MISSION INNOVATION

COUNTRY REPORT: INDONESIA

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ABBREVIATIONS AND ACRONYMS

Bappenas	State Ministry of National Development Planning
BKPM	Indonesia Investment Coordinating Board
DG EBTKE	Directorate General of New and Renewable Energy and Energy Conservation (MEMR)
DG Migas	Directorate General of Oil and Gas (MEMR)
DG Minerba	Directorate General of Minerals and Coal (MEMR)
GDP	Gross Domestic Product
KEN	National Energy Policy
MEMR	Ministry of Energy and Mineral Resources
MOEF	Ministry of Environment and Forestry
MOF	Ministry of Finance
NRE	New and Renewable Energy
PGN	State Gas Company
PLN	State Electricity Company
RE	Renewable Energy
RUEN	National Energy Plan
R&D	Research and Development
RD&D	Research, Development and Demonstration
RDD&D	Research, Development, Demonstration and Deployment
PUSDATIN	Centre of Data and Information (MEMR)
Ristekdikti	Ministry of Research, Technology and Higher Education

I. SITUATIONAL CONTEXT

A. Country Context

Indonesia is the largest archipelago in the world covering an area of 7.7 million km2 which includes 1.9 million km2 of land, 3.1 million km2 oceans, and 2.7 million km2 of marine waters. There are more than 13,000 islands which make up the estimated 47 distinct ecosystems and, while covering only an area of 1.32% of the world, Indonesia is home to some of the largest concentrations of flora and fauna.

The country is a strong and stable democracy that aspires to generate prosperity for all its citizens.A country with a diverse population and complex landscape, Indonesia is the world's fourth most populous nation with people inhabiting over 6,000 islands. Indonesia's constitution embraces democracy and pluralism and is home to 300 distinct native ethnic groups and other populations, speaking over 700 languages and dialects.

Divided administratively into 34 provinces with more than 514 districts, Indonesia has an estimated population of 267 million people and 72 million households which make up the 82,190 thousand villages.[1] The average population density is 140/km^2 although, the island of Java which constitutes only 7% of the total land area, and home to 57% of the population, has a population density of 1,160/km^2.

Indonesia is one of the largest emerging economies in the world - with an expected USD900 billion GDP in 2015, making Indonesia the largest economy in Southeast Asia and the 16th largest economy in the world. Due to its reliance on natural resources and domestic markets, however, Indonesia has been less integrated into global supply chains.

Like many emerging economies, Indonesia's economic focus on natural resources has delayed its development and expansion of the service sector which, in turn, has curtailed capacity development of the estimated 170 million work force. The current administration, however, in its first budget in 2015, more than doubled capital expenditure for infrastructure development aiming to reverse the country's reliance on domestic markets, increase investment, and expand its foreign trade potential.[2]

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1 These statistics are calculated from the national 2014 census data. While figures for population were not published in the 2014 statistics, household totals were provided for each of the 80,190 villages (72,195,696). The population count in this document is calculated based on the ratio of people-households (at village level) from the 2011 census data which published figures for population. See: *Pendataan Potensi Desa/Kelurahan 2011, 2014*, Badan Pusat Statistik.

2 Despite its reliance on domestic markets, Indonesia's trade to GDP reached 45% in 2014 with an estimated USD199.8 billion in exports and USD212.5 billion in imports.

B. Energy Resilience

In addition to infrastructure spending, a key priority for the Indonesia's medium-term development plan (RPJMN 2015-19) is to increase the country's capacity to generate energy and ensure equitable access and affordable supply of energy for social and economic development.[3] There are an estimated 11,157,701 (4%) people without electricity in Indonesia and 8,596,62 (3%) rely on combustion fuels for local energy supply. Furthermore, for the government to maintain its economic growth target of up to 6-7%, which it has achieved over the past decade, an estimated 35GW will need to be generated over the next 5 years to avert an embedded slowdown of it recent economic achievements.

