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TKN REPORT

Investment Incentives for Renewable Energy: Case study of Indonesia

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Abbreviations and Acronyms

AANZFTA	ASEAN, Australia and New Zealand Free Trade Agreement
ACFTA	ASEAN China Free Trade Agreement
ADB	Asian Development Bank
AGOA	African Growth and Opportunity Act
APINDO	Asosiasi Pengusaha Indonesia (Employers' Association of Indonesia)
ASEAN	Association of South East Asian Nations
BAPPENAS	Badan Perencanaan dan Pembangunan Nasiona (State Ministry of National Development Planning)
BPKM	Badan Koordinasi Penanaman Modal (Indonesia Investment Coordinating Board)
FDI	Foreign Direct Investment
FTA(s)	Free Trade Agreement(s)
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GoI	Government of Indonesia
GVC(s)	Global Value Chain(s)
ICT	Information and Communication Technology
IK-CEPA	Indonesia Korea-Comprehensive Economic Partnership Agreement
IS	Innovation System
MFN	Most Favourite Nation
IT	Information Technology
MoT	Ministry of Trade
MP3EI	Master Plan for Acceleration and Expansion of Indonesian Economic Development (2011-2025)
NSW	National Single Window
NTMs	Non-Tariff Measures
OECD	Organisation for Economic Co-operation and Development
PPP	Public Private Partnership
RoO	Rules of Origin
RCEP	Regional Comprehensive Economic Partnership
R&D	Research and Development
RQ	Research Question
SMEs	Small and Medium Enterprises
TRIMs	Trade-Related Investment Measures
WTO	World Trade Organization

1.0 Introduction

Energy markets around the world face many challenges. Conventional supplies of fossil fuel reserves are becoming increasingly scarce, leading to rising prices and the development of unconventional sources. At the same time, concerns over climate change are growing, increasing the urgency for countries to decouple greenhouse gas emissions from economic growth.

All of these pressures have greatly raised the profile of renewable energy technologies (RETs), with governments now commonly providing a range of support frameworks and incentives to attract investment.

In developing countries, the support of renewable energy is complicated by the need to simultaneously expand access to energy more generally, as a cornerstone of poverty eradication and improvement of living standards. Frameworks and incentives must attract finance and maximize benefits from natural resources, while expanding energy access and keeping energy affordable for consumers and industry.

In order to achieve this difficult balancing act, policy-makers must know what kind of investment incentives are most effective at raising capital for renewable energy projects? And what size of support is affordable and reasonable?

This report assesses investment incentives for renewable energy in Indonesia. It focuses on four types of renewable energy: geothermal power, hydropower, biomass power and biofuels. Through an analysis of the incentives available for these technologies, and drawing on insights from representatives from governments and industry, it suggests some initial findings on the extent to which Indonesia's investment incentives for renewable energy are effective and affordable, and identifies further research that could usefully be conducted in this area.

The analysis is part of a series of reports that aim to conduct an initial, exploratory assessment of such incentives in developing countries around the world.

2.0 Definitions and Methodology

There is no one agreed definition of "investment incentives." Thomas (2007) defines them narrowly as "a subsidy given to affect the location of investment," while UNCTAD (2004) defines them more broadly as incentives intended to attract foreign or domestic investment using: financial incentives (such as grants and loans at concessionary rates); fiscal incentives (such as tax holidays and reduced tax rates); subsidized infrastructure or services; and concessions or exemptions from regulations and standards.

This study follows the broader definition of "investment incentives," recognizing that the vast majority of renewable energy subsidies cannot just focus on attracting investment to a particular location, but must also provide the financial support that makes such investments viable in the first instance. In this sense, the words "investment incentive" and "subsidy" can be considered interchangeable throughout the report, to the extent that the subsidy in question can be argued to affect investment decisions.

It should be noted, however, that "investment incentives" and "subsidies" do not include measures that are intended to remove existing market distortions that are a barrier to renewable energy. For example, none of the following measures would be considered to qualify as investment incentives: the removal of fossil energy subsidies; regulation intended to remove barriers to renewable energy entering the energy market; or the use of taxation and payments to internalize positive and negative externalities. While such measures are not the focus of this report, they are identified and factored into assessments where relevant.

Two main research methods were used to collect data for this study: desk research and structured interviews.

The desk research focused on reviewing three issues: i) the current state of Indonesia's energy supply and demand and the structure of its energy industry; ii) the laws and regulations that govern the Indonesian energy industry, including those that, although not targeted at energy, are nonetheless relevant to energy development, such as laws and regulations concerning tax and investment in general; and iii) general issues that affect renewable energy markets, such as ease of doing business. Sources reviewed included government documentation, research papers and news media.

The interviews were held with a range of stakeholders in government and the energy industry, including representatives from: the National Development Planning Agency (BAPPENAS); the National Energy Council (DEN); the State-Owned Enterprises (SOE) Risk Subdivision of the Fiscal Policy Office in the Ministry of Finance; the Directorate of Various New Energy and Renewable Energy in the Ministry of Energy and Mineral Resources; the Indonesia Renewable Energy Society; the Indonesia Geothermal Association; the Indonesia Biofuels Association; the State Electricity Company (Perusahaan Listrik Negara, or PLN); Perum Jasa Tirta II, the state-owned company in charge of Jatiluhur hydro power plant; and PTPN III, a plantation company developing biomass electric power based on palm oil waste.

Interview questions were tailored to suit each respondent's background or institution, but all focused on how best to develop renewable energy development in Indonesia. Respondents were asked to identify the main impediments to developing the renewable energy industry and to suggest incentive schemes that the government should pursue to attract investment.

The study first outlines the status quo of the energy sector and investment incentives for renewable energy—see Section 3 (Overview of Indonesia's Energy Sector), Section 4 (*Overview of Indonesia's Energy Sector*) and Section 5 (*Investment Incentives for Renewable Energy*). It then analyzes the extent to which existing incentives have adequately addressed investment barriers for Indonesia's four key renewable energy technologies: geothermal power, hydropower, biomass power and biofuels—see Section 6 (Assessment of Investment Incentives). The analysis draws on research, interviews with stakeholders and the authors' own assessment of the incentive measures.

3.0 Overview of Indonesia's Energy Sector

Indonesia's energy sector plays two important roles in the economy. First, it produces and refines hydrocarbon fuels, contributing significantly to economic growth, exports and government revenue. Second, it provides necessary inputs for production and other economic activities.

3.1 Energy Production

Table 1 shows the role of the energy sector in the economy over the past decade. Oil and gas production, the most important energy resource, has been declining: in 2000–2004, oil and gas production accounted for more than 10 per cent of the economy's gross domestic product, while by 2010–2011 this had fallen to only 6 per cent. This decline is both relative and absolute, as shown in the negative rate of growth in value added. It is also reflected in the decline of energy exports as a share of total exports, from around 9.5 per cent in the early 2000s to only 6.7 per cent in 2010–2011.

The absolute value of energy exports, however, has grown over the past decade. Fuel exports in 2010–2011 accounted for more than 32 per cent of GDP, up from 25 per cent at the beginning of the last decade. This is partly due to increasing international prices and partly due to an expansion in coal production and export. Currently, 75 per cent of domestic coal production is exported.

TABLE 1. ENERGY SECTOR CONTRIBUTION TO THE ECONOMY

	2000–2004	2005–2009	2010–2011
Oil and gas as a share of GDP (%)	10.6	7.3	6.0
Value added growth (% change per annum)			
Crude oil and gas production	-4.1	-0.5	-0.5
Petroleum refining	-1.1	0.1	0.0
LNG	-2.4	-1.1	-0.9
Fuels exports as % in total exports	25.3	27.7	32.0
Export growth (% change per annum)			
Crude petroleum	0.6	-1.0	15.3
Gas	4.0	-0.6	29.4
Other fuels	11.4	26.0	19.1

Sources: StatistikEkonomi dan Keuangan Indonesia, Bank of Indonesia and UN COMTRADE, compiled and calculated by authors.

Indonesia has a rich endowment of renewable energy resources, such as hydropower and geothermal, but these are largely undeveloped. There are a number of reasons for this, among them the significant subsidies for petroleum products, which reduce incentives to develop alternative sources of energy.

3.2 Energy Consumption

Indonesia's energy demand is on a strong upward trend. This is due to an average annual economic growth of between 6 and 7 per cent as well as a growing population. From 1990 to 2010, Indonesia's total final energy consumption (excluding biomass) grew at an average rate of 5.5 per cent (Center for Data and Information on Energy and Mineral Resources [CDI-EMR], 2011).

