheless, SEHEN project is less successful in its implementation. Since 2013, PLN has to withdraw one thousand units because the users were failed to make payment as requested.[18]

Since 2009, PLN has been working on building renewable energy generation in 1000 islands, in order to substitute diesel generator. In the first stage (2010-2011), PLN has built solar PV plants with capacity of less than 1 MW to feed into the local grid. In total, PLN planned to build 620 MWp Solar PV plants in hybrid with diesel or biomass power plants in hundreds of locations in Indonesia up to 2020 (Sofyan 2013). The first stage of this project was entirely financed by PLN although International Financial Institutions such as World Bank and ADB have offered to finance this project.

In addition to receive revenue from payment of electricity *customer* and government subsidy, the financial sources provided by PLN to invest in renewable energy are:

1. Two steps loan from International Financial Institutions (IFIs); meaning that the central government applied for international loans, and PLN will apply such loan to the central government.
2. Direct loans from IFIs or commercial bank. One of the loans that PLN received was from KfW in form of "direct financing" to PLN without Government's Guarantee. PLN and Pertamina are two companies among 25 international companies that are considered feasible by KfW to receive direct access to funding without Government's Guarantee.

3. International Bonds. Since 2006/2007, the Two Steps Loan has decreasing, and to fill the gap of finance, PLN was looking for finance from international money market, in the form of bonds.

Development agencies support renewable energy financing through provision of various technical assistances such as: sector policy development, guidelines, assisting in pre-FS stage of project, provide small grants for pilot projects or demonstration project, and technical assistances to government funded or other donor renewable projects. Most of donor programs also play a role as matchmaker between project partner and financial institutions with focus on development of commercial project. Currently, there are a number of active renewable energy programs in Indonesia that were established by development agencies, among others:

5.2.1 USAID's Indonesia Clean Energy Development (ICED)

ICED was designed to assist Indonesia in progressing towards low carbon development by improving the enabling environment for renewable energy, energy efficiency and clean transport. Its period of performance was started in March 2011 and terminated in February 2015. Picking up on small hydro (1-10 MW) and biomass as its focus areas, ICED offered supports in the forms of technical assistance to project developer, financial institutions, and others relevant stakeholders. In conducting this project, ICED engaged Ministry of Energy and Mineral Resources, particularly the Directorate General on New and Renewable Energy and Energy Conservation.

During its period of work, ICED has several targets to achieve:

- To have clean energy projects implemented, giving contribution of 4 million tons of CO2-equivalent to be reduced
- Having 120 MW of clean energy installed capacity
- Leverage of at least USD 120 million public and private funding
- To have at least 20 small and medium sized projects to be implemented
- Increasing access to clean energy for 1,2 million people in Indonesia
- Having around USD 120 million reduction of subsidy, through energy price increment, as well as replacing current use of diesel fuel

ICED aimed at identifying gaps and providing recommendations to the Ministry of Energy and Mineral Resources for:

- improving and implementing energy policies and regulations in support of clean energy development,
- conducting comparative analysis of effective fiscal incentives and subsidies used in other emerging market countries to facilitate

investments in clean energy development by the private sector,

- assisting the state-owned electric utility (PLN) in revising its standard Power Purchase Agreement for small renewable energy projects as an effort to facilitate greater project implementation by private sector,
- supporting the development of a renewable energy resource inventory/geographic information system (GIS) *database* to be used by interested developers of clean energy projects,
- performing due diligence *review*s of promising renewable energy and industrial energy efficiency projects for potential lenders and investors, and
- providing project development support and transaction structuring assistance to private developers of promising projects.

5.2.2 Indonesia Domestic Biogas Program (IDBP)

Indonesia Domestic Biogas Program (IDBP) is a biogas program that was conducted by HIVOS together with Government of Indonesia. This program was officially started in May 2009 and ended in December 2013. The Government of Netherlands has allocated around EUR 656,535 to enable the market oriented, feasible, self-reliant biogas sector. The government of Norway also provides funding, especially for program in Sumba Island.

IDBP in Indonesia is more familiar as BIRU (Biogas Rumah) Program. The main objective of this program is to increase the access to a sustainable energy source through the dissemination of domestic bio-digester in houses by developing a commercial, market-oriented sector. BIRU also aimed to develop biogas sector by deploying around 8,000 units of $6m^3$-biogas-digesters before the end of 2012.

There are 6 provinces in which the program was first conducted: East Java, Central Java, Yogyakarta, West Java, Lombok, and Bali. In its first installation, several issues emerged, causing the program to have had a slow progress. Investments related issues became a major finding as the cause, which related to time and manpower availability to focus on the activities of the regional offices.

The scope of the program covers:

1. Research and Development. In this stage, the program has engaged local workshops to develop local appliances, including the main gas-pipe, gas tap, mixer, water drain, biogas lamp, manometer and biogas stove.
2. Cooperation with the government. The Government of Indonesia gave a full endorsement and support for the sustainability of this program, especially due to its relevancy to renewable energy.

The Government of Indonesia has allocated funding for these activities, as a mean of support to the project.

3. Market studies in potential target areas. The project was started due to the recommendations from the feasibility study that was conducted in 2008. The recommended sites that are predicted to be feasible for this program are those with high densities of cows and an active dairy sector, which then fall to the provinces of West Java, Central Java, Yogyakarta, and East Java. Additional market studies were also undertaken in areas that are characterized by high densities of cows, pigs, or chickens.

BIRU provided financial assistance to rural households to build biogas. BIRU project provides subsidy in the range of 20 – 60% of total cost for a typical 6 m^3 bio-digester, depends on the economic situation of the recipient households. Remaining cost has to be paid by the recipient, in form of direct cash or using credit scheme. In addition to that, BIRU also provides guarantee to the unit and maintenance services.

5.2.3 Finland's Energy and Environment Partnership Indonesia

Finland's Energy and Environment Partnership Indonesia, or EEP Indonesia, is a joint collaboration between the Government of Indonesia and the Government of Finland, to promote renewable energy, energy efficiency and investment in clean energy technology in Indonesia. The program commenced in April 2011 and ended in 2014 that focuses in two provinces: Central Kalimantan and Riau. The program aims to support wider provision and use of renewable energy, particularly bio-energy, to combat climate change.

EEP Indonesia provided EUR 5 million as total funding and offered technical assistance as well as project implementations. Aside from that, EEP also provides funding for feasibility study and capacity building.

5.2.4 GIZ's Promotion of Low Cost Renewable in Indonesia (LCORE-INDO)

The LCORE project is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (ICI), implemented by the GIZ Renewable Energy Program Indonesia in cooperation with the Indonesian Directorate General of New and Renewable Energy and Energy Conservation (DG-NREEC). The ICI funded EUR 3 million. As a three-year program (2012-2015), the project supports the planning and implementation of new and best practice approaches to harness Indonesia's renewable energy potential. LCORE promotes the use of renewables in areas where renewables can be applied cost-efficiently. In this context, LCORE operates in

three fields of activities: (1) utilization of biomass waste from the agricultural industry for power generation, (2) replacement of diesel fuel through grid-connection of renewables as well as (3) new application and models for off grid renewables.

5.2.5 Energizing Development (EnDev)

EnDev is a multi-country program funded by various government agencies and development agencies: German Federal Ministry for Economic Cooperation and Development (BMZ), the Netherland Ministry for Development Cooperation (DGIS), Norwegian Ministry of Foreign Affairs, Australian Agency for International Development (AusAid), UK Department for International Development (DFID), and Swiss Agency for Development and Cooperation (SDC). The program was managed by GIZ and the Dutch NL Agency (NLA), and implemented by GIZ. EnDev has EUR 130 million funding with activity in 24 countries, including Indonesia.

EnDev Indonesia was launched in 2006 along with other 20 countries. EnDev Indonesia phase 2 commenced in 2009 and will conclude in mid-2014. EnDev Indonesia primary focus is to support the electricity provision to 112,000 people, 200 social institutions, and 340 productive uses of energy (PUE) applications. The technological focus is on micro-hydropower and photovoltaic facilities. Its activities are clustered in 6 areas: Micro-hydro support, Photovoltaic support, PUE, Capacity Development, Sustainability Monitoring, and Knowledge Management. EnDev Indonesia basically provides technical supports for various RE projects financed by the government of Indonesia (e.g. Ministry of Energy and Mineral Resources or PNPM) or other donors.

According to its Annual Report,[19] by 2013 the project has supported the installation of 185 micro-hydro power plants, provided technical assistances and undertaken technical inspection for 112 solar PV village power with mini-grids. Both projects have reached more than 121,000 people, 1,300 micro enterprises and 900 social institutions, to gain power supply. Management teams have been established and trained in 228 villages. MHPP sites consist of 122 sites under Green PNPM, 54 sites under Rural PNPM, and 9 sites under other initiatives. In addition to that, there are about 914 biogas digesters already installed in East Java by HIVOS through BIRU program (HIVOS 2014).[20] Some EnDev activities in Indonesia are financed through Fast Start Finance from the Netherland; for instance the EUR 8 million hydropower support (GIZ and Adelphi 2013).[21]

5.2.6 DANIDA's Environmental Support Program 3 (ESP3)

DANIDA ESP3 program has three components; with component 2 directly supports sustainable energy development. The objective of the project is to support government at the national and regional levels to implement as well as to monitor energy efficiency, energy conservation and renewable energy activities. The component features pilot projects that will provide demonstration and experience of energy efficiency, energy conservation and renewable energy utilization in Indonesia. ESP3 could also provide capital for demonstration projects. DANIDA's ESP-3 was commenced in 2013 until 2017. The total budget for ESP3 project is about USD 50 million or around 600 billion Indonesia Rupiah but the budget for Component 2 only, was about USD12.6 million.[22]

5.2.7 UNDP's Wind Hybrid Power Generation (WhyP-Gen)

UNDP's WhyP-Gen was established by the fact that Indonesia will still need around 35,000 MW of electricity before 2015, both to meet its growth requirement and to meet its societies' needs on energy. In order to answer the challenge, the National Electricity Company (PLN) has encouraged the private electricity companies to start investing in renewable energy generation. This has been encouraged by PLN to support the existing limited fossil fuel power generation that is currently outage.

Moving on from the above facts, confirmed by the need of Indonesia to increase the share of renewable energy in the energy mix as well as its commitment to reduce its emission down to 26% voluntarily by 2020, Ministry of Energy and Mineral Resources (MEMR) has started to look for options to develop renewable energy.

UNDP initiated a project called Wind Hybrid Power Generation (WhyPGen), with partial fund from Global Environment Facility (GEF), engaged Agency for the Assessment and Application Technology (BPPT). The strategy was to facilitate the commercialization of WhyPGen systems by demonstrating their advantages, providing attractive financing solutions and supporting the establishment of positive policies by showing all aspects on demonstration sites. The goal of this project is to reduce the growth of greenhouse gases emissions in power sector. The duration of the project is from 2012-2015. UNDP has applied a number of activities, including co-finance in few demonstration projects.

Figure 5.1 WhyP-Gen Project Approach

5.2.8 MCA's Green Prosperity Program Indonesia

Millennium Challenge Account (MCA) Green Prosperity Fund is part of MCA Indonesia, which is funded by the Millennium Challenge Corporation (MCC), a US government agency. It is a five year program with around USD 600 million compact with Indonesia, which is designed to reduce poverty by promoting economy growth through 3 (three) projects: the Green Prosperity Project; the Community based Nutrition to prevent Stunting Project; and the Procurement Modernization Project.

The Green Prosperity Projects is designed to support Government of Indonesia to achieve its economic growth by applying a more sustainable, less carbon-intensive approach. It seeks some of Indonesia's most development priorities that include increasing the access to clean and reliable energy in rural areas and improving stewardship of natural assets. This is due to Indonesia's challenge

in reducing its greenhouse gases emissions, while at the same time, Indonesia has to meet the need to have reliable electricity by not depending on the expensive and unreliable diesel generation.

For this effort, MCC has provided around USD 332,5 million for the Green Prosperity Project. It will provide commercial and grant financing to help greater private sector investment in renewable energy and sustainable land use practices. This project will also provide technical assistance to support project preparation, improve land use planning, and strengthen local and regional capacity to pursue a low carbon development. This project also supports a number of mutually reinforcing, community-based objectives that promote productive use of energy, and protect watersheds and other renewable resources from which energy can be generated.

This project consists of four core activities: an investment facility, participatory land use planning, technical assistance and oversight, and "green knowledge" capacity building. The centerpiece activity of this project is the investment facility, which will provide commercial and grant financing to support economic development projects in two thematic areas:

1. Renewable Energy, including small operations (less than 10 MW), hydropower, and bio-waste (agricultural waste) to energy, biogas, and solar.
2. Sustainable land use and natural resources management, including sustainable agriculture, forestry, fisheries and watershed management.

International financial institutions or Multilateral Development Banks (MDBs) are engaged in renewable energy development in Indonesia mainly through technical assistance and loans to government or private sector. Donor strategy focuses on the development of renewable energy and energy efficiency market, and creates demand for commercial finance.

a. Asia Development Bank (ADB)

In 2011, Asia Development Bank, as a part of its regional initiatives, undertook a scoping study to assess the potential for increasing energy access using off-grid renewable energy, identify innovative technologies, examine different institutional models and outline possible financing approaches. The scoping study concluded several points:

1. MEMR, having its mandate to oversee all energy-related programs in the country, should direct and coordinate the implementation of energy access program; not only those under the MEMR, but also those with the local government. The study also reveals the importance of having a more conducive enabling environment for local and regional banks, as well as having independent power producers (IPPs) to bring in additional resources and expertise.

2. The study also noted that the local governments in the focused areas that have gained considerable financing and implementation responsibility as part of the government's decentralization efforts, would need to integrate it into the implementation of specific programs.

Based on the conclusion of the study, MEMR then asked ADB to provide Technical Assistance to support its effort in promoting access to energy through increasing renewable energy utilization. The focus areas proposed are remote areas and small islands in Eastern Indonesia. After several consultations, it was decided that the main focus would be Sumba Island, East Nusa Tenggara. The Technical Assistance was started based on the information on initial resource surveys and economic analysis conducted in respected locations done by HIVOS.

The scope of work under this project is capacity development that will support the Ministry of Energy and Mineral Resources, the provincial government of East Nusa Tenggara and the local government of Sumba Island, and secretariat of Sumba Iconic Island to plan and implement energy access programs based on renewable energy sources. This technical assistance is expected to directly contribute to the Indonesia Country Partnership Strategy, namely inclusive growth and environmental sustainability with climate change mitigation and adaptation. This project is financed by the Clean Energy Financing Partnership Facility of the ADB that also administered by ADB. The two-years project is expected to come with:

1. Detailed energy access plan for Sumba has been developed
2. Investment projects to be developed by small IPPs have been prepared
3. Implementation of ongoing and planned energy access programs financed by the strengthened government

The kerosene to LPG conversion program was successfully implemented in the urban area; but as for people who live in rural area that is far from the city, the successful rate was only 9 percent (which is marked by the declining fuel wood users) over 3 years period (2007-2010).

b. World Bank's Clean Cook stove Program

Indonesia's statistics show that currently there are around 40% of the total households in Indonesia that are still using traditional biomass for cooking. This has resulted in indoor air pollution that becomes the main cause of respiratory diseases for women and less than 5 year children. The Government of Indonesia has started the initiative to shift from kerosene (and even from fuel wood) to LPG, a more modern source of energy with much lesser pollutants compare to the traditional ones.

Indonesia has previously launched its kerosene-to-LPG conversion program, which resulted in five-fold increment of LPG consumers. The program was successfully implemented in the urban area; but as for people who live in rural area that is far from the nearest city, the successful rate was only 9 percent (which is marked by the

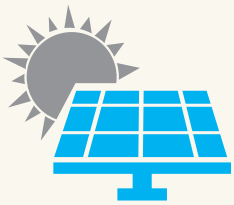
declining fuel wood users) over 3 years period (2007-2010). For people who live in rural area, fuel wood is the only primary energy source that they could use. Therefore, people with this limitation become the main target for the Clean Stoves Initiative (CSI).

The Clean Stoves were claimed to be more efficient in the use of biomass, thus implementing it will contribute to greenhouse gases emission reduction. At the same time, it supports the sustainable production through the use of lesser fuel wood. The use of clean stoves also lead to better health, reduced poverty, greater gender equality, and less pressure on the local and global environment.

World Bank then launched its Clean Stove Initiative in Indonesia, which aims to achieve universal access to clean cooking solutions by 2030. There are four phases of this initiative to be conducted:

1. Initial stocktaking and development of the implementation strategy;
2. Institutional strengthening, capacity building, and piloting of the strategy;
3. Scaled-up program implementation; and
4. Evaluation and dissemination of lessons learned

Clean Stove Initiative is still in the pilot scheme in one province to test output based aid (OBA) model in providing incentives for stove producers, who then will sell the stove at market price to users, possibly using credit scheme.



The growth of renewable energy project is highly influenced by the engagement of private sectors, especially the financial institutions such as banks for its role in financing the project.

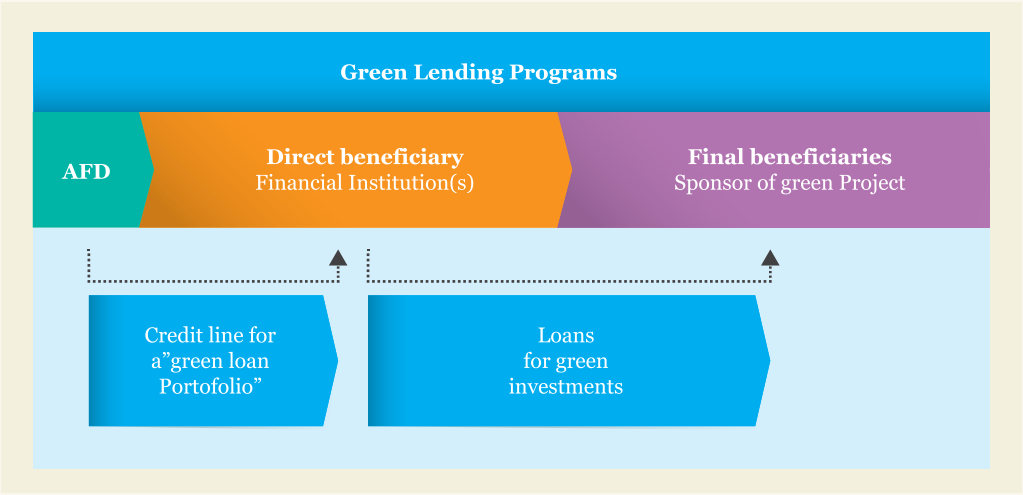
Few Commercial Banks has just started in establishing credit line to support renewable energy projects, with development agencies' assistance. The growth of renewable energy project is highly influenced by the engagement of private sectors, especially the financial institutions such as banks for its role in financing the project. In many cases, banks are more cautious to provide loan to renewable projects because it is still being considered as risky projects. Most of Indonesia banks do not have specific credit line to finance renewable energy projects that require different treatment than non-energy projects.

The biggest government-owned Bank, Mandiri Bank, has admitted that the interest of credit for renewable energy is based on the basic interest set by Bank Indonesia. The interest rate for renewable energy projects has no difference than other projects because the Bank uses the same source of money and its cost of money has no difference.

A number of development agencies have been trying to partner with local Bank to establish a long-term credit facility in supporting renewable energy loans. One example is Green Credit Line Program of AFD in cooperation with Bank Mandiri. AFD loans a low-interest fund to Bank Mandiri, therefore Bank Mandiri could provide loan to green projects. AFD loaned in total USD 200 million, the first USD

100 million was approved in 2010 and the second USD 100 million was approved in 2013. The second credit line aims to finance a number of renewable energy projects between 2013 and 2015, such as mini-hydropower, biomass, solar and geothermal power, energy efficiency (in cement industries and agro-industries), and conversion to natural gas and/or cogeneration. The credit line is combined with a technical assistance component that aims to build the bank's capacities to process and select projects.[23] In 2014, AFD loans USD 50 million to Bank Bukopin, a private bank. This credit line aims to finance five renewable energy projects between 2014-2016, such as mini-hydro (up to 15 MW), biomass, and solar power plants.[24]

Figure 5.2 Illustration AFD Green Credit Line Program



Source: AFD (2013)

Corporate Social Responsibility (CSR) has been emerging as an alternative source of finance for renewable energy projects, particularly small scale, off-grid and non-commercial projects. According to Law No. 40/2007 on companies, in Article 74, it is stated that companies are obliged to pay for corporate social (and environmental) responsibilities, which the detail should be formulized under the Government Regulation. Government Regulation No. 47/2012 on Corporate Social (and Environmental) Responsibilities, stated that all state-owned companies are obliged to allocate from each budgets for activities outside the business as usual, that will give benefits to others without taking anything back from them. The allocated budget should be endorsed and approved by shareholders meeting. Shareholders meeting should not only endorse and approve the budget but also the activities that will be conducted on behalf of Corporate Social Responsibilities.

For instance, Bank Nasional Indonesia (BNI) as a state-owned company has come up with a decision to spare 4% of their net revenue every year, to be allocated as Corporate Social

Responsibility (CSR). In their Corporate Social Responsibility structure, BNI has divided the activities into two: micro financing and community welfare, which can be seen from Figure 5.3. Under BNI's CSR Scheme in 2011, the Bank supported a number of small-scale and community based renewable energy projects, such as pico-hydro in Cianjur, West Java, and biogas in Sumba Island, East Nusa Tenggara.[25] Other state-owned companies such as Bank Mandiri, Pertamina and PLN also support small-scale and community based renewable energy technology through their CSR programs.

Figure 5.3 BNI's CSR Scheme

Source: BNI (2013)

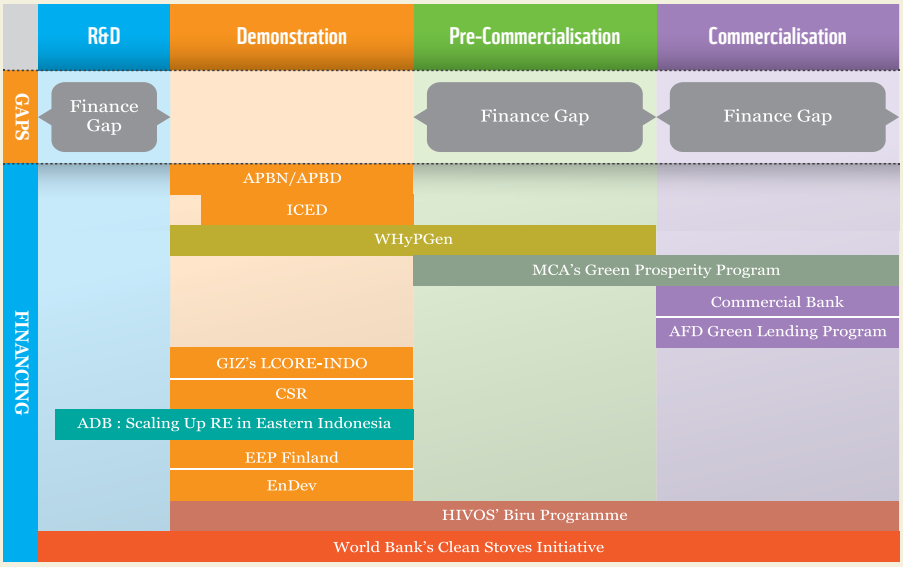
Most of the public financing modalities that are currently available are largely allocated for pilot or demonstration projects undertaken by government agencies.

Financing instruments and modalities to support rapid development and deployment of sustainable energy are largely available from various sources; but existing available finance modalities are lack of cohesion, coordination, and are ineffective to fill the existing financing gap, particularly for commercial-based projects. In general, public finance instrument is still lacking in supporting commercial project finance. Most of the public financing modalities that are currently available are largely allocated for pilot or demonstration projects undertaken by government agencies. Nevertheless, Government of Indonesia has established a number of institutions to support financing for commercial renewable energy projects such as *Pusat Investasi Pemerintah* (Government Investment Unit) and PT SMI. However, these institutions have been taking cautious approach in providing financing because of their lacking in experience, capacity and knowledge of its human resources in analyzing risks and lacking in empirical evidence of typical RE projects (Syahruzad, 2014).In addition, the existing financing for large-scale projects also comes from few commercial banks.

Most of government-funded projects are demonstration and pilot-type projects; both off-grid and on-grid with lack of strong consideration of financial viability and poor sustainable business model. Meanwhile, financing for R&D to enhance commercialization of RE technology innovations is still limited. Most R&D research, both basic and application of technologies is carrying out by government institutions like Agency of Technology Assessment and Application *(Badan Pengkajian dan Penerapan Teknologi/BPPT)* and Indonesia Academy of Sciences *(Lembaga Ilmu Pengetahuan Indonesia/LIPI)*. The source of budget for technology R&D comes from the government's annual budget. Lack of connectivity between research and market causes only few technology researches that proceed to commercialization stages. Most of them stay as the lab product or demonstration scale.[26] Some donor agencies provide technical assistance to support some research activity or resource mapping, such as ADB's technical assistance for Sumba Iconic Island. The technical assistance was to develop grid mapping of Sumba Island and identify suitable locations for on-grid and off-grid projects that could assist coordination between various projects that are supported by government and non-government.

Figure 5.4 shows gaps in the financing for sustainable energy that are currently exist in Indonesia. Analysis in Figure 5.4 suggested that most of the existing funds for sustainable energy projects in Indonesia are only focus in the demonstration activities, but not many that paved the way to technology commercialization. While in order to achieve Sustainable Energy, one technology needs to be massively adopted by all levels, thus it should proceed to the commercialization stage. For a developing country like Indonesia, where sustainable energy market is not mature yet, it will require a long-term strategy and consistent approach to remove barriers in introducing technologies and market development for specific renewable energy. This can be done through a better government-donor coordination.

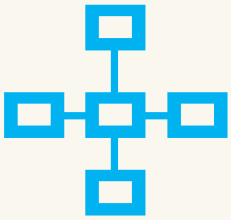
Figure 5.4 Mapping for Sustainable Energy Finance in Indonesia



Source: Authors' analysis

Various financing sources for sustainable energy in Indonesia are available; but it lacks of cohesion and is scattered as well as less effective to address financing gap in each stage of project development. Several financing gaps are then identified based on current available sources:

1. Government program budget, both central and local government budget. Funding from this source mostly comes as national and regional annual budgets (APBN/APBD). These budgets are mostly available for capital investment of small-scale renewable projects. The budget supports construction or installation of units or plants, and in many cases these projects are classified as demonstration or pilot projects. This type of project has lack of financial viability perspective. Funding allocated through local government mostly for small renewable system and off-grid type renewable projects such as solar home system (SHS) 20 to 50 Wp to small-centralized hybrid system (up to 15 kWp) or micro-hydro power plant of 10 to 25 kW. Funding for preparation phase, including pre-FS and FS, institutional set up, and community consultation and preparations are mostly not available under the national or local government budget scheme.
2. Government Guarantee. Ministry of Finance (MoF) provides government guarantee for PPP projects including renewable energy projects, mostly micro-hydro and geothermal. Government guarantee is made available for renewable projects that listed in fast-track phase-2 (FTP-2) program. By the end of 2013, MoF has agreed to provide guarantee for 5 renewable projects (geothermal and hydro-power), with total amount of USD 3.5 billion (MoF, 2014).[27]
3. Government funding for energy efficiency is only available for conducting energy audit under the Partnership Program. Public funding mechanism to support investment to implement energy saving measures has not yet established. Since 2012, Ministry of Finance and Ministry of Energy and Mineral Resources have been setting up a revolving fund to provide a low interest loan through credit facility in the commercial bank, but this mechanism has not been completed and implemented yet.
4. Financing sources from NGOs are only available for small scale, off-grid renewable energy projects. Most NGOs channel fund from donor institutions (from developed countries) or from companies' CSRs to develop renewable energy projects. Funding from donor mostly come in multi-years (2-3 years per project), therefore financing allocation can be structured to cover cost from preparation stage to construction stage, even more on the operational stage. However, the current trend of funding support from development partners for renewable projects is slowly declining. Funding from CSRs is usually in small amount and limited.
5. Financial instruments from commercial financial institutions are dedicated more to finance renewable energy projects in medium



Lack of connectivity between research and market causes only few technology researches that proceed to commercialization stages.

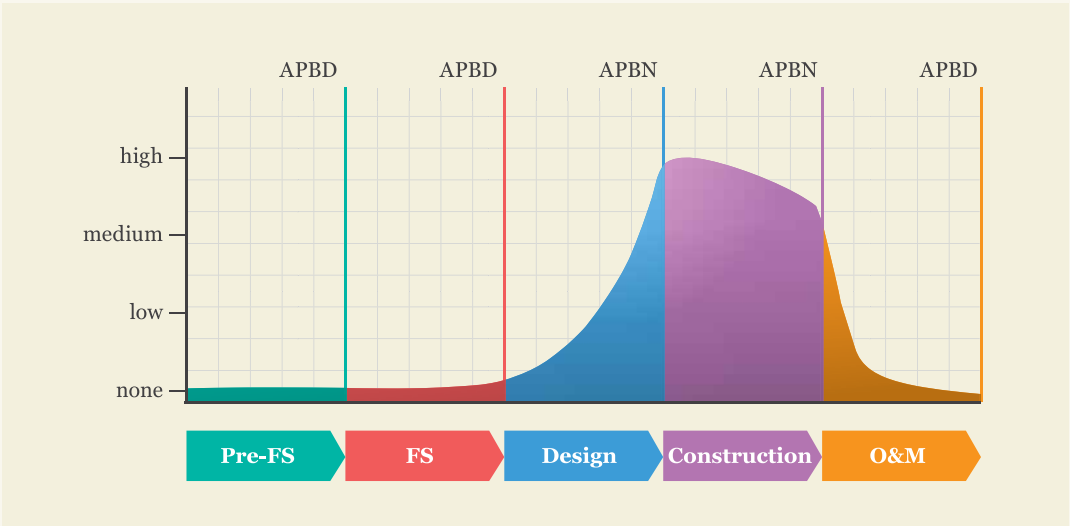
to large scales. Financing usually available as a corporate-finance, dedicated for small and medium size projects.

Lack of financing in pre-commercialization stage leads to the inability of any sustainable energy technology to proceed to commercial stage.