Indonesia is adopting wide ranging policy reform to resolve these challenges and ambitious targets, focusing particularly on energy supply diversification. These reforms cover: i) increased private-sector investment and more effective public-sector investment; ii) greater reliance on domestic gas, renewable energy (RE), and energy-efficiency; and iii) expansion of energy supply and access to all Indonesians.

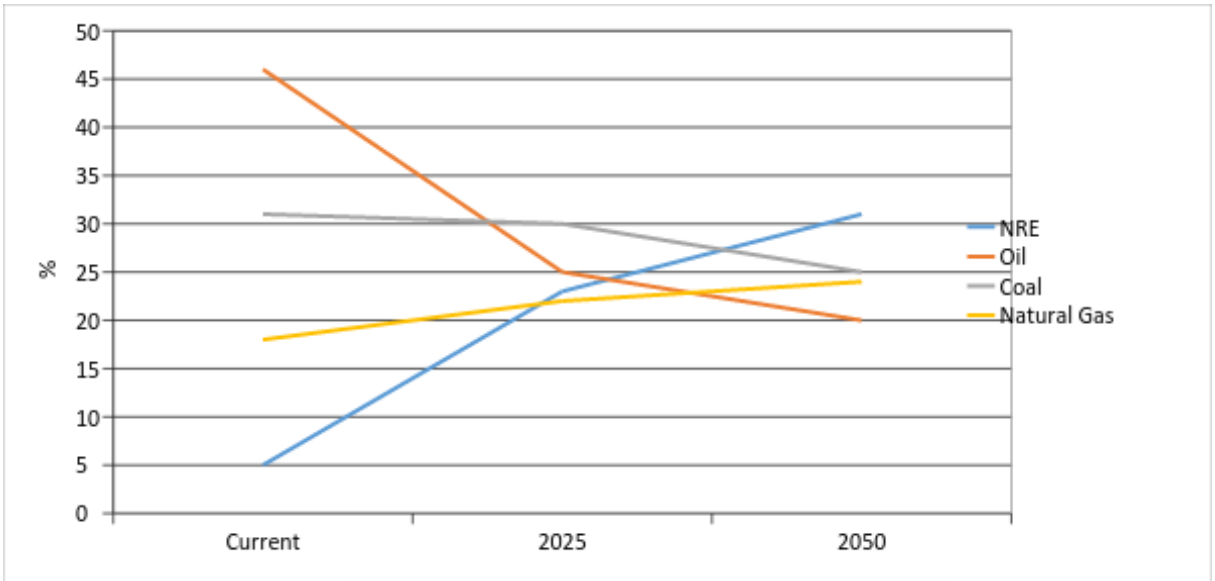

Figure 1: Diversification of Electricity Generation[4x]

Meeting demand growth and ensuring environmental sustainability of energy supplies are key considerations for Indonesia's economic and investment policies and strategies. With exhausted oil and gas reserves, a lack of exploration and production, and ageing refineries, the cost of meeting the energy demand through combustion fuels continues to escalate, and is clearly not sustainable.[5]

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3 "Energy Resilience" refers to a situation where the supply and public access to energy is guaranteed - at an affordable cost over the long term, while continuing to protect the environment (PP 79/2014).

4 Adapted from Government Regulation 79/2014 concerning the National Energy Policy (*Kebijakan Energi Nasional*, KEN), Article 8, 9.