The most important energy inputs for the Indonesian economy are fossil fuels, with oil products alone accounting for almost 50 per cent of energy consumption in 2010, although that share has been declining since 2005 (CDI-EMR, 2011). Another important energy source is coal. Massive coal exploration and production since the early 2000s has triggered rapid expansion in coal use—an increase of around 300 per cent during the last eight years (CDI-EMR, 2011).

Industry and transportation are the biggest consumers of energy, accounting for more than 36 per cent and 38 per cent of total consumption in 2010, respectively (CDI-EMR, 2011). Since the early 2000s, the household sector has come to use less energy, both in relative and absolute terms: consuming 21 per cent of total energy in 2000, and declining to only 13 per cent in 2010, an absolute decline of 6 million barrels of oil (BOE) equivalent. This decline began in 2006 when the government introduced a program encouraging households to switch from using heavily subsidized kerosene to using more expensive but efficient liquefied petroleum gas (LPG).

Transport Fuels

Oil-based fuels remain the fundamental source of energy for transportation, providing 99.95 per cent of the energy consumed, despite government plans to promote the use of biofuels and compressed natural gas (CNG).The biggest share of oil products goes to transportation—almost 70 per cent of fuels consumed in the country (CDI-EMR, 2011).

Two types of biofuels have been introduced and developed in Indonesia: bioethanol and biodiesel. The beginning of biofuel use in Indonesia's transportation sector was marked by the selling of Pertamina's fuel products in 2006, consisting of the mixture of biofuels and tradition oil-based fuels. The three products that Pertamina offered were: "bio-premium," (a mixture of 97 per cent premium and 3 per cent ethanol); "bio-pertamax" (97 per cent pertamax and 3 per cent ethanol);[1] and "bio-solar" (97.5 per cent diesel fuel and 2.5 per cent methyl-ether). Table 2 presents the structure of fuel consumption in Indonesia's transport sector.

TABLE 2. FUELS CONSUMPTION IN TRANSPORT SECTOR (KILOLITRE)

	BIO-PREMIUM	BIO-PERTAMAX	BIO-SOLAR	TOTAL FUEL	SHARE OF FUEL (%)
2006	1,624	16	217,048	28,117,389	99.95
2007	55,970	9,956	877,457	29,623,396	99.94
2008	44,016	16,234	931,179	32,564,294	99.91
2009	105,816	20,232	2,398,234	37,238,870	99.94
2010	0	0	4,393,861	42,102,919	99.95

Source: CDI-EMR (2011)

Total consumption of biodiesel in Indonesia was 220 million litres in 2010, which was around 30 per cent of total production. Most biodiesel was exported to European countries due to attractive prices (Asociación Nacional De Productores De Biocombustibles [APROBI], 2011). Meanwhile, bioethanol fuels, production of which had increased

[1] Premium and Pertamax are the brand name of Pertamina's fuel products equivalent to RON 88 and RON 92.

significantly between 2006 to 2009, were no longer in production after 2010 due to a major discrepancy between the price paid by Pertamina to bioethanol producers and the cost of production, which has risen significantly following increases in the price of molasses. As a result, since 2010 Pertamina has no longer sold bio-premium or bio-pertamax.

Conversion from petroleum to CNG was introduced in the late 1980s by developing several CNG stations in some big cities and encouraging public transportation using more gas-based fuels. However, by 2010, only 500 vehicles were using the fuel, out of around 6,000 that were equipped with the converter kit. The biggest challenges come from availability and distribution: out of 42 CNG stations in Jakarta, only six remained open in 2010 (Susanti, Hartato, Subekti, & Saputra, 2011). In 2012, the government again proposed a conversion program to increase the use of gas for transportation. It set aside Rp2.1 billion (around US$200 million) to develop CNG facilities and distribute conversion kits. However, as of the third quarter of 2012, only a small proportion of the funds are reported to have been used (Wijayanto, 2012).

Electricity

During the first decade of the new millennium, demand for electric power is estimated to have grown around 6.8 per cent per year (Muchlis & Permana, 2006). Current estimates place coverage of power services at around 70 per cent of the population, with yearly average per-capita consumption of around 655 kilowatt hours (PLN, 2012a). Growth in demand has not been matched by growth in supply, however, with generation capacity increasing by a little less than 5 per cent annually (PLN, 2012a). Massive power blackouts have frequently taken place as a result. Despite this, the power sector has increased its contribution to national energy consumption, supplying 13 per cent of the total energy consumed in 2010.

Table 3 breaks down power capacity and generation by energy sources in 2011. As with energy consumption more generally, fossil fuels are the dominant energy input. Oil-based power plants dominate two-thirds of installed capacity, and most of them are controlled by the state electricity company (Perusahaan Listik Negara, or PLN). Due to various government incentive programs to promote non-oil-based energy sources, only around 16 per cent of private power plants use oil: instead, they rely on coal. However, some electricity is generated from renewable energy technologies—namely, geothermal and hydro power. The share of power generated by these technologies is small in proportion to national capacity. Renewable power plants also operate below their capacity, generating less than 50 per cent of their potential due to low utilization of hydropower.

TABLE 3. POWER CAPACITY AND ELECTRICITY GENERATION BY ENERGY SOURCE IN 2011

	HYDRO	OIL	COAL	GEOTHERMAL	GAS	OTHERS	TOTAL
Installed capacity (megawatts)							
PLN	3,553	21,475	160	439	945	6	26,547
Private power plants (independent power plants [IPPs] & private power utilities PPUs)	187	1,211	4,859	754	249	24	7,284
Electricity generated (gigawatt hours or GWh)							
PLN	10,316	43,617	54,950	3,487	30,369	1	142,740
Private power plants (IPPs + PPUs)	2,102	1,835	22,802	6,051	7,893	-	40,682
Total	12,418	45,452	77,752	9,538	38,262	1	183,422

Source: MEMR (2012a) and PLN (2012a), compiled by authors.

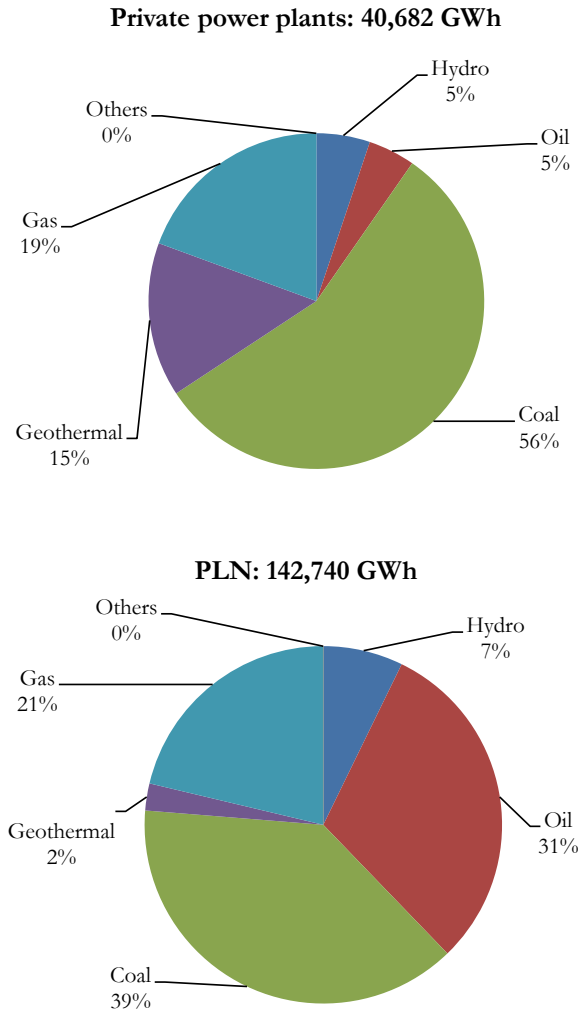


FIGURE 1. ELECTRICITY GENERATION BY ENERGY SOURCE IN 2011: PLN AND PRIVATE POWER PLANTS

Source: MEMR (2012a) and PLN (2012a), compiled by authors.

Energy Efficiency

One measure of energy efficiency, energy intensity—measured as the amount of energy consumed per unit of economic output—has declined over the last decade. In the early 2000s, it was above 500 barrels of oil equivalent per Rp billion (BOE/Rp billion), whereas it is currently less than 450 BOE/Rp billion (authors' calculations based on CDI-EMR, 2011).

