ASEAN
Renewable Energy Policies

One Community
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Energy

ASEAN Renewable Energy Policies

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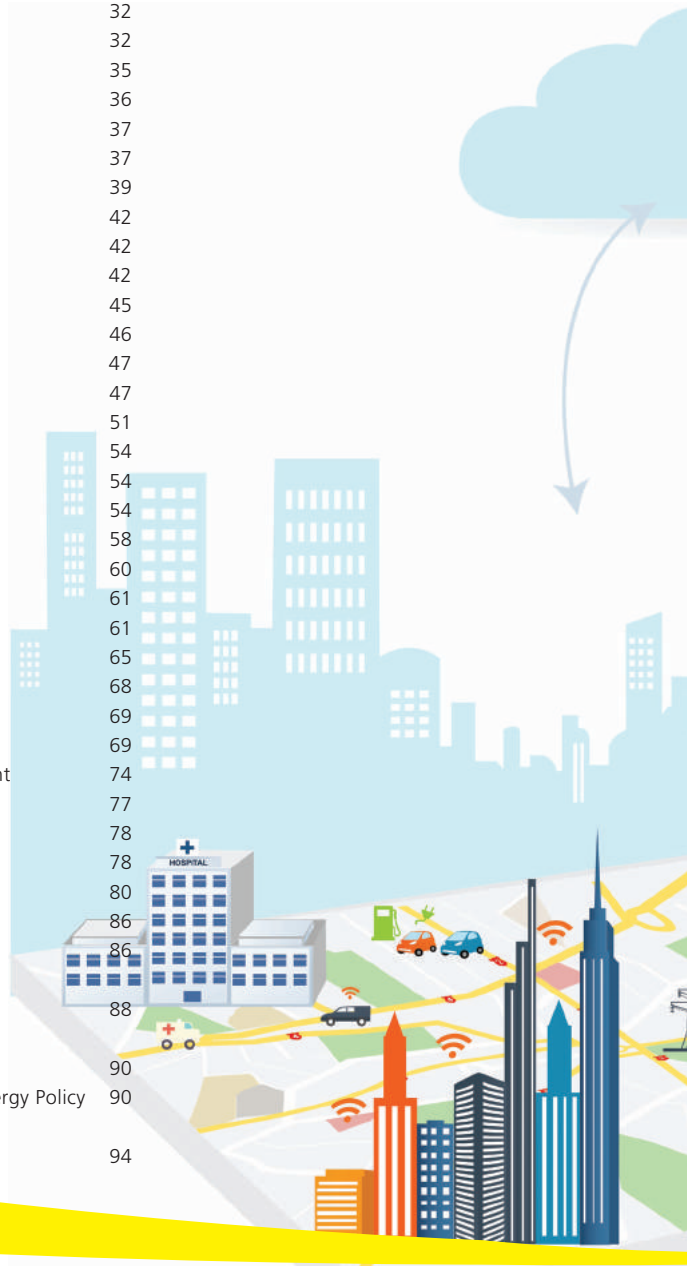

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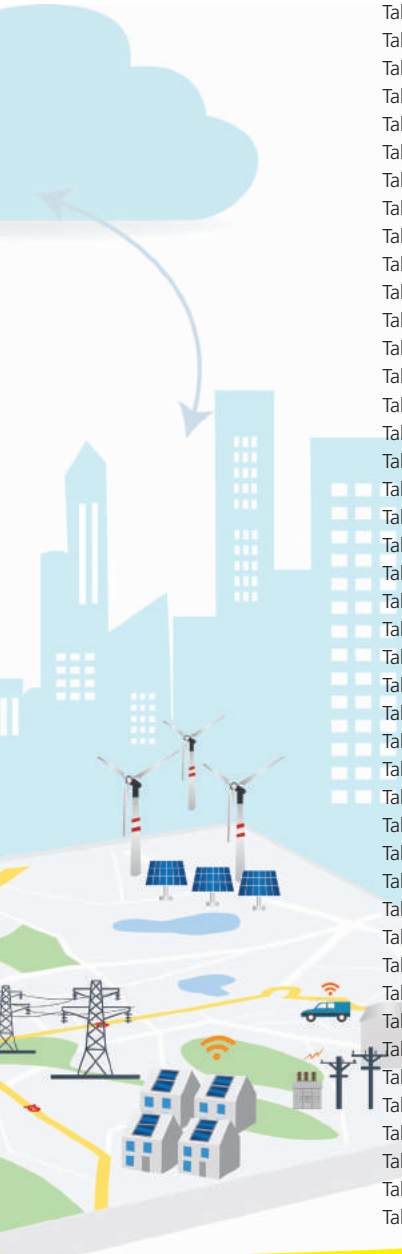

ABBREVIATIONS

A

ACE	ASEAN Centre for Energy
ACT	Avoided Cost Tariff
ADB	Asian Development Bank
AE	Alternative Energy
AEDP	Alternative Energy Development Plan
ASEAN	Association of Southeast Asian Nations