Public Finance Mechanisms (PFMs) has not been available yet, and the current use of public money is still not effective or efficient to remove financing barriers for sustainable energy projects or to expand renewable energy market. Both central and local government develop renewable energy project as demonstration project that puts less consideration to the financial viability of the project. The existing efforts show a lack of supports to the development of sustainable energy technology, particularly in addressing the gaps in Research and Development, pre-commercial stage, and commercial stage. According to UNEP Financing Initiative, the financing gap in the pre-commercial stage is also called as Death of Valley, where the Sustainable Energy cannot be achieved. Lack of financing in pre-commercialization stage leads to the inability of any sustainable energy technology to proceed to commercial stage.

In Indonesia, the current public fund instruments are not properly used to accelerate the deployment of sustainable energy technologies and establish projects. Figure 5.5 shows the actual case of energy funding in Indonesia. Ideally there should be a comprehensive and coordinated process to do project planning, especially those regarding Sustainable Energy. Achieving the state of Sustainable Energy is a continuous process, which is beyond a one-year program and/or project. Figure 5.5 also shows that there are several stages to achieve a sustainable energy project - started from the pre-FS, FS, Design, Construction, and Monitoring and Evaluation - yet, the funding availability is not enough to conduct all stages.

Figure 5.5 Integrated project development to maximize public money



Source : Authors' Analysis

Due to the regional autonomy, several stages of project development are ideally conducted at local level, which means the budget allocation should also be at local level and shall be available for multi-years. The current practice for project that is financed by central government budget has showed that the funding for identification of potential project, pre-FS and FS stages can be allocated from the local government budget. This is a good approach since the local Government knows more about the situation at the local level; started from the availability of resources, the sustainability potential, as well as the barriers that need to be tackled in meeting the objective of the development itself. But most of the cases, the allocated budget for investigation stage or pre-FS/FS for projects are relatively small and insufficient for conducting a proper and detail feasibility study or detail design engineering that leads to the poor quality of those studies. In the near future, central government or respective ministries can provide guidance and standard for local government to carry out pre-FS or FS as a requirement to receive capital grant from central government for renewable energy project at district/municipal level.

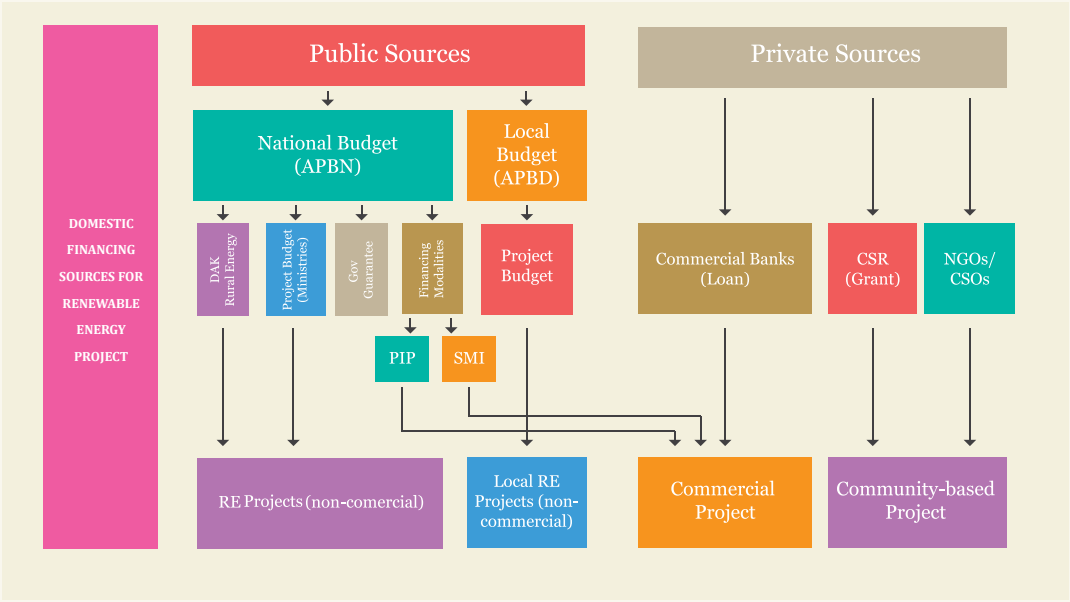
It is expected that the local government is capable to conduct monitoring and evaluation activities after the construction completed and facility becomes fully operational, and asset is handed-over to the local government. In many cases, local government does not allocate any budget to conduct proper operational and maintenance (O&M) for most sustainable energy facilities after it became operational. Without ensuring who will be responsible for Operational and Maintenance tasks, it is impossible for one energy facility/plant to achieve its Sustainable Energy state. This leads to repetition of project stages, where the Government has to start again from zero, which will cause more money to be allocated, as well as losing the opportunities in meeting the objectives of sustainable energy. Most cases have proven that all incomes from the electricity sale could not cover the operational and maintenance costs. Therefore, there should be a specific budget to be allocated for operational and maintenance.

Several areas in Indonesia have showed that most of the local government's power plants were shut down due to the unavailability of funding for operational and maintenance. It was then given to the local PLN (national electricity company) to operate and maintain the existing power plants. This situation leads to an increase in the operational and maintenance budget at PLN side since some power plants might need to be revitalized after the hand-over from the local government was conducted.

In several cases, the design stage was neglected. The project proceeds directly to the construction stage, and, skips the design stage, which plays a significant role in achieving the Sustainable Energy state. Design stage is not merely on the technical part, but also the institutional set-up, financing scheme, and others. Design

stage does not only focus on the technical construction but also the operational and maintenance structure after the power plant has been built.

Figure 5.6. Landscape of Domestic Financing Sources for Renewable Energy (2014)



Source: Authors' Analysis

In the near future, funding from the national/local budget should be shifted to the pre-commercialization stage for technology development, to replicate the existing demonstration plants. This support is required to advance the technology to be mature enough for commercialization. Pre-commercialization stage in this case contains activities such as: enhancing the existing demonstration plants by replicating it in different places. Pre-commercialization could also include technical assistance for planning, establishing the needed policies, shaping the market, and other activities related to prepare the technology to be ready for market. If the financing gap still exists and no intervention is taken to address the gap, the fast deployment of sustainable energy technology will be difficult to achieve.

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6. CASE STUDIES

6.1. DOMESTIC CASE STUDIES

Indonesia has been developing renewable energy since 1990s, which were mostly small-scale, off-grid and community-based projects. There are three different case studies that will be discussed in this section, projects that are located at different places in Indonesia. Each case study has different type of energy delivery and different context, not only in the implementation but also in the financing options.

The first one is the Indonesia Domestic Biogas Program (IDBP). This case study was chosen as an example of activities that provides access to energy for cooking, but also due to its uniqueness of financing scheme. The second case study is the Indonesia Solar Energy Lending Program (ISL). This case study presents an example of providing lighting solution to rural community in isolated places, another kind of concept of financing scheme and business model. The third case is micro-hydro power plants in Seloliman, Trawas,

which is operated under community-based management. Each case study has its own strategy to mobilize financing in order to not only deploy the technology, but also to ensure the energy sustainability and to highlight several replication cases in other part of Indonesia.

6.1.1. Case Study 1: Indonesia Domestic Biogas Program

6. 1.1.1 Background

The Indonesia Domestic Biogas Program (IDBP), better known as "BIRU", is a joint program between HIVOS, a Dutch NGO, and the Ministry of Energy and Mineral Resources (MEMR) of Indonesia, with funding from the Netherland Embassy in Indonesia. HIVOS managed and implemented the program, with technical assistance provided by SNV, a Netherlands development organization. BIRU means "blue" that reflects the color of the flame which is produced from biogas-powered stove. It is an acronym of "Biogas Rumah", which translates as "biogas for home".

IDBP or BIRU program aims to disseminate domestic bio-digesters as local, sustainable sources through development of commercial, market oriented sector in selected Indonesian provinces. This means another opportunity for jobs as well as businesses for masons and partner organizations in construction. According to an initial study, the affordability and willingness to pay for biogas would be sufficiently high in Indonesia, leading to the technical potential of biogas for more than 1 million users (SNV 2008).

Initially, BIRU program aims to construct around 8,000 biogas digesters for domestic use in four years (2009-2012) in no more than 8 provinces. The project was extended one year to the end of 2013 due to high demand of biogas digesters. By the end of the program, BIRU has built 11,249 units of biogas digesters in 9 provinces in Indonesia that covered 568 sub-districts in 103 districts.[28]

This project runs with a strategy to develop market for small-scale bio-digester through involvement and capacity development of various stakeholders, such as local construction companies/ contractor, mason, cooperatives, micro-finance institutions, and farmer, and local NGOs. The capacity development also involved local vocational institutes. Therefore to make this scheme operational, HIVOS engages various stakeholders such as government, local non-government organizations, local businesses and potential users (farmers) and farmer organization, standard body, in the implementation level.

BIRU builds 5 sizes of biogas reactors (biogas digester): 4, 6, 8, 10 and 12 m^3 for livestock's manures processing, particularly cows in rural areas. The 4 m^3 and 6 m^3 digesters are the popular sizes among

farmers in rural areas. This relates to the limited time that people in rural areas tend to spend for cooking. In recent years, the 8 m^3 digester is getting popular among slightly wealthier farmers (BIRU, 2014).

In addition to the main funding provided by the Netherland government, the project also received additional funding from Norway Embassy, Sawadee, ENDEV, and Bank Nasional Indonesia (BNI), including matching fund from local governments.

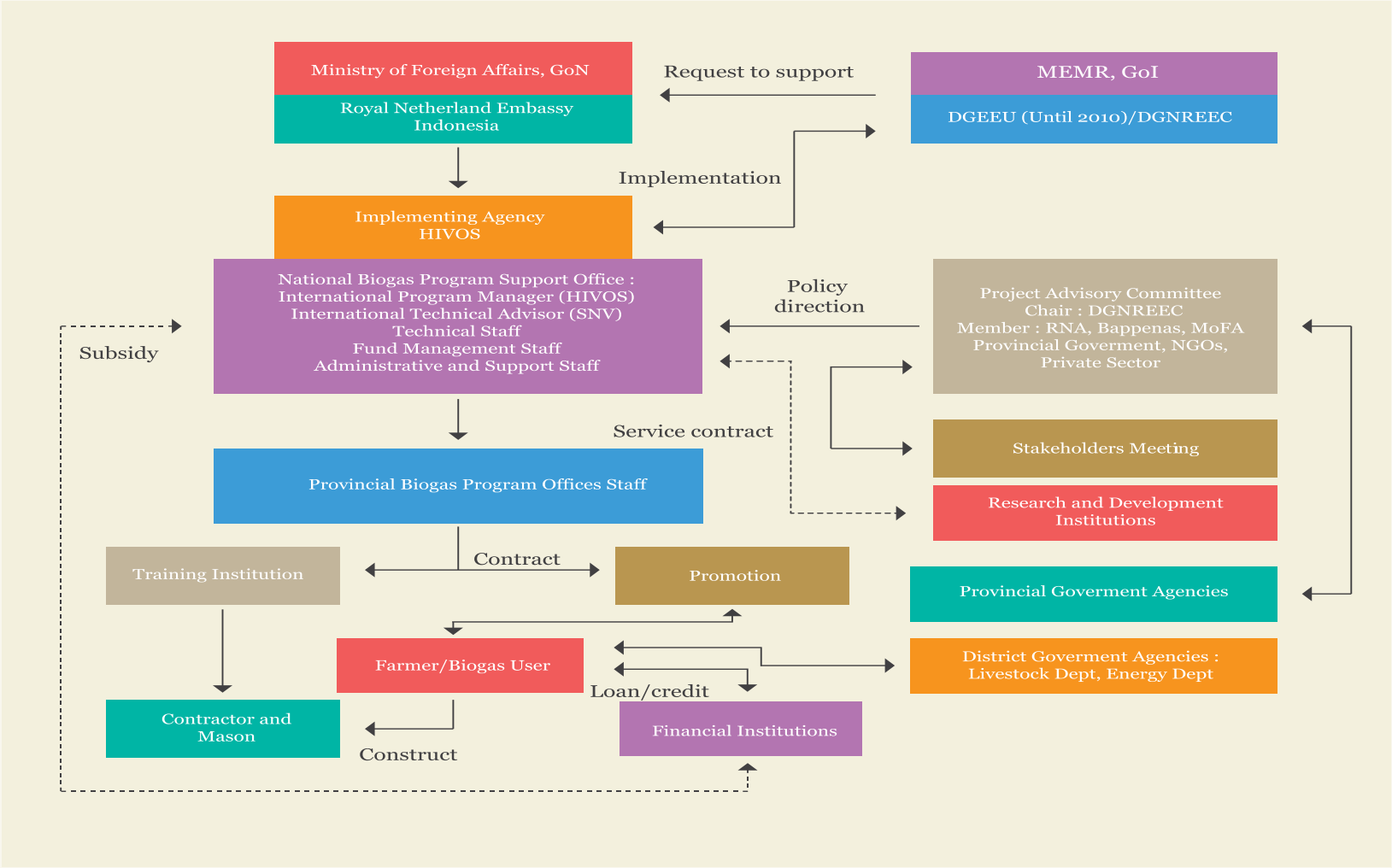
Through BIRU strategy, biogas sector was developed in Indonesia not only by constructing biogas digester by the construction partners, but also through developing the biogas market by providing an investment incentive and access to credit to the farmers. With BIRU scheme, farmer receives subsidy up to 40% of the price of one digester or about Rp 2 million per unit bio-digester. The level of this incentive is based on the expected return of investment of farmers. A farmer who invests in biogas can have his investment back within approximately three years by only use the biogas. They even could make it for two years, if the bio-slurry is applied appropriately (leading to higher yields of crops and lower dependency on chemical fertilizer). A biogas digester can serve its owner for 15 to 20 years with minimum maintenance costs. Access to finance is facilitated by foundations that provided credit/loans to the farmer and subsidized interest rate is given by Nestle that purchase the dairy from the farmers.

The construction of biogas digesters in rural households, not only delivered clean energy for cooking as an alternative to LPG or kerosene, it could also contribute to mitigation of climate change. It will reduce greenhouse gases emissions at different levels. The methane gas as the result of the natural decaying process of dung will be utilized as the source of energy, replacing firewood, charcoal or kerosene. The slurry replaces chemical fertilizers that will mitigate climate change if the production and transportation are omitted. In addition, the produced organic fertilizer will not cause soil degradation as chemical fertilizers do. It has also higher nutritional value compare to ordinary animal manure.

6.1.1.4 Institutional Set-Up

This project is managed and implemented by HIVOS but it involves and in coordination with a number of stakeholders such as: Ministry of Energy and Mineral Resources (MEMR), local government units (Dept. of Energy, Dept. of Agriculture, Dept. of Livestocks), small and medium construction companies (local), dairy farmer cooperatives, local NGOs, and micro-credit financial institutions. These stakeholders directly involve and support the project implementation in national and sub-national level.

Figure 6.1 Institutional Setting of IDBP



Source: Modified from de Groot (2011)[29]

The project has established a National Biogas Programme Support Office (NBPSO) that supports Provincial Biogas Programme Offices (PBPO). Provincial offices are responsible for project implementation at local level (sub-district), and also to synchronize and liaise with local government agencies in provincial and district level. Tasks of PBPO also include biogas promotion, capacity building, and development of biogas sector, quality control, slurry development and gender mainstreaming (BIRU 2014).

To ensure the quality of biogas digester, HIVOS has entered into participation agreement with 80 construction partner organizations (CPOs) that have been trained and groomed to provide the high quality biogas digester to cattle farmers who are interested in investing in biogas. Local partners that consist of local NGOs, cooperatives and private sector entities are given responsibilities to promote biogas, undertake construction, maintenance, and developed themselves as the biogas business service providers. This role has opened up business opportunities for local partners to manufacture and market the biogas appliances, as well as take the role as credit providers.

6.1.1.3 Funding Sources

Funding for the entire first phase of project (2009-2013) that covered project management cost, technical assistance cost, capacity building, capital for biogas digester construction, and subsidies for farmers, was provided at EUR 656,535 in form of grant disbursed by the Netherland Embassy in Indonesia through HIVOS. During the project implementation, some donor organizations and institutions also provided financial support to build a number of bio-digesters, such as Dutch NGO "Op Eigen Wieken", and Bank Nasional Indonesia (BNI). BNI channels its fund directly to two HIVOS' partners in Sumba for the implementation of IDBP project in that island.

Local Government of Nusa Tenggara Barat provided co-financing along with HIVOS' funding to purchase construction materials in order to build 1000-units of biogas in Lombok and Sumbawa Island. The funding came from the Annual Local Government Budget (APBD). Using the same scheme, the support continued for 410 units in 2013. DGNREEC also implemented similar scheme using Special Allocation Fund (DAK). Using the similar scheme of NTB Provincial Government, the fund was co-financed with HIVOS to build 506 digesters in Lombok Utara District.

For the second phase (2013-2016), BIRU planned to construct another 26.000 units of biogas digester. Funding for the project implementation in 2014 came from various sources, such as: Norway Government (USD 450,000, grant), and additional funding from GIZ's managed program, Energizing Development (ENDEV). In addition, MEMR and some local governments also provided funding to support the construction of bio-digesters for farmers in some poor regions, in

cooperation with HIVOS, by using the BIRU digester design. HIVOS also contributes its carbon credit fund obtained by IDBP through Gold Standard registration.

6.1.1.5 Financing Mechanism

Funding for this project comes from various sources: donor countries, multi-donor project, government budget, CSR fund from companies, and micro-credit/soft loans, zero interest loan, and funds from carbon credit. Funding from donor and CSR are used to pay the subsidy for farmers, and subsidy for loan margin of Bank or MFI.

The program provides a flat subsidy or investment incentives of USD 200 (around Rp. 2,000,000) per digester, benefiting poorer farmers more than better-off farmers. Each farmer has to pay 60-80 percent of the investment cost, ranging from USD 400 for a $4m^3$-size digester to USD 1000 for a $12m^3$- size digester - a considerable amount for many small farmers. Since January 2013, the subsidy increase to Rp 3,000,000 (USD 300), and the average cost of biogas digester is about Rp. 7,500,000 (USD 750). This means that it requires another average loan of Rp. 4,500,000 (USD 450) to purchase a unit of biogas digester.

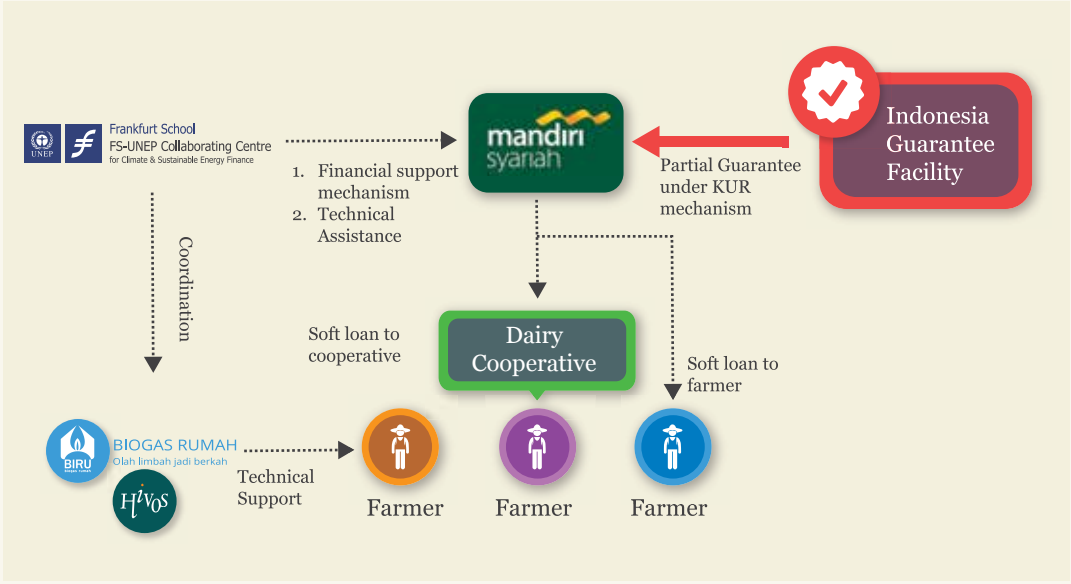
IDBP also facilitates farmers in accessing credit for the bio-digester's investment cost. Credit for farmers is provided by the micro finance institutions (MFIs) that have been in agreement with HIVOS. However, the access to finance seems challenging for biogas. One of the cooperation was between HIVOS and Rabobank Foundation that was marked by an agreement that was signed in 2010. The cooperation has made possible for cattle farmers to access around EUR 1.5 million of low-interest micro-credit, channeled through the Rabobank's retail network in Indonesia via dairy cooperatives and member-based micro-finance institutions to the farmers. However in practice, it appeared difficult for farmers in most of the IDBP target areas to access the loans, due to limited number of local micro-finance organizations, which could meet the requirement to access the loan to Rabobank Foundation (de Groot 2013).[30] Nevertheless, the first agreement to channel the credit for bio-digester was formalized in 19 August 2010 with a cooperative called *"Koperasi Peternak Sapi Perah Bandung Utara"* (KPSBU), one of the largest dairy cooperatives in West Java. This partnership aims to providing loans to at least 1,000 members of the cooperative to build bio-digesters by end of 2012.[31]

A big company, Nestle, has put a lot of interests to participate in this project. Nestle agreed to provide an "interest free"-loan with revolving funds scheme to finance biogas digesters owned by small dairy farmers who supply their milk to Nestle. Nestle initially allocated USD 1 million for revolving fund, and this amount can

be increased up to USD 3.1 million. The typical loan for farmers is Rp. 5 million (USD 500), the payback period is set for 3 years, with zero interest rate. In average, every month each farmer shall pay USD 14. This partnership has highly contributed to the construction of more than 6,000 bio-digesters for Nestle milk suppliers. Nestle cooperation with HIVOS fits in Nestlé's CSR program on Creating Shared Value (CSV).

Bank Syariah Mandiri (BSM) through cooperation with UNEP under Finance for Access to Clean Energy Technology (FACET) program also provides soft-loans for dairy farmer cooperative and farmers to finance their investment in bio-digester. UNEP provided USD 400,000 to Bank Syariah Mandiri (BSM) to provide 4% interest margin subsidy for 10,000 unit digesters. Using KUR's scheme, the interest for micro-loan up to Rp. 20 million is 22% and interest for Dairy Farmer Cooperative using KUR's retail scheme is 9% to 13%. BSM estimated that total credit for 10,000 bio-digesters could reach Rp. 60 million.[32]

Figure 6.2 BSM's FACET Scheme



Source: UNEP FI (2013)[33]

In 2013, HIVOS registered the program to get carbon credit, as a Voluntary Gold Standard Program of Activities. HIVOS estimated that by 2016 there would be about 76,800 tCO_2 avoided every year by IDBP digesters, in average about 3 to 4 tCO_2 per household annually. After clear up the process, the first verification process will review 33,046 tCO_2 as Voluntary Emission Reductions (VERs).

The main feature of financing of the project is the partial subsidy scheme to the farmers/recipients. There were 4 (four) types of possible financing schemes to the recipients/farmers that are applied through this program:

1. Subsidy BIRU + farmers own financing. This type of scheme was only 20% from the total unit installed by the project.
2. Subsidy BIRU + credit/loan (MFI) + farmers own financing/ contribution. This scheme requires farmers to get loan from MFIs. Farmer's contribution could be in-kind. In the current setting, there are three existing accesses to credit. Firstly, access to zero interest loan provided by Nestle to farmers who are milk producers for the company, with payment period of 2 to 3 years; secondly, subsidized interest loan as implemented by BSM FACET program; thirdly is through Rabobank Foundation. BSM and Rabobank charge interest rate of 8% to 11% with payment period of 3 to 5 years.
3. Subsidy BIRU + Government subsidy + farmers contributions. This has already been adopted in West Nusa Tenggara Barat since 2012 and 2013, using the funding from APBD to construct around 1000 units. Provincial government of NTB used its fund to purchase construction materials and give it for free to the users. Under this scheme, farmer needs to contribute around Rp. 1.5 million to Rp. 2 million per unit built. The similar model was replicated by DGNREEC in 2013.
4. Subsidy BIRU + subsidy from CSR fund + farmers contributions. This scheme has not been fully implemented since the absence of CSR fund and government budget.

Scheme 2 is the most used scheme. An evaluation study commissioned by the Netherland Ministry of Foreign Affairs, conducted by RWI and ISS (2012)[34] concluded that about 93% of digester built in East Java province, are using credit/loan scheme as financing scheme.

6.1.1.5 Project Challenges

In implementing BIRU, there are two types of project challenges found:

1) Technical challenges:
    a. Establishing standardization for fixed dome bio-digester model and quality standard for biogas digester this challenge can be addressed through intensive technical meetings that involve academic institutions, experts and practitioners. The consensus on fixed dome digester was reached in 2011 and registration for standardization by MEMR took place in 2012. In addition to standardization for biogas digester,

developing standard for biogas appliances such as cook-stoves, lamps, etc., required intensive consultations with stakeholders, including private sector.

b. Use of bio-slurry. The utilization of bio-slurry is the key element of IDBP program. It increases economic value of biogas and provides wider benefit to agriculture crops and product. There was different understanding about the benefit of applying bio-slurry for the crops among the farmer/biogas users that resulted in different attitude towards utilization of bio-slurry. HIVOS has been conducting training to biogas households on how to utilize bio-slurry, and campaign on the use of bio-slurry among the biogas users.

Free digesters distribution will reduce the ownership of the people and it will slow down the market development for biogas digester.

2) Non-technical challenges

a. In practice, it was difficult for farmers in some of the IDBP target areas to access the loans, due to the limited number of local microfinance organizations. Access to credit is also hindered by financial capacity of farmers, such as those in Lombok Island, West Nusa Tenggara province.

b. There are other projects on going (usually from the government), which gives away free digesters. This has increased the mentality of the locals, that instead of paying for the technology, they will try to have the cheapest one. This mentality, results in a low level of ownership.

c. In Sumba, the challenge for financing is more difficult than those in East Java. The market in Sumba is smaller and HIVOS' partners, those who do project implementations, were not as many as those in Java. The willingness to pay in Sumba is also lower than those in Java.

As typical interest for micro-loans might not interest the farmers due to their level of ability and willingness to pay for bio-digester, a low interest or zero interest loan is the most suitable financial instrument that could attract farmers to apply for loan.

d. Several biogas system does not working properly, because no more cows existed in the area. It could be due to meat consumption, or the people there sold the cows. Either one, it affects the sustainability of the energy system, regarding to the supply security.

6.1.1.6 Lessons Learned

As IDBP runs, there are several lessons learned from IDBP strategy and activities:

1. Competition with similar government's program. BIRU program has faced challenging situation in the location where government has built a number of fully subsidized biogas digesters. Thus, in this area, the willingness to pay of potential users (farmers) is very low. Free distribution of the digesters will lead people to choose to wait for government to distribute free digesters,

instead of buying the biogas digester from IDBP. This practice will reduce the ownership of the people and it will slow down the market development for biogas digester. Competition also occurs in South Sulawesi and Lampung provinces where the program of conversion of kerosene to LPG is successfully undertaken. In both areas, it was difficult to introduce the credit mechanism to the farmers since the conversion program distributes gas stove and 3 kg LPG canister for free (BIRU, 2014).

2. Government fund has lack of flexibility. In this case, government fund has to be spent on a tangible material, and cannot be used for alternative approach such as revolving fund. This might limit the effective contribution of government fund towards the project. More effective and closer coordination, upholding technical standard of digester and the overall biogas system, training for users, and promoting high quality mason or local construction company to acquire contract for building the digester could help in ensuring that government funding with all of its limitation can be used to cover full capital costs (material and labor costs). In this case, the role of HIVOS or other institutions is to provide technical assistance to the government both local and national, as well as to supervise the quality of the installed unit.
3. Credit facility and access to credit line. The successful implementation requires farmers' access to the credit facility provided by MFIs, banks or cooperatives. A typical interest for micro-loans might not interest the farmers due to their level of ability and willingness to pay for bio-digester; therefore, low interest or zero interest loan is the most suitable financial instrument that could attract farmers to apply for loan.
4. Cooperation for implementation. Promotion is important, but it cannot stand by itself. The BIRU team cannot stand-alone. Therefore, cooperation is strongly required for the successful of the program.
5. Partners' selections and assessments are important process that needs a careful attention. BIRU is a program with half business and half social in nature. While the fact is the local NGOs do not have the business sense, yet they have a strong social sense. In some cases, some NGOs withdrew from the program.
6. Financing options for NGO. Only several NGOs that have the ability to do pre-financing for their activity, which it should cover not only the program development and promotion, but also the monitoring part. In the future, implementing organization (HIVOS) must consider a scenario of providing financial assistance for local NGO partners that have good capacity but lack of financial resources. This might sound risky, but implementing organization must take any measures to avoid this risk.
7. Becoming fully commercial. The phase one and phase two projects are still maintaining fixed subsidy scheme that is provided through donor funding. The next concern is how

the subsequent program will not heavily depend on grants or subsidy to farmers. So far, the economic feasibility of the digester is the subsidy that covered 20% to 30% of total capital cost. To sustain the market, in the near future, eliminating the subsidy scheme for farmers should be considered. Attractiveness and willingness to pay can come from reduced cost of initial capital through the carbon credit and easy access to zero or very low interest loan.

8. There is a need to establish an institution at local level to oversee the market development at the end of the project when no more donor-specific funding is available.

6.1.1.8 Continuity and sustainability

The 2008 biogas feasibility study conducted by SNV (SNV, 2008) indicates a technical potential in achieving the construction of 1 million units of domestic biogas in Indonesia. But instead, the IDBP has come to the conclusion that the potential is even higher and might reach 2 million units. By the end of phase 1, biogas market has not yet fully developed, in a sense that the construction and after-sales service should be based on commercial price. Instead, the digester construction at the farmer level still requires subsidy from HIVOS. In the near future, subsidy to farmer has to be reduced to accelerate market development.

By 2013, there were about 11,250 biogas digesters constructed and there are another 4000 digesters to be built in 2014/2015. By the end of 2015, it is expected there will be more than 15,000 unit biogas digesters installed. This number is extremely significant in building the confidence as well as to generate the marketing-viral on the technology. HIVOS has trained more than 1000 masons and worked with more than 60 local organizations to implement the program. These partners, with their current capacity, knowledge and skill, can continue to do marketing and technical assistance to the new market segment.