The decline in energy intensity is due to efficiency improvements in the industrial, commercial and household sectors. Meanwhile, the transportation sector seems to have become a less-efficient user of energy (with energy intensity of around 2,000 BOE/Rp billion, and on an increasing trend) due to the growing number of private vehicles. Substantial government subsidies for Premium brand gasoline and Solar brand diesel also dampen price signals that would otherwise incentivize more efficient fuel use (Tumiwa, Lontoh, Laan, Lang, & Vis-Dunbar, 2012).

Another measure, the elasticity of energy—ratio of the growth of energy consumption and GDP growth—is also trending downward. Currently, the elasticity of energy in Indonesia is less than 1. This was also the case during the last decade, but is lower than its value in the 1980s and 1990s, when it hovered between 1.04 and 1.35 (Ardiansyah, Gunningham, & Drahos, 2012).

3.3 The Regulatory Framework

The umbrella regulatory framework for the energy sector began to develop at a sub-sectoral level in 1998 and was fully established in Law No. 30/2007. This sets out the guiding principles of national energy management. Under this law, a National Energy Council (DEN) was established with the authority to design and formulate long-term energy policy. This will be specified in a National Energy Policy (Kebijakan Energi Nasional, or KEN), which is under discussion in parliament at the time of writing. The aim of the KEN is to develop an energy sector that provides sufficient and affordable energy, as well as promoting more efficient energy consumption.

There are also several other laws describing regulations for specific energy sectors.

The earliest law defining the hydrocarbon industry is Law No. 22 on Oil and Gas of 2001. This stipulates one the most important reforms in the energy sector up to that time: removing from Pertamina (the state-owned company for oil gas production) the authority to assign working contracts. Previously, Pertamina conducted exploration and extraction itself, in addition to giving licenses and rewarding contracts to other operators, making it both an industry player and the regulatory agency. The new law transferred Pertamina's regulatory function to two new agencies: BPMigas, to control upstream production; and BPH Migas, for downstream.

The situation regarding the regulation of the hydrocarbon sector very recently (in November 2012) became uncertain, with Indonesia's Constitutional Court dissolving the upstream regulator BPMigas following a judicial review of Law No. 22/2001. The court declared that BPMigas is not in line with Article 33 of the Indonesian Constitution, which stipulates that the state should reap the greatest benefit from the country's natural resources. It is not clear what new regulatory structure will emerge. Currently, BPMigas' previous function has been taken over by the Ministry of Energy ("Task force takes over BPMigas job," 2012).

Attempts were made to improve the regulation of the electricity sector in 2002, when the government replaced Law No. 15/1985. This was intended to move the electricity market from a monopolistic structure to a limited competitive market within a five-year time frame. However, in 2004, this too was annulled by Indonesia's constitutional court. It was declared anti-constitutional because it gave up production of electricity to the private sector.

An important recent change in the regulatory framework of the electricity sector is the passing of Law No. 30/2009. This is a second attempt to improve upon Law No. 15/1985, though attempting less reform and liberalization. In essence, it would see Indonesia's electric power services still controlled by the government, but allow for the electricity supply to be distributed by either the central or regional governments through the PLN or regionally owned utilities. It also promotes more active participation from the private sector (in the form of IPPs), including in the retail selling of power.

No specific law sets out policy on renewable energy, except for Law No. 27/2003 on geothermal power. However, Presidential Decree 26/2006 set a target for renewable energy to make up 17 per cent of the total energy mix by 2025. In 2010, the Ministry of Energy revised this target up to 25 per cent. Several policies have since been introduced to support renewable energy development. The most recent is a new regulation setting out a feed-in tariff for renewable electricity. This requires PLN to purchase renewable electric power at prices that are intended to incentivize RET deployment.

3.4 Industry and Market Structure

Indonesia's energy market has a rigid oligopolistic structure: it is dominated by a few players and is heavily regulated by the government. This is a legacy of a long history of having state-owned companies' with monopoly rights. Until early 2000, only state-owned companies were allowed to operate and provide energy products for each sub-sector of gas, oil and electric power. Private participation was either prohibited or limited to supplying contractual works (International Energy Agency [IEA], 2008). The Asian financial crisis put pressure on the government to liberalize and deregulate the industry. As a result, there are now several players in the industry, but the state-owned companies maintain a dominant position.

The oil and gas industry is separated into upstream and downstream sub-sectors. Companies operating in the upstream sector are prohibited from conducting business downstream. They may, however, set-up separate business establishments to operate in each subsector (PWC, 2012). Pertamina, the state-owned company in charge of oil and gas production and distribution, used to be the biggest player in the upstream business and also acted as the government representative to assign contract works to other companies. However, as a result of the deregulation stipulated in Law 22/2001 on oil and gas, it lost its licensor power.

Indonesia's two largest oil producing fields, located in the Riau province of Sumatra, are operated by Chevron, making it the biggest producer of crude oil, delivering 356,000 barrels per day, equivalent to 40 per cent of the country's total oil production. Other important producers are some of the largest international oil and gas companies, such as Total, Conoco Phillips and Exxon Mobil. Pertamina remains one of the biggest crude oil producers and currently produces around 132,000 barrels per day.[2] There are also a large number of smaller-sized domestic companies. Most of those companies' operations are based on production sharing contracts (PSCs).

In the downstream sector, the situation is a little different because private participation has only been allowed since 2005, as stipulated in Law No. 22 on Oil and Gas of 2001. Previously, Pertamina and the National Gas Company (Perusahaan Gas Negara, PGN) were the only distributors of oil and gas products in the domestic market, though private companies had been allowed to build refineries since 1997. In recent years, several foreign companies have entered the distribution and retail markets, but they remain marginal. This is because of the government's significant subsidies for Premium brand gasoline and Solar brand diesel. Only Pertamina is allowed to distribute these oil products. Because they are so much cheaper than non-subsidized fuel, they constitute around 86 per cent of domestic consumption (Ministry of Energy and Mineral Resources [MEMR], 2012b). The prices of the fuels are set by the government, with the government then paying Pertamina the difference between the cost of the fuel and the regulated retail price. The government last set the price of fuels on January 2009. Recently the government has opened up the possibility for other companies to supply subsidized fuels as part of their universal service obligation, but only for the area outside Java ("AKR eyes higher portion," 2012).

The power sector in Indonesia is categorized into three related activities: generation of power, transmission of power and distribution and sale. Today, electricity is either generated by the state-owned power company, the National Electric Company (Perusahaan Listrik Negara, or PLN), or from private power producers (IEA, 2008). Power generation has been partially liberalized since the early 1990s, when the government first invited private independent power producers (IPPs) to participate in the power sector. Transmission, distribution and sale are dominated by PLN. It is virtually the sole supplier, transmitter and distributor of power services to final consumers, with the exception of several small privately-owned, closed electric networks, which normally operate in industrial areas.

[2] The figures come from the Revision of State Budget 2012, which sets the target of crude oil production as the basis for revenue calculation. According to media reports, actual production is slightly lower, with Chevron producing 344,000 barrels per day and Pertamina around 127,000 barrels per day ("BP Migas Perkirakan Produksi," 2012).

However, those IPPs that operate large-scale power plants are only allowed to sell their services to PLN based on specific power purchase agreements (PPAs) which specify the amounts and agreed-upon selling prices of the services. Currently, there are 28 IPPs in operation supplying electric power to PLN under long-term contracts of from 20 to 30 years (PLN, 2012b).

The transmission, distribution and selling activities are done exclusively by PLN except, as noted, for small providers servicing limited areas. Those providers are required to develop and build their own closed off-grid networks. Those companies hold a special licence that allows each company to generate electricity and sell their services to limited number of consumers. Most of them are industrial estate and building managements; some cooperatives and local government agencies also operate in the areas not covered by PLN's services. The new 2009 Electricity Law preserves such arrangements, although it also opens up new opportunities for the private sector to use transmission facilities and to distribute electricity, provided that certain conditions are fulfilled.

3.5 The Renewable Energy Industry

Renewable energy still plays a very small role in the national energy supply, accounting for only around 6 per cent of the total final energy supply. Most renewable energy comes from geothermal, hydro and biomass power. Presidential Decree No. 5/2006 mandates an increase in renewable energy production to a level of 17 per cent by 2025, as described in Figure 2 below.