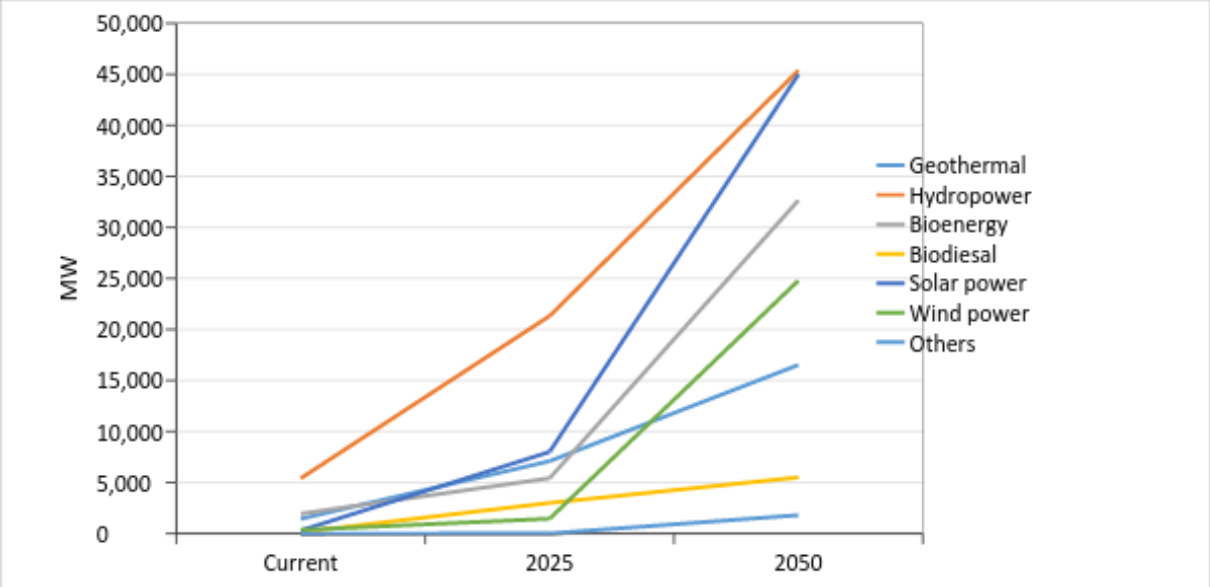
5 Currently, Indonesia imports over 800,000 barrels of oil per day and continues to finance subsidised end-consumer prices, which are a legacy from pre 2004 when Indonesia was a net oil exporter. These energy subsidies in 2014 reached IDR315 trillion while in 2015 were reduced to IDR131 trillion.

Indonesia has prioritized reducing GHG emissions by 41% by 2020 (with international assistance) and codified this into a Presidential Decree and National Action Plan for Reducing GHGs (RAN-GRK).With environmental sustainability and climate change a national and international priority, the prospect for developing the infrastructure, and managing social and environmental safeguards, for increased domestic use of coal is increasingly not tenable.[6]

Indonesia's diversification of energy will focus primarily on the research and development, deployment and investment, of clean energy and related technologies, given these constraints, and the global trend towards renewable energy deployment.[7]This includes the goal of reaching a 23% renewable energy share, from its current 7%, in the national energy mix by 2025.

C. Clean Energy

In order to bridge the energy demand gap and ensure environmental sustainability, Indonesia is moving towards adopting modern, clean and highly efficient energy technologies. These technologies will be deployed to "leapfrog" the emission-intensive development paths that developed countries have taken and move towards sustainable energy sources that are renewed or replenished rather than exhausted.Given the country's past and present reliance on non-renewable energy, this move is challenging, and cannot be achieved without a major restructuring of, and paradigm shift within, the energy and related sectors.



6 Indonesian is the largest exporter of coal globally and the largest exporter of gas and liquid biofuels regionally. See IEA, *Indonesia 2015*, p. 9.

7 Renewable energy will soon become the main source of energy world wide. IEA estimates that RE will account for 60% (USD5 trillion) of global investments over the next 10 years. In 2014, RE electricity generation reached 1,828 GW compared to 1,500 GW gas and 1,880 GW coal, and the labour force for RE increased by 18% with an estimated 200,000 employees coming from the oil and gas sector.

Figure 2: NRE Electricity Generation Targets[8]

The technology and capacity to harvest RE sources remains under developed in Indonesia as it does in most emerging economies, despite the country's abundance of almost every RE source, including solar, wind, biomass, ocean and an estimated 40% of the world's geothermal reserves.Unlike traditional sources of energy, the deployment of RE is not about the energy itself, which is free, but rather the technologies that capture it. Furthermore, unlike previous energy transitions from wood to coal, or coal to oil, the transition to RE represents a major shift from conventional energy systems and infrastructure.