As the phase 1 of BIRU program come to its end in 2013, the local institution, Yayasan Rumah Energi (YRE) has taken over the implementation of BIRU phase 2, using similar business model as the one applied in the previous phase. This transition through localizing project implementation by local institution, in partnership with HIVOS, is a good model and strategy to ensure the continuity of domestic capacity development and biogas market development.

6.1.2. Case Study 2: Indonesia Solar Loan Programme (ISL)

6.1.2.1 Background

Market for solar energy in Indonesia is huge and untapped.

The country has abundant solar resources over the year. With electrification ratio of 80 percent, there are still about 55 million of the population or 12.5 million households that have no access to electricity. Due to geographical challenge, on-grid and off-grid connection are both viable options. Indonesia has 6000 inhabited islands, and highly sparse population that makes on-grid solution is not cost-effective and economically feasible. Given this situation, the use of solar photovoltaic (PV) technology was expected to meet the electricity need that is currently growing in the isolated areas. Solar PV was considered as one of the technologies that can be implemented throughout the nation due to its resources availability and its modularity to meet the dynamic demand.

In general, solar PV technology is modular and the size of installation can be adjusted to the demand. In the past most solar PV application for rural electricity was in the form of solar home system (SHS). A typical 50 kWp SHS costs about USD 300 to USD 400. This price can be higher due to transportation and additional service cost. In the recent years, simplified SHS has been commonly used to provide lighting services for rural households that are far from the grid or has no access to local grid. With the rise of LED technology as a highly efficient lamp, combination of small PV panel and LED could be an effective solution for low cost lighting for rural population, particularly those who live in isolated or remote areas.

Indonesia Solar Loan Programme (ISL) is a public and private partnership between UNEP, German Government, and Indonesia financial institutions that aims to establish a solar lending finance mechanism for Indonesia's business sector through pilot project. ISL was intended to be a program that will support the development of competitive credit market for Solar Energy Technology (SET) to increase the access to energy, particularly for isolated rural communities.

Initiated by UNEP with the support of the German Government, the program has four goals (Stojiljkovic, 2012):

- Supporting the mainstreaming and commercialization of SET;
- Increase outreach to rural, peri-urban, and urban low-income areas that would benefit most from the technology's application;
- Reduce energy poverty; and
- Enhance transactional capacity of Indonesia's financial institutions.

ISL was implemented by Frankfurt School of Finance and Management that provides technical assistance to project stakeholders (solar technology suppliers, financial institutions and end-users). The project was implemented within one-year period, commenced in October 2010 and completed in December 2011. The project focused in Central and South Kalimantan areas.

Solar Home System (SHS) is used quite widely in Indonesia. But due to maintenance and quality problem, there are many SHS that are not in operation anymore. In many cases, the problem occurs due to lack of users' willingness and capacities to perform regular maintenance. It was also worsened by the unavailability of local services center or technicians on site to maintain and repair the SHS when it has trouble. Some cases also related to the ignorance of users, which leads them to have low interests to maintain. Some other cases show that due to their lack of knowledge and understanding, most of the people use too many electricity for their appliances and modified the system by connecting the appliances directly to the battery. Along with time, the electricity consumption becomes higher, while the capacity of the battery stays the same, or even decreasing. As these practices continue, the SHS becomes out of order.

As individual SHS is not a viable option, in order to respond to the demand for lighting in the rural community, PT.Azet Surya Lestari, a local solar PV manufacture company, introduced Small Light System (SLS). SLS consists of a small solar panel and 1 to 5 LED lamps with a build-in lithium battery, and charge controller. SLS is a scale-down version of solar home system (SHS). SLS is a closed system and it prevents the system to be manipulated by users like the users usually do with SHS.

Solar PV technology was being used to establish a mini-charging station, called Wartes or solar shop, which provides charging services for SLS units. The mini-charging stations are maintained and operated by a local micropreneur. This of course has increased the potential and the demand for the charging services, which can swiftly be replicated since the concept of replicating mini-charging stations had attracted other potential micropreneurs.

There are three pilot projects in 3 villages located in Central Java and East Java in Java area, and 3 sites in Kalimantan (West Kalimantan, South Kalimantan, and Central Kalimantan). Project in both islands have showed different results, which brought us to the point that in deploying renewable energy, extra efforts to disseminate information and adaptive implementation are strongly required. The showcases also suggested that renewable energy deployment would depend on the social situation on the target location aside from the technical aspect.

6.1.2.1 Institutional Set-Up

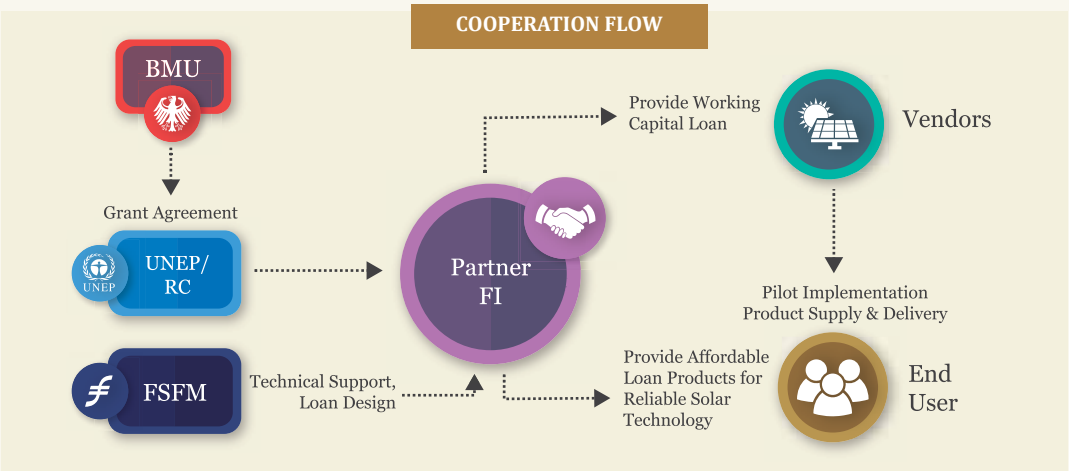
ISL designed a model of cooperation that involved several stakeholders, as follow:

1. German Government/BMU
2. United Nations Environment Program (UNEP)
3. Frankfurt School for Finance and Management

4. PT Azet Surya Lestari (technology vendor)
5. Local Investment Partner (in charge for setting up Wartes)
6. End-users (consumers)
7. Micro-finance institutions (MFIs)

Funding for the program was provided by BMU to the UNEP/ URC and Frankfurt School. Both institutions provided technical assistance to partner financial institution in designing loan scheme and technical support. Partner financial institution is expected to provide loan for working capital for vendor and credit scheme for end-user to purchase the technology. Technology vendors conduct pilot implementation and supply product and deliver it to end-users. According to the scheme of the project, partner financial institutions play a key role in this project.

Figure 6.3 Cooperation of ISL



Source: Stojiljkovic (2012)

Business Model

The challenge with solar PV (SHS) project is the users' bad *experiences* with this technology. End user already had unsatisfactory perception based on poor performance of the previous installed system. This experience caused the end user to be reluctant in investing their money to purchase solar technology. Since SHS is also quite expensive, people have expected the technology to be free of charge. Given this situation, the project came out with alternative products, which is Solar Lighting System (SLS), as a scale down model of SHS, and Solar Water Heater (SWH). SLS is small, compact, and low-cost, so it is more affordable for rural households.

In order to create demand for loan or credit facility, the design of market support structure for solar product should be developed. The design of market support structure is based on the roles of the technology vendor in delivering solar technology experience to the end-user, among others: technology and service provision as well as local capital stimulation to involve in the business. This innovative

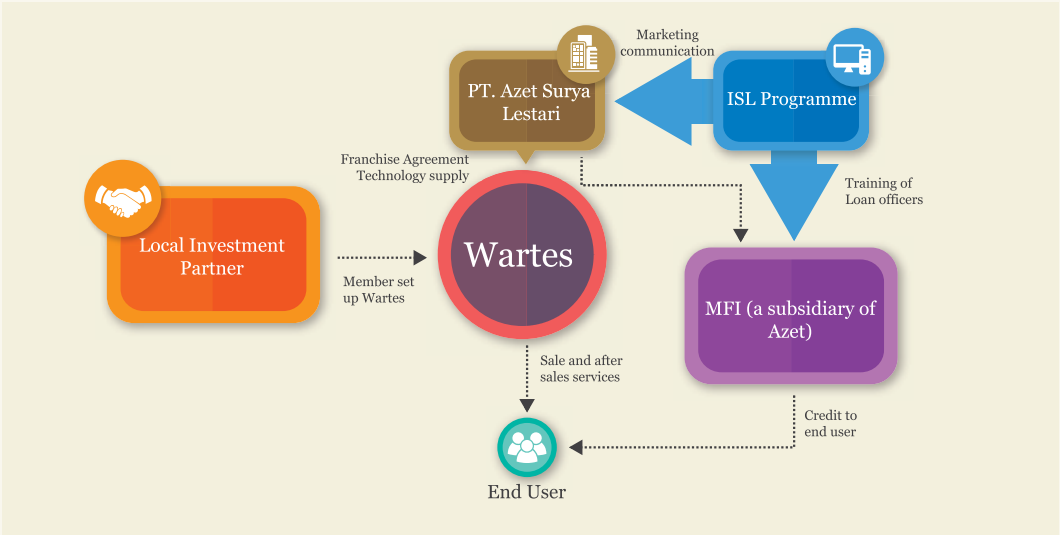
approach could ensure the end-users to have better understanding in purchasing and using their SLS.

The implementation of this concept was done through the establishment of Warung Tenaga Surya (Wartes) or Solar Shop. Wartes then became the distributor of solar products and offered charging services for the battery, as well as service providers for solar technology. Wartes also provides opportunity for local entrepreneur and investor. The establishment of Wartes requires local investor as partners who then will put a seed fund for the capitalization and initial operation of the Wartes.

In this project SLS technology was supplied by PT Azet Surya Lestari, which did not only provide the technology but also technical assistance. Other approaches were also made to offer the end users to have opportunity in managing the Wartes by themselves. If the end users were interested to do this, a credit could be given to them, which they could pay back through the services sale from which they earn revenue.

The cycle rotates, which created demand for the services that establishes the market; not only for the service, but also for the technology deployment through Wartes. The business model can be seen from the following:

Figure 6.4 Wartes Business Model of ISL



6.1.2.3 Financing

The key concept of this project is end-user financing that relies on the role of financial institutions. Partner financial institution received technical assistance in designing its loan from UNEP. The financial institution provides working capital to technology vendor and loan product to end-users.

There are three different financing plans that were designed by the project based on the segmentation of end users:

- Segment 1: For under developed area, GoI/local government provides SHS, transportation to site, and installation, for free.
- Segment 2: For area where potential end users are able to purchase solar PV system (SHS, Centralized PV, or Hybrid PV system), GoI contributes or subsidizes the cost of installation, transportation fee, Training, and interest rate. The end user has to pay monthly fees for electricity provided.
- Segment 3: the end users are able to pay the installed system with the support from local financial institution through credit scheme with 1-3 years payback time. The types of system (SHS or SLS) will be marketed by suppliers (private companies).

Among these three, financing scheme of segment 3 is designed to be fully commercial with the following conditions:

- SLS system cost is USD100
- The down payment is between 20% – 30% of total cost
- Payment period is 1 to 3 years
- Interest rate is 3-4% per month (follow local commercial rate)
- Monthly installment is around USD 2-4
- Marketing strategy depends on the dealer policy

6.1.2.4 Project Challenges

There are two types of challenges in conducting this project:

1. Technical
    a. **Low awareness at end-users for maintenance of technology.** Individual users or community sometime do not apply proper maintenance for the technology; even the users could not do the simplest maintenance.
    b. **The community has a lack of understanding on household energy management,** such as turning off one or two lamps that are not used. This behavior could shorten battery and LED lifetime. Since battery is critical component and quite costly, deteriorating in battery lifetime will affect the system performance.
    c. **Up-scaling the charging station.** The charging station is not used to only charge the lamps, but also other electronic appliances.
    d. **Product range,** means that the charging station should increase their economic scale. Because if they only sell lamps (solar lanterns), then the profit that they gain is limited. As a solution, they were offered to sell not only the lights but also its charger at Rp. 350.000 (around USD 35). Therefore the charging station does not offer lights but also a solution.

This will fulfill the communities' expectation by turning the station into central-solutions.

e. **The credit timeframe** was set for 6 months. But in practice, some users have difficulties to pay after the third month and they would ask to pay the monthly installment for the next month. Currently, to avoid the credit extension, the micro-preneurs were encouraged to pay the monthly installment to not exceed Rp. 100,000 (~ USD 10), so they could finish their credit terms in 6 months. However, if they have stated their unaffordability to pay the down payment, then the local government, CSRs, or even PNPM, as sponsors for the users will be requested to pay the users' down payment. Applying this method will help the users to pay their monthly installment, and it will accelerate the development of ISL at the local level.

2. Non-technical

   a. **Low-income population.** Income level determines the willingness and ability to pay for the technology.

   b. The challenge for replication is **the mind-set of the community** that expected to obtain the technology for free in which such kind of activity would be replicated

   c. Indonesia has **geographical challenges** that need to overcome. The geographical situation causes the regular monitoring becomes very challenging to be conducted.

   d. **Financing for capitals.** To date, this activity is still funded by consignment. Several other financing options are also being explored.

6.1.2.5 Lessons learned

Several lessons learned that can be taken from this project are:

1. **PV technology is relatively expensive and costly for rural population, and difficult to be provided in remote and rural areas.** Market structure limits the commercial diffusion of SHS, as end users expecting them to be free of charge. A cheaper and more affordable alternative product needs to be developed for rural population, e.g. SLS.

2. **Consumer locations are in many cases scattered,** resulting in relatively high transportation and sales cost. Direct sales operation and after sales services are costly due to geographical factors. Establishment of retail and services center that are operated and managed by local entrepreneurs, could reduce these costs. However, investment still has to be made, through finding suitable local entrepreneurs and build their capacity in running the business.

3. **To overcome the high initial investment cost,** an appropriate financial mechanism and implementation

concept have to be developed to provide affordable financing at the local level for those that need it the most.

4. **Promoting institutional** as well as local capacity building, increasing awareness, and recognizing proper needs are necessary to support proper program implementation and system sustainability.
5. **Government can support by developing supporting policy to enable effective private participations** in terms of PPP framework, guarantee scheme, and limit SHS distribution for free.

6.1.2.6 Continuity and Sustainability

Currently, there are 38 pilot projects implemented, which includes on-site development, mounting and performance monitoring. There are three charging stations (Wartes) in Kalimantan that have been operating for around 3 years. The project has built the capacity of participating financial institutions by conducting Training for loan officers at Revolving Fund Management Agency / LembagaPengelola Dana Bergulir (LPDB).

Project scaling up is possible if the main obstacles could be overcome through the following activities:

- Ground market assessment data
- Diversification of funding and more self-sustaining business model
- Additional funding needed for scaling up the project
- Requirement for financial support, e.g. partial guarantee scheme

The successful and sustainability depends on several factors: quality of product and services of SET, marketing, price of technology, and access to finance for end-users. In regards to access to finance, there are three issues to be considered:

- **Access to credit facility** is the main challenge for end-user. Through this project, a financing mechanism for end-user and business model has been established with PT Azet Surya Lestari, which is based on micro-finance principles. Similar financial scheme for end users can be extended and replicated in other area.
- **Alternative financing and service schemes for direct consumer lending** to finance SHS/SLS deployment for remote village. Large banks in cooperation with large technology vendors can provide this financing scheme. Large banks can use their extensive/wider network and branches in rural areas. This can bring end-users closer to source of finance. Bank can use consumers lending scheme, so it will not need collateral. Vendor can establish service point in the branch of the bank or use the existing branch as consumer contact centers. This will improve

the after sales services and communication between end-users and the vendor regarding the performance of SET.

- **Affordable re-financing scheme.** SHS sales and lending through cooperatives. Under this scheme, commercial bank provides soft-loan and partial risk guarantee to local cooperative. Several vendors supply the product and after sales services. Local cooperative can use micro-finance scheme, with interest rate of 2.5-3% per month. Commercial Bank soft loan can be provided with interest rate of 1% per month.

6.1.3. Case Study 3:Microhydro power plant in Seloliman

6.1.3.1 Background

Seloliman micro hydro power plant (MHPP) was built in 1994 by the Environment Education Center (PPLH) of Seloliman, East Java. The objective of this MHPP was to meet the electricity demand of Janjing village, PPLH Seloliman itself, several houses and small industries in Sempur village. PPLH Seloliman as the center for environmental education is also in need of electricity from renewable source, to support the center's operational activities. To meet this objective, PPLH Seloliman built a micro hydro power plant with the capacity of 12 kW. With such capacity, PPLH Seloliman is able to provide electricity for around 100 households.

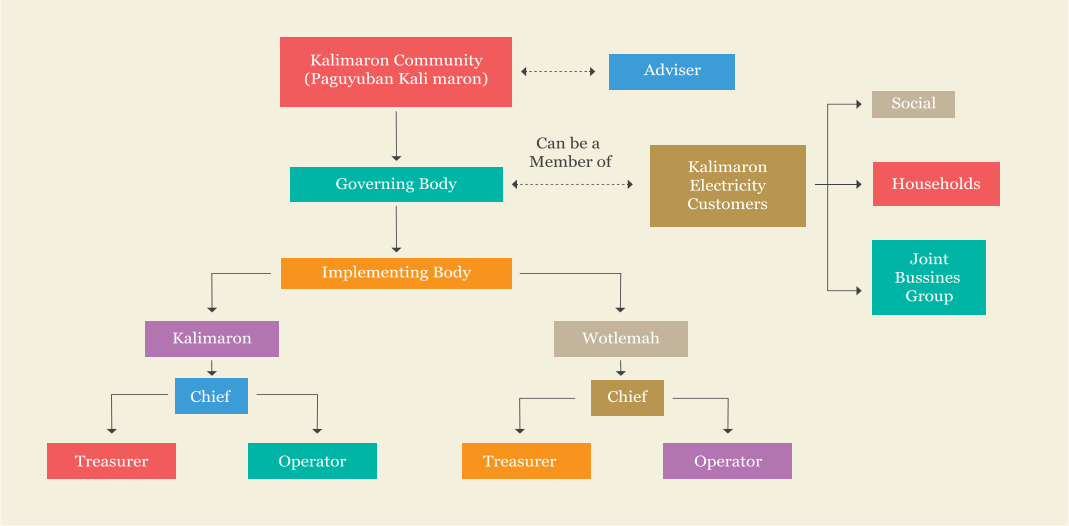
After fulfilling the need of electricity for the local community, PPLH decided to build the second micro hydro power plant. The second plant, Wot Lemah, was built to generate electricity and sell it to the grid of National Electricity Company based on an agreed price. The plant commenced in 2000 and connected to the grid. The power plant owned and managed by local community. As the consequences, PPLH conducted Trainings to the community on how to manage the micro hydro plant. By conducting this Training, the community was expected to manage their own micro hydro, both in technical aspect as well as the management aspect; such as collecting the payment, operating and maintaining the micro hydro, and others related.

6.1.3.2 Institutional Set-up

Seloliman Micro hydropower plants are owned and managed by the local community, through a consortium called Paguyuban Kalimaron. The executive body of Paguyuban Kalimaron consists of 5 people who were elected from the existing electricity users of the micro hydro that they're managing. Under the executive body lies the implementation body, which is different for every micro hydro. Therefore, Kalimaron has their own chief, treasurer, and also operator; so does the Wot Lemah.

In order to prepare the community, PPLH had conducted consultations and Training sessions for the community to empower them in running the micro hydro by themselves; both the institution as well as the facilities. As the result, the community has established an operational entity, in which its members' meetings hold the highest power to decide on what Paguyuban Kalimaron should pursue. Figure 6 5 presents the organizational structure of Seloliman's Micro hydro.

Figure 6.5 Organizational Structure of Seloliman's Micro hydro



Author's analysis

The main task of the micro hydro power plant implementing body is to operate and to manage the revenue from the electricity payment. The revenue is used for micro hydro's operational costs including operators' wages, maintenance, spare parts, as well as savings. The micro hydro institution also has the obligation to do the expenditure report of the institution. The 2012 report has showed that Seloliman has received around 70 million rupiah, which can be seen from the following :

Table 6.1 Revenue of Paguyuban Kalimaron in 2012

	By December 12 th 2012
Income of the Microhydro	
Income from the customer	Rp 27.288.621
Income from the PLN	Rp 74.207.506
Income from the customer	Rp 2.225.000
Total Income	Rp. 103.721.127
Expenditure	
Wages	Rp 27.230.000
Maintenance cost	Rp 1.614.500
Operational cost	Rp 4.808.500
Total Expenditure	Rp 33.653.000
Net Profit	Rp 70.068.127

6.1.3.3. Financing

Seloliman micro hydro was funded through collaboration between donor and community own-fund. In accordance to its development state, Seloliman has different financing scheme for two power plants it has built.

The first micro hydro, Kalimaron, was built small. Kalimaron was built in 1994 with the aid from Germany Embassy, which disbursed their fund through their small project fund for technical implementation (10 kW).[35] As for the planning, PPLH Seloliman did the assessments on resources availability, dissemination of information, feasibility study and others related.

After 5 years of operation, 10 kW of micro hydro was considered insufficient to meet the electricity demand; therefore, a scenario to up-grade the Kalimaron micro hydro was developed. With the aid from MHPP-GTZ, PPLH then conducted a feasibility study on the possibility to upgrade the plant from 10 kW to 30 kW. PPLH later formed a consortium that consists of local community members as well as local NGOs. The consortium prepared a proposal that was submitted to both GEF-SGP and MHPP-GTZ, from where they got the funding and technical assistance. For upgrading the plant, GEF-SGP recorded that there were several contributions on board, among others: USD 27,388 (GEF-SGP), USD 53,802 (Co-financing in Cash), USD 1,478 (Co-financing in-kind).[36] The upgraded Kalimaron MHPP does not only serve the local community, but it also has electricity

excess that provides additional income. Such revenue could be used to finance the up-coming MHPP.

After their electricity demand is met, Seloliman community decided to sell the excess power from the micro hydro to the National Electricity Company, PLN. The agreed electricity tariff that is stated in the contract between PLN and Seloliman micro hydro was Rp. 533/kWh that applies since 2005.

In order to connect to PLN grid, Seloliman micro hydro had an access to a Rp. 108 million (USD 10.800) loan from the Cooperative for building interconnection infrastructure. After the micro hydro was operating, the revenue was used to pay the loan. Not only to pay the loan, but Seloliman community also built another micro hydro using the collected revenue. The community has been receiving around Rp. 70 million from the electricity sale and maintenance of the micro hydro facilities.

Replicating Kalimaron. In 2007, Wot Lemoh Micro hydro, as the replication of Seloliman Micro hydro started its operation with the capacity of 14,5 kW. Wot Lemah was built to electrify the area of Balekambang sub-village and Biting sub-village that cover 50 households. The excess power was then connected to the PLN (National Electricity Company) through parallel system with Kalimaron micro hydro power.

After observing the successful operation of Kalimaron MHPP, the Paguyuban Kalimaron planned to replicate the model by constructing Wot Lemah MHPP. The success of Kalimaron MHPP also gave great precedent for donors to disburse their funds. GEF-SGP disbursed another USD 50,000 and East Java distribution office of National Electricity Company (PLN) also disbursed their CSR fund in the form of soft-loan. Since the cost of grid interconnection is high, Paguyuban Kalimaron had to add another co-financing scheme in the forms of in-kind and cash. The co-financing cash came from the collected revenue from the Kalimaron MHPP's electricity sale. GEF recorded that the co-financing cash to build Wot Lemah was USD 2,778 while the in-kind was USD 39,872.[37]

6.1.3.4 Project Challenges

In conducting this project, there are 2 (two) challenges encountered; the technical and non-technical challenges. Although Seloliman has been operated for years, human resources has always been an issue for Seloliman. To date, Seloliman still highly depends on external expert to handle the technical aspect. Local community is not empowered through provision of adequate workshop that could enable them in fixing or repairing the turbines and equipment. This situation leads to a high maintenance cost. Moreover, since micro hydro is a multi-disciplinary work, more skillful human resources

are needed, not only in operating the facility, but also in advanced technical issues as well as electrical issues.

1. The current deal they have with the PLN, only applies for a short period of time, not long-term; it is established under annual contract. This implies to revenue fluctuation from the PLN to the village. There should be a long-term arrangement between PLN and Seloliman on the proper targets
2. A challenge was found in the maintenance of the water catchment area. Until today, there is no direct incentive to the local initiative such as forest rehabilitation activities (DAS).

6.1.3.5. Continuity and Sustainability

Aside from electrifying several villages, the establishment of Seloliman micro hydro has delivered several impacts to the local community:

1. The project has successfully increased the local community's awareness on natural resources conservation; such as forest, and water;
2. The project has enabled the local community to organize themselves, not only for the operational and maintenance of the facilities, but also for revenue management.
3. There's a local business model on natural resources that leads to the sustainable development of the village

6.1.3.6. Lessons Learned

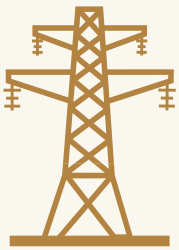
Engaging community in the design, planning, construction and operational stages could give a long-term benefit to the sustainability of MHPP.

There are several lessons learned that can be taken from micro hydro project in Seloliman:

a. Seloliman has given an example of renewable energy development that engaged community in the design, planning, construction and operational stages. Such engagement could give a long-term benefit to the sustainability of MHPP.
b. With the electricity generation from the micro hydro, the local community could earn more income due to the productive activities that result in electricity excess. The community does not only manage to engage PLN as the electricity buyer, but they also receive additional income that is very valuable for the village development.
c. A community renewable energy project can use mix funding type from various sources, including equity finance provided by community, to build the power plant and grid infrastructure. This type of financial arrangement requires a feasible project and trust from donor and other financial provider, feasible business

plan, and sufficient capacity of community organization who develop and manage the project.

d. The community has the capacity to manage their own natural resources if they could get an equitable opportunity to develop.



A community renewable energy project can use mix funding type from various sources, including equity finance provided by community, to build the power plant and grid infrastructure.

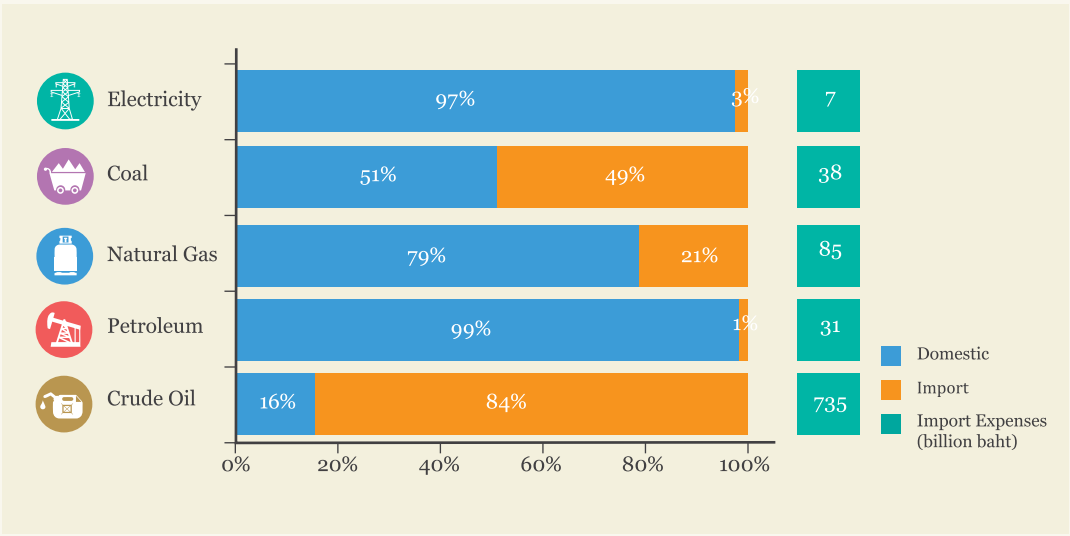
6.2. International Case Studies

At the international level, financing issues to support sustainable energy also occur. Many instruments were developed to address the existing gaps that become major obstacles for countries to achieve Sustainable Energy. In this section, there are 3 case studies on Sustainable Energy Financing measures in Thailand, England, and India. The case studies present the efforts of each country to minimize the risks that may occur in achieving Sustainable Energy. This can be done through developing a specific financial institution, creating a fund, or designing a de-risking instrument.

6.2.1. Case Study 4: Thailand's Energy Conservation Fund (Encon Fund)

Thailand is a net energy importer country. In 2010, Thailand's energy expenses had reached USD 50 billion.[38] At the same time, the total commercial energy used in Thailand was 1,2 million barrels oil equivalent per day. Thailand imported around 84% of its crude oil consumption (Figure 6 6).

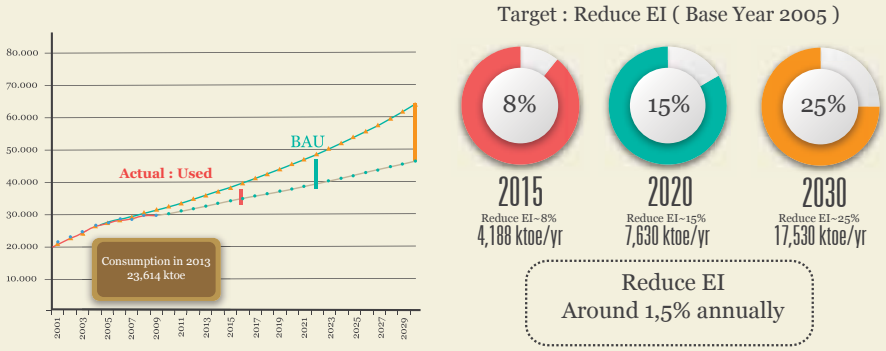
Figure 6.6 Thailand's Domestic to Import Energy Ratio



Source: Thailand Energy Statistics, DEDE (2010)

Thailand developed its energy efficiency plan that targets the industrial and commercial sectors. The plan shows that there are needs to reduce the energy intensity by 8% from the 2005 energy consumption in 2015, 15% in 2020, and 25% in 2030. In order to do so, Thailand has also identified all energy efficiency measures that can be tapped to contribute in achieving the targets. The same thing goes with the renewable energy development in the next 15 years. Thailand was not only developing its plan, but the country is also identifying the possible funding options to achieve the renewable energy development target.