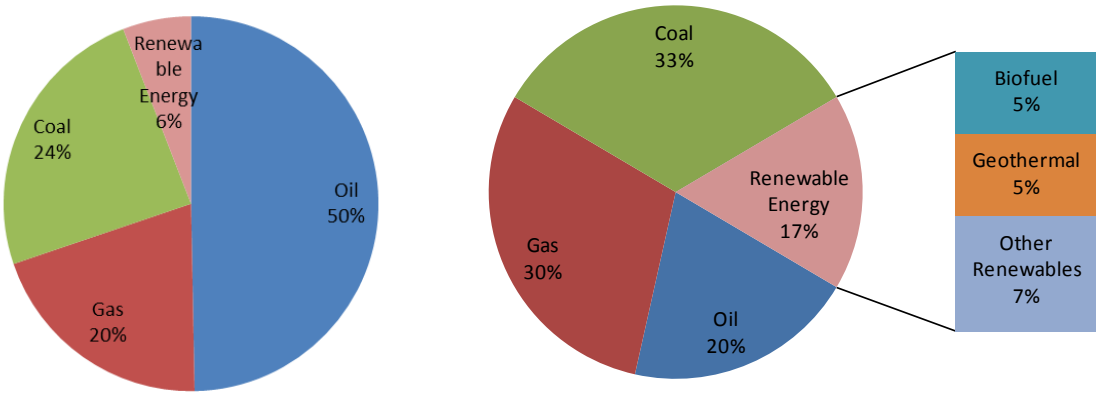


FIGURE 2. INDONESIA'S TOTAL PRIMARY ENERGY CONSUMPTION

Source: Ministry of Energy and Presidential Decree No. 5/2006. The most detailed breakdowns of "other renewables" state that hydropower, solar power and wind power will contribute 5 per cent of total primary energy consumption, with the remaining 2 per cent to be provided by coal liquefaction.

The country's geothermal resource is estimated at around 28 gigawatts (GW) of capacity, about 40 per cent of the world's known potential. At the moment, the installed capacity is less than 1.2 GW, only around 2.7 per cent of Indonesia's total installed power capacity in 2011 (Warnika, 2012). Several IPPs operate geothermal power plants in addition to the plants operated by PLN. While the cost of geothermal is low, high upfront capital requirements have hindered development. The investment cost of PLTP Wayang Windu II, a geothermal plant with a capacity of 100 MW, has reached US$300 million (PLN, 2012b).

Hydropower is also estimated to have the potential to reach 75 GW. Currently, only 7 per cent of this has been developed, mostly by PLN, but with some plants operated by private power companies (Warnika, 2012). According

to the Indonesia Renewable Energy Society, there are not many ongoing hydro power projects. Out of 130 PPAs involving hydro power projects that have been signed, only around 40 have been implemented.

PLN is currently developing a Fast Track Program Phase II, a part of the Fast Track Program launched in 2006 to rapidly build power plants to service increasing electricity demand in Indonesia. The second phase aims to provide 10 GW of new power capacity by 2014, including 2.5 GW from geothermal plants and 875 MW from hydropower.

The potential for biomass power is thought to be as much as 50 GW (Warnika, 2012). The technology is still very under-developed: the current installed capacity is only 1,618 MW, mostly produced by agricultural plantations for their own use. The main challenge is that biomass power requires feedstock materials. While these are available from various sources—crop and agriculture residues, forest waste and several plantation products—they need to be collected and transported on a scale sufficient for commercial electric production.

Biofuels represent another way of harnessing Indonesia's biomass potential. The main feedstock for biodiesel is oil palm and, to a lesser extent, jatropha, while bioethanol's main feedstocks are corn, sugarcane and cassava. Indonesia is the main producer of palm oil. In 2010, the total production was around 22 million tonnes of crude palm oil, or close to 44 per cent of global production, with oil palm plantations covering around 7.8 million hectares of land (Komarudin, Obidzinski, & Adrianto, 2012). In addition to edible oil and energy, palm oil is also used as inputs in the cosmetics industry in the form of oleochemicals. According to one estimate, by 2020, domestic demand for cooking oil will be 12 million tonnes, biodiesel will be 12 million tonnes, and oleochemicals will be 4 million tonnes. By then Indonesia will produce around 40 million tonnes of crude palm oil (Komarudin et al., 2012).

According to the Ministry of Energy and Mineral Resources (MEMR), biofuel consumption will be around 83.1 million barrels of oil equivalent (MBOE) per year, or three per cent of the country's total primary energy consumption by 2025 (MEMR, 2012c). Yet, despite the ambitious target, the progress in biofuel development has been slow. In 2011 the mandatory biodiesel consumption target was 1,297,000 kilolitres, but the actual consumption was only around 358,812 kilolitres, or only around 27.7 per cent of the targeted amount (Komarudin et al., 2012). As of 2012, there are 23 bio-diesel producers with a total installed capacity of around 4.8 kilolitres per year (kl/year) and seven bio-ethanol producers with a total installed capacity of around 365,000 kl/year (Hutapea, 2012).

4.0 Investment Incentives for Renewable Energy

This section describes various policy schemes that have been introduced by the Indonesian government to promote the development of renewable energy. The discussion is restricted to policies and regulations that affect the four types of renewable energy focused on in this study: geothermal power, hydropower, biomass power and biofuels.

4.1 The Institutional Framework for Renewable Energy

Policy-makers and Implementers

Indonesia has rather complex institutional and stakeholder arrangements in the energy sector. At least four government agencies are directly involved in formulating or implementing renewable energy policy at a national level, with local governments and a number of other government agencies also having influence over either policy or its implementation, as described below.

- **The Ministry of Energy and Mineral Resources (MEMR)**. This national government agency is the main institution responsible for day-to-day supervisory activity related to the energy sector. In particular, the ministry oversees state-owned companies. It is also in charge of providing data and analysis related to energy sector development and conducting surveying and research into energy and mineral resources. In 2010, the ministry established a Directorate General in order to administer the development and promotion of renewable energy. The formation of this sub-ministerial agency has strengthened regulatory supervision over renewable energy.
- **The National Energy Council (DEN).** The council was set up in 2009 as a part of the implementation of the Energy Law of 2007. It is expected to formulate a comprehensive national energy policy and general plan, as well as set out a strategy for energy consumption to be implemented and executed by the MEMR. The agency is chaired by the President, while accommodating seven ministries as members. To balance government officials, the council also has eight non-government members, including academics, environmentalists, consumer advocates and industry and technology representatives.
- **The National Planning Agency (Bappenas).** While this agency is not involved directly in the implementation of energy regulation, it is quite influential in determining the direction of energy policy, as well as aligning it with broader economic plans and regulations. Bappenas sets out the plan for energy development to be is carried out by MEMR. Its recent roadmap for the acceleration of development identifies the promotion of renewable energy as a key issue in the provision of infrastructure. Economic planning is carried out through the proposed allocation of the MEMR's annual budget, particularly in infrastructure development.
- **Ministry of Finance (MoF).** The Ministry of Finance has authority over approving the use of government expenditure, including investment incentives. It sets out these decisions when considering the annual government budget that it formulates.
- **Local and regional governments.** These play an important role in the implementation of energy policy by developing relevant regulations and issuing permits. They may also introduce their own, sub-national promotional strategies. Some local governments also provide schemes to simplify administrative procedures related to project development.
- **Other government agencies.** There are several other agencies that are related to energy policy formulation and implementation.

- The Ministry of State-owned Enterprises (SOEs) controls the operation of SOEs in energy sector. Since the energy sector remains highly regulated, with SOEs as dominant players, the ministry also plays an important role in determining the direction and implementation of energy policy.
- Policies from the Ministry of Environment and Ministry of Forestry can also affect the development of renewable energy projects.

Subjects of Policy

The actors who are the subjects of energy policy—and who, in turn, often seek to influence policies to meet their needs and interests—are several state-owned enterprises and, in certain segments of the industry, private companies. This includes:

- **The National Electric Company, PLN.** PLN operates many power plants and is also responsible for almost all transmission and distribution of electricity.
- **Independent power producers (IPPs).** There are some IPPs generating electricity from renewable technologies in Indonesia. In most cases, they must sell their electricity to PLN. The electricity is sold at rates set by power-purchase contracts or in line with the national feed-in tariff.
- **The national oil company, Pertamina.** Although Pertamina is not the only distributor of fuel, it is the only company authorized to distribute subsidized fuels, including subsidized biodiesel.
- **Biofuel producers.**

Figure 3 provides a broad outline of the different actors and incentive policies that make up this institutional framework.