B

BCA	Building and Construction Authority
BESS	Battery Energy Storage System
BKPM	Badan Koordinasi Penanaman Modal (Investment Coordinating Board, Indonesia)
BOI	Board of Investment

C

CAGR	Compound Annual Growth Rate
CC	Contestable Consumer
CDM	Clean Development Mechanism
CEPO	Clean Energy Programme Office
CERTP	Clean Energy Research Test-bedding Programme
CESP	Clean Energy Scholarships Programme
CIS	Central Intermediary Scheme
CoP	Code of Practice
CSP	Competitive Selection Process
CTF	Clean Technology Fund

D

DBP	Development Bank of the Philippines
DEB	Department of Energy Business
DEDE	Department of Alternative Energy Development and Efficiency
DEPD	Department of Energy Promotion and Development
DEPP	Department of Energy Policy and Planning
DOE	Department of Energy
DP	Dialogue partner
DU	Distribution Utilities

E

EAC	Electricity Authority of Cambodia
EDB	Economic Development Board
EDC	Electricité du Cambodge
EDL	Electricité du Lao
EE	Energy Efficiency
EE&C	Energy Efficiency & Conservation
EEP	Energy Efficiency Plan
EGAT	Electricity Generation Authority of Thailand
EIPO	Energy Innovation Programme Office

F

FCAS	Frequency Control Ancillary Services
FESR	Framework for Economic and Social Reforms
FGD	Focus Group Discussion
FiA	Feed in Approval
FiT	Feed-in Tariff
FiT-ALL	Feed-in Tariff Allowance

G

GEMP	Government Energy Management Programme
GFF	Geothermal Fund Facility
GHG	Greenhouse Gas
GoI	Government of Indonesia
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GoM	Government of Myanmar
GoV	Government of Vietnam
GTFS	Green Technology Financing Scheme

H

HESSI	Handbook of Energy & Economic Statistics of Indonesia

I

IBRD	International Bank for Reconstruction and Development
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IGS	Intermittent Generation Sources
IIGF	Indonesia Infrastructure Guarantee Fund
ILF	Incentive for Load Follower
ILP	Interruptible Load Programme
IUPL	Izin usaha Penyediaan Tenaga Listrik (Permit of Power Supply Business)
IUJPTL	Izin Usaha Jasa Penunjang Tenaga Listrik (Permit of Power Supporting Business Service)
IPP	Independent Power Producer
IRENA	The International Renewable Energy Agency

L

Lao PDR	Lao People's Democratic Republic
LBP	Land Bank of the The Philippines

M

MDF	Market Development Fund
MEA	Metropolitan Electricity Authority
MEMR	Ministry of Energy and Mineral Resources
MEPE	Myanmar Electric Power Enterprise
MEPRA	Myanmar Energy and Power Regulatory Authority
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MOST	Ministry of Science and Technology
MoU	Memorandum of Understanding
MSW	Municipal Solid Waste

N

NCDP	National Comprehensive Development Plan
NEA	National Environment Agency
NEMC	National Energy Management Committee
NEP	National Energy Policy
NGCP	National Grid Corporation of the The Philippines
NGO	Non-Government Organisation
NPC	National Power Corporation
NRE	New and Renewable Energy
NREB	National Renewable Energy Board
NREP	National Renewable Energy Programmes

O

O&M	Operations & maintenance

P

P2P	Power to the Poor
PDP	Power Development Plan
PEA	Provincial Electricity Authority
PEP	Philippine Energy Plan
PhD	Doctor of Philosophy
PLN	Perusahaan Listrik Negara (State Electricity Company)
PPA	Power Purchase Agreement
PPT	Power Point Presentation
PSA	Power Supply Agreement
PSC	Philippine Grid Code
PSO	Power System Operator
PV	Photovoltaic

R

R&D	Research and Development
RA	Republic Act
RE	Renewable Energy
REDP	Renewable Energy Development Plan
REF	Rural Electrification Fund
REGP	Renewable Energy Generation Plants
REPA	Energy Payment Agreement
RESA	Renewable Energy Supply Agreement
RESC	Renewable Energy Service Contracts
RESP	Renewable Energy Support Programme
RET	Renewable Energy Technology
RPS	Renewable Portfolio Standards

S

SCS	Solar Capability Scheme
SEB	Specialized Energy Body
SEDA	Sustainable Energy Development Authority
SHP	Small Hydropower
SHS	Solar Home Systems
SMSRE	Small and Medium Scale Renewable Energy and Excess Power
SPP	Small Power Producer
SPPA	Standardised Power Purchase Agreement
SPS	SP Services Limited

T

T&D	Transmission and Distribution (power system)
TFEC	Total Final Energy Consumption
TIEB	Thailand Integrated Energy Blueprint
TISI	Thai Industrial Standards Institute
TSB	Tenaga Suria Brunei

V

VAT	Value-Added Tax
VRE	Variable Renewable