Figure 6.7 Thailand's Energy Intensity Reduction Plan



Source: Achavangkool (2011)

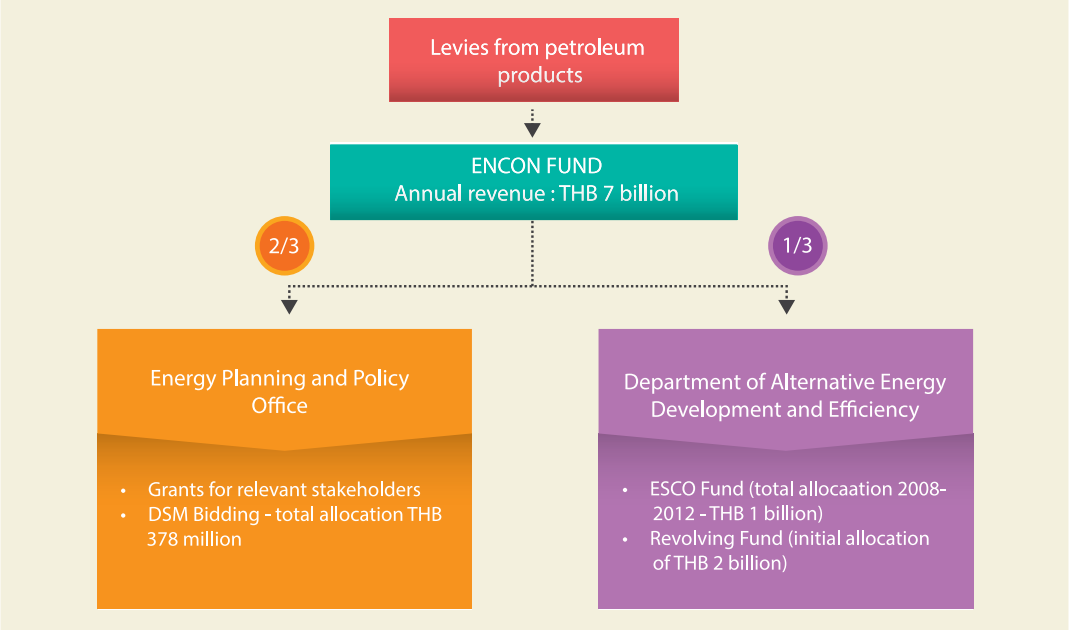
To reduce the rate of energy consumption and improve energy intensity, Thailand established an energy conservation promotion fund under the Energy Conservation Promotion Act 1992, which was revised in 2007. The 1992 Act outlined three major program areas: a compulsory program that required the large commercial and industrial 'designated' facilities (classified as facilities with electrical demand greater than 1,000 kW or annual energy use of more than 20 TJ/year of electrical energy equivalent) to improve the energy efficiency, a voluntary program targeted the small-to-medium enterprises, and a complementary program covering research and development and publication initiatives (Jue *et al* 2012).

The ENCON Fund ("Fund") was established to provide financial support for the implementation of energy efficiency and renewable energy projects. The ENCON fund is managed outside the government budget system, although the governing body of ENCON fund mainly consists of relevant government agencies. The overall management of the ENCON fund is under the responsibility of the ENCON Fund Committee along with the guidance of the National Energy Policy Council (NEPC), while the members of the Committee are the Deputy Prime Minister (Vice Chair) and Ministers of Finance, Energy, Transport, Commerce, Industry, Agriculture, Science and Technology and others. The Committee that is responsible for the

allocation of ENCON fund also consists of representatives from relevant government agencies. The implementation of ENCON Fund is mainly under the Ministry of Energy, particularly the Department of Alternative Energy Development and Efficiency (DEDE) and Energy Policy and Planning Office (EPPO). EPPO as the secretariat to the NEPC and the ENCON Fund Committee is currently responsible for the day-to-day implementation of the ENCON Fund, particularly for the grant allocated to government, NGOs and universities for the promotion of renewable energy and energy efficiency. DEDE manages the Energy Efficiency Revolving Fund (EERF) and the ESCO Fund.

The fund itself was sourced from a tax of all petroleum sold in the country (THB 0.04/USD .001 per liter) and has raised from USD 50 million in 1992 to USD 240 million in 2000s. Since its first establishment, the fund has reserved USD 500 million in 2010. Initially in August 1992 when it was launched for the first time, around USD 50 million (1.5 billion THB) from the Petroleum Fund was injected into the ENCON fund. A few months after receiving the initial capital, the National Energy Policy Council (NEPC) started imposing a levy on domestic gasoline, kerosene, diesel and fuel oil to raise revenues for the ENCON Fund. In 1994, the NEPC started to establish the Energy Conservation Program (ENCON Program) and set guidelines, criteria, conditions and priorities for the allocation of the ENCON Fund to support the implementation of the ENCON Act. The ENCON Fund started providing financial assistance for the promotion of energy conservation in Thailand since 1995.

Figure 6.8 Implementation of ENCON Fund



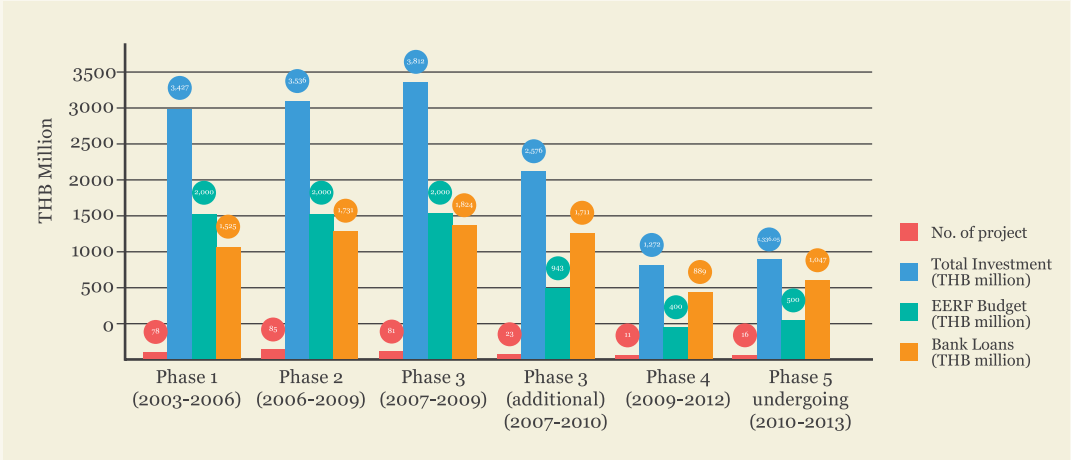
The money from this fund is then distributed through 3 channels: Energy Efficiency Revolving Fund (EERF) which is disbursed through banks, ESCO Venture Capital Fund that reaches around USD 16,2 million, and grants allocation to government, universities and NGO for promotion of renewable energy and energy efficiency. The Fund is allocated to support the Power Development Fund, which prioritizes all activities that promote renewable energy development.

Currently, Thailand also developed a tax on palm oil. In 2011, around USD 3 million was used to support the Biofuel National Programme. It is one of the triggers of more ethanol-fueled vehicles in Thailand nowadays.

One of the windows of the ENCON Fund, The Energy Efficiency Revolving Fund (EERF), was launched in 2003. The objective of EERF was to stimulate investments in large-scale industrial projects by increasing the availability of debt financing for EE and RE projects while minimizing the loan costs to project developers. The EERF was initially funded with THB 2 billion (USD 50 million) from the ENCON Fund and was managed by DEDE. Funding was initially available to the large energy consuming "designated" utility (as required by the law), however it was later expanded to cover the commercial building and other industrial facilities.

The EERF initially provided credit lines at 0% interest in the range of USD 2.5 million to USD 10 million. Such credit facility is provided for the participating local banks to finance EE projects. As the financing volume increased, banks began to co-finance projects and the interest rate was reset to 0.5% to cover the administrative costs. Local banks were obliged to repay the principal and interest back to the EERF within 10 years. Local banks were able to provide low-interest loans that covered up to 100% of project costs but limited to THB 50 million (USD 1.4 million) per project. Loans were provided to developers of EE and RE projects and ESCOs at a fixed rate between 0% and 4% (compared to the market rate of 9%) with up to seven-year loan period. The repaid loans were used to finance new EE and RE projects. The scheme is called revolving fund.

Figure 6.9 Funding phase for EERF (2003-2013)



Source: Frankfurt School-UNEP

EERF is considered successful in stimulating local banks financing for energy efficiency and renewable energy projects; the sectors that were previously avoided by the bank. EERF was phased out in 2011 since DEDE believed that banks were already familiar with EE/RE lending practice and could continue the scheme without EERF. At the time EERF program was closed, there were 13 local banks that provided financing for 294 projects. The total investment was USD 521.5 million that consisted of USD 236 million from EERF and USD 285 million in debt financing from local banks.

Another funding window of ENCON Fund is the ESCO Fund. It began in 2008 with an initial budget of THB 500 million (USD 15.7 million) and was targeted at small-to medium enterprises and ESCOs. The Fund is sponsored by DEDE and is managed by two government-appointed-non-profit-organizations, the Energy Conservation Foundation of Thailand (ECFT) and Energy for Environment Foundation (E for E). With a fixed government budget, both Fund managers have the ability to co-invest in EE/RE projects and/or ESCOs, and also can provide assistance in securing funding from other co-investor.

The ESCO Fund has been implemented in 3 phases. Phase 1 of the project took place from October 2008 through September 2010 with a total ESCO Fund budget of THB 500 million (USD 16 million) with half managed by E for E and half by the ECFT. Phase 2 of the project took place from October 2010 through Sept 2012 with a total budget of THB 500 million (USD 16 million), and was recently extended until the end of 2013 with an expanded budget of THB 3.5 billion (USD 116 million). Phase 3 of the program is scheduled to begin in late 2013 with a budget of THB 500 million.

There are two financial mechanisms under the ESCO Fund:

a. **Equity investment.** Equity investment provides co-investment in EE/RE or green field project. In this case, project developer could sell specified amount to the investor (E for E or any private equity) in return for a certain stake in the future project profit. The equity finances the project and covers 10% to 50% of the total cost of a project investment but limited to USD 1.6 million per project. The internal rate of return (IRR) on projects ranges from 9-15% and is returned in the form of a dividend and/or exit price. However E for E requires an IRR of 13%-15% commercial projects with existing operating facilities, while new commercial projects require a discount rate (3%-4% lower from project IRR) but not less than 9%. The project payment period can be up to 5 to 7 years of the project period.
b. **Venture Capital (VC) for ESCO.** VC provides equity investments of up to 30% of the registered capital of the ESCO but is limited to THB 50 million (USD 1.6 million) per project. The investment payback period ends within 5 to 7 years, by which investors can exit the project by selling shares back to the entrepreneur,

finding a new strategic partner(s). Additionally it is required that investor has a seat on the Board of Directors for a period of up to 3 to 7 years.

c. **Equipment leasing can be utilized for both small and large EE and RE projects.** This mechanism allows the ESCO Fund manager to carry out an equipment purchase agreement with an ESCO. The terms of financing as followed:

   - The leaseholder (ESCO or project developer) will select an asset (equipment, vehicle, software);
   - The lessor (ESCO Fund Manager) will purchase that asset up to 100% of equipment costs, up to a maximum of THB 10 million (USD 325,670) per project;
   - The leaseholder will have use of that asset during the lease period of up to 5 years;
   - The leaseholder will pay a series of rentals or installments and interest (4% per year) for the use of that asset through revenue from the energy savings of the project;
   - The lessor will recover a large part or all of the cost of the asset plus earn interest from the rentals paid by the leaseholder; the leaseholder has the option to acquire ownership of the asset (e.g. paying the last rental, or bargain option purchase price).

d. **Credit Guarantee Facility.** The Credit Guarantee Facility provides partial credit risk guarantee to commercial bank that will provide loans on EE/RE project developed by SMEs. The Credit Guarantee Facility will cooperate with financial institutions and/or credit guarantee agencies to assist project developers or ESCOs in accessing long-term loans from banks by providing credit guarantees depending on the risk of the project and limited to THB 10 million (USD 334,000) per project. The project developers pay a fee to the guarantor (ESCO Fund manager) at 1.75% per year of the guarantee amount. Currently, the design of the mechanism involves the ESCO Fund manager in providing funds to commercial banks to on-lend to project developers or ESCOs, and provides the partial credit guarantee to the project developer. To date, this facility has not yet fully utilized.

6.2.2. Case Study 5: Small Firms Loan Guarantee Scheme (SFLGS) of England

Although England is a developed country, but when it comes to funding, similar problems occur, especially those related to all funding from any financial institutions in respected countries. England decided to establish a financing scenario in order to electrify villages. This financing scheme is called Small Firms Loan Guarantee (SFLG). This loan helps small entrepreneurs who came up with good

proposals, but do not have the capacity to provide guarantee as the requirement from related financial institutions. The guarantee itself can be accessed by directly borrowing money from the approved lenders who make all the commercial decisions on loan.

The annual report of SLFG acknowledges that there were around 4,5 million of SMEs in UK and around 1,7 million are VAT-registered. Around 23% of the SMEs sought external finance during 2006 with 75% successful rate but another 13% have failed to attract any external finance. Around 70% of the latter cases were found to have insufficient security as the principal factor. SFLG was designed to address a market failure in the provision of debt finance by providing a Government Guarantee to the lender in case the businesses with viable business plan are unable to raise finance because they cannot offer security for their debt. SFLG covers up to 75% of qualifying loans of up to GBP 250.000 with the terms between two to ten years. In return for the guarantee, the borrower pays to BERR (Department of Business, Enterprise and Regulatory Reform) an annual premium of 2% of the outstanding balance of the loan, assessed and paid quarterly. This scheme is available for qualifying UK businesses with an annual turnover of up to GBP 5,6 million. The facilities can be accessed by both new and existing businesses.

It is a joint venture between UKDTI and the appointed financial institutions. The fund is managed by Small Business Services (SBS), an entity under DTI. A feasible business proposal needs to be submitted to know how big the investment is.

6.2.3. Case 6: India's Renewable Energy Development Authority (IREDA)

6.2.3.1 Background

India is one of many countries with renewable energy potential, despite the fact that in 2010 there was still 25% of India's population that had no access to electricity. In 2010, India had also experienced the electricity shortage as much as 8,5% of its total energy supply. As a coal-driven-power-plant country, India has contributed around 4% of the global greenhouse gases emissions. India projected that the growth of installed electricity capacity will be 16 percent or around 80.000 MW from 2012 to 2017.

India has developed its national action plan on climate change that sets a target of attaining 15% of the renewable energy generation by 2020 relative to the 2008 output. But even with several policies that support the growth of renewable energy in India, a number of financial barriers exist, which include: limited access to capital, high cost of capital, lack of familiarity in financing renewable energy and energy efficiency projects, and loan mismatches for projects that require longer loan maturities relative to those available from the commercial banks.

6.2.3.2 Business Model

India has established a special entity to enhance the renewable energy investment. Indian Renewable Energy Development Authority (IREDA) was established as a public company under Ministry of New and Renewable Energy (MNRE) of India in 1987. The mandate of IREDA is to provide financing schemes to project developers and is partly funded by the national government. IREDA aimed to promote, develop, and extend financial assistance for renewable energy and energy efficiency, with motto: Energy for Ever. IREDA objectives are:

1. To provide financial support to specific projects and schemes for generating electricity and/or energy through new and renewable sources and conserving energy through energy efficiency.
2. To maintain its position as a leading organization in providing efficient and effective financing in renewable energy and energy efficiency / conservation projects.
3. To increase IREDA`s share in the renewable energy sector by innovative financing.
4. Improvement in the efficiency of services provided to *customer*s through continual improvement of systems, processes and resources.
5. To strive to be a competitive institution through *customer* satisfaction.

IREDA main capital comes from the government of India. IREDA's resources are also earned by issuing tax-free bond, and loans from commercial bank. In addition, IREDA also receives financial and technical support from various development organizations and foreign banks such as the German development bank (KfW), French development bank (AfD), Nordic Investment Bank (NIB), European Investment Bank (EIB), Japan International Cooperation Agency (JICA), World Bank, Asian Development Bank (ADB), and other international financial institutions, agencies and investors. From 2006 to 2010, IREDA's total funding grew by 70% from approximately USD 391 million to USD 665 million.

IREDA acts as a specialized financial intermediary by operating a revolving fund for promoting and developing renewable energy projects. IREDA offers innovative financing scheme, such as project financing up to 80% of project cost, equipment financing up to 75% of equipment cost, and other types of medium to long term debts (up to 12 years), with the interest rate of 5 to 12%.

Eligible sectors to be funded by IREDA include small hydropower, medium to large hydro projects above 25 MW, wind energy, bio-energy, solar energy, energy efficiency and energy conservation, biofuel and alternative fuels, and new and emerging technologies. The minimum loan amount provided is USD 90,000. IREDA also provides finance for rural electrification using Energy Service Companies (ESCO) model, and administers subsidies on behalf of other government programs.

Several financial programs under IREDA that can be accessed by eligible renewable energy and energy efficiency project developers are the following:

1. **Concessional loans:** the available loans in this category are up to 70% of the project costs or energy efficient equipment. Projects implemented through an ESCO are eligible for an 11,25% interest rate with a 10 year maturity, or a 10,25% interest rate with an 8 year maturity.
2. **Interest rate rebates:** under this scheme the renewable energy project developers are eligible for up to a 0,5 to 1% reduction in the set interest rate. Developers are also eligible for an additional interest rate rebate of 0,5% for timely payment of loan interest and principal.
3. **Financial assistance:** under this program the renewable energy project developers are eligible for a 50% discount of the initial costs of project implementation, including: processing, inspection, legal, and front-end fees related to renewable energy installations.
4. **Credit lines for commercial banks:** IREDA extends a line of credit to eligible financial intermediaries to lend and/or lease energy-saving equipment for a minimum of USD 46,000 and maximum of USD 184,000 with a 10% interest rate and 10 year payback period.
5. **Tax benefits:** developers are eligible for up to 100% of tax deduction for the recovery of depreciated property in the first year of the project on specified equipment. They are also exempt from import and excise taxes on energy efficiency and renewable energy technology. Some state governments provide financial assistance for conducting energy audits and provide tax exemptions for power generation projects.

6.2.3.3. Alternative Financing Model

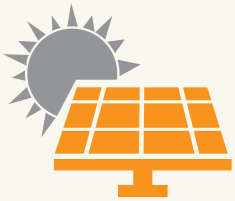
In the past, IREDA provided equity investment, loans and grants to private sector, solar PV manufacturer and marketer. This approach provided alternative financing mechanism for manufacturer and distributors/marketer to expand business to the potential consumers.

In 2009, IREDA introduces initiative to overcome credit availability barriers in the rural market for solar PV system. Initiative included arrangement for leasing system to households on monthly payment basis with maintenance and services included. Other approaches included providing loan for PV through existing micro-finance institutions.

© Papua-Solar PV training / WWF Indonesia

7. MOBILIZING SUSTAINABLE ENERGY FINANCE IN INDONESIA

7.1. Introduction



Globally renewable energy made up around 43.6% of new power capacity added to all technologies in 2013 and raised its share of total generation globally at 8.5% from 7.8%. Total investment for renewable power and fuels reached USD 214 billion in 2013 (BNEF, 2014)

Renewable energy is in fact a billion dollar business in the dynamic global energy market. The investment figures show an increasing trend with average annual growth during 2004-2013 reached 21%. Annual investment in renewable energy technologies such as solar, wind, and hydropower has surpassed investment in fossil-fuel technology in 2011. Globally renewable energy made up around 43.6% of new power capacity added to all technologies in 2013 and raised its share of total generation globally at 8.5% from 7.8%. Total investment for renewable power and fuels reached USD 214 billion in 2013 (BNEF 2014).

Renewable energy has a significant potential to supply the increasing energy demand of Indonesia. As discussed in previous chapter, Indonesia has abundant and untapped renewable resources. Besides producing clean power, utilization of renewable energy can also address the concerns of environmental and social impact of energy provision. It mitigates the greenhouse gases emissions that cause climate change, reduces poverty and creates jobs. Government of Indonesia has set an ambitious target in the supply side: to supply energy system with renewable sources over the next decades as a strategy for energy supply diversification in order to ensure energy security.

Mobilizing finance for renewable energy requires strategies to reduce or remove barriers to achieve an economically viable investment

Despite the government's ambitious plan to increase renewable energy uptake, investment in renewable energy remains, by far, the smallest segment in Indonesia's energy industry. According to Indonesia Investment Coordinating Board (BKPM), the realization of foreign direct investment for renewable energy in 2009-2013 only reached USD872 million [39] (BKPM 2014). Various finance related risks and barriers have failed to speed up the renewable energy investments. Most of renewable energy technologies have high up-front capital costs relative to conventional technologies. Typical off-grid plant has low return on investment, and longer payback period time. Not to mention the uncertainties of renewable resources quality in longer time; sun is not always consistent in producing the required heat, or wind does not always produces the required speed. All of these are coupled with lack of policies to address the externalities of energy cost. The existence of fossil fuel subsidies cause the investment for renewable energy becomes less attractive. Many investors or financiers are not ready or willing to invest at this high risk and low return option with less attractive investment climate.

As renewable technology is relatively new and rapidly developed, financial institutions are having lack of experience in evaluating risks that are specific to renewable energy projects.

7.1.1. Enabling Condition for Mobilizing Sustainable Finance

Mobilizing sustainable energy financing needs a holistic approach and an understanding that renewable energy market is unique and highly complex based on each country's situation. Financing responds to policy and regulatory signals that supports renewable energy. Investors and financiers need to have a reassurance of clear and strong market signals, which could be established through a set of national policy instruments. Unless there are clear public policies and regulations that are consistently implemented, as well as incentives that could reduce the existing risks and remove barriers for investment, complement by increasing the return of investment of renewable project, private investor will not consider that the investment on renewable is attractive. Mobilizing finance for renewable energy requires strategies to reduce or remove barriers to achieve an economically viable investment.

7.1. Characteristics of Renewable Energy Investment

Investment in renewable energy projects is different from conventional energy investment, due to some characteristics of renewable:

- Renewable energy can be very costly, especially in project development and investment cost. It has a very different cost structure with an extreme up-front share and usually very low operational cost.
- As renewable energy projects are very capital intensive, they are extremely sensitive to the structure and the conditions of capital cost financing.
- They often have insufficient data for prudent project analysis, due to lack of accurate reports on the supply of "fuel" (resources) at specific sites, i.e. solar insolation, wind speed, etc.
- This uncertainty and the limited possibilities to control some of essential factors like "fuel", creates a difficult risk profile with an elevated ratio of high risk factors or unclear risks, including the difficulties in guaranteeing cash flow.
- Most technologies are fairly new and therefore have a limited track record of reliability.
- Due to their time horizon, renewable energy has a very long exposure period to risk.
- To avoid further handicap of competitiveness in comparison to conventional power they need cash-flow adequate terms, i.e.
  - Long to extra-long maturities and
  - Interest rates in the lower range of the market.

Excerpt from Financing Renewable Energy (KfW 2005)

Unlike the conventional energy, investing in renewable energy has more risks; both real risks and perceived risks. Many projects are perceived by financial institutions to have high resources and technology risks. Project risk affects the amount, timing and availability of funds to finance a project. As renewable technology is relatively new and rapidly developed, financial institutions are having lack of experience in evaluating risks that are specific to renewable energy projects, particularly those institutions from developing countries.

In addition to the standard project risks (commercial and non-commercial), renewable energy project also has some risks that are related with various factors: technology, construction, operational performance, quality of "fuels" or resources, market, and regulatory risk, as well as macro-economy risks (see Table 7 1). Perceived risks usually related to consistency and longevity of policy and regulation for the sector, including country risks. These risks are often considered as factors on why investing in renewable energy is not as attractive as investing in conventional energy. Various detail risks of each renewable energy project based on its resources are presented in Table 7 1

Table 7.1 Risk Types of Renewable Energy, Source: KfW (2005)

Technology Risk	The risk that the proposed technology for the project does not work according to specifications or it works at a very high cost.
Resource/Fuel Risk	The risk that the fuels supply will be unreliable, resulting in the inability to generate energy in a predictable and dependable manner.
Construction Risk	The risks that project will never be completed at all, thus will never generate any revenue to repay the loan. It is also included the risk that the project does not constructed accordingly with the required specifications that leads to the shortfall in capacity and efficiency.
Performance Risk	The risk that the plant will not operate in accordance to the contractually prescribed requirement in terms of time and quantity.
Demand Risk	The risk that the energy that has been contracted for will not be needed as anticipated.
Regulatory Risk	The risk of future laws or regulations, or regulatory *review* or renegotiation of a contract, will alter the benefits or burden to either party.
Macroeconomic Risks	The risk related to macro-economy conditions, such as local currency devaluation, inflation, or increasing of interest rate.
Political risks	Political violence, expropriation or convertibility
Nature	Natural disaster, force majeure events

Table 7.2 Typical Risks of Different Renewable Energy Projects, Source: UNDP (2004), KfW (2005)

Geothermal	• Drilling expense and associated risks • Exploration risks • Critical components failure • Long lead times
Large-scale Photovoltaic	• Large up-front cost • Component breakdown • Weather damaged • Theft/Vandalism
Small hydro power	• Flooding • Seasonal/annual variability • Prolonged breakdown due to off-site monitoring
Wind power	• High up-front cost • Critical component failures • Wind resource variability
Biomass power	• Fuel supply availability and variability • Resource price variability • Environmental liability
Biogas power	• Resources risk • Planning opposition associated with odor problem

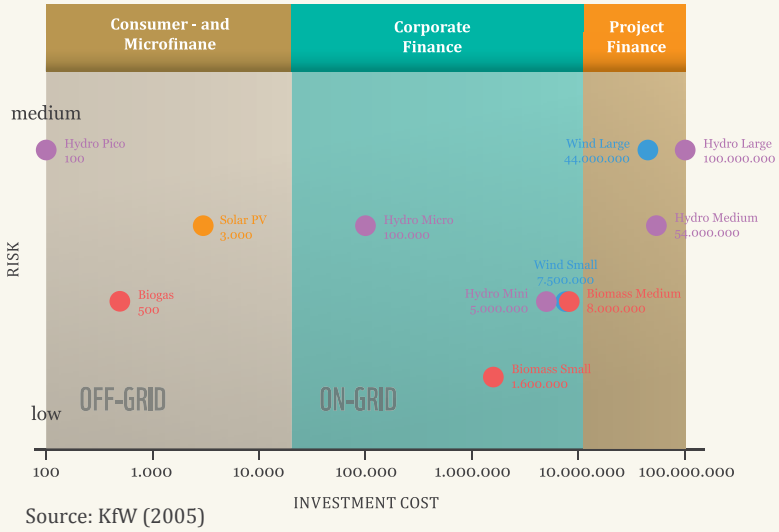
Capital requires good environment to function effectively. Any capital or investment requires nominal expected return based on the risk associated with project and risks where the capital is invested. By nature, renewable energy characteristics pose significant risks in investment, both actual and perceived (see box 1). The sound policy, regulation and public support could lower or remove those risks and thus will create a good enabling environment for investing. Some enabling environment aspects that need to be met by country are outlined as follows:

- Policy and Regulatory Framework, e.g. national policy target, access to the grid;
- Maturity of energy market, e.g. existence and scale of fossil fuel subsidy;
- Public finance mechanism, e.g. financial support from government budget, mitigation risks;
- Incentives, e.g. feed in tariff, fiscal incentives;
- Reliable partner and supply chain, this aspect relates to the reliability of the partner. In regards to supply chain, it is important to know how rigid the supply chain is, especially when it comes to technicalities, such as availability of spare parts.

Financing mechanism can be tailored to address general and specific risks for specific projects in order to meet expectation of financial return and determining necessary amount of investment and type of finance to cover risks. Based on the above risks, a mapping on types of financing scheme that will be appropriate for projects based on associated risks and investment costs for a number of renewable energy project (KfW, 2005), has been developed. There are three financing options that can be considered for renewable energy deployment:

- Micro-finance, which is suitable for small, household and off-grid RE facility that have low investment requirement and low to medium risk exposures.
- Corporate finance for small to medium on-grid RE project, which is suitable for medium scale investment with the size of investment between EUR 10,000 to EUR 10 million.
- Project finance for medium or large on-grid RE project, will be suitable for investment with the size of more than 10 million euro

Figure 7.1 Investment Cost and Risks for Various Renewable Energy

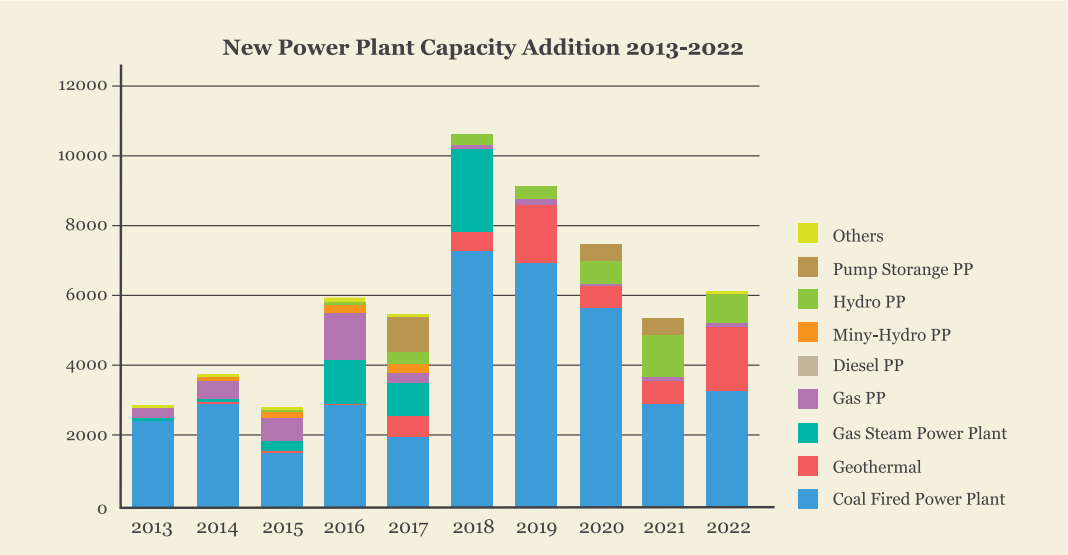


Source: KfW (2005)

7.1.1.1. Investment Required for Developing Renewable Energy

Electricity demand increases significantly. Electricity demand in Java-Bali will grow about annually. But as for outside Java-Bali, the demand grows more than 10% annually. In order to meet the electricity demand, the National Electricity Company (PLN) has developed Electricity Development Plan (RUPTL) that is annually updated. It refers to National General Electricity Plan that was issued by Ministry of Energy and Mineral Resources (MEMR). RUPTL estimated that the electricity demand of Indonesia would reach 385 TWh with electrification ratio of 97.7% by 2022 (See Figure 7.2). To meet the increasing demand from 2013-2022, PLN will need 59,518 MW of new additional power plants in the same period.