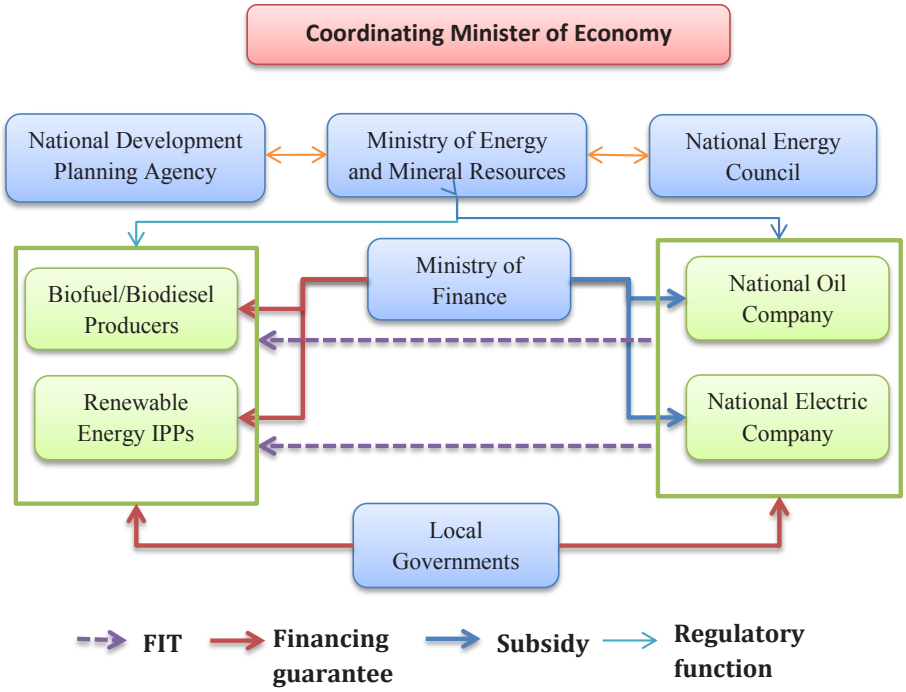


FIGURE 3. INSTITUTIONAL FRAMEWORK OF INVESTMENT INCENTIVES IN RENEWABLE ENERGY

4.2 General Policy Framework Related to Renewable Energy

Various generic economic and business regulatory frameworks influence the development of renewable energy.

The main regulatory framework surrounding investment is stipulated by Law No. 25, 2007 on investment. It sets out the major principles related to the establishment and operation of business activities: for example, procedures for legalization of business and licensing; land use; and investment facilities and incentives. It also sets out how authority over investment policy should be distributed and coordinated among different government agencies and between central and local government. It influences renewable energy projects due to how it allows land to be licensed and acquired. It also affects projects by deciding which business activities are currently closed or open to private sectors with conditions, known as the Negative List of Investment (DNI). In DNI 2010 (Presidential Regulation No. 36, 2010), for example, the government opens micro power plant investment (<1 MW) only to small enterprises, while keeping foreign investment in other energy sectors below certain limits.

Since the decentralization process began in 2001, some authority over investment procedures and related government revenue has been transferred to regional and local governments. Regional governments, for instance, retain the right to determine the site of business activities following their local development master plan. Often, investors that have secured permissions from the central government will need to reevaluate their plans in order to comply with regional and local governments' requirements, or even totally cancel them (Pambudi, 2006). Local governments' may also hinder or promote investment decisions through regional fiscal policies, such as local taxes and levies or local subsidies.

Environmental and forestry regulations can also affect renewable energy development. Law No. 41/1999 on forestry, for example, which was amended in 2004, bans all mining activities in forest areas, unless a special permit is obtained. This prohibition can have implications for geothermal resources that are within a forest area. In 2010, the government introduced Government Regulation No. 24/2010 which gives special permission for projects that are deemed strategic (including geothermal exploration) to take place within forest areas. However, according to interviews with government sources, this still requires that permission be granted on a case-by-case basis.

4.3 Investment Incentive Framework

Investment incentives for renewable energy development in Indonesia can be classified into a number of groups: first, financial incentives, which provide loans and loan guarantees at below-market rates; second, fiscal incentives such as tax exemptions and other tax-related subsidies; third, access to services at below-market rates; and fourth, market price support and regulation, which provide above-market prices or demand when renewable energy is produced and sold.

Most of these incentives are briefly mentioned in the Presidential Regulation No. 5/2006 on National Energy Policy. The implementation of specific schemes is described in detail under various ministerial decrees and regulations.

Table 4 summarizes the major incentive schemes that were identified in this study. They are described in more detail in the rest of this section.

TABLE 4. INCENTIVE SCHEMES FOR RENEWABLE ENERGY

INCENTIVE SCHEME	RELATED REGULATIONS	REMARK
Financial incentives		
Indonesia Infrastructure Guarantee Fund	MoF Regulation 260/2010	SOE providing guarantee to attract private capital investment in infrastructure development.
The Geothermal Fund	MoF Regulation 3/2012	Provides finance for exploration, only to be paid for if sites prove productive.
Development Credits for Biofuels and Plantation Revitalization	MoF Regulation 117/2006 MoF Regulation 79/2007	Low-cost loans for farmers and farmer groups that plant energy crops.
Government financial guarantee	MoF Regulation 139/2011	Government guarantee for geothermal and hydro power plant projects as part of FTP II of electricity development.
Fiscal Incentives		
Import duty and VAT 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	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 goods or services below market value		
The Geothermal Fund	MoF Regulation 3/2012	Survey and exploration services, only to be paid for if sites prove productive.
Guarantee on business viability of PLN	MoF Regulation 139/2011	Guarantee that PLN would perform its business activities and respect contracts with IPP.
Public competitive bidding	MEMR Regulation 1/2006	Agrees favourable tariffs with most competitive company bidding for tender.
Feed-in Tariffs	MEMR Regulation 4/2012 MEMR Regulation 22/2012	FIT for biomass and mini hydro power plant. FIT for geothermal power plants.
Mandatory utilization	MEMR Regulation 32/2008	Obligatory usage of biofuels for fuel mix. Mandatory usage of biofuels in mining industry.

Source: Compiled by authors from various sources.

Financial Incentives

Financial incentives focus on the provision and cost of project finance. This can be a major issue for big renewable energy projects such as geothermal power and hydropower plants, which require large amounts of capital and can therefore involve substantial risk. They often take the form of mechanisms such as investment grants, subsidized loans, loan guarantees and insurance at preferential rates.

In Indonesia, the following financial incentives are related to renewable energy:

- **The Geothermal Fund Facility (GFF).** This fund is currently managed by the Indonesia Investment Agency (Pusat Investasi Pemerintah, or PIP). In the 2011 State Budget, the government allocated a revolving fund of Rp 1,236.5 billion for geothermal development (Center for Energy Sustainability and Economics, 2012). One of the two services performed by the GFF, as stipulated in MoF Regulation No. 3/2012 , is that it will provide financial support for data collection and high quality information about new potential geothermal sites. The fund can be applied to by either local governments where the sites are located, or by private investors. Similarly, the PIP also offers loans to geothermal developers to finance geothermal exploration activities. Both local governments and the geothermal developers are eligible to borrow up to US$30 million, available at the central bank (BI) rate. The cumulative total amount of funds available in 2011 and 2012 is Rp 2 trillion, equivalent to around US$217 million (MoF, 2012). The cost of the research is only to be paid back if a site is proven to be productive. The service is intended to reduce financial risks during the early stages of geothermal power development.
- **The Indonesia Infrastructure Guarantee Fund** (IIGF or also known as PT PII Persero) is a newly created state-owned company which guarantees any contractual risks in relation to government actions in order to facilitate the implementation of large infrastructure projects. This is part of public private partnership scheme as described in the Presidential Regulation 78/2010 and MoF Regulation 260/2010. The scheme is not limited to renewable energy projects.
- **Loans at an interest rate lower than that provided by national banks** are available to farmers, particularly for planting palm oil for biofuels, as set out in Regulation 117/2006. This was followed up by MoF Regulation 79/2007, which enables small and medium-size enterprises to obtain low-cost finance from national banks for food and energy crops. The loans, which do not charge commission or administrative fees, can be given to farmer groups or cooperatives for particular commodities for a period of five years.

Fiscal Incentives

Fiscal incentives are provided through tax provisions. They are typically intended to reduce costs related to investment and plant operation. Some of these have been introduced for renewable energy in Indonesia but only to a limited extent. Fiscal incentives related to renewable energy include the following:

- Income tax facilities:
  - **Income tax reductions.** A renewable energy investor is eligible for net income reduction by 5 per cent of the investment value each year, over a six-year period (Ministry of Finance Regulation No. 21/2010).
  - **Accelerated depreciation and amortization.** This allows investments to be depreciated within 2–10 years, depending on type of asset. This incentive would reduce the income tax paid by the investors and is expected to encourage expansion of investment (Government Regulation No. 1/2007).
  - **An income tax reduction for foreign investors** allows them to pay a rate of only 10 per cent on dividends they receive.
  - **Compensation for losses for foreign investors.** This is available for more than five years and follows certain criteria. VAT on imported goods for producing renewable energy can also be exempted.