The Government of Indonesia, private sectors, research institutions and communities are already equipped with baseline understanding on what and which clean technology that has worked or could work in Indonesia. This is evident in Indonesia's various electrification programs. The remaining task is developing a solid coordination among stakeholders to share data and information which could be used as lessons learned for future planning. This would demonstrates Indonesia's resolve and commitment to develop its clean energy to the world, potential partners and investors.

To enable this diversification to RE and to accelerate Energy Efficiency (EE) implementation, Indonesia's regulatory and market environment will require a major transformation, and the trade or transfer barriers that prohibit countries from modern clean energy technologies will need to be reformed. In addition, environment policies and incentives for the adoption of RE technologies will require further development along with capacity building. This not only addresses the energy supply side but also from the demand side. Incentives for technology owner and user would need to be addressed to trigger technology transfer and usage.

The development of quality data and information regarding RE sources will need to be accelerated in Indonesia in order to facilitate decision support mechanisms, feasibility assessments, and least-cost electrification analysis. For Indonesia to "leapfrog" emission-intensive development through clean energy and related technologies, improved coordination and greater market orientation is required to ensure that the sector's institutional environment is coherent with clearer definitions of responsibilities that enable the rapid transformation required to support the national development targets.

To encourage the patient investment required to finance a national transformation to RE, national and international partnerships will need to be forged in an effort to participate globally, and apply locally, the advancements in modern clean energy technologies and the knowledge required to develop a capacity both locally and nationally.

Through the Mission Innovation initiative, Indonesia aims to address these challenges and engage in collaborations to build capacity for clean energy innovation worldwide and to facilitate exchanges, discussion, and linkages between government-funded research and development programs and the private sector investors and companies.

8 Adopted from *Draft National Energy General Plan 2015-2050*, Part 3: Annex, Ministry of Energy and Mineral Resources, 10 December 2015, p. 60.

II. BASELINE AND PLEDGE PRIORITIES

Indonesia's participation in the Mission Innovation initiative is a part of its global commitment to address the challenges of energy security and climate change. Given Indonesia's current and growing dependency on importing oil and gas, and its vulnerability to climate change, solutions for the former and mitigation or adaptation of the latter need to be acted upon urgently. An obvious strategy is to address these challenges simultaneously through the use of sustainable energy sources which can displace emissions of greenhouse gases from the combustion of fossil fuels and thereby mitigate climate change.

If developed and deployed correctly, sustainable energy sources can contribute to social and economic development, to energy access, to a secure and sustainable energy supply, and to a reduction of the negative impacts of energy provision on the environment and human health. While there are range of government institutions equipped with the capability to develop (or acquire) clean energy technology, through Research and Development (R&D), the challenge now facing Indonesia's clean energy revolution is not limited to the lack of government-funded research and development programs. Rather, as a vast archipelagic nation with varying levels of economic and social development, Indonesia's challenge lies in its ability to effectively deploy clean energy technologies.

It is Indonesia's contention that a broader objective of the Mission Innovation initiative is to facilitate deployment of clean energy technology through innovative approaches that accommodate diverse social and environmental circumstances.

A. Baseline

The baseline year that is 2016, comprising R&D budget for clean energy across various government institutions with total amount of USD16,7 million. At the moment, the majority of R&D budget is allocated to develop cleaner fossil energy, and will remain favorite in 2017 along with growing interest in new and renewable energy, electricity grid and basic energy research.

The proliferation of clean energy in Indonesia as a prominent emerging economy with population of 267 million people is significant, particularly within the context of climate change mitigation. To increase new and renewable energy portion in the national energy mix and gradually integrate clean energy as part of social life and one of the drivers of economic growth, Indonesia is committed to enhance its research and development budget from USD16,7 million in 2016 to USD 150 million by 2020.