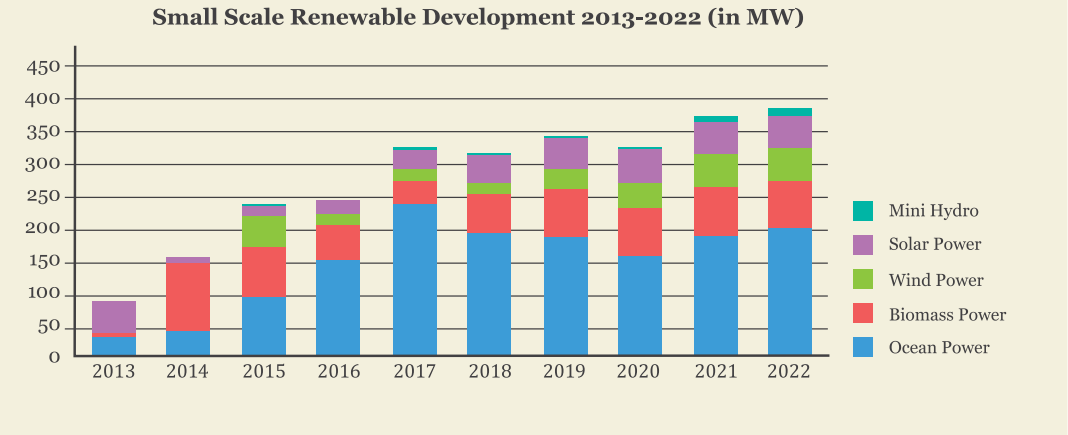
Figure 7.2 New Additional Power Plant Capacities 2013-2022,



Source: PLN's Power Supply Business Plan 2013-2022, IESR's Analysis

Figure 7.2 shows that the new additional power plant capacity is dominated by coal power plants. However, capacity of renewable power also increases substantially by 2022. About 64% or 38,000 MW of the new capacity will be supplied by coal power plants, and about 24% or 14.531 MW capacity will be supplied by various renewable energy, mostly from geothermal and hydropower. Development of other renewable that are considered as small scale renewable power plants, consist of mini hydro, solar, wind, biomass, and ocean are accounted for 4.6% of total new additional capacity or 2,766 MW (see Figure 7.3).

Figure 7.3 Small Scale RE Development 2013-2022



Source: PLN's Power Supply Business Plan 2013-2022

Total investment required from 2013 to 2022 to build renewable power based on RUPTL 2013 is in the range of USD 38.1 billion to USD 45.3 billion, it is about one-fourth to one-third of USD 125 billion investment to add 59 GW power plants. This figure consists of investment requirement for small-scale renewable power plants, including bio-diesel power plants that are estimated to be around USD12.61 billion. Investment required for building 5.7 GW hydropower and pump storage are estimated USD 10.5 billion to 12.7 billion. For 6 GW geothermal, investment required for power plant is estimated from USD 18 billion to USD 24 billion.[40] This figure only accounted the development of power plants that are already in PLN's development plan, and has not yet counted the investment for transmission and distribution.

Table 7.3 Investment requirements for renewable power development

Renewable Energy	Capacity (MW)	Estimated Investment (in billion USD)
Geothermal	6,060	18 - 24
Hydro Power and Pump Storage	5,694	10.5 – 12.7
Small scale (mini-hydro, solar, wind, biomass, ocean, biofuel)	2,766	12.61
Total	14,520	41.11 – 48.31

Source: PLN RUPTL (2013), IESR's calculation (2014)

7.2. Barriers of Geothermal Energy Financing in Indonesia

Indonesia has the largest geothermal power in the world, with estimated potential of 28.5 GW. However, only 5% of this potential that has been tapped. Geothermal Road Map (2007) aims to develop 6000 MW by 2020 and 9500 MW by 2025. Data from existing and new fields suggested that there are potential of 15,000 MW new capacities that could be added if financing is available (Girianna, 2013). Bappenas estimated that the development of geothermal power plants in 54 fields where these resources are located, requires around USD 75 billion of investment.

There are great interests to invest in geothermal project. Nonetheless real investment has been limited thus far. WRI (2013) suggested that the following barriers deterred investment in the geothermal sector:

- Policy framework that favors conventional energy sources, including subsidies for oil and coal based electricity
- Lack of regulatory framework for renewable energy pricing, requires developers to negotiate a power purchase agreement (PPA) on a case-by-case basis with the state-owned utility (PLN), which had no obligations to buy renewable electricity and no incentive to do so, given its higher price
- Lack of Government management and planning capacity for geothermal energy at the national and local government levels (World Bank 2008)
- Insufficient domestic technical capacity among industry for geothermal development (World Bank 2008)

- Lack of access to finance for geothermal projects due to the high risk perceived by financial institutions
- High costs and risks associated with exploration of geothermal resources, which had to be borne by the developer (World Bank 2008)

Government of Indonesia was aware of those barriers, particularly on the risk of exploration of geothermal resources. GoI initiated Geothermal Fund Facility (GFF) in 2011 and allocated around USD 145 million (Rp. 1.127 billion) that was deducted from the national budget as a seed fund. By the end 2013, the GFF has accumulated Rp. 3.1 trillion (USD 300 million) of seed fund. The fund is managed by Indonesia Investment Agency (IIA), an investment and financial company under the Ministry of Finance. The Fund aims to improve adequacy data from preliminary survey, and provide supporting data for further development. The Fund is only available for those projects that use the Public Private Partnership scheme, and the costs of the survey and the initial exploration will be recovered through data compensation to bidders and drilling cost reimbursement to the winning bidder. Having data on resource availability enhanced, will make the geothermal risk to be more defined and manageable when the working area is offered for tender, resulting in more accurate pricing. However until early 2014, GFF has not yet operational.

7.1.2. Delivery Rural Energy Service

Rural or remote areas are often disadvantaged due to the lacking in all basic services: road, clean water, telecommunication and energy. With regards to energy, electricity provision has potential to provide conditions to improve the productivity and provide opportunity for rural population welfare. Because its vital role in advance development and generate social benefits by enabling other basic services to perform and delivered such as health, clean water supply, and telecommunication, electricity services provision is highly desired by rural communities and development program. Other type of energy for cooking such as cleaner cooking fuel could improve the people's quality of life by reducing health impact of using traditional biomass or low quality fuel, particularly to women and children. In some cases, alternative fuel such as biogas and bio-charcoal could reduce energy cost caused by using kerosene as fuel for cooking.

Rural energy service delivery should be accompanied by different strategy due to some unique challenges that are location-specific, such as conditions of rural people, development, and their need of energy. Rural electricity provision requires a number of conditions at the institutional level to ensure the successful and sustainable service expansion due to its unique challenges. In general, challenges for rural electrification is outlined below. More detailed challenges can be found in Box 7.2:

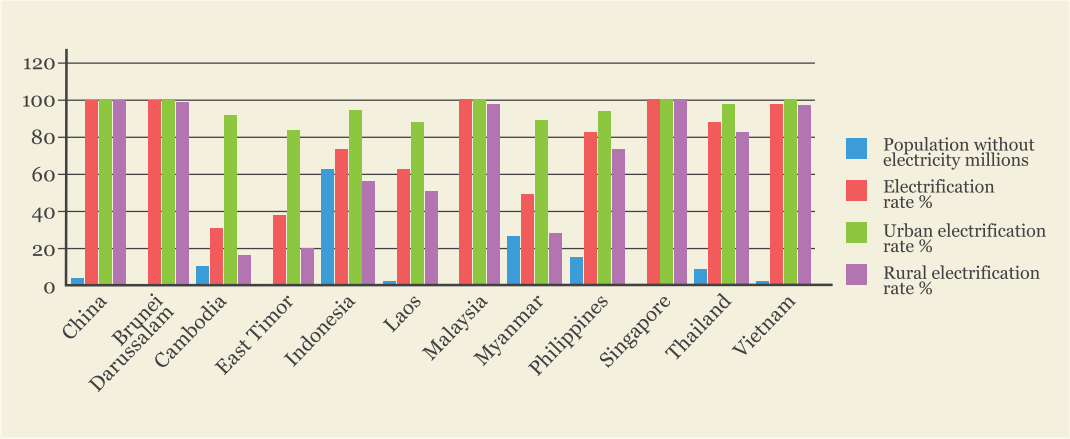
- Rural population is dispersed in remote areas. The access is difficult and geographically, rural area is very challenging. Due to these factors, providing centralized electricity service (e.g. using

centralized grid) might be difficult and uneconomical.

- Cost of decentralized technology is relatively higher, such as solar PV or micro-hydro power technology.
- Transaction cost of providing energy services in rural area is high, resulting in higher price of energy/electricity.
- Poor affordability, as many rural people live in poverty due to low economy or low income-generating activity.

Indonesia's rural electrification is relatively low compared to others neighboring countries in Southeast Asia. Rural electrification has been one of the focus programs of the Government of Indonesia (GoI) since late 1980s, marked by assigning PLN to conduct the program. In the Five Year Development Plan (1989-1994), the state-owned electricity company, PLN, planned to electrify 11 thousand villages. After the completion of five year plan, GoI requested bilateral and multilateral cooperation such as World Bank and JICA to continue the rural electrification program, by installing scattered diesel generator and micro-hydro power for off-grid application.[41] With all the efforts, IEA (2012) reported that Indonesia's electrification rate is 73% in 2010;the rural electrification rate is 56% and urban is 94%.[42] Based on this data, there are about 56 to 57 million rural population who still have no access to electricity. Considering the rapid development of rural electrification program since 2010 to date, this number could be lower today, which is estimated 48 to 50 million. Around 50% of the un-electrified population are living in electrified areas and would need grid intensification. Total village without electricity in 2012 is 10.211 in which around 401 are located both in Java and Bali.[43] Since late 2000s, rural electrification program funded by GoI have been shifted to grid extension. At the same time PLN has been starting to develop decentralized power in areas where renewable energy resources are available locally and feasible to develop (Winoto, et al, 2012; PLN, 2012).

Figure 7.4 Electricity Access in Developing Countries in Asia (2010)



Source: IEA (2012)

Difficult geographical conditions and hard terrain cause rural or remote areas to be less accessible, disperse population, relatively low level of economic development, and poor education are considered as major factors that hinder rural electrification program. Providing electricity to rural population living outside Java and Bali are challenging and in many case uneconomic due to high investment cost, low return, and high risk. Density and ability to pay determined the viability of the project. The population densities in a number of islands in Indonesia where electricity services are not available are low. Bappenas (2009) reported that based on 2008 data, the average density of rural areas in Papua is 12 people per km2, as for Maluku is 49 people per km2, Kalimantan 88 people/km2, while density in Java and Bali is 5131 people per km2. Due to these conditions, technology options are rather limited when economics consideration is applied. Grid connection often is not feasible. Combination of poverty and low level of education make the benefits of rural electrification could be reaped by the poor because the limited use of electricity, which is mostly for lighting. All households use it for this purpose, and many use it for little else. Rural electrification can be an impetus to support small business and other productive activities. Therefore a complementary program to support rural electricity consumer to enhance electricity utilization for productive use, e.g. capacity development on small business, provision of mechanical equipment for agricultural processing, access to finance, etc., is highly required.

From resources and technology perspectives, rural electrification can be delivered through various means by considering their economics, social and environmental impacts to the rural population. Renewable Energy Technologies (RETs) based electricity supply, are seen as more appropriate and environmentally friendly and could promote local community participation. Fossil fuel based technology, such as diesel generator could be expensive and contribute to climate change. Rural electrification has biggest effect if it is used for productive use (e.g. process agricultural product, coffee processing, etc.) and social infrastructures (e.g. health facility, school, rural internet, etc.). Therefore design of rural electricity project should take into account its utmost impacts and benefits to rural population. Various technology options for rural electricity are listed in Table 7 4.

Table 7.4 Rural Electrification Approaches and Its socio-economic dimension,

Electrification Approach	Renewable Energy Technologies	Potential Use of Electricity	
Solar lanterns	Solar PV	Households purposes	Light and mobile phone charging
Households based system	Solar PV Wind Pico-hydro	Households purposes	Light and mobile phone charging Cooking, cooling and entertainment of single households
Village grids	Solar PV Wind Micro-hydro Biomass Hybrid (diesel & batteries) Diesel generator	Households purposes	Light and mobile phone charging Cooking, cooling and entertainment of single households
		Productive use	Machinery
		Social infrastructure	Health clinic, School, ICT
Grid extension	Mixed, depending on national electricity mix	Same as village grid, but depending on grid's reliability	

Source: Adapted from Blum (2013)

The rural electrification is not profitable business in nature therefore it requires specific financing mechanism depends on project economics. Based on experience in a number of countries there are some possibilities to finance rural electrification projects, particularly for off-grid. The most commonly options applied in ASEAN are private financing, financing through public utility, government financing, and PPP (ACE, 2012). All of these financing options need policy and regulatory support from government (Table 7 5). However in most cases, rural electrification is not the sort of investment that is going to attract private investors to maximize their return. Therefore, private investment options per se might be limited. In many countries, government or development organizations/donor agency subsidize rural electrification projects through grant and concessional loan. The mechanism for this can be done in several ways: (1) creation of specific fund, such as Cambodian's Rural Electrification Fund that set up to finance rural electrification program in the country; (2) annual budget allocation

dedicated for such funding such as in Indonesia, government allocated budget annually to extend grid and task the state-owned utility to do so, and as well as pay for the connection charge for poor rural households; as well as specific allocation fund for supporting small scale, off-grid renewable projects in rural area.

Table 7.5 Financing mechanisms for off-grid rural electrification and support policies,

Financing mechanism	Financing sources	Key support policies required
Private financing	• Equity • Commercial and/or soft-loans	• Market-based electricity pricing policy in target areas • Clear legal framework on private financing in off-grid rural electrification • Indirect subsidies (VAT exemption, income tax holiday, etc.) • Soft-loan policy for RET-based
Public power utility financing	• Equity • Commercial and/or soft-loans	• Inclusion on off-grid electrification into utility's work program (e.g. through regulation) • Policy on cross subsidized tariff • Indirect subsidies (VAT exemption, income tax holiday, etc.) • Soft-loan policy for RET-based rural electrification projects
Government financing	• Government budget • International/local grant (ODA) • Local/international long-term soft loans	• Policy on off-grid rural electrification • Institutional set-up to implement off-grid rural electrification program • Financial incentives including direct and indirect subsidies
Public Private Partnership (PPP) financing	• Private financing • Government budget • Loans	• Grants (e.g. project preparation, seed investment, etc.) • Soft loans policy for RE-based rural electrification • Financial incentives including direct and indirect subsidies

Source: ACE (2013)

As public resources become scarce and cost for rural electrification is getting higher, financing rural electrification shall consider optimizing the allocation of public fund and the use of public fund to leverage private investment in order to bring electrification faster to the rural population. Combination of public fund source and private finance can be used to structure finance whenever the project is economically viable, that includes the ability and willingness to pay of the rural energy consumers at the tariff level that is determined by the project.

7.3 Challenges in rural energy provision

Providing energy for rural area has different challenges than providing energy to urban. Rural area has smaller market and higher risks. Delivery energy provision to rural area must address six key challenges:

1. High capital investment, longer payback period, which can be caused by:
    - High cost to mobilize workers, transporting material, etc.
    - Energy per unit cost, including transportation of material to the site, is higher compare to other system.
    - Ability to pay of local community is lower that makes tariff might not be able to cover production cost.
    - Payment for the investment. It is unlikely for rural energy provision/delivery projects to access the commercial financing scheme. Therefore other financing scheme is highly needed that could cover the capital cost and operational cost to deliver rural energy services.
2. Operational cost is relatively high due to:
    - Low energy consumption/demand. Without productive end-use or industries, energy consumption only comes from domestic uses (households). Without sufficient capacity factor, this means that the cost to generate the energy is relatively high.
    - Low collection rate or low return of investment.
    - High maintenance cost. It is high because the spare part needs to be imported or bring in from other location. Ideally, the operational cost for renewable energy is low, but since the location is in rural area, then the cost could be expensive to transport the equipment.
3. No or low subsidy from government that makes:
    - No subsidy for private enterprise. Subsidies are available only for the National Electricity Company, but none for private, even if they would like to build a power plant in rural areas.
    - Lack of interest from the private sector. Moreover, the Government is also lacking in providing subsidies for operational costs. The existing subsidy is used to build grids.
4. Uncertainty in grid connection
    - Uncertain in grid development. If previously there is no grid, then it cannot be guaranteed that the grid will be available in the near future.
    - Increase risk of project investment. The unavailability of grid will be perceived as risk, since without grid, there won't be any possibility to increase the revenue.
5. Regulation requires private enterprise to supply state-owned power company
    - Increase transaction cost
6. Risk associated with State Owned Enterprises (PLN), as small electricity producer has to sell the electricity to the grid owned by PLN. The main risk is grid reliability that could affect generator performance and revenue flow.

7.2. Existing Source and Modalities for Sustainable Energy Financing in Indonesia

Renewable energy programs and projects require various financing modalities for its development. Most of physical renewable energy supply and infrastructure that are built in community level that are not viable economically, but politically and socially important for government, are funded through public finance instrument. Private renewable energy projects (e.g. IPP) that have more commercial value and economically viable are getting project financed through debt/loan instruments from financial institutions both domestic and international with de-risking instruments provided by government of Indonesia. The followings are the existing renewable energy financing instruments in Indonesia.

Combination of public and private finance can be used to structure finance whenever the project is economically viable, that includes the ability and willingness to pay of the rural energy consumers at the tariff level that is determined by the project.

7.2.1. Public Finance Support Mechanism

Government of Indonesia has been using public finance instruments to support renewable energy development since early 1990s. Public finance support mechanism for renewable energy projects mainly comes from government (public) funding and grant or loans from international donor and foreign country through development cooperation.

Funding support from central government for renewable energy development derives from government revenues in treasury that is allocated in the Annual State Budget and Expenditure (APBN) or Annual Local Budget and Expenditure (APBD), and executed or implemented by ministry/agency or local government unit. The one that executed by Ministry of Energy and Mineral Resources (MEMR) is allocated in the program budget under the assigned Directorate General (DG), such as DG for New, Renewable Energy and Energy Conservation, and DG for Electricity. Aside of MEMR, other ministries also carry out various type renewable energy at the local level.

In general, the Public Support Mechanism for renewable energy has been delivered in the form of (a) grant and capital subsidies; (b) debt finance; (c) risk mitigation instrument.

7.2.1.1. Grant and Capital Subsidies

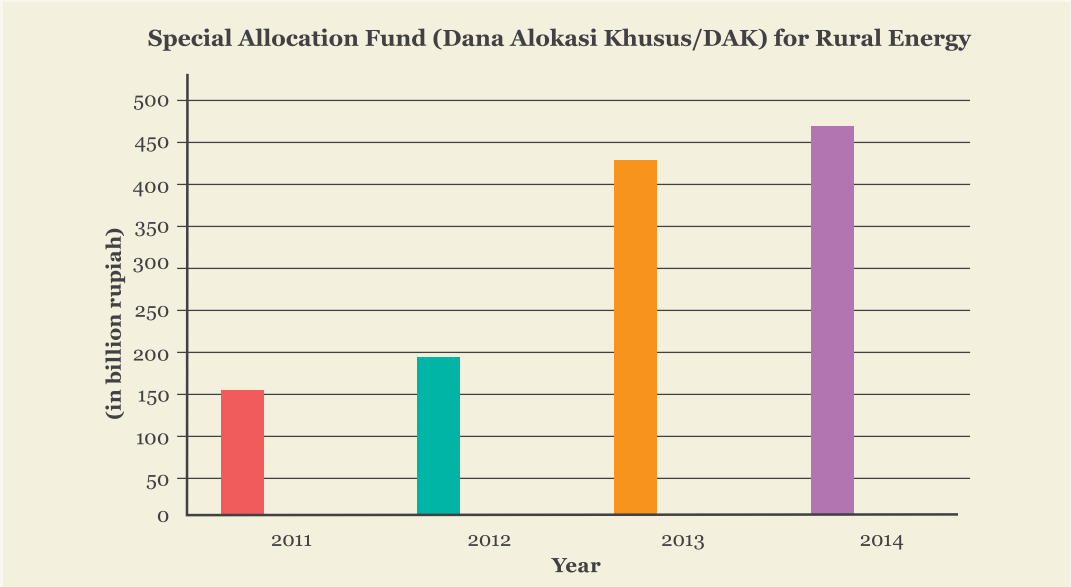
7.2.1.1.1. Special Allocation Fund (Dana Alokasi Khusus/DAK)

Special Allocation Fund (SAF) has been used as a mechanism to finance specific activities by local government. Primary objective of SAF is to improve the provision of public services that have not met certain standard. Since 2011, the Government of Indonesia introduced a Special Allocation Fund for Rural Energy (SAF-RE) in the State Annual Budget, allocated under the budget line of Ministry of Energy and Mineral Resources. Previously it was called as SAF for Rural Electrification *(DAK Listrik Perdesaan)*. This fund is distributed to a number of local governments to support development of renewable energy. The fund is eligible for constructing physical infrastructure of off-grid renewable energy installations, such as: micro or mini-hydro, centralized solar photovoltaic and solar home system, development of mini-grid, and household biogas unit in rural areas where the electricity services are unavailable. The fund is also eligible for revitalization of broken micro or mini-hydro plants and solar photovoltaic unit. Local government who is eligible to receive this fund must prepare at minimum 10% matching fund to support the physical infrastructure development. The amount of SAF-RE has been increasing significantly since 2011 and has reached around 460 trillion rupiah (USD 45 million) in 2014.

Aside of SAF-RE, renewable energy project also can be financed through Special Allocation Fund for Environment (SAF-E), allocated under the budget line of state Ministry of Environment. SAF-E can finance activity that supports development facility and infrastructure for climate change adaptation and mitigation, including the use of renewable energy technology to meet this objective. The budget for SAF-E has been increasing significantly from Rp 113 billion in 2006 to Rp 530.5 billion (USD 50 million) in 2013.

Despite Special Allocation Fund usefulness to directly support the development of physical infrastructure, the fund is limited to use since it cannot be spent for some activities, including project preparation, training, and administrative works.

Figure 7.5 Special Allocation Fund for Rural Energy Development



7.2.1.1.2. Grant from central government to local government

Another instrument that is being used to support renewable energy is grant from central government to local government. Grant to the local government can be delivered in two forms: grant from domestic revenues and grant which source of fund comes from grant or loan extension from foreign donor or foreign country. In addition to that, funding from foreign grant can be delivered through trust fund mechanism.[44]

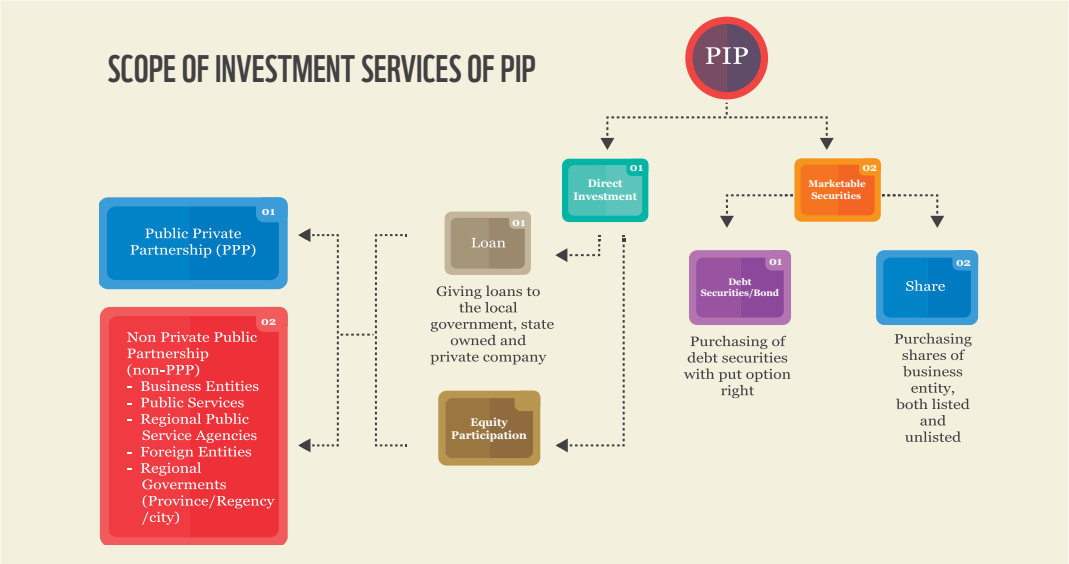
7.2.1.2. Debt finance

7.2.1.2.1. Concessional Loan from Indonesia Investment Agency or Pusat Investasi Pemerintah (PIP)

Ministry of Finance (MoF) established the Indonesia Investment Agency or Pusat Investasi Pemerintah (PIP) with the objective to accelerate the infrastructure development. This unit was established in 2007 through Ministry of Finance Regulation Number 52/PMK.01/2007. According to Ministry of Finance Decree No. 91/KMK.05/2009, PIP is considered as a Public Service Unit (BLU).

PIP Fund comes from state budget, accumulated investment return, trust fund and other legitimate sources. PIP provides loans and equity participation to PPP and non-PPP projects that are sponsored by local government, business entities such as state-owned enterprises, and local government-owned enterprises, or private companies. PIP also can invest in marketable securities in the form of bond and purchasing shares in a project or company (see Figure 7 6)

Figure 7.6 PIP Scope and Investment Services



Source: PIP (2013)

Government Regulation No. 1/2008, Ministry of Finance Decree No. 177/2010 provided legal basis for PIP to support environmentally friendly project. With this mandate, PIP expands its financing scope from traditional infrastructure such as road, transportation, telecommunication, and electrification to the renewable energy installations. PIP has focused on certain renewable technology, started with mini-hydro power plant in 2012 and later expanded to other renewable technologies. PIP could also finance other renewable and clean energy projects such as biomass power, waste to energy, solar and wind power, and energy efficiency project.

Interest rate for loan from PIP is relatively competitive compare to typical commercial loan from general bank. PIP loans interest is BI rate + 2%, with longer term of loan payment with grace period. This scheme could increase financial feasibility of the project.

As in other transfer schemes from the central government to the local government, the local government would need to provide co-financing for loan scheme from PIP to ensure the commitment of the local government to the project. In addition, through the loan provided by PIP, local government is required to pay an interest rate in addition to the loan principal. The loan from PIP is also guaranteed by General Allocation Fund (DAU) or Revenue *Sharing* Fund (DBH).

By 2013, PIP has allocated Rp 450 billion (USD 40 million) to finance renewable energy projects but it has difficulty to channel loans to any renewable projects. One of most contingent issues is the quality or character of those potential lenders.[45] Most of hydropower developers are new companies that lack of or do not have audited financial report with qualified opinion for three years. This limitation has made them failed to comply with the requirement of PIP.[46]

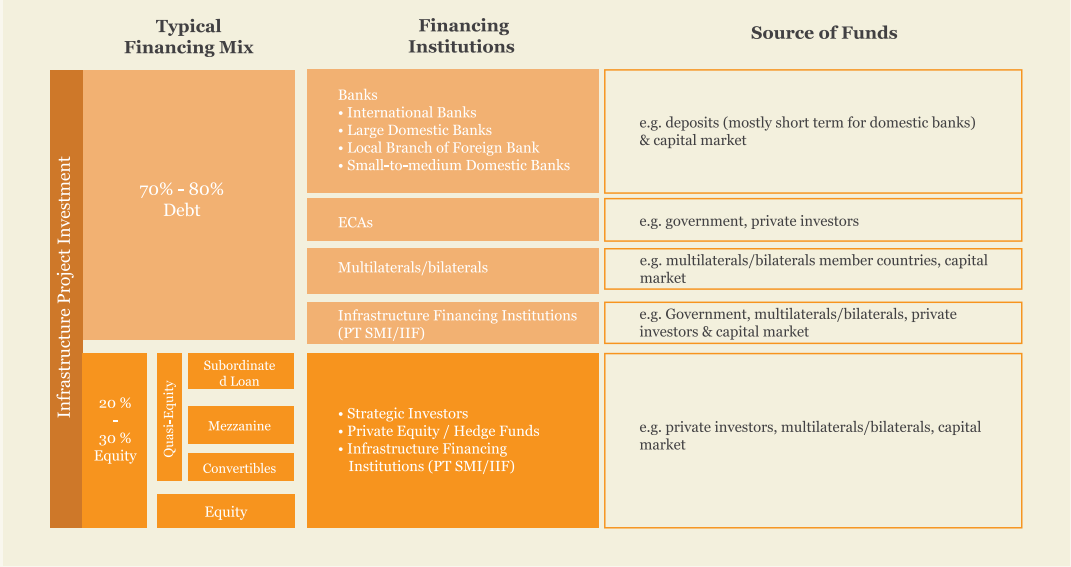
7.2.1.2.2. Commercial Financing Instruments Provided by PT Sarana Multi Infrastruktur

PT Sarana Multi Infrastruktur (SMI) is a state-owned financial company established in 2009 with the purpose of becoming a catalyst for accelerating infrastructure development in Indonesia. PT SMI is established through the Government Regulation No. 66/2007, amended by Government Regulation No. 75/2008. PT SMI is 100% owned by Government of Indonesia through Ministry of Finance. PT SMI's business license came from the Ministry of Finance Decree No. 396/KMK.01/2009. PT SMI has authorized capital of Rp 16 trillion, with paid in capital of Rp 4 trillion.

Government of Indonesia through SMI can absorb and manage certain risks that are considerably high to minimize risk exposure to the investor and create more bankable projects. To perform its duties, PT SMI acts as a catalyst or facilitator between project owner and project investor/financier through its various financial services to deliver a structured project financing. By using its financial product such as term loan, bridge loan, and sub-ordinate loan, PT SMI could mobilize additional private financing from various sources: international financial institutions/multilateral development banks (MDBs), international banks, private equity, and international funds.