- Import duty and VAT facilities:
  - **Exemptions from import duty for capital goods and machinery**, provided that the goods are not available in Indonesia, or that their Indonesian equivalents have unsuitable specifications or are available in insufficient quantity (Ministry of Finance Regulation No. 21/2010). While the Decree is specifically directed for renewable energy promotion, the same import duty exemption is also available for power plant development from all other sources of energy. The exemption is valid for two years and can be extended for one more year. Investors need to request the facility by following various procedures and showing required documentation. The incentive can also be requested for activities to increase the capacity of existing power plants.
  - Until recently, Indonesia also offered a tax incentive for investors in renewable energy projects that would allow the government to pay for their income tax and VAT for the current year. In fiscal year 2010, the government set aside Rp 900 billion in the State Budget to pay for the taxes that can be disbursed based on investors' requests. However, this was terminated following a ruling by the Supreme Audit Board that the government may provide tax exemptions but may not pay taxes owed by another entity.

Provision of Goods or Services Below Market Value

Governments can also try to incentivize investments by providing goods or services related to a renewable energy project. This type of incentive is often a way for governments to take on the risks associated with a particular stage in project planning, but it may also be used to reduce the cost of doing business as a way to attract investment from one location to another.

In Indonesia, only one example of this kind of incentive was identified:

- **The Geothermal Fund Facility (GFF).** MoF Regulation No. 3/2012 (IIA, 2012) also stipulates that the GFF ought to provide interested parties with information and data that has been verified by reputable international geothermal consultants. This will be made available to interested parties at cost plus a 5 per cent margin.

Market Price Support and Regulation

Market price support and regulation are often not considered in the "investment incentives" group because they focus on providing ongoing support during a project's operation and are not typically targeted at affecting the location of an investment. In the case of renewable energy, however, they can be instrumental in the investment taking place at all, and as such are an important part of the framework attracting investment in renewable energy in Indonesia. The country offers a number of such policies, including:

- **A guarantee for PLN's business viability for power projects operated by IPPs** for energy technologies specified under PLN's Fast Track II program (Regulation No. 139/2011), which includes (but is not limited to) renewable energy. It is available to all renewable energy technologies, but since the program only consists of large projects, only geothermal and hydro projects get the facilities. With this guarantee scheme, the government ensures that PLN would have sufficient financial capacity to fulfil its payment obligations to IPPs under the specified purchasing power agreements (PPA). The mechanism is important, as PLN typically struggles to generate sufficient revenue to cover its operational costs and has had problems with insufficient transmission capacity, both of which can substantially increase the risk associated with an IPP's investment.[3]

[3] The Fast Track Program is PLN's effort to rapidly build power plants to address the increasing demand for electricity in Indonesia. It was started in 2006 and carried out in two phases, each aiming for the construction of 10 GW total capacity. The program was predicted to finish in 2010 but has been extended to 2014.

- Bidding processes for power projects are sometimes used to choose which investor should be awarded a tender to build new capacity and to agree an appropriate concessionary tariff. New projects can be procured following two different processes: direct appointment or public auction. MEMR Regulation No. 11/2009 describes all necessary requirements and procedures for the bidding process of geothermal power projects. In the case of hydro and geothermal sites, tenders are usually awarded through a competitive evaluation of project development plans, technical and financial capacity and various other administrative criteria. The concessionary tariff for power generated used to be one of the most important criteria in determining a successful bidder, but it has become less relevant with the introduction of Indonesia's feed-in tariff (see below). For smaller electricity providers, e.g., mini and micro hydro, biomass power plants, MEMR Regulation No. 4/2012 specifies that PLN has an obligation to purchase the energy produced.
- A feed-in tariff (FIT) sets a guaranteed purchasing price for renewable electricity generated by IPPs. The feed-in tariff is set by the government at the start of the project with an assurance that PLN will take all the electricity produced by the power plant in question. This price certainty reduces the risk associated with recovering investment and operational costs. A guarantee of this kind is particularly important in Indonesia, where the PLN's domination of transmission and distribution makes the electricity market a monopsony. As of 2012, the government of Indonesia has introduced a FIT for the purchase of electric power generated from various renewable sources, summarized in Table 4. To encourage smaller-scale power plants using renewable sources, the government has also introduced FITs for mini and micro hydro power, biomass and waste power plants. Other regulations to promote the use of solar power, including feed-in tariff and purchasing arrangement for small scale users, are currently under consideration ("Tarif Listrik Tenaga," 2012).

TABLE 4. FEED-IN TARIFF FOR RENEWABLE ENERGY

ENERGY SOURCE	FEED-IN TARIFF	CONDITIONS
Geothermal	U.S. cent 10–18.5/ kWh	Depends on location, and whether the power plant is connected to a high- or medium-voltage network.
Mini and Micro Hydro	Rp 656–1,506/kWh	<10 MW; depends on location and whether it is connected to a low- or medium-voltage network.
Biomass	Rp 975–1,722.5/kWh	<10 MW; depends on location and whether it is connected to a low- or medium-voltage network.
City Waste	Rp 850–1,398/kWh	<10 MW; depends on the technology utilized and whether it is connected to a low- or medium-voltage network.

Source: MEMR Regulation 12/2012 and MEMR Regulation 4/2012, compiled by authors.

- **Consumption mandates for biodiesel and bioethanol**, as described in MEMR Regulation No. 32/2008. The government sets an obligation for fuel distributors to mix some part of their products with biofuels, following standardization of the products and approval for diesel and gasoline fuels to contain up to 10 per cent fatty acid methyl ester (biodiesel) and 10 per cent bioethanol. In 2008, when mandatory regulation was introduced, the target was for biodiesel and bioethanol to make up 1 per cent of total fuels in the transport sector. This percentage is expected to increase in the future, with a target 20 per cent of transportation fuels by 2025. Another form of this policy is the mandatory use of biofuels in certain industrial sectors. So far, the government has required the mining industry to use biofuels in lieu of traditional fossil fuels. It is expected that in the future that this will expand to include more industrial sectors.

- **Price subsidies for biodiesel and bioethanol** are also provided. In 2012, the government set these subsidies at Rp 3,000 per litre for biodiesel and Rp 3,500 per litre for bioethanol ("Formula Harga," 2012).

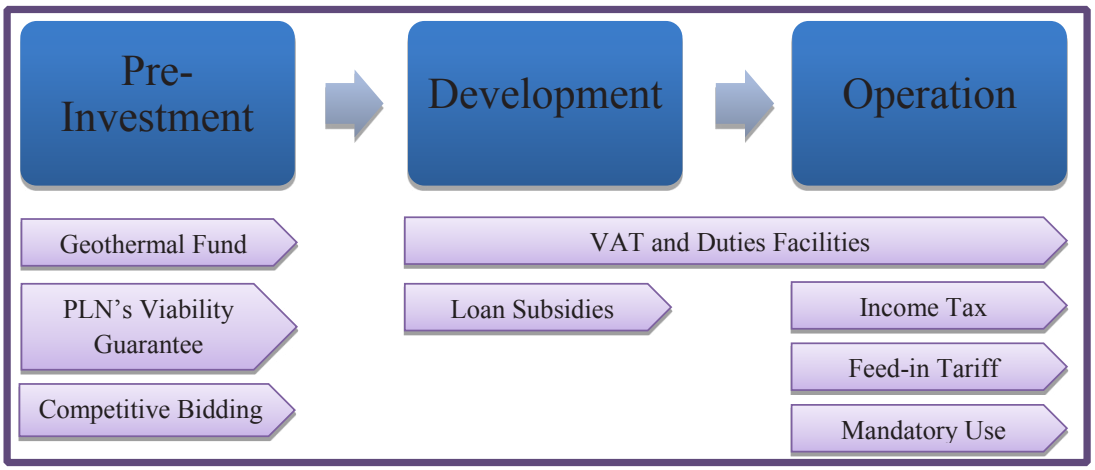
Other subsidies

In addition to the above investment incentives, it should also be noted that in both the power and fuel sectors currently receive significant subsidies. PLN's electricity tariffs are usually too low to cover its core business activities of generation, transmission and distribution and sale. The gap between revenue and expenditure is compensated by government subsidies. Similarly, transport fuels are heavily subsidized. This distorts the playing field in favour of fossil thermal power generation and petroleum fuels, dis-incentivizing investments in renewable energy. Investment incentives must overcome both these subsidies for traditional fuel as well as closing the gap between the market price of fossil fuels and renewables.