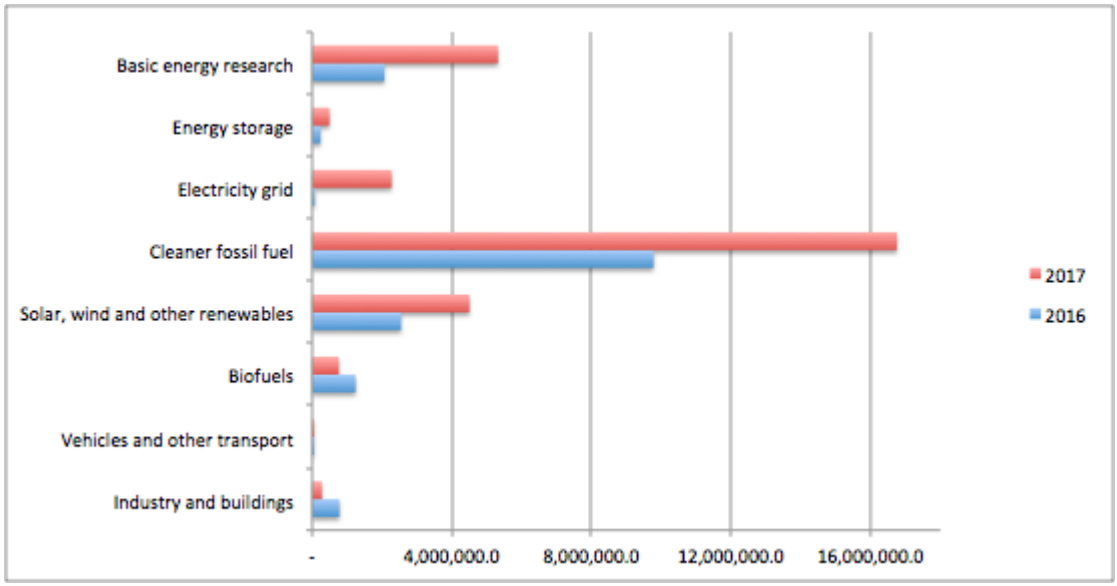


Figure 3: Clean Energy R&D Focus Areas (USD)

Mission Innovation

Table1: Clean Energy R&D Appropriations in Support of Mission Innovation Pledge in FY 2017

	Clean Energy R&D	2016	2017
1	Energy Efficiency	776,771	272,727
	Energy efficiency and Conservation	776.771	272,727
2	Vehicles and other transportation	12,545	16,309
	Transport	12,545	16,309
3	Biofuels	1,239,381	759,645
	Biofuels (Incl. Liquid biofuels, solid biofuels and biogases)	1,239,381	759,645
4	Solar, wind and other renewables	2,543,278	4,503,436
	Ocean Energy	328,228	115,967
	Geothermal Energy	1,806,997	4,240,121
	Other renewable energy resources	75,455	147,349
	Unallocated renewable energy sources	332,599	-
5	Cleaner fossil energy	9,778,510	16,735,995
	Oil and gas	3,829,381	9,604,995
	Coal	5,548,739	7,149,000
	Unallocated fossil fuels	400,390	-
6	Electricity grid	72,930	2,271,719
	Electric power generation	63,839	2,259,900
	Electricity transmission and distribution	9,091	11,818
7	Energy storage	235,386	490,973
	Energy storage (non-transport application)	235,386	490,973
8	Basic energy research	2,067,067	5,320,091
	Energy system analysis	149,616	-
	Basic energy research that cannot be allocated to a specific category	1,099,269	4,501,909
	Unallocated	818,182	818,182
TOTAL BUDGET		**16,725,869**	**30,388,895**

B. Pledge Priorities

Realizing the importance of promoting clean energy, Indonesia has almost doubled its R&D budget in this sector from its baseline year from USD16.7 million in 2016 to USD30.3 million in 2017 and ambitiously aiming to reach USD 150 million in 2020.