Until mid of 2014, PT SMI has provided a total financing commitment of Rp. 4.47 trillion with total project cost of Rp. 45.7 trillion. During its five-year operational, the biggest financing by PT SMI is in electricity sector with the portion of 39% from the total financing in which 18.75% of it or about Rp. 4.4 billion of total project cost is allocated for renewable energy project. About 225 MW capacity of renewable energy project has been financed since 2005 until 2013.

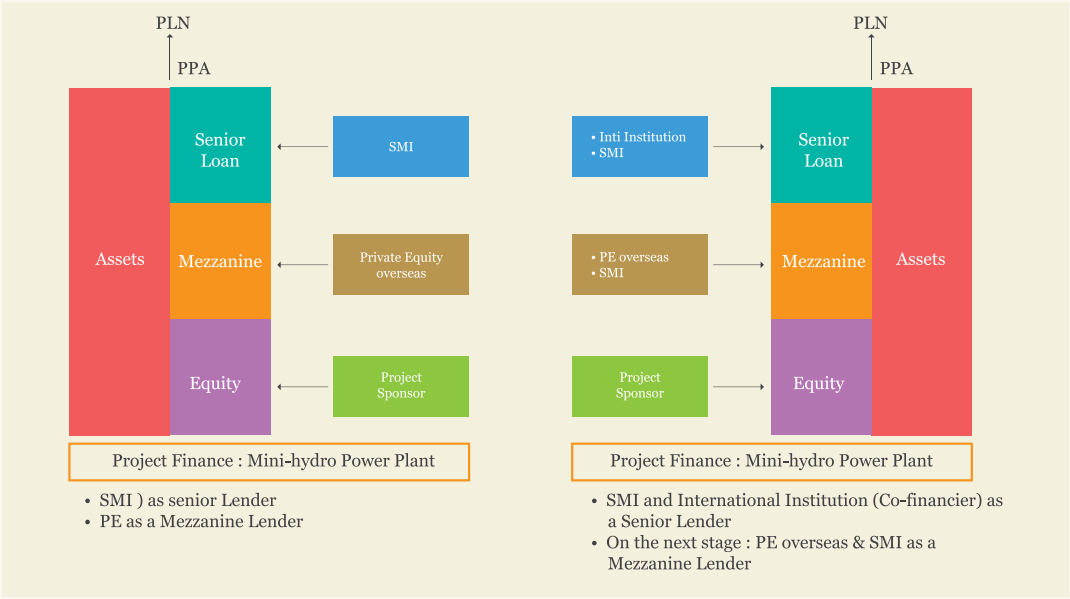
Figure 7.7 Source of Finance for RE Projects and Role of SMI



Source: PT SMI (2014)[47]

In 2010, PT SMI with IFC, ADB and DEG established a subsidiary company called PT Indonesia Infrastructure (IIF). IIF is a private non-bank financial institution formed by and under the Ministry of Finance of the Republic of Indonesia. The establishment of IIF aims to increase supply of finances for PPP infrastructure project that require long tenor or long-term payback period. Licensed under the Minister of Finance Regulation (PMK) No. 100/2009, IIF is professionally managed and focused on supporting and investing in commercially feasible infrastructure projects through loan, equity finance, and credit enhancement.[48] Similar to SMI, IIF also finances various infrastructure projects, includes renewable-based power generation.

Figure 7.8 Financing Structure for Mini-Hydro Plant



Source: PT SMI (2014)[49]

7.2.1.3. Risk Mitigation Instrument

7.2.1.3.1. Geothermal Fund Facility (GFF)

In 2011 Government of Indonesia established the Geothermal Fund Facility (GFF), a risk mitigation instrument to reduce or mitigate risk of geothermal exploration. GFF is a financing instrument for supporting geothermal exploration through loan and exploration data on geothermal reserve potential that are verified by international consultation. This facility runs as revolving fund scheme to provide potential developers and investors with sufficient, high quality information (temperature and chemical characteristics and potential reserves) of pre-selected green field geothermal sites.

IIA/PIP has been assigned by the Ministry of Finance to manage a total of Rp. 3,1 trillion initial capitals from this fund. GFF Objectives

are as follows:

- To enhance data adequacy from the preliminary survey in order to reduce and mitigate exploration risks on the development of geothermal power plant projects (GPPPs);
- To provide supporting data for tender documents of working areas to be offered with public private partnership (PPP) scheme, and/or;
- To provide financing support for exploration activities aimed at accelerating GPPPs development in Indonesia.

As potential developers and investors are provided with sufficient and credible information on green field geothermal sites that will be offered during the tendering process of new areas, the costs of conducting the survey and initial exploration would be recovered in various forms, including data compensation to be paid by the participants in the tender process and reimbursement of the drilling costs by the winner. This payment then will go back to the facility and will be made available for other participants or investors.

It is expected that the GFF may make the risks of geothermal project to be more measurable. Thereby it should reduce the expected cost and project's IRR, as well as smoothen financing mobilization for the project, which will translate to lower tariff with the off-taker (PLN).

Local government who will be issuing geothermal business permit through bidding process to holders of geothermal business permit (IUP) and holders of geothermal power concession before the 2003 Geothermal law, are eligible to access GFF. Project that has been declared as prospective by MEMR and project that has been listed in the Annual Electricity Provision Plan (RUPTL) are eligible to be funded. Each project could have loan up to USD 30 million from GFF with interest as much as BI rate when the loan agreement is signed.[50]

Until the first semester of 2014, PIP is still carrying out preparation to enable GFF to be fully operational. The preparation includes procurement for consultants, preparation for manual, preparation of MoU between MoF and MEMR, Agreement between PIP and Geological Agency, and internal capacity building. It is expected that the first disbursement will take place in second semester of 2014.[51]

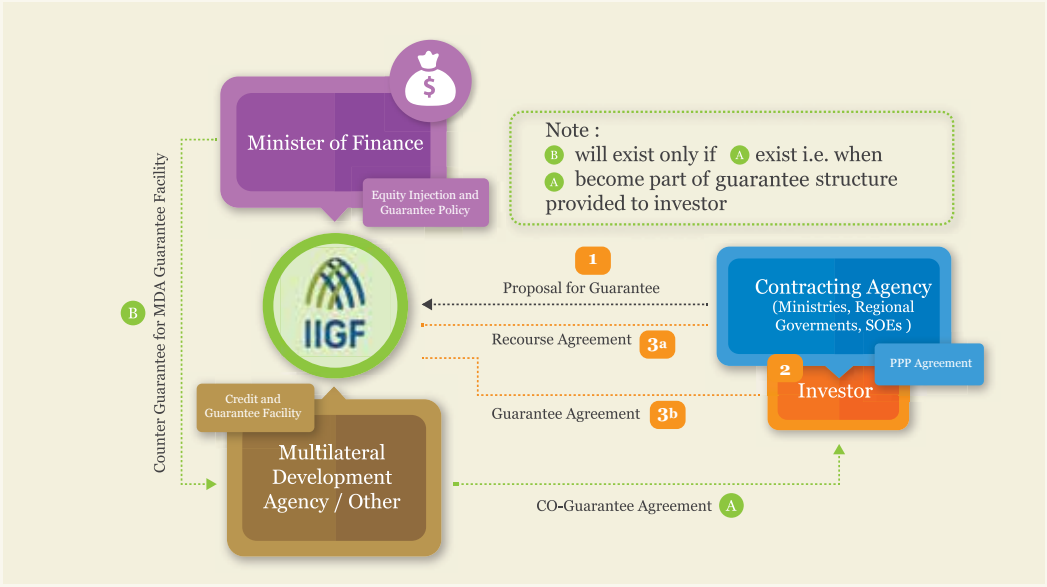
7.2.1.3.2. Indonesia Infrastructure Guarantee Fund (IIGF)

Presidential Regulation No. 13/2010 states the existence of contingent support for PPP Project in the form of Government Guarantee, which will be granted by the Minister of Finance. The Minister of Finance through an Infrastructure Guarantee Business Entity gives this contingent support or guarantee. Indonesia Infrastructure Guarantee Fund (IIGF)/PT *Penjaminan Infrastruktur Indonesia* (PII) established in 2009 to perform this task.

IIGF is a state owned company acting as a single window for appraising, structuring, and providing guarantees for Public Private Partnership (PPP) infrastructure projects proposed by government contracting agencies (Ministry, Local Government, and SOE). IIGF acts as the Guarantee Provider to the private sector for various infrastructure risks that may occur because of the government's actions or inactions, which may result in financial losses to the PPP infrastructure projects, such as delays in the processing of permits and licenses, changes of rules and regulations, lack of tariff adjustment, failure to integrate the network/facilities and other risks that are borne or allocated to the government in each PPP contract.

This guarantee is expected to give a quality value on the infrastructure projects, which will attract the banks and other private financing entities to finance the project and reduce the costs of infrastructure projects financing. By having this guarantee structured, it will enable the Indonesian Government to manage its fiscal risks better by ring fencing the government obligations vis a vis guarantees.

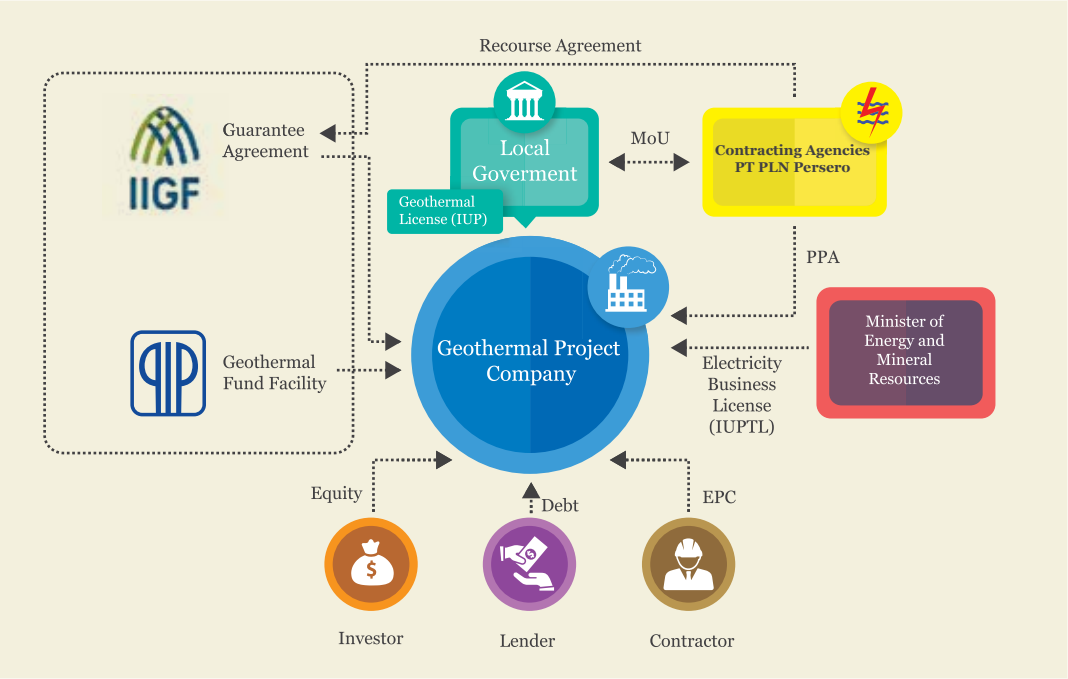
Figure 7.9 IIGF Business Model



Source: IIGF (2013)[52]

IIGF guarantee instrument can be applied for various infrastructure projects: transportation, toll road, electricity, water supply, waste water, telecommunication, irrigation and selected oil and gas projects. IIGF can potentially guarantee large-scale renewable energy PPP project such as geothermal, hydro, biomass and large-scale wind and utility of solar PV in which PLN is the off-taker. Combination of IIGF instrument and GFF can be applied to minimize the risks of geothermal power project, thus make it more bankable (Figure 7.10)

Figure 7.10 Application of Risk Mitigation Instruments for Geothermal Project



Source: Center for Fiscal Risk Management, MoF (2013) [53]

7.2.1.3.3. Government Guarantee for non-PPP FTP-2 Project

Government of Indonesia provides government guarantee for non-PPP renewable project that includes in the Fast Track Program 2 (FTP-2) based upon the Presidential Regulation No. 4/2010 and the Minister of Energy and Mineral Resources Regulation No. 1/2012. The later lists all power plants (IPP) that are eligible to obtain the government guarantee. Government through the Minister of Finance provides an off-take guarantee for the business feasibility of PLN to meet its financial obligation to IPP during the overall periods of power plant operation as agreed in the PPA. With this guarantee, Ministry of Finance could interfere in the event when PLN fails to meet its financial obligation or default.

By early 2014, there have been 5 geothermal private projects receiving guarantee letter from the Minister of Finance with total amount of USD 3.5 billion.

Table 7.6 Recipient of Government Guarantee

Project	Recipient	Amount (USD)
PLTP Rajabasa	PT Supreme Energy Rajabasa	663,328,250
PLTP Muaralaboh	PT Supreme Energy Muaralaboh	602,669,500
PLTA Wampu	PT Wampu Electric Power	174,168,238
PLTP RantauDadap	PT Supreme Energy Rantau Dadap	664,049,500
PLTP Sarulla	Sarulla Operation Ltd	1399.486,000
Total		3,503,701,488

Source: MoF (2014)[54]

7.2.2. Overseas Finance/International Finance

7.2.2.1. Grant and Technical Assistances (TAs) from Foreign donor to Government, Non-governmental Entity, and Community

Some international donor agencies, development agencies or private charity also provides grants or subsidy to renewable energy projects. The grant is delivered through government, NGOs, community-based organization, and private sector. This model is very common and has been used for a long time. With this type of grant, recipient can fund the preparation activities, including feasibility and technical studies, training, construction, monitoring and evaluation, and develop the necessary enabling environment. Example of this is Biogas Rumah (BIRU) program, a multi-years household biogas program that was initially financed by The Netherland Governments and implemented by HIVOS as the main recipient of the grant.

In recent years, grants from international donor to government come in the form of technical assistances (TAs) to support specific project or program in some specific areas, including renewable energy project. Typical technical assistance activities are various, from policy development, project design, feasibility study, market study, assistance in project implementation, monitoring, Training and capacity building, etc. Most of these works are usually carried out by individual consultants or consulting firms assigned by the donor. For example TAs by Energizing Development (EnDev), that provides technical support for Micro-Hydro Power Plant (MHPP) development under Green PNPM program, and provides technical *review* for village solar power plant project installed by DGNREEC.[55] ADB and Norway Embassy also provide TA to support Sumba Iconic Island initiative. The TA is accompanied by small grant for capital

investment for renewable energy installations/facilities using Output Based Aid (OBA).

World Bank has managed and implemented a number of Technical Assistances and Policy Advice for supporting renewable energy project development in Indonesia such as: Energy Subsidy Reform, capacity building for geothermal development, renewable energy resource mapping and geospatial planning, capacity building for smart grid planning and investment, support MEMR to revise pricing policy for geothermal development. World Bank also actively assists Indonesian government to conduct renewable energy project preparation such as 1000 island, geothermal and hydro power project (Pham, 2014).[56]

Grant from international donor and private foundation are also channeled through NGOs, CBOs, and private sector to perform renewable energy project. This practice has been applied since 1980s. Renewable energy installations powered by hydro, solar, biomass, and biogas that were constructed in the period of 1980s to 2000s were mostly funded by the international donors through NGOs or CBOs to implement the project at the community or local level. Nowadays, donor supports program for renewable energy development such as USAID ICED or Finland's EEP [57], both will be terminated by the end of 2014/early 2015, also provide small grants for community group, local, national or international organizations to install renewable energy power-plants. EEP Indonesia also provided grants for pre-feasibility study (pre-FS) and feasibility study (FS). However as Indonesia is now considered as a middle-income country, grants from international donor organization or private foundation tends to decline and becomes more difficult to be accessed by NGOs or CBOs.

In many developing countries, debt is less available and significantly more expensive than in developed markets (Nelson and Shrimali, 2014). Thereby bring in capital from developed world to developing country market could reduce the cost of capital and lower the cost of renewable energy investment.

7.2.2.2. Concessional Finance

7.2.2.2.1. Clean Investment Fund (CIF)

Investment of renewable energy in developing country requires long term and patience capital. Unfortunately this kind of capital is hardly found in financial market in developing country. In many developing countries, debt is less available and significantly more expensive than in developed markets (Nelson and Shrimali, 2014). Thereby bring in capital from developed world to developing country market could reduce the cost of capital and lower the cost of renewable energy investment. Instrument such as concessional loans can improve project feasibility and become more attractive to investor. Clean Investment Fund (CIF), established in 2008, is one of the sources for this type of loan.

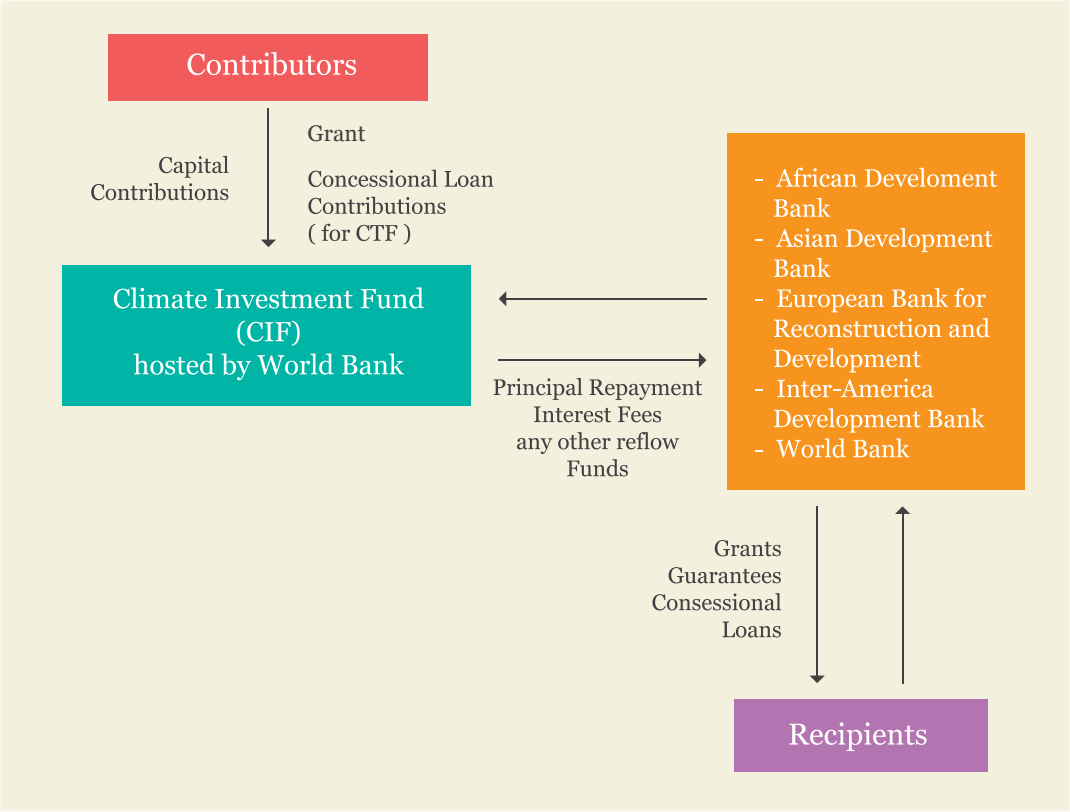
CIF allocates the fund into four funding windows:

a. Clean Technology Fund (CTF) with the amount of USD 5,5 billion
b. Forest Investment Program (FIP) with the amount of USD 639 million
c. Pilot Program for Climate Resilience (PPCR) with the amount of USD 1,3 billion
d. Scaling Up Renewable Energy in Low Income Countries Program (SREP) with the amount of USD 551 million

When it was established, CIF agreed to open the opportunity for financial blending between CIF, MDBs, as well as financial resources from national and private sector, which leads to the leverage of substantial additional funds. The flow of CIF Funds can be seen in Figure 7.11.

The Clean Technology Fund (CTF) provides middle-income countries with highly concessional resources to explore the options to scale up the demonstration, deployment, and transfer of low carbon technologies in renewable energy, energy efficiency, and sustainable transport.[58] Clean Technology Fund (CTF) is channeled through Multilateral Development Banks, such as World Bank, ADB, IBRD, IDB and AfDB, that have been targeting the large scale commercial, and country initiated renewable energy projects such as geothermal, solar, wind, small hydro power, biomass; and industrial energy efficiency project.

Figure 7.11 Flow of Fund of Climate Investment Fund



CTF Investment Plan for Indonesia that was approved in 2013 indicated the financing plan of USD 5,470 million, comprises financings from CTF, MDB, public sector co-financing and private sector co-financing. The new financing plan increases significantly from the initial USD 3,110 million approved in 2010. About 90% of the financing plan is allocated for financing geothermal project (see Table 7.7).

An example of how CTF can reduce financial viability gap of geothermal project and improve its bankability can be drawn from the case of Pertamina Geothermal Energy's (PGE) project Ulubelu (unit 3 & 4) and Lahendong (Tompaso) (unit 5 & 6). Concessional loan totaling USD 300 million from World Bank's lending facility for middle income countries is being extended through IBRD and CTF to finance these project. The two projects are not financially viable unless it receives adequate price from the off-taker (PLN) for the electricity. It means higher PSO subsidy for the Government of Indonesia. The concessional financing package, which includes CTF loan was able to bridge the financial viability gap, along with government intervention to cover some additional costs. The financing package from World Bank has lower interest rate than the commercial rate that could reduce financing cost of PGE. As the result of this package, PGE agree to lower its return on equity (ROE) that leads to lower electricity price for PLN, which enable the Government to suffer from the increasing PSO subsidy to PLN (ESMAP 2013).[59]

Table 7.7 Revised CTF Financing Plan for Indonesia (2013), Source: CTF (2013)

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

Source: Joint Mission Aide Memoire, 1 February 2013

7.2.3. Specific Funds

7.2.3.1. Global Climate Partnership Fund (GCPF)

Global Climate Partnership Fund (GCPF) is an investment fund, which provides financing for sustainable energy project in emerging and developing market. GCPF is initiated in 2011 by the German government and KfW with Deutsche Bank AG as its investment manager. The investors include Germany Government, UK Government, IFC, KfW, and Deutsche Bank. The Fund dedicates to contribute to greenhouse gases emission reduction in emerging markets across the world in 13 target countries, including Indonesia. GCPF provides dedicated funding to local financial institutions or co-invest directly to renewable energy or energy efficiency projects.

Figure 7.12 Cooperation of GCPF with Local Financial Institution

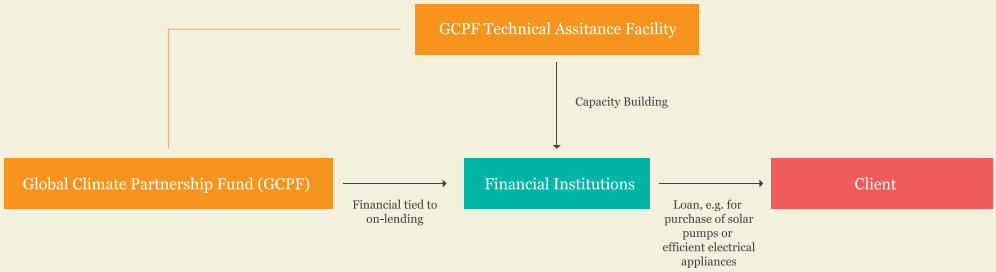


Figure 7.13 Investment Process for Financial Institutions

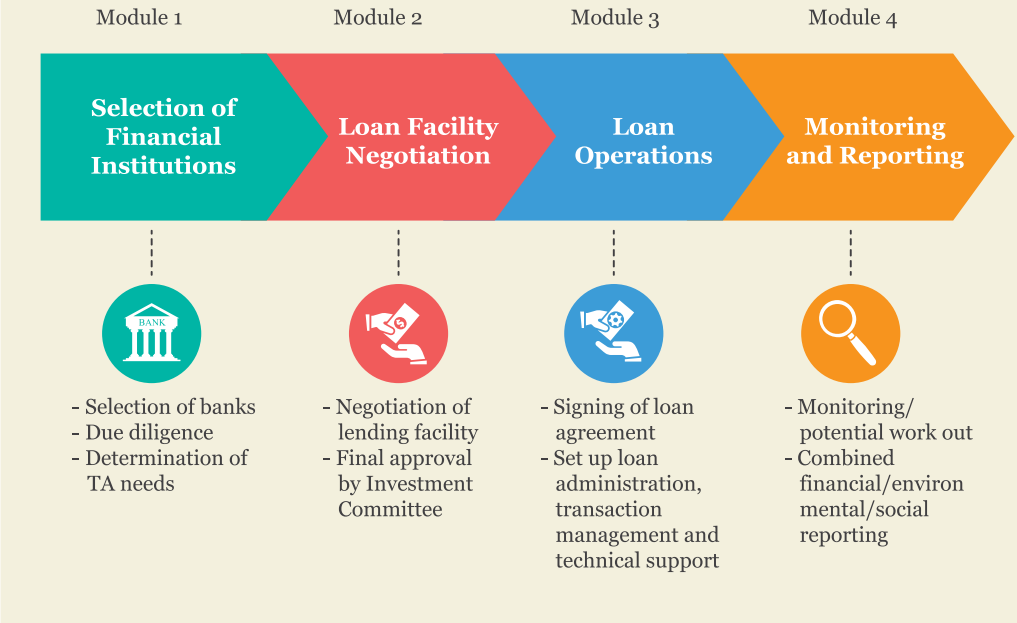
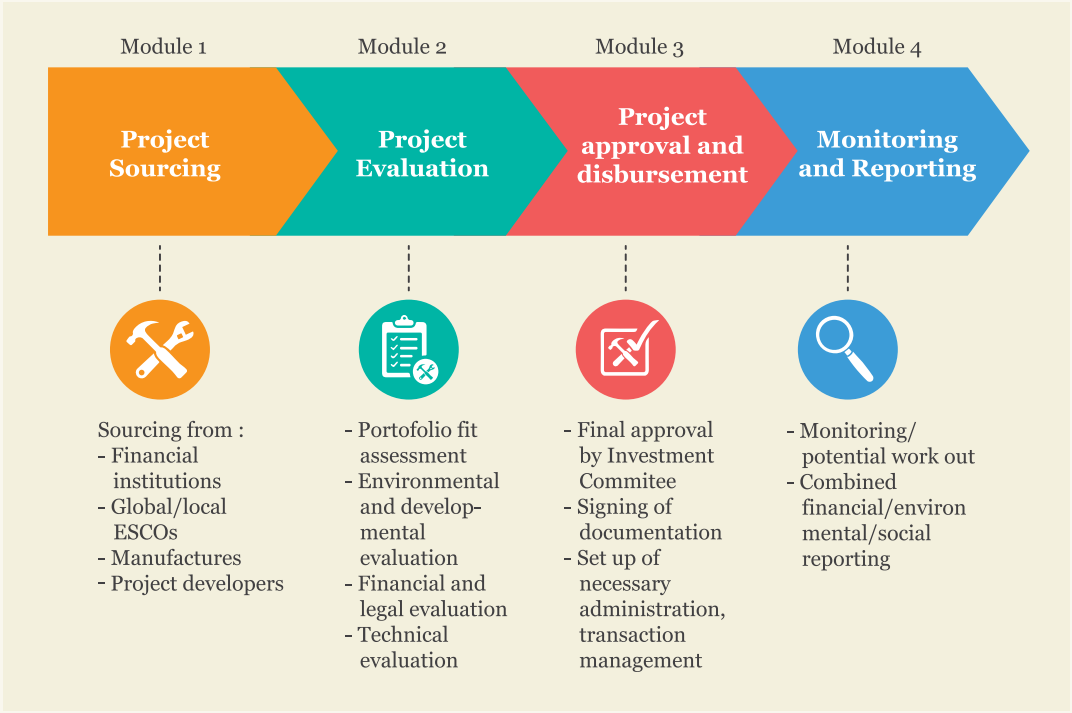


Figure 7.14 Investment Process for Direct Investment



Financial institutions that offer solutions in regards with the renewable energy or energy efficiency, or which are interested to develop such products, the Fund can provide three instruments of financing:

a. **Refinancing**. GCPF provides a debt instrument to the selected financial institutions. Each financial institution is allowed to have a maximum investment size of USD 30 million for debt. The debt instruments are available at commercial rates. The idea is that each financial institutions would disburse sub-loans for clients with renewable energy or energy efficiency proposal, which can be accessed in USD or local currency. If local currency is applied, then DB (Dutche Bank) will provide the hedging, if it is needed. The instruments provided are: senior debt, subordinated debt, and guarantees.

b. **Co-investment**. GCPF provides co-investment for the institutions with little or no experience that are seeking a stronger partner in the field of energy financing. The co-investment is dedicated for financing the stand-alone projects, and can be accessed in a form of loans or equity during all phases of a project. GCPF can provide debt up to USD 30 million and up to USD 12 million (more likely around USD 2-5 million) for equity.

c. **Technical assistance**. GCPF also provides technical assistance to financial institutions that have limited experience in sustainable

energy lending. The technical assistance will enable financial institutions to design, set up, as well as implementing the new business. However, this service is only available for those that are tied to GCPF financing.

Currently, the Fund has USD 205 million as current commitments from the international investors. By 2013, GCPF has active projects in 7 countries and project preparation in most of target countries. In Indonesia, technical assistances are provided to prepare hydropower and energy efficiency projects.

7.2.3.2. Indonesia Climate Change Trust Fund (ICCTF)

Indonesia Climate Change Trust Fund was established in September 2009. The ICCTF objective is to pool and coordinate funds from various donors to finance Indonesia's climate change policies and programs. In accordance with the principles of the Jakarta Commitment (2008), the ICCTF will be nationally managed and hence will support and strengthen the effectiveness of national development plans. The legal basis for the establishment of the ICCTF is the Minister of National Development Planning/ Chairman of the National Development Planning Agency (BAPPENAS) Decree No. 44/M.PPN/09/2009.