Investment Incentives Across the Lifecycle of Projects

Figure 4 describes available investment incentives for renewable energy in Indonesia in the context of development and operational stages of a renewable energy project. Most of the incentives and promotional schemes are currently focused on providing assistance during the operations phase of a project. This affects investment decisions by giving greater certainty for revenue and thereby reducing investment risk. It also commits the government only to providing financial advantages to those companies that are actually producing renewable energy. Few investment incentives are available at the pre-investment stage, with most of these being targeted at large geothermal power and hydropower projects, where initial capital needs are very high. Many incentives in the pre-investment stage are not targeted at renewable energy development specifically; instead, they are intended to promote the development of infrastructure more generally. This study also identified no incentive programs that support innovation and technology acquisition that would promote investment in renewable energy.

FIGURE 4. INVESTMENT INCENTIVES AND STAGES OF OPERATION



5.0 Assessment of Investment Incentives

It is difficult to assess the extent to which investment incentives succeed in attracting investment. This section reviews the major barriers facing renewable power projects and biofuels and asks, "What are the major barriers to investment in this technology in Indonesia?" and "Are they being adequately addressed?"

5.1 Power Projects: Geothermal, hydro and biomass power

Power projects face a number of economic, financial and project risks that are fairly generic across different technologies; and some that are technology-specific. This sub-section first considers the success of investment incentives in addressing generic barriers and then moves to discuss three technologies in turn: geothermal, hydro and biomass power.

Generic Issues

The most important general risks facing power projects are economic risks related to the absence of a competitive market and a market-determined price for electricity. These derive from the fact that the state electricity company, PLN, has the sole right to distribute electricity, and the electricity tariff is set by the government. In addition, PLN's tariffs for conventional power are often set too low to cover costs. This is effectively a subsidy for fossil-power generation—meaning that the premium which needs to be negotiated for a renewable energy project is actually higher than it would be in a fully liberalized, competitive market. Moreover, there is a concern that, even where PLN agrees to pay a higher rate for renewable power, it may at some point run into cash flow problems and renege on its commitments.

Two broad efforts have been made to address these issues: incentives that try to guarantee contractual terms and power demand, and incentives that make project operations more profitable.

Contractual uncertainty is addressed through more than one mechanism. For investments that are part of the Fast Track Program Phase II, the government's power "off-take" guarantee obliges PLN to pay for all electricity that comes online (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.).[4] For investments that do not qualify under this program—mostly public-private partnership (PPP) projects—the same guarantee is offered by the Indonesia Infrastructure Guarantee Fund (IIGF), available at the construction and operational stages (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.).[5]

It is too early to gauge the performance of the IIGF. The institution is relatively new; it was established on December 30, 2009. However, the fact that World Bank provides support to the IIGF is likely to boost its credibility. Note that the World Bank has provided US$25 million to support IIGF in issuing its own IIGF guarantees for qualifying projects. Qualifying projects will be those that are appraised by the World Bank and meet other reputational risk considerations.[6]

[4] See also MoF (2012b).
[5] See also MoF (2012b).
[6] See the press release on the establishment of the Indonesia Investment Guarantee Fund, available at http://www.djkn.depkeu.go.id/content/berita/bmn/berita-325.html. See also Indonesia Investment Guarantee Fund Project available at http://www.worldbank.org/projects/P118916/infrastructure-guarantee-fund?lang=en.

The main incentives that have been used to increase the profitability of projects are: i) bidding mechanisms, which award construction rights and higher tariffs to specific developers; and ii) Indonesia's feed-in tariff, which is an ongoing commitment to pay any project developer a fixed price for electricity, with the tariff in question varying depending on the technology.

According to policy-makers and industry stakeholders, bidding processes have been used with mixed success. According to the Indonesia Renewable Energy Society, some processes have failed to adequately take into account the financial and technical capability of bidders, as a consequence of trying to encourage small local enterprises. This has resulted in some winners of geothermal tenders not having the financial or technical capabilities needed to undertake projects. A number of biomass projects have also been approved but not implemented due to project winners lacking the financial capacity to undertake the project on their own. In these cases, the licences are often used as collateral to lure investors and to secure loans from banks (General Secretary of the Indonesia Renewable Energy Society, personal communication, n.d.; Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.). According to the National Planning Agency, BAPPENAS, this problem of bidders applying without adequate financial capability is complicated by the fact that most Indonesian banks do not have sufficient knowledge and experience to provide loans for renewable energy projects (Director of Energy, Telecommunication and Informatics, BAPPENAS, personal communication, n.d.).

Recently, problems have also been experienced due to the co-existence of bidding processes and the newer feed-in tariff incentive. According to the MEMR (2011b), the government has annulled the outcome of some bidding processes for geothermal projects because the winning bids demanded a power tariff higher than the rate set by the government's feed-in tariff (MEMR, 2011b). MEMR representatives suggested that this problem may be due to the fact that bidding rounds are run by the local governments where the project will be located. These bodies may not possess human resources with sufficient technical capability and expertise to administer the process. Interviews with the Ministry of Finance also suggested that a conflict of interest may exist—local governments have an incentive to allow bidders to set higher feed-in tariffs, as they will receive royalties from renewable power projects operating in their jurisdiction (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.). These problems suggest that committees should be at least partially populated by central government representatives (Director of the Directorate of Various New Energy and Renewable Energy, MEMR, personal communication, n.d.). In general there is no problem in the implementation of the feed-in tariff. This is primarily because the scheme provides power producers with price stability assurance. If there is any disagreement, it is usually concerning the tariff rate, which is set by the central government and varies from region to region. Of course, power producers always want to sell their electricity at the highest possible price. And, as noted, some local governments, for their own reasons, seemed to have let bidders of power projects ask for a higher tariff than the feed-in tariff. The immediate implication of such actions is a delay in the implementation of the project.

In addition to bidding mechanisms and the feed-in tariff, a number of incentives also exist that aim to improve profitability by reducing investment and operations costs through tax- and duty-related provisions. This includes exemptions from or reductions in import duties, income taxes and VAT. These facilities are available to developers who are involved in exploration, construction and operation activities. So far there has not been any study, at least not to the authors' knowledge, that evaluates the likely implications of the government's fiscal policies to support the implementation of renewable energy projects in Indonesia.

Geothermal Power

Geothermal power is a particularly high-risk investment as the cost of resource exploration and development is very high as a proportion of total project costs. In assessing the resource risks associated with geothermal power in Indonesia, GeothermEx, Inc. (2010) has estimated the following costs:

- Surface exploration (reconnaissance and detailed phases): from US$1,250,000 to US$2,000,000;
- Temperature-gradient drilling: from US$300,000 to US$2,000,000;
- Deep-exploratory drilling: from US$7,000,000 to US$23,000,000;
- Long-term flow testing: from US$500,000 to US$1,000,000.

This brings the total average resource exploration cost to between US$9,050,000 and US$28,000,000. Meanwhile, depending on the size of the power plant that will be developed, the total estimated costs ranged from as low as US$1,090,000 per MW for a 100 MW power plant, to as high as US$3,120,000 per MW for a 20 MW power plant. Accordingly, the total cost for a 20 MW power plant ranged between US$40,050,000 and US$62,500,000, for a 50 MW ranged between US$69,650,000 and $90.050,000 and that of a 100 MW power plant ranged between US$109,050,000 and US$134,500,000 (GeothermEx, Inc., 2010, Table 1-1). This means that the cost of raising financing for geothermal power projects can be particularly high. This is further exacerbated by general perceptions that Indonesia is a country with high political risk, although there have been signs of an improvement in Indonesia's country risk in recent years.

Geothermal also faces barriers to investment from forestry regulations. This is because the geothermal sector is legally considered to be part of the mining sector and Article 38(4) of the Forestry Law (Law No. 41/1999) prohibits open-pit mining activities from taking place within protected forest areas. Geothermal projects are not open-pit mining activities and cover a much smaller area that most mining activities, but this has not stopped the Ministry of Forestry from slowing down some geothermal projects.

Efforts have been made to address both of these the barriers: reducing the risks of resource exploration through the Geothermal Fund Facility (GFF); and overcoming regulatory barriers through negotiated exemptions. However, in each case, it is not clear whether the incentives in question are sufficient to overcome the associated barriers.