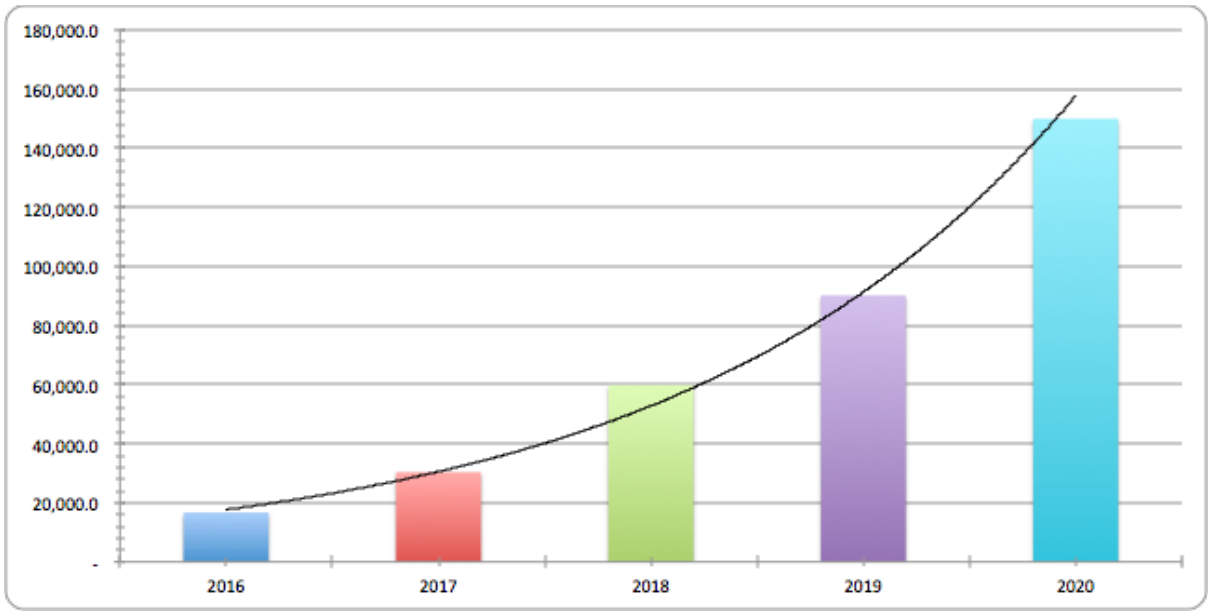


Figure 4: Indonesia R&D budget allocation projection from 2016-2020 (Thousand USD)

Currently Indonesia's priority in research and development of energy is threefold: i) mitigating the impact of climate change; ii) reducing dependency on fossil fuels and iii) promoting clean energy in social and economic development.

Indonesia also has a number of priority programs concerning clean energy in the pipeline, namely:

1. The establishment of **Indonesia's Centre of Excellence (CoE) for Clean Energy** is a collective endeavor led by the Ministry of Energy and Mineral Resources. CoE aims to holistically address research, deployment, investment and project development as interlinked aspects that are required for the acceleration of clean energy technology diffusion.

CoE envisions to enhance access to reliable and affordable supply of clean energy to achieve sustainable social and economic development through three approaches:

- Consolidating information and high quality data analysis to stimulate synergy and innovation;
- Supporting higher certainty of financial viability through providing data and analyses that can assist, among others, constraint mapping and environmental impact analysis. Moreover, CoE aims to reduce administrative and regulatory barriers through synchronizing and coordinating government supervision over clean energy project; and

- Enhancing quality of basic science and technical support synchronized standards and certifications that are conducive for sustainable development of clean energy and, ultimately, locally appropriate technology innovation ready for deployment.

2. **Bali National Clean Energy Area** or *Kawasan Nasional Energi Bersih* (KNEB) is a pioneer initiative where clean energy deployment applied at territorial scale which in this case is at provincial level. The main goal of the initiative is for Bali to use 100% of its energy use from clean energy. KNEB is using a 3 (three) tier approach which encompasses: 1) Tier 1: conversion of fossil-fuel based energy to clean energy mainly targeting large power plants; 2) Tier 2: clean energy utilization by businesses, communities and households; 3) Tier 3: operationalization of Center of Excellence as the center for applied research, investment facilitation and decision making support. In 2017, ERF will allocate around USD740,740 through a competitive call for proposal targeting innovations in clean energy initiatives in Bali Province.