The goal of ICCTF is to support the efforts of Indonesia in reducing greenhouse gases emissions and developing a low-carbon economy and, moreover, to adapt to the adverse effects of climate change. The ICCTF is intended to coordinate and channel funds for climate mitigation and adaptation projects in order to ensure the effectiveness development assistance for climate initiatives. The ICCTF serves as a channel to attract, mobilize and manage financial resources for climate change mitigation and adaptation programs, projects and activities, which contribute to the national climate change policies of Indonesia. It could receive and manage funds from various domestic and international sources including bilateral and multilateral donors, and to allocate the fund to adequate projects according to priority and funding modalities.

ICCTF has three thematic windows that were identified as high priority, which are:

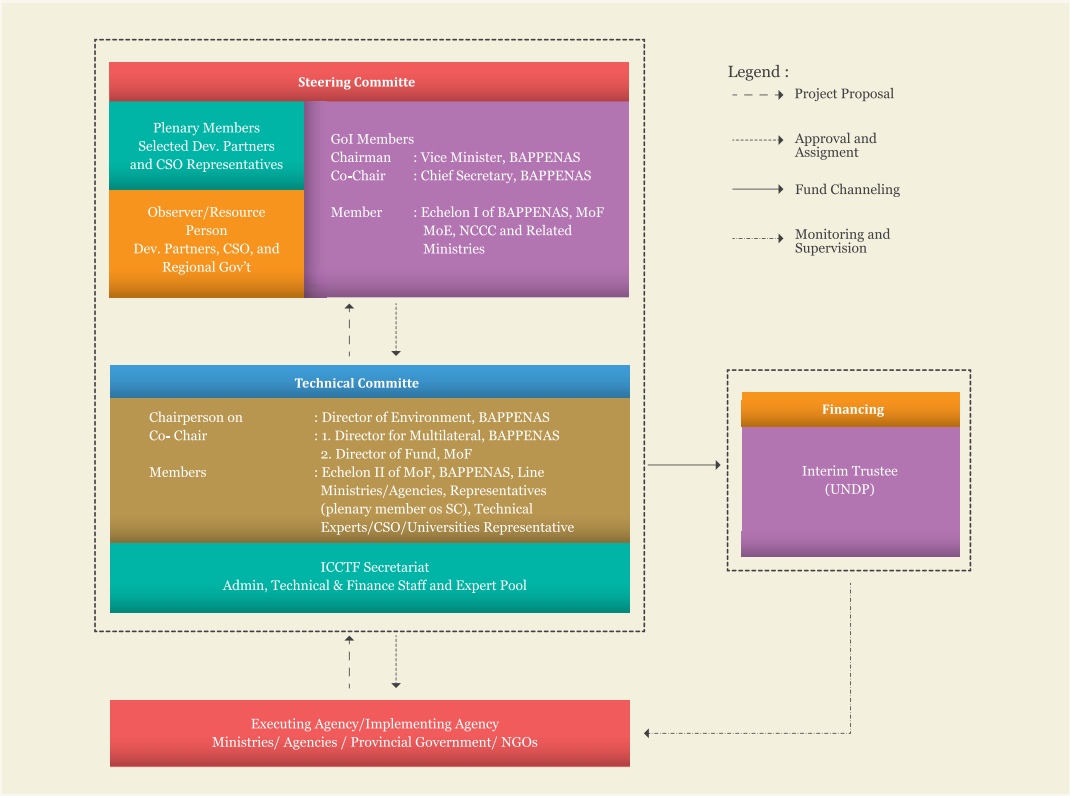
a. The Land-based Mitigation Window, aims to reduce GHG emissions by supporting the work of afforestation/reforestation activities, together with sustainable agriculture, forest management as well as avoiding deforestation activities.
b. The Energy Window. This window can be accessed by activities that aim to significantly reduce GHG emissions both at the supply side and the demand side. Activities related to encompassing the financing of low-carbon energy supply technologies and the implementation of energy conservation and efficiency measures could also be an interest.

c. The Adaptation and Resilience Window. This window strives for preparing Indonesia's national and local institutions and vulnerable communities, for the current and future impacts of climate change by enhancing the dissemination of climate information, developing and improving the design of adaptation strategies, utilizing appropriate technology and knowledge, and establishing favorable policies for supporting adaptation activities.

ICCTF Business Plan (2011) laid out two stages of operationalization of ICCTF: preparatory stage that was taken place in 2009-2011 and full operational in 2012 to 2020.[60] Donor commitment to the preparation phase of the fund was USD 11.2 million. The 2011-2020 Business Plan indicates the requirement of USD 1.65 billion to finance three focus programs and operational of the secretariat. In 2013, Bappenas allocated counterpart funding of USD 49,500 to support the operationalization of ICCTF. Bappenas also stated that there will be an allocation of USD 30-50 million in 2014 to be utilized starting in 2015 (ICCTF, 2014).[61]

During the preparation stage, ICCTF Fund was disbursed through the line ministries and government agencies as the Executing Agency (EA) to finance project that was not funded by State's Budget. The EAs (as beneficiaries) will submit a project proposal and will also be responsible for implementing the projects after their proposals have been approved by ICCTF. EAs may also collaborate with other organizations, such as CSO, private companies, local governments as well as academic institutions, which then will act as the Implementing Agencies (IAs) in order to ensure an effective implementation of the project as illustrated in Figure 7.15.

Figure 7.15 Governance Structure of ICCTF



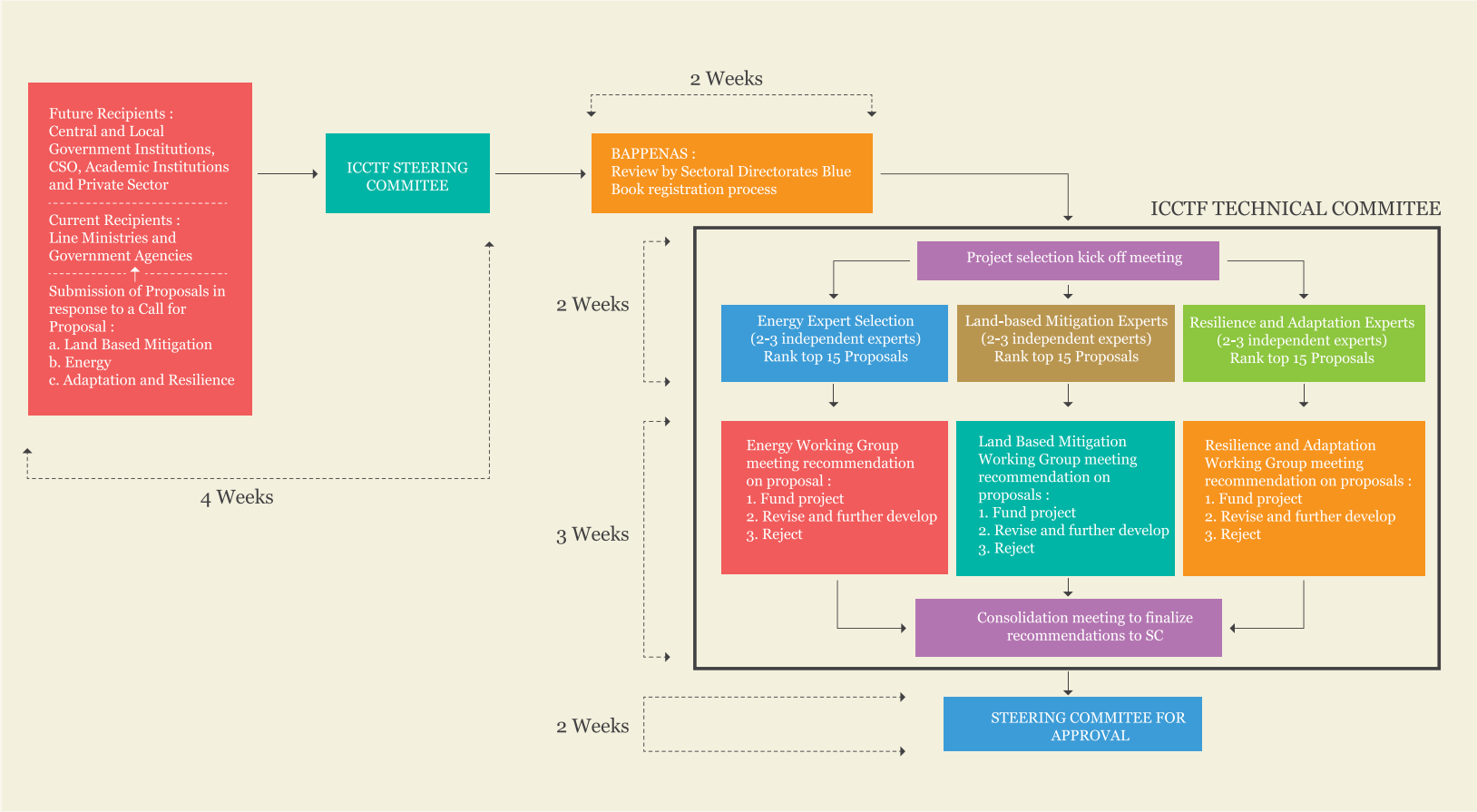
The project selection process can be seen from Figure 7.16. ICCTF Steering Committee will issue the call for eligible project proposals from line ministries and government agencies. It is envisaged to enlarge the group of recipients including local governments, CSO, private sector and academic institutions. The ICCTF Secretariat in cooperation with the Technical Committee (TC) will *review* the submitted project proposals according to their alignment with the general development plan of GoI within four weeks. After that, the TC experts will rank the proposals against specific criteria (as described in the ICCTF Investment Strategy) to ensure the activities fit into the overall window investment strategy and fulfill the ICCTF priorities. Hereby, the ICCTF takes into account:

a. General criteria that ensures the suitability of the activities for the policy of ICCTF criteria to assess the ability of the project proponent to be able to conduct the proposed activity;

b. Whether specific criteria related to the thematic windows have been met.

c. Resulting from this assessment, a shortlist of 15 top ranked projects will be formally followed up and discussed further among the TC's working group for each thematic window. The TC's working group has the mandate to recommend whether the project will be funded, revised or rejected based on its proposed activities, strengths and weaknesses. The SC will give the final decision and approval for the funding of projects within two

Figure 7.16 Project Selection Process



Source : SOP, ICCTF 2011

weeks. The entire selection process takes approximately seven weeks.

After the project has been approved, the SC requests that the National Trust Fund Manager allocates the funds for the envisaged project activity. To ensure a secure disbursement, the Trust Fund Manager finalizes a Letter of Agreement (LoA), which will be signed by the respective Executing Agency and the Trust Fund Manager. The Executing Agencies are requested to submit a Quarterly Work Plan to the TC providing detailed information on the envisaged activities and the funds needed. After the TC verified the Work Plan it will then request the Trust Fund Manager to transfer the funds to the Executing Agency. The Trust Fund Manager will disburse the funds to the EAs on a periodic basis and according to their progress report.

7.2.4. Commercial Finance

7.2.4.1. Financial Services and Insurance

Encouraged by the Green Banking Regulation of Bank of Indonesia, some local Banks and insurance companies have been provided commercial financing for renewable energy and energy projects. Typical lending is corporate financing that requires sufficient equity (at least 30%), with payback period between 5 to 7 years, and collateral.

Despite many banks still perceive renewable energy projects as risky businesses, in the last five years, there are more banks that provide medium size in the form of debt for mini or small hydro and biomass projects or other renewable projects.

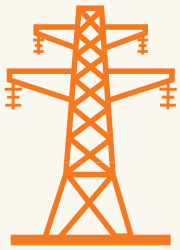
Despite many banks still perceive renewable energy projects as risky businesses, in the last five years, there are more banks that provide medium size finance in the form of debt for mini or small hydro and biomass projects or other renewable projects. Some examples of renewable energy lending by commercial banks are the following:

a. Bank Muamalat has been financing in total Rp. 987 billion for 17 small/mini hydro projects with total capacity of 81 MW, and Rp. 854 billion for 9 hydro projects with total capacity of 305 MW. Until 2014, Bank Muamalat has made investment of Rp. 1.8 trillion for 386 MW hydro projects in Indonesia.[62]

b. Bank Mandiri has channeled financing for 1 biogas power plant and 2 mini-hydro projects, 9 and 1.6 MW each, in 2010-2012. The source of finance was USD 100 million from AfD credit line facility for RE and EE financing. Started in 2014, the second USD 100 million credit line facility will finance geothermal, mini-hydro, solar and biomass projects.

c. Bank BNI lending for renewable energy and energy efficiency was Rp. 9,021 billion in 2011.

7.3. Mobilizing Renewable Energy Finance



Due to the importance of rural economy, rural electrification should not limit only to provide access to electricity to the households, but it must also consider ways and means to stimulate local economic development through the availability of energy services in rural areas.

7.3.1 Financing Energy Service Delivery

Providing access to energy to rural or remote villages has many challenges. It is related with the villagers/end-users' level of poverty, ability to pay, and willingness to pay. The ability to pay is closely related with the degree of economic development of respected villagers. Other challenges are low population densities in rural area that leads to high capital and operating cost of electricity operating companies or local utility. Due to the importance of rural economy, rural electrification should not limit only to provide access to electricity to the households, but it must also consider ways and means to stimulate local economic development through the availability of energy services in rural areas.

Identifying and implementing country specific approach and mechanism in financing sustainable rural energy services is an issue, it requires policy, institutional arrangement and consultations among stakeholders. In the past, the Government of Indonesia often did not have enough resources to finance its rural energy service needs. Therefore, it depends on the supports from MDBs or donor countries. As Indonesia economic developed and national budget increases, it is unlikely that grants and/or concessional supports from multilateral and bilateral donors in electrification efforts will continue. Such supports are, in fact, showing a decreasing trend.

Experiences elsewhere have shown that creating a transparent legal and regulatory environment can be an effective way to mobilize private resources and capital for rural energy services delivery.

However, as public financial capacity increases, the budget priorities are also expanded. From budget allocation perspective, there is always a competition to get sufficient budget allocation to support rural electrification. Therefore to ensure this effort, alternative ways of financing rural energy services delivery such as the mobilization of private sector or local communities, or combination of various financing sources should be explored in order to create the enabling environment. Experiences elsewhere have shown that creating a transparent legal and regulatory environment can be an effective way to mobilize private resources and capital for rural energy services delivery.

Achieving sustainable energy state in Indonesia will require a very strong financing continuum. Depending on the scale and feasibilities, mobilizing sustainable energy finance will require different approaches tailored to the situation of each project. Given to variety of context and challenges of Indonesia renewable energy project, there is a need to establish various financing options and financing structure to fund renewable energy projects using

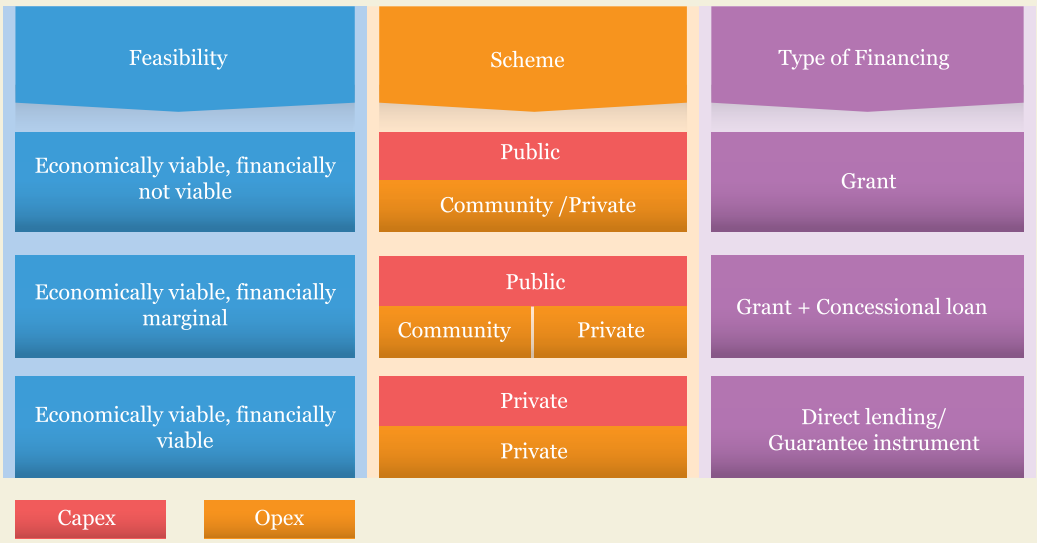
available source of funding: Public Finance Mechanisms (PFM), donor support, and private sector investment.

In general there are three types of projects from the financial viability perspective:

- **Economically viable, financially not viable**. This refers to a project that is technically feasible and able to generate marginal economics return (or social return) but the project is not financially viable. With the characteristic like this, getting loans from the financial institutions is very unlikely. The source of finance is either funding from philanthropy, aid or public finance mechanism (PFMs) such as grant from government. In this case, grant from government agency can be used to cover capital expenditure (CAPEX) for the project, including project preparation stage, while operational expenditure (OPEX) shall be paid by the revenue generated from end-users' payment for service. In case the end-users have a low ability to pay, a subsidy scheme to this project can be applied with funds from the derivation of government/public sources or possibly CSR.
- **Economically viable, financially marginal.** This refers to a project that technically is feasible and able to generate marginal economics return (or social return) but the financial return is marginal. The financing option for this type of sustainable projects is to use PFMs, in this case grant or combination of grants and concessional loans (soft-loan) to cover the project's CAPEX. Operational and maintenance services can be provided by private sector or local cooperatives, that cover its OPEX from energy service payment by end-users. The idea behind this that O&M operator does not have to charge the service very high, because the cost of financing for CAPEX is actually lower, so most part of the service fee that are paid by end-users, are used for operational and maintenance cost, and profit for the operator.
- **Economically viable and financially viable.** This refers to a sustainable energy project that is technically feasible, and generate good economic return, and financially viable and bankable. This type of project can draw investor and direct lending from commercial financing both for its CAPEX and OPEX. Private sector/entrepreneur can build and operate the facility, and end-users pay its provided services. In this case, the role of government in direct financing could be minimal. Nevertheless, it can provide different support for private financing by providing instrument such as partial risk guarantee. If the return of investment is relatively high, RESCO model can be applied in this project.

Figure 7.17 shows three models of financing options that can be applied in different economically and financially viabilities of energy projects.

Figure 7.17 Different Financing Scheme for Various Activities for Energy Project



7.3.1.1. RESCO MODEL for Financing Rural Electrification\

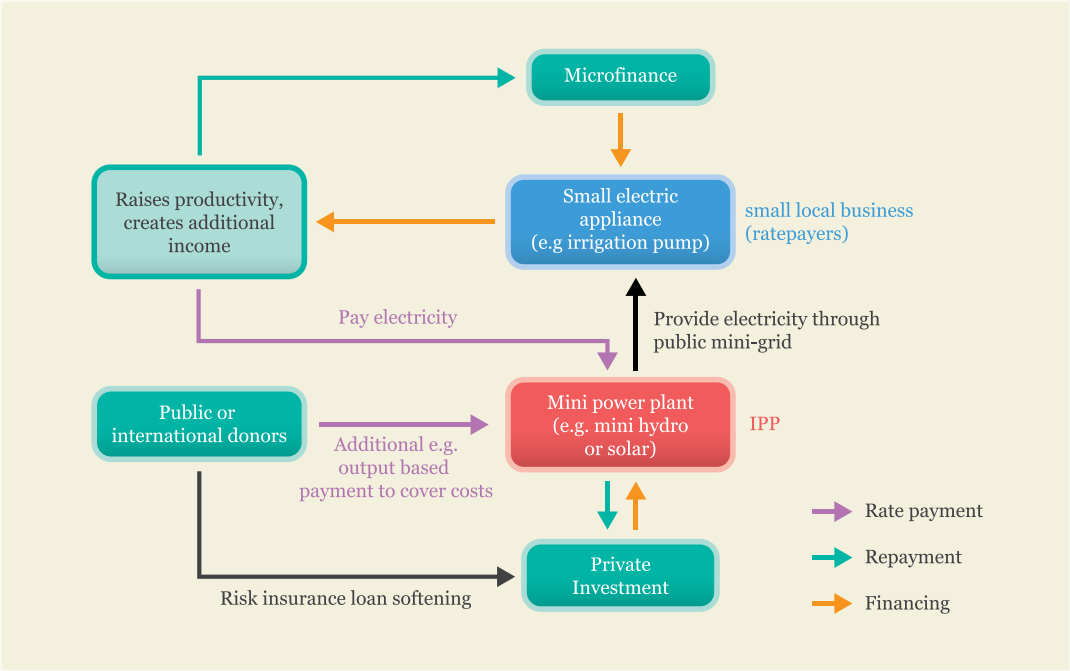
In case that grid expansion is expensive to reach community, the rural electrification can be delivered by implementing renewable village power system, using renewable energy and mini-grid architecture. The renewable village power system is a very important means of solving the residential power supply problem in remote areas. The village power system can be delivered through a Renewable Energy Service Company (RESCO).

Under RESCO approach, a renewable energy service company, which can be electricity utilities, cooperative, NGO, or private company to buy the system (e.g. solar PV, micro-hydro, etc.), installs and operates the power plant to provide electricity to local *customer*s. RESCO retains both ownership of the system and responsibility to maintain and service the system. *Customer*s (households) are charged for payment of fee every month for electricity service provided. RESCO can own and operate power plants that provide electricity to rural households through mini-grid, such as rural utility, or it can also own and manage the single energy generated technology such as solar home system (SHS) installed in each households, and perform regular service and maintenance to ensure the system is operating. For the first case, the user pays the fee based on the amount of electricity used, as for the latter case, the user pays a fixed fee every month. RESCO model increases the possibility of system or technology

installed to function as long as possible to deliver energy services to the users in rural area.

RESCO model opens the possibilities of combining funding from various sources to finance its capital. It is opened for international aids, government funds, NGOs, or private sector investments for initial capital to purchase and installed the system. Instruments such as microfinance can be combined to finance electric appliance for increasing productive use of electricity in the rural areas. This is to ensure that the generated electricity is utilized not only for consumptions but also for productive activities that increases the capacity factor. This scheme will be more influential when the energy facilities (electricity, in this case) result in or help to boost the productivity that opens another income opportunities for the community.

Figure 7.18 RESCO Model on Financing



Source: IEA (2011)

7.3.2. Mobilizing Finance for Delivering Energy Services using Renewable

Funding support for small projects, community based or household based are limited. Given the existing financing

mechanisms, financial supports for mini or small-scale electricity projects below 1 MW in the form of grants are declining, while soft-loans/concessional loans are almost none. Similar situation happens for clean cooking technology such as biogas, where funding from both public and private sources are limited and may continue to decrease in the near future.

On-grid and off-grid projects have different requirement and financing characteristic. The size of project, particularly for off-grid, determines the types of financing mechanism and instrument for the project. Government intervention or participation is required to establish an innovative finance mechanism to provide finance required for specific project, as well as addressing the finance gap.

Table 7.8 On-Grid Project Finance Continuum,

Condition	Project Development	Financial Structuring	Risk Management
Often secure	Developer/ Sponsor Equity	Corporate/Project finance loan	Insurance
Occasionally secure	Grants	Mezzanine finance	Export credit, other risk management
Gap and Barriers	Under financed project developer	1. Widening debt/ equity gap 2. Bankers lacking experience with RE project 3. Elevated transaction cost	Lack of appropriate risk management instrument; Lack of actual data/ difficult to assess the risk; Non-traditional RE risk Inflexible underwriting mentality
Proposed interventions	1. Contingent project development grant; 2. Public participation in private equity funds/ equity finance; 3. Tax incentives for 3rd party investor	1. Public participation in mezzanine funds; 2. Banker capacity building on RE technology, risk and project; 3. Investment transaction support	1. Change underwriting risk perception and rating methodologies; 2. Extend existing insurance products to RE; 3. Promote new non-insurance product; 4. PPP to share cost/benefits of innovation.

Source: Adapted from Sontag-O'Brien and Usher (2004)

Table 7.9 Off-Grid Project Finance Continuum,

Condition	Start Up Capital	Operating Capital	End-use finance
Often secure	Entrepreneur's equity	-	Supplier credit
Occasionally secure	Grant	Bank loans	-
Gap and Barriers	1. Lack of business development 2. Lack of initial seed and early stage capital 3. Lack of intermediaries/ brokers/platform to channel seed finance	1. Lack of appropriately priced growth capital; 2. Lack of support of local bank in local currency	Lack of instrument such as micro-credit to pay RE products and services
Proposed interventions	1. Enterprise development support 2. Donor granted seed capital fund, managed by specialist entity 3. Policy support to increase role of energy in service delivery	1. Support local bank through capacity building, lines of credit and credit enhancement 2. Public/Private SME Growth Capital Fund managed by specialized entity.	Consumer finance, micro-credit; leasing/fee for service; 3rd party finance

Source: Adapted from Sontag-O'Brien and Usher (2004)

The DAK allocation in the budget year shall consider the level of project preparation made by the local government in the previous year, including the institutional set-up to operate and manage the renewable energy plants or technologies.

7.3.2.1. Proposed Instrument and Mechanism

Increasing supply of finance for small-scale renewable energy

- **Modify the Specific Allocation Fund.** Government modifies the Specific Allocation Fund (DAK) for rural energy to finance project preparation, e.g. feasibility study and engineering design of renewable energy system. The DAK allocation in the budget year shall consider the level of project preparation made by the local government in the previous year, including the institutional set-up to operate and manage the renewable energy plants or technologies. This is to ensure the quality and sustainability of renewable energy project funding using public fund.
- **Establish renewable energy financing facility for small-scale project.** Renewable energy financing facility is a specific fund to support the small-scale renewable energy facility below 1 MW for off-grid project, as well as biogas or clean cook-

stove. Funding for renewable energy facility comes from the government annual budget (e.g. MEMR, MoF or Bappenas). The objective of this fund is to support a rural energy service project that is economically feasible but financially marginal. This fund can be managed and disbursed by the existing institution that operates in Indonesia, e.g. Indonesia Climate Change Trust Fund (ICCTF). ICCTF could use its one funding window for social enterprise and NGOs, or by creating a new trust fund that could be managed by NGO.[64] The instrument can be delivered as a full grant, grant convertible loan, concessional loan, equity financing, that is equipped with technical assistance component. The main recipient for this is NGO, cooperative, or small private sector.

- Establish renewable energy financing facility for medium to large-scale project. This facility is designed to support the large-scale renewable project that requires a patient capital that refers to a capital with payback period of more than 7 years and concessional loans for debt financing and/or equity financing. Loans are expected to progressively approach the commercial market rate as the technologies get wider acceptance or have a good market penetration. This facility can finance the emerging technologies such as utility scale solar PV, wind farm project, and biomass project. If this can be combined with FiT instrument, in the medium term, the FiT price can be reduced. As capital cost for project and maturity of technologies increased, direct subsidy to renewable technologies through FiT mechanism from the government or utility can be reduced. Financial sources are from government and international financial institutions, international funds, or development institutions. Government can appoint PIP or PT SMI to manage this fund and channel it to the appropriate renewable energy projects.

Figure 7.19 Proposed Small Scale Sustainable Energy Fund

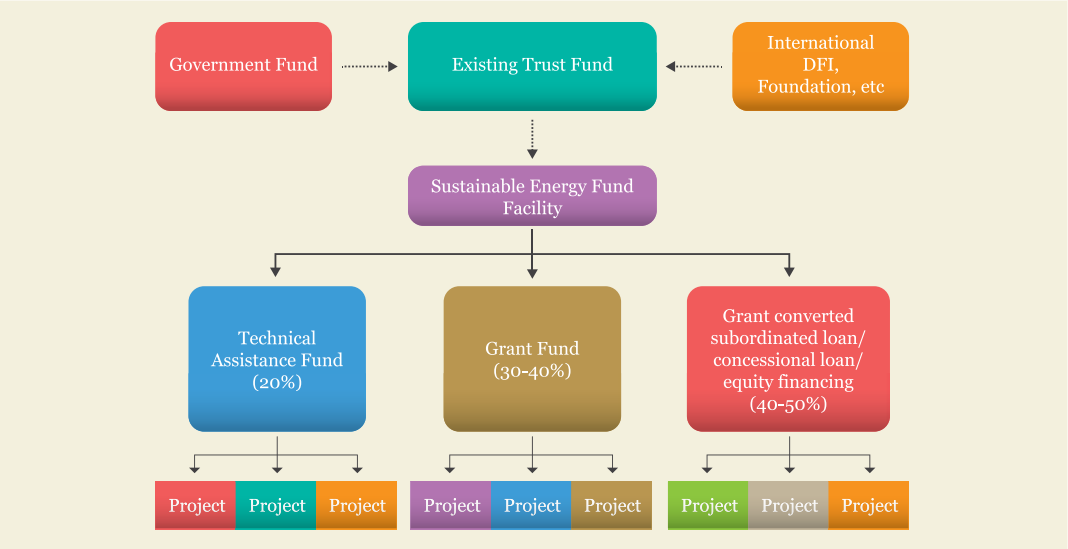
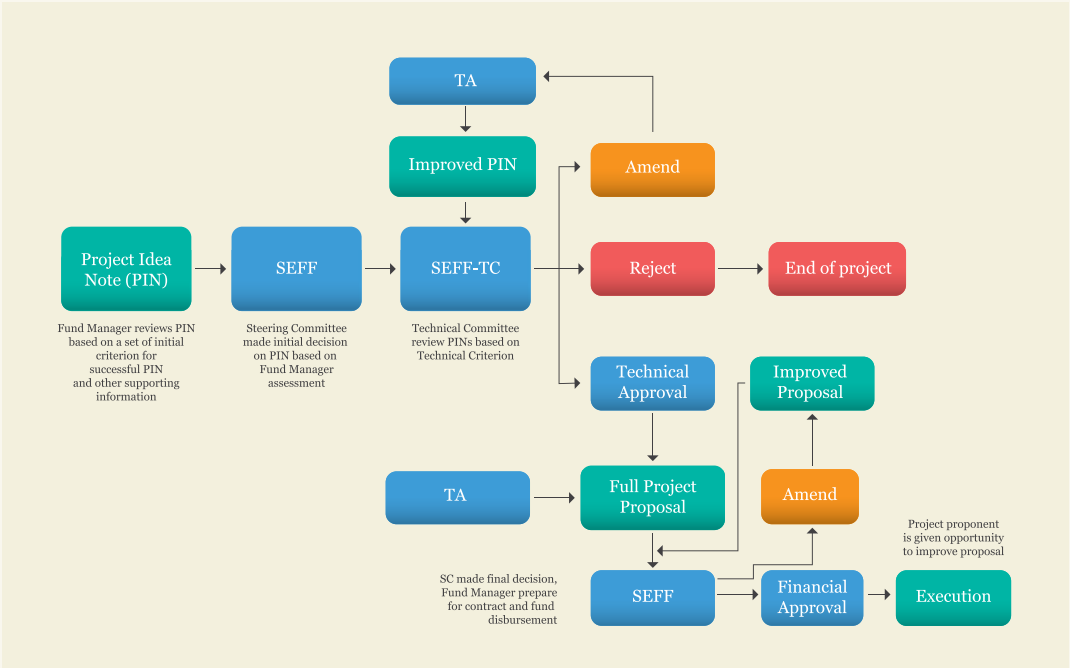


Figure 7.20 Process and flow of SEFF



Using PFM to reduce risk and leverage private investment renewable energy project

- **Establish partial risk guarantee mechanism for small-scale REPP**. Partial Risk Guarantee mechanism is an instrument to mitigate certain risks for small-scale renewable energy power plant (REPP) below 10 MW and for energy efficiency project undertaken by private sector. The government can expedite the existing IIGF to include the risk mechanism into their portfolio. Otherwise the government can establish a partial risk guarantee mechanism for project below 10 MW and for energy efficiency project in industry and building. This instrument can cover various risks from currency risk to policy change risk.
- **Develop publicly funded project development companies**. One of the constraints to mobilize the private sector or investor finance is the unwillingness to provide capital due to commercial attractiveness of the project. Development stage of renewable project is seen as a risky stage that causes the reluctance of investor or finance manager to provide funding support. To address this concern, the government can establish project development companies that specifically focus to work on the early stage of project development that includes: 1) arrange permit and licenses; 2) prepare off-takers; and 3) land acquisitions. Once these stages are being completed, the project can be offered to investor that will continue the project and pay all the costs spent at early stage development.