The GFF combats resource exploration risks by providing data on geothermal resources and by providing loans for exploration activities, where the loans must only be repaid if sites are proven to be productive. According to policy-makers and industry stakeholders, the effectiveness of the GFF is difficult to assess, as it is a relatively new facility. The Ministry of Finance reports that it has yet to collect sufficient data to fulfil its function of providing information on geothermal resources to developers (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.). Members of the Indonesia Geothermal Association state that the Geological Agency of Indonesia, which is supposed to collect the geological data and information, is not yet up to this task. In part, this is because the drilling equipment at its disposal is only capable of drilling up to 1,000 meters of depth and the GFF has not, recognizing this, tendered out any exploration activities (various members of the Indonesia Geothermal Association, personal communication, n.d.). It is also not clear whether this service—to be provided "at cost" plus a margin of 5 per cent—would be significantly more or less expensive than if it were performed by a private-sector body. There is no information available as to whether GFF has started to provide loans, but it is likely that it has not yet begun to do so. As noted earlier, the procedures for the management and accountability of the fund was only recently stipulated in the MoF Regulation No. 3, 2012.

Stakeholder interviews suggest that no long-term solution has been found to the regulatory barriers related to forestry law. A Memorandum of Understanding signed in December 2011 by MEMR and the Ministry of Forestry agreed to expedite the implementation of 28 geothermal projects that had hitherto been held up because they were located within protected forest areas (MEMR, 2011a). But there is no guarantee that the Ministry of Forestry will automatically agree to other future projects. According to the Director of the Directorate of Various New Energy and Renewable Energy, MEMR, both parties will consider any future project on a case-by-case basis (personal communication, n.d.). This suggests that the government needs to establish principles that prevent such regulation from unnecessarily stalling geothermal power projects. One possible solution could be to set a maximum area where a mining activity can take place within a forest area.

Hydropower Program

Most specific issues facing hydropower relate to micro- and mini-hydropower projects. According to the Director of Energy, Telecommunication and Informatics at the National Planning Agency, BAPPENAS, such projects are in many cases not bankable (personal communication, n.d.). This is due to a lack of capacity both on the part of project developers and on the part of lending institutions: the former often do not know how to prepare project proposals that will be acceptable to institutional lenders, while the latter may also lack the knowledge and experienced needed to assess the acceptability of projects. No incentives were identified that attempt to tackle this problem. This suggests that some kind of intervention is required to help project developers and banks build their competence in renewable energy project financing. Lessons might usefully be derived from the experience with microfinance. Banking capacity in this area was built by the government, initially designating only one bank, Bank Rakyat Indonesia (BRI), to administer microfinance, and allowing commercial banks to follow into the business as experience grew (see e.g., Siebel, 2005 and Miyashita, 2000). Today commercial banks have entered the microfinance industry as well ("Indonesian Microfinance," 2011). A few state-owned banks, which have branches throughout the country to administer lending, could be tasked with developing suitable portfolios for lending to renewable energy projects.

Criticism has also been aimed at the treatment of small hydro by Indonesia's feed-in tariff policy. Under the current scheme, the tariff rate varies depending on whether a plant is connected to a medium- or low-voltage power grid. Connecting to a medium-voltage network results in a lower tariff rate (Rp 656/kWh) than connecting to a low-voltage network (Rp 1004/kWh). According to representatives of state-owned hydropower plants, this means that the entire feasibility of a project can depend on it selling electricity to a low-voltage network. According to an official of Perum Jasa Tirta II, a state-owned company in charge of Jatiluhur hydro power plant, this is problematic since interconnections with a low-voltage network tend to be unstable if there is a high-voltage fluctuation, which may result in power plants having to temporarily shut down (personal communication, n.d.).

The biggest barrier facing hydropower projects is related to turbine availability. According to MEMR, there are only a few domestic turbine producers. Most produce only small-size turbines and they are all located in Bandung. Bigger turbines are usually imported. Unless there is substantially higher demand, there will not be a strong enough profit motive for producers to expand their production into other cities, especially outside Java (Director of the Directorate of Various New Energy and Renewable Energy, MEMR, personal communication, n.d.). This is an issue because many of those who are interested in developing micro- and mini-hydropower projects are local people, who reside close to the projects' locations and who do not know much about turbine markets or how to source turbines from distant producers.

Biomass Program

Biomass power plants utilize biomass wastes from forests, agriculture, estates and urban sources. The main problem faced by these plants is how to ensure a sustainable supply of biomass feedstock. Government policy-makers in the Ministry of Finance have pointed out that, once people realize that the wastes have some value, they will suddenly disappear, only to reappear but "with price tags" (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.). No general incentive mechanisms appear to have been introduced to tackle this issue on a broad basis, although, according to one PLN official, ad hoc solutions appear to have been developed to address this problem. For example, to ensure a sustainable biomass supply for a 1 MW biomass power plant to be built in Bima, a small island in East Nusa Tenggara, it is said that the local government has set aside around 100 hectares of land to be planted with fast growing trees (PLN officials, personal communication, n.d.). It is not known how widespread this type of arrangement may be nor the full cost of employing this kind of measure.

5.2 Biofuels

Like power projects, most of the risks related to biofuel investments are market-related. The price of gasoline is subsidized by the government, making it more difficult for biofuels to compete on a price basis, and the state oil company, Pertamina, is the only distributor allowed to sell subsidized fuels.

The two main incentives that have been established to promote biofuel investment are a consumption mandate and a price subsidy for both bioethanol and biodiesel. It is not clear how the first of these incentives can effectively achieve its aims, as it is not clear how the government will enforce its mandate. Komarudin et al. (2012) argue that for this reason Indonesia is likely to continue to miss its target for biofuel consumption. Meanwhile, since 2010, Pertamina has stopped producing biogasoline because there was no supply of un-hydrous ethanol, as domestic producers have preferred to export their products because the price is higher than the domestic price. According to Pertamina, Indonesia will face a shortage of around 1 million tonnes of biodiesel by 2020. There are also problems associated with the quality of both ethanol and fatty acid methyl ester (FAME), the main ingredient of biodiesel (Pertamina, 2011).

In part, the above problems reflect the extent to which energy sector stakeholders are divided on the issue of biofuels. The government lacks the political will to push forward incentives for biofuels, and there is a lack of coordination and concerted policies among ministries and local governments. The MEMR, for instance, seems to support the idea proposed by the Indonesia Biofuel Producers Association (APROBI) to shift Indonesia's fuel subsidies from oil products to biofuel (APROBI, 2011; MEMR, 2012c). The Ministry of Finance, however, is against such an idea, at least for now. Its main concern at the moment is to reduce fuel subsidies (Head of SOE Risk Subdivision, Fiscal Policy Office, the Ministry of Finance, personal communication, n.d.).

More generally, government officials are ambivalent about the program, seeing conflicts between food security and energy security. According to an energy expert from BAPPENAS, for example, the biofuels will become highly competitive if the price of oil rises very high, but biofuels would then risk crowding food out of the market unless, of course, the price of food increases accordingly (Director of Energy, Telecommunication and Informatics, BAPPENAS, personal communication, n.d.). The only alternative would be for crop production to increase, but the total size of oil palm plantation in Indonesia is already around 7.8 million hectares, and as observed by Komarudin et al. (2012), a further expansion could have significant land-use implications.

6.0 Conclusions

This study provides an exploratory assessment of investment incentives for renewable energy in Indonesia. It finds that the government of Indonesia is already providing a broad range of incentives to promote investment in this area. This includes a range of financial incentives, fiscal incentives, the provision of goods and services, and market and price support measures.

Although this study is not able to provide a comprehensive assessment of these incentives, it has been able to identify the following general lessons:

- A divided stance between government institutions can be one of the most serious impediments to the promotion of renewable energy. For example, geothermal projects have been stalled due to disagreements between the Ministry of Forestry and the Ministry of Energy and Mineral Resources, while incentives for biofuels remain weak because of disagreements about the fuel's sustainability and its impacts on food markets.
- A lack of coordination can be equally damaging. A number of geothermal projects, for example, were cancelled by the central government because local governments had promised feed-in tariffs that exceeded the official ceiling set by the central government feed-in tariff. In all cases, those who administer incentives must be competent to do so, knowing what is admissible or inadmissible. In particular, it should not be possible for bidding processes to conflict with the government's feed-in tariff in this way—competition over tariff rates should no longer be part of the bidding process.
- The Indonesian government's continuing subsidization of gasoline and under-pricing of electricity generation provides incentives in direct contradiction to investment incentives for renewable energy.
- No measures were identified to help project developers apply for finance or to help banks assess renewable energy projects. Interventions to build capacity in this respect would be useful and could draw on lessons learned from microfinance.

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