3. **Program Indonesia Terang** (PIT) is a national electrification program that sets to provide electricity to people living in remote, underdeveloped, and outermost villages in Indonesia--people who are currently living without electricity, using clean energy. The goals of PIT are to enhance the current electrification ratio which currently stand at 86 per cent to 97 per cent by 2020, as well as increasing new and renewable energy portion up to 23% by 2025. Through the application of geospatial analysis, PIT is focused on areas that can not be accesed by conventional electricity grid. Therefore, PIT utilizes off-grid approach which include mini/micro grid option for clustered residentials and solar home system for scattered households. The foundation of the programme are: 1) inclusive: involvement of all relevant stakeholders in entire stages; 2) affordable: considering the community's ability to pay; 3) progressive: starting from Eastern Indonesia and gradually reach Western Indonesia, and 4) synergistic: integrating government budget and corporate funding mechanism.

4. As an effort to reduce dependency on fossil fuel as electricity source, **the government is developing new and renewable energy power plants with capacity of 8,800MW**. The 8,800MW new and renewable energy power plant is part of the government's 35,000MW electricity programe where 25% of this capacity will be generated from clean energy. Moreover, the 8,800MW power plant will be derived from solar (4,000MW), bioenergy (1,000MW), geothermal (1,500MW), hydro (1,800MW) and wind (500MW). In general, the development of new and renewable energy to complement the 35.000MW electricity program is build through three specific approaches: 1) acceleration the diversification of energy towards achieving 23 per cent of the energy mix of new renewable energy in 2025, 2) the conversion of diesel power plants into renewable energy, and 3) improving existing power plants, including the development of power plants in remote and border areas.

3. Aside from accelerating the development of new and renewable energy, the Government of Indonesia is also pushing **energy efficiency and conservation** effort. This concern is reflected on General Plan of National Energy which emphasises the importance of energy conservation's role in achieving energy resilience, along with energy supply and generation. One of the manifestation of this effort is through an initiave called "Reduce 10%". This movement encourages all elements including government,

business and industry, civil society organizations, up to the individual to conserve 10 per cent energy consumption from their daily life--equal the cost to develop a 3,5GW power plant (USD4million).

In addition, the Government also plans to funnel R&D funds through the Energy Resilience Fund and the Indonesian Science Fund:

1. **Energy Resilience Fund (ERF)** is a pool of fund that is established by the Government of Indonesia through the Ministry of Energy and Mineral Resources focusing on incentives in accelerating new and renewable energy deployment in Indonesia towards energy resiliency. Amongst the funding windows under the ERF, namely: 1) offgrid and on grid electrification project; 2) biofuel; 3) energy efficiency; 4) R&D. Under the R&D window, a competitive call for proposal will be conducted to invite innovations in the clean energy sector. Recipients may come from community organizations, start-up companies, corporations and even individuals. In 2017, the ERF will allocate USD1,481,481 for research proposals along the innovation chain from laboratory research, demonstration activities to pre-commercial development. Furthermore, ERF will fund research for setting solar panel standard and certification for USD 3.7 million.

2. On March 30 2016, Indonesia launched its first research funding institution, named the **Indonesian Science Fund (ISF)**, supported by the Government of Indonesia, United States, Australia, and United Kingdom. ISF provides multi-year grants for fundamental and frontier research. ISF aims to elevate the current state of science by providing sustainable funding for Indonesian scientists to conduct world-class research. ISF focus areas encompases: 1) Identity, Diversity and Culture, 2) Archipelago, Marine, and Bio-Resources, 3) Life, Health and Nutrition, 4) Water, Food and Energy, 5) Earth, Climate and the Universe, 6) Natural Disasters and Community Resilience, 7) Materials and Computational Science, 8) Economy, Society and Governance. In 2016, ISF opened its first call for proposal for Identity, Diversity and Culture and Life, Health and Nutrition for up to 3 years of research at a maximum amount of IDR 1.5 billion (USD 100,000) a year. Although the call for proposal for energy area is not yet commenced, the ISF's has shown its commitment in removing barriers to science funding.

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