Table 7.10 Key Features of Three Domestic Sustainable Energy Activities in Indonesia

Key Features of the Case Studies	Indonesia Domestic Biogas Program (Case Study 1)	Indonesia Solar Energy Lending Program (ISL) (Case Study 2)	Mycrohydro Power Plant in Seloliman (Case Study 3)
Objective(s)	1. To provide a clean, decentralized energy sources that can be accessed by poor people, allow them to shape better lives 2. An opt for 100% of sustainable energy solutions 3. To facilitate access to clean and sustainable energy sources for lower-income populations	To establish a solar lending finance mechanism for Indonesia business sector through pilot project.	To meet the electricity need of Janjing sub-village, PPLH Seloliman (as the center for environmental education), as well as small industries in Sempur sub-village.
Duration of work	Phase one: 2009-2012, but extended to the end of 2013. Phase two : 2013-2014/2015	October 2011 to December 2012	The first MHPP was established in 1994
Location(s)	West Java, D.I. Yogyakarta, Central Java, East Java, Bali, West Nusa Tenggara (NTB), South Sulawesi, and Lampung.	3 sites in Java and 3 sites in South and Central Kalimantan.	Seloliman, East Java
Method used to provide access to energy	Providing technology of 6m3 biogas digesters for the livestock farmers that can also be built inside houses for cooking and lighting.	Small Light System (SLS). SLS consists of a solar PV and 1 to 5 LED lamps with built-in lithium battery and charge controller. SHS is used to establish a mini-charging station that could recharge the SLS.	Using micro hydro of 12 kW capacity that could electrify around 100 households.

Stakeholders involved	• Ministry of Energy and Mineral Resources (MEMR) • Small-medium Construction Companies • Cooperatives • Local NGOs • Private sector • Local companies/ cooperatives • Local people	• The ISL Program itself • PT Azet Surya Lestari • Local Investment Partner • WarungTenaga Surya (Wartes) • End users • MFI	• Community of Seloliman • Paguyuban Kali Maron • PLN
Financing mechanism	There are 4 types of financial mechanisms: 1. Subsidy BIRU + farmers. This type of scheme was only 20% from the total, because many farmers could not afford it. 2. Subsidy BIRU + credit + farmers 3. Subsidy BIRU + government + farmers : has been adopted in West Nusa Tenggara Barat since 2011-2012, by using funding from APBD to construct around 1000 units. 4. Subsidy BIRU + CSR Fund + government budget, which has not yet been the main alternative	There are 3 different financing plans based on the segmentation of end-users: 1. Segment 1 - underdeveloped area. GoI/Local government provides SHS, transportation to site, and free installation. 2. Segment 2 - area where end users are able to buy solar PV system (SHS, centralized PV, or Hybrid PV system). GoI contributes for installation, transportation fee, Training, and interest rate. End user has to pay monthly fees for electricity provided. Segment 3 - end users are able to pay the installed system with the support of local FI via credit of 1-3 years.	The existing power available was used to meet the local demand where community has to pay for their electricity consumption to the Paguyuban Kalimaron. Meanwhile, any excess power that is generated by the power plant is sold to the National Electricity Company (PLN).

Investment Support	Subsidy for farmers: Rp. 2.000.000 (USD 200)/household, increased to Rp. 3.000.000/ household in 2013.	No subsidy for end-users. The system cost (not included preparation and cost for preparing the project) USD 100 for a complete SLS system, with monthly installment of USD 2-4	
Innovative Financing Scheme	Combination of grant from donor, loan from MFI, result of carbon credit to deliver a package scheme that makes the technology affordable and economically feasible for end-users.	Innovative business model that brings together financial institutions, technology vendor and end-users. Financial institutions provide loan/ credit for vendor and end-users.	Local community has been able to generate revenue from the project, and invest in additional power plant, community-owned power plant.
Challenges	1. Technical Challenges: a. Standardization of technology b. Utilization of bio-slurry 2. Non-technical Challenges: a. Access difficulties due to limited number of microfinance organizations with high demand of bio digesters b. Existing projects that give away technologies have hindered the program, since many of the locals preferred free technologies	1. Technical Challenges a. Improper maintenance of technology b. Lack of understanding on energy management c. Product range of the charging station, which gives more opportunity to gain more economical benefit 2. Non-technical a. Low-income population, which determines the willingness and ability to pay for the technology b. Mind-set of the community where the activity will be replicated	1. Highly dependent on external expert on the technology. 2. Current deal with PLN is a short-period deal that is based on yearly contract. 3. Protection of water catchment area.

	c. The market is smaller (learning from Sumba and Java), so financing issues become dominant.	c. Geographical challenges cause difficulties for constant monitoring d. Financing for capitals. Other financing options need to be explored.	
Continuity and Sustainability	d. Security of resources supply. Many cows are no longer exist, they have been sold or consumed.	This initiative has implemented 38 pilot projects (on-site development, mounting and performance monitoring). Three charging stations (Wartes) are now available for 3 years already. Remaining challenges: market development, collection rate of credit, cost of distribution, and available financial schemes for end-users.	1. It is successful to build the community's awareness on natural resources conservation 2. Enabling the local community to organize the program by themselves 3. Establishing a local business model on natural resources to the sustainable development of the village. Remaining challenges: institutionalizing local capacity, upgrade technical capacity of the local community, co-financing.

8. CONCLUSIONS & RECOMMENDATIONS

8.1. Conclusions

1. **Indonesia needs to utilize its renewable energy potential to improve access to energy of its population, to ensure the energy security by diversifying energy supply that is currently dominated by fossil fuels, and to mitigate greenhouse gasses from energy production that causes climate change.** Lack of energy will adversely affect Indonesia's economic growth and human development. With this argument, renewable energy development must be carried out consistently and effectively to meet its objectives.
2. **Despite the ambitious plans of the government to increase renewable energy uptake, investment in renewable energy remains, by far, the smallest segment in Indonesia's energy industry.** Indonesian government has set an ambitious target to increase the share of renewable energy from 5% today to 23% in 2025, as well as target to reduce the energy elasticity and intensity by 2025. However, data on investment of renewable for

the last 3 years suggested that the investment has been relatively stranded or having a slow growth.

3. **Policy makers in Indonesia are aware that the creation of enabling environment is essential for renewable deployment through various public policies: fiscal policy support, financial support, and market price support. Yet these policy instruments still could not accelerate the renewable energy investments to date.** As FiT policy has gained reputation internationally as a powerful instrument to boost renewable energy investment by private sector elsewhere in the world, its impact to attract investment in renewable energy in Indonesia seems limited. The historical growth of renewable energy capacity suggested that the existing policies are less effective to enlarge market, drive investment and push the penetration of renewable energy technology.

The historical growth of renewable energy capacity suggested that the existing policies in Indonesia, are less effective to enlarge market, drive investment and push the penetration of renewable energy technology.

4. **Meeting the renewable energy and electricity supply target require enormous amount of investment both for renewable energy and energy efficiency. Financing sustainable energy remains a daunting challenge for Indonesia.** Despite the progress in renewable financing in the last couple of years, the existing financing instruments and modalities from public and private sectors are still insufficient and incomplete to meet the need of renewable project finance. The current financial instruments are available to meet the demand of medium to large size on-grid renewable energy projects, meanwhile the finance instrument for energy efficiency is still limited. There are some gaps of sustainable project finance. In the case of on-grid renewable energy, the financing instruments from DFI, CFI, MDBs, and private investor, local financial institutions such as Bank, and government backed finance for large-scale projects are available in the form of concessional and commercial rate loans. The remaining issue is the bankability of the project that is also determined by the credibility and capacity of the project developer or borrower to put their own funding and close the finance. There appear to be inadequate financing for off-grid and small-scale project. Available financing comes mainly from government funding, bilateral development agencies, and foundations in the form of small grant and technical assistance (TAs). Using the sustainable technology development continuum, the finance is only available for renewable technology at the demonstration stage, but will not go beyond the commercial/mass deployment stage. Most of the government or donor financing only covers the up-front capital costs, but does not extend to operational and maintenance of the plant, capacity building support and productive use support. This limitation could jeopardize the sustainability of the project itself and benefits for the community.

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5. **Indonesia can learn from some funding mechanisms and institutions that have been applied in other countries and develop its own model based on the character, context and challenges faced in the country to mobilize and leverage investment for sustainable energy.** But there are options available that can be learned and implemented in Indonesia. Thailand for instance with their ENCON Fund, where they have been collecting tax from fuel, which then will be allocated to either renewable energy projects or energy efficiency projects. Funds also available to support variety of financing demand for those project. UK government applied a financing scheme called Small Firms Loan Guarantee Scheme, where the scheme provides a guarantee that cannot be provided by small firms with good proposals, which is provided by the UK Government. India also establishes a special entity called Indian Renewable Energy Development Authority (IREDA) that was mandated to provide financing scheme to project developers and is partly funded by the national government. Similar institution, like IDCOL in Bangladesh, supports the distribution of RE finance.

6. **Various public financing instruments for sustainable energy in Indonesia are in place but they are lacking in cohesion, scattered in various ministries and agencies, and continue to be less effective instrument to address and close financing gap that appear in each stage of project development.** The coordination of government support program for renewable energy in various ministries (MEMR, Ministry of Cooperative & SME, Ministry of Environment, Ministry of Development of Disadvantage Region, etc.), and coordination between central and local government are weak. The sustainability of government-sponsored projects is low and fails to transform the renewable energy market. In fact there appear to be an urgent need to *review* and evaluate the impacts of this financing as well as the need to consolidate all the public finance supports posted in the ministerial budget from the annual state budget, in order to create a more effective and larger impact renewable energy deployment to the community.

7. **The challenge is to introduce the right policy frameworks and financial tools to enable public and private investment in renewable energy.** The available public support instruments such as fiscal incentives (tax incentives, etc.) and Feed in Tariff are currently not being aligned with the objective of these policies to remove the barriers of renewable investment and to effectively reduce risks for renewable deployment effectively. Conduct energy-pricing reform by rationalizing the fuel and electricity subsidies could improve the competitiveness of renewable technologies to be deployed on the ground.

8. **Public Finance Mechanisms (PFMs) could play an extremely important role to finance various stages of sustainable energy technology innovation and sustainable energy project development. PFMs can be used to increase the**

supply of private finance for sustainable energy projects and the demand for private finance that could fill the gap of financing. However, the evaluation of existing Public Finance Mechanisms (PFMs) of Indonesia show that they are not sufficient to serve these purposes, such as minimizing existing investment risks, leveraging additional private finance, and expanding renewable energy market. PFMs are not being structured to act along with the entire chain of financial intermediation. In order to deploy PFMs, public sector (government) must play more the active roles in creating a supportive policy environment and better coordination and implementation among government agencies, DFIs, MDBs, and private sector finance.

To anticipate shortage in financing supply, innovative approach of combining available public funds and private finance can be used to structure financing mechanism

9. **Financing instruments shall be tailored to market segments and project context for large, medium and small-scale sustainable energy projects.** Combining various existing financing instruments from Public Finance, Development Finance Institutions (DFIs), Commercial Financial Institutions (CFIs), CSR, etc. could improve the supply of finance to meet specific financing needs of renewable project, improve its financial feasibility, support or enhance the distributed renewable energy financing mechanisms (consumer credit model, leasing model, fee for services/RESCO).

10. **Financing renewable for rural energy services, particularly rural electrification, is more challenging. By nature, rural energy provision is not a profitable business, thus it requires specific financing mechanism that suits the project finance condition. Provision of rural energy should aim at delivering full energy services.** International experiences have shown that in a number of countries, government or development organizations/donor agency subsidize rural energy provision projects through grants and concessional loans that are channeled through a dedicated fund and/or annual budget allocation for specific project. However, as public finance become scarcer, the renewable energy financing becomes more challenging. To anticipate shortage in financing supply, innovative approach of combining available public funds and private finance can be used to structure financing mechanism.

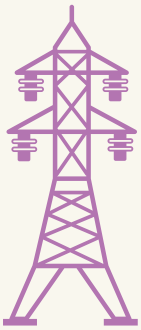
Instruments such as microfinance can be combined to finance electricity appliances to increase the productive use of electricity in the rural areas. Local and national government shall look at this model and develop a regulatory framework for quality assurance, tariff structure, and business model, and capacity building to support its development.

11. **Innovative energy delivery mechanism using RESCO approach could be a suitable solution for off-grid renewable project.** RESCO model opens the possibilities on combining funding from various sources to finance its capital. It is opened for international aids, government funds, NGOs, or private sector investments for initial capital to purchase and installed the system. Instruments such as microfinance can be combined to finance electricity appliances to increase the productive use of electricity in the rural areas. Local and national government shall look at this model and develop a regulatory framework for quality assurance, tariff structure, and business model, and capacity building to support its development.

12. **Innovative financing scheme for small/medium scale renewable energy project can be built using existing instruments and modalities.** To achieve this, it might require respective ministries to modify the mechanism and streamline process of existing instruments, such as Special Allocation Fund (DAK), grant instrument, list of government program and budget (DIPA); and the existing institutions and funds such as PIP, ICCTF, and IIGF.

8.2. Recommendations

These recommendations are directed to the government that has power and authority to set up policy, regulation and instruments to support sustainable energy finance.



Indonesia should be able to direct the available funding to any area of energy that should be prioritized in terms of building the facility, building the local capacity in order to maintain, operate, and monitor the power plant.

Objective: Establish coherent and consistent policies in place to create sufficient incentives for investors and remove barriers for investment.

- Consolidate all fiscal (e.g. tax credit, tax holiday) and financial supports (e.g. grant or financing) policies and measures for renewable energy. Those policies and measures should be clear for better implementation.
- Provide incentives for various stages of technology development from R&D (e.g. public funds) to commercial use (e.g. tax credits). The incentives should be structured in order to address specific market barriers, be removable, reward innovation, and be cost-effective.
- Improve Feed in Tariff (FiT) system through transparency improvement on the formula used for calculation, assumption and conditions, process, and time frame for the implementation, including revision. Improved FiT could give better signal for investor to decide time for making investment.
- Develop competitive PPA for renewable energy. This model can be tested in parallel with the implementation of FiT. The objective of this model is to have a better market price signal for renewable energy technologies that can be used to adjust FiT.
- Energy subsidy, fuel and electricity subsidy to be reformed in order to make renewable be more competitive. Provide incentives for rural energy that utilizes renewable sources.

Objective: Improve level of sustainability of off-grid, community-based renewable energy technologies that have been deployed on the ground and financed by the public/government fund to continue providing energy services to the community.

- Improve coordination on project and budget allocation for renewable energy technology deployment in various ministries and agencies, including SOEs and local government; set common framework and indicator of performance for monitoring and evaluation purpose. Budget support for renewable energy development is scattered in some ministries, agencies, SOEs and local governments. Coordination between ministries should be done in order to disburse the funding efficiently and effectively to avoid overlapping. Coordination is also important, in order to ensure the sustainability of the publicly funded project to deliver energy services to citizens. It is imperative for government to have a registry system for all RE projects implemented in the country and common framework for monitoring and evaluation of project performance that can be used by all government agencies.
- Setting future target by planning for each stage of renewable technology deployment, particularly for off-grid/distributed and small-scale project. Government funding is available only on a yearly basis and has a very tight administrative schedule. This creates some barriers for a quality distributed or on-grid RE projects. So far there is no multi-year program to fund small-scale renewable plants, while completing the full cycle of a project (feasibility study, design engineering, community preparation and institutional development, installation and evaluation) could take more than 1 year, thus require a multi-year financing. To respond this, government's planning should consider the multi-year project budget to cover all stages of RE projects.
- Enhance coordination with donors that support the development of renewable energy through a joint planning and regular monitoring and evaluation on the result and achievement. There should be a coordination to allocate the funding from donor so the activities that were supported by the donor will not overlap. This means that Indonesia should be able to direct the available funding to any area of energy that should be prioritized in terms of building the facility, building the local capacity in order to maintain, operate, and monitor the power plant. Indonesia should not only focus on construction stage, but also on preparation including planning, designing, feasibility studies, as well as operational and maintenance.
- Improve, expand and modify the use and disbursement of Special Allocation Fund, in particular to link this instrument with the development of Public Service Agency (Badan Layanan Umum) at local government that could provide pre and post-

installation services. PSA could provide after sales services such as maintenance, service, fee collection, and expanding the installation. PSA can apply fee for services model or other types of end-user financing to finance the service provided.

- Increase ownership and responsibility of project beneficiaries and community. It is a standard practice that Government's program consists of distributing free technologies to the local community and/or individual households. This might limit the ownership and responsibility of the recipients to the technology itself. The government can change the outcome of the situation permit by adopting the partial subsidy mechanism to cover the capital cost of technology and work with the technology vendor to distribute the RE financing model.

Objective: Maximize financial leverage of PublicFinance Mechanisms (PFMs)

- Overcome the front-end barriers of project development by: (1) creating public finance facility to share some costs of the project development on a contingent grant basis. This facility could be used to support variety of activities: renewable resources mapping and data collection, feasibility study, lower loan evaluation and transaction cost, and covering portion of equity. This grant could be paid back once the project takes off and operational or converted as subordinated debt; (2) develop publicly funded project development company that works to prepare the project and bring the project at the level of readiness to attract financing from investor.
- Close debt/equity gap through increase public support for mezzanine type funds to buy down the risks and buy up the returns of commercial investors.
- Engaging domestic commercial financial institutions (CFIs) through credit lines and guarantee.
- Mobilize corporate finance by introducing tax incentives and leasing structures that improve the financial performance of RE projects for corporate sponsors.
- At the latter stage, the competition to access PFMs should be introduced.

Objective: Establish or strengthen the financial support instrument and mechanism for small scale and rural energy project finance.

- Establish a sustainable financing facility for small-scale project/ rural electrification project that could:

- Support the creation of early-stage seed capital funds, provide capital and enterprise development services to innovative clean energy entrepreneurs to carry out rural energy provision.
- Finance growth capital (funds for working capital or investing in new infrastructure) uses blended arrangements that buy down the risks and buy up the returns for commercial investors.
- Provide credit enhancements to share the risks (guarantees) or buy down the financing cost (interest rate softening) of commercial loans.

- This fund/facility can be arranged through a number of options: (1) put this fund under existing institution, e.g. Indonesia Climate Change Trust Fund (ICCTF). However, it is possible to improve ICCTF mandates and modify its structure; (2) establish new fund structure where government provide seed capital that run as trust fund by Non-Governmental Organization.

Objective: Increase awareness and capacity on sustainable energy finance of national and local policy makers and domestic financial institutions.

- Improve knowledge of commercial financial institutions (CFIs), micro-credit financial institutions (MFIs) on renewable energy and energy efficiency finance through Training and other capacity building programs. The Training will enable the financial institutions for conducting assessment and risks management, and understanding the revenue streams of various renewable energy projects, and business model of energy efficiency.
- Improve knowledge and understanding of policy maker at national and local level to enable them develop an adequate policy and regulatory framework to support the sustainable energy development.
- Provide technical assistance to establish PSA/BLU at local level to operate, manage, and maintain renewable energy facilities, technologies that have been deployed on the ground.

Endnote

Chapter 1

1 PLN Statistics 2009

2 PLN RUPTL 2013-2022

3 Presidential Regulation Number 5/2006 regarding National Energy Policy

4 Nuzahar, Hasril (2013): Rencana Umum Ketenagalistrikan Nasional dan Program Listrik Perdesaan, Presentasi untuk Inisiatif Sustainable Energy for All, 20 August 2013, Ditjen Ketenagalistrikan, KESDM2 PLN RUPTL 2013-2022

5 This figure is higher than the official figure by Ministry of Energy and Mineral Resources. According to figure from Director General of Mineral and Coal, coal production from PKP2B and BUMN in 2012 was 240.371 million ton, and coal export was 179.973 million ton, and domestic selling was 51.495 million ton.

6 As comparison, China shares 12,8% of global proven reserve, Australia shares 8,6%, and India shares 6,8%. China, India, and Australia are number 1, 3 and 5 of world coal producer in 2012, while Indonesia is no. 4 in that list.

7 Komipo Wampu SHPP, 45 MW hydro power plant owned by Korean investors, main financier is Sumitomo Bank (Japan) and Export Credit Agency; Bina Puri Desa Patteneteang SHPP, 4 MW small hydro power plant owned by Malaysian investor, main financier is Bangkok Bank; SGI Mitabu Solar Plant, 50 MW solar power owned by Australian investors, main funding is generated by Islamic bond (Sukuk).

Chapter 2

8 World Bank's GDP ranking 2012, can be accessed at *http://data.worldbank.org/data-catalog/GDP-ranking-table*

9 Based on IEA indicators. IEA use Total Primary Energy Supply (TPES) that is made up of production + imports – exports – International Marine bunker - International aviation bunker +/- stock changes.

10 Kementerian ESDM (2014): Program Lisdes Berkontribusi Besar Tingkat Rasio Elektrifikasi *http://www.esdm.go.id/berita/listrik/39-listrik/6764-program-lisdes-berkontribusi-besar-tingkat-rasio-elektrifikasi.html*

Chapter 3

11 The national policy has set the optimum energy mix target, that by 2025 the energy mix should compose of : 20% of oil, 30% of gas, 33% of coal, 5% of biofuel, 5% of geothermal, 5% of new and other renewable energy, 2% of liquified coal.

12 As listed in the Annex of Presidential Regulation No. 61/2011

Chapter 5

13 Potential reserve for geothermal was estimated 10,000 MW and hydropower was estimated 31,000 MW (World Bank 1981).

14 Retnaestri, et al (2003): Off-grid Photovoltaic Application in Indonesia: An Analysis of Preliminary Fieldwork Experience.

15 Cabraal, et al (1996): Photovoltaic Household Electrification Program: Lesson from Experience in Selected Countries, World Bank.

16 Kemenkop dan UKM resmikan PLTMH di Alor, retrieved from *http://www.seputarukm.com/kemenkop-ukm-operasikan-pltmh-di-alor/*

17 Distribution for SEHEN system for NTT province was targeted to reach 200,000 units by end of 2012. *http://m.inilah.com/read/detail/1912353/pln-targetkan-200000-pelanggan-pakai-sehen*

18 For instance, PLN dismantle 3500 units of SEHEN in Manggarai Barat, NTT because the user failed to pay monthly charge, *http://kupang.tribunnews.com/2014/05/26/pln-bongkar-3500-unit-sehen-di-manggarai-barat*, PLN also dismantle more than 6800 units of SEHEN in Ruteng, NTT due to similar situation, *http://www.floresbangkit.com/2013/03/tunggak-iuran-6000-lebih-lampu-sehen-terancam-ditarik/*

19 http://www.giz.de/en/downloads/giz2014-en-endev-indonesia-annual-report.pdf 56

20 http://sfiles.biru.or.id/uploads/files/finalreport-IDBP.pdf

21 http://www.adelphi.de/files/uploads/andere/pdf/application/pdf/indonesia_climate-finance-report_giz-adelphi.pdf

22 http://www.esp3.org/index.php/en/ and figure is taken from ESP3 Annual Progress Report 2013, from http://www.esp3.org/images/Library/PapersReports/ESP3_2013_Annual_Progress_Report_Final_rev0.pdf

23 http://www.ambafrance-id.org/AFD-dan-Bank-Mandiri-menjalin

24 http://www.ambafrance-id.org/AFD-memperluas-pendanaannya-ke

25 BNI financed USD 200 million pico-hydro project located in Cianjur district, conducted by IIEE. Another project is developing home bio-digester unit (6m3) for poor households in Sumba Island partnering with HIVOS under its BIRU project. The project cost is about 190 million rupiah.

26 The indication of poor of invention of technology of a country is number of patents registered. According to US Patent and Trademark Office (USPTO), total patent that registration from Indonesia until 2013 is 297 patents. As comparison, Malaysia 2152, Philippines 529, Thailand 802, and Singapore 7986.

27 Ministry of Finance Decree No. 113/KMK.08/2014

Chapter 6

28 The 9 provinces where BIRU program took place were: West Java, DI Yogyakarta, Central Java, East Java, Bali, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), South Sulawesi and Lampung. With the current demand and scope, the whole project that was started in May 2009

is expected to be finished by December 2013.

29 De Groot, Robert (2011): Governance and Institutional Aspect of Decentralized Dissemination of a Sustainable Biogas Sector in Indonesia, retrieved from https://www.wageningenur.nl/upload_mm/6/3/6/3508176f-a790-4b65-b4bf-580838dd327d_deGrootGovernanceofandInstitutionsforaDecent.pdf

30 De Groot, Rober (2013): Innovative Development Financing through Public Private Partnership, accessed from http://capacity.org/capacity/opencms/en/topics/gender-and-social-inclusion/innovative-financing-in-the-indonesia-biogas-programme.html

31 http://www.hivos.nl/eng/Business-Partners/Update/Rabobank-and-Hivos-partnership-providing-credit-for-biogas-to-small-scale-farmers

32 http://www.biru.or.id/index.php/news/2013/08/28/143/kolaborasi-bsm-unep-incar-pembiayaan-reaktor-biogas-rp60-miliar.html

33 http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/2013_events/GBEP-PANGEA_event_Brussels_24_June_2013/4_-_TARRAF.pdf

34 http://www.iob-evaluatie.nl/sites/iob-evaluatie.nl/files/Impact%20evaluation%20domestic%20biogas%20programme%20Indonesia.pdf

35 http://www.energiindonesia.org/issue_detail.php?idberita=1

36 http://sgp.undp.org/index.php?option=com_sgpprojects&view=projectdetail&id=6615&Itemid=205

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38 USD 1 = THB 30,1899 86

Chapter 7

39 FDI for electricity sector and biodiesel

40 This figure is based on the estimation of average capital investment for exploration and power plant construction, which is about USD3000 – 4000/kW. Bappenas (2013) estimated that the investment needs for developing 15 GW geothermal power plants are about USD 75 billion. With 30% equity, it requires USD 22.5 billion direct capital from project developer or investor.

41 For example see JICA's evaluation report on Rural Electrification Project completed in 1997, can be accessed at http://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2002/pdf/033_full.pdf

42 MEMR claimed that rural electrification rate has reached 96% in 2011 and has target to reach 98% in 2014. See also Radja, V and Edison Saragih (1995), can be accessed at: http://www.geothermal-energy.org/pdf/IGAstandard/WGC/1995/3-radja.pdf

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45 The bank assesses the trustworthiness of candidates for character. Factors for character criteria are: business experience and knowledge, personal and/or business credit history, references,

and education

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60%
RECYCLED

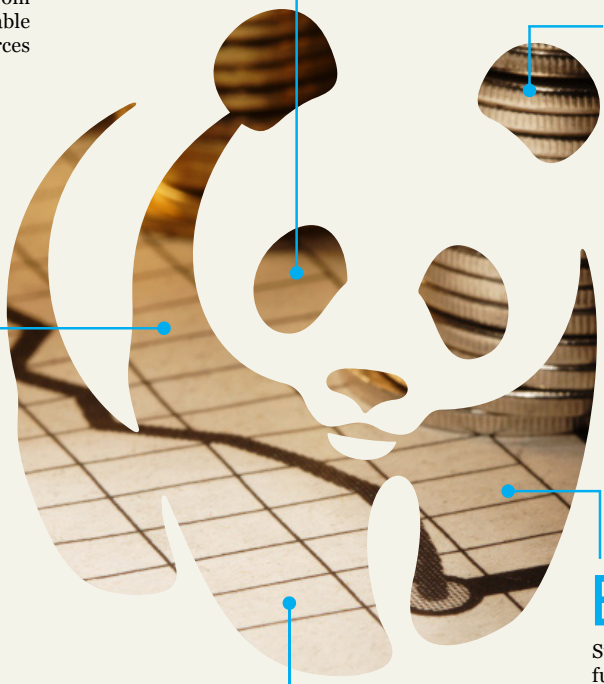
WWF Global Energy Vision:
100% Renewable Energy by 2050

VISION

By 2050, we could get all the energy we need from sustainable renewable sources

SOLUTION

Sinergy all stakeholders : policy maker, investor, business leader,communities, and individual



SCENARIO

Extensification of electric transportation; energy conservation; grid expansion/ *smart grids*; sustainable energy for all

BENEFITS

Stop pollution from fossil fuel; saving money; mitigate climate change impact; improve health; no risk of nuclear; create jobs; innovation; protect environment

CHALLENGES

Energy conservation and demand reduction; improve electrification; energy access an poverty alleviation; investment; implication to land/water/sea use; good governance; lifestyle choice-behaviour change & public ethic; innovation and R&D

WWF Mission

To stop the degradation of the planet's natural environment and to build the future in which human lives in harmony with nature

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WWF Sustainable Energy Finance in Indonesia

IDN WWF.OR.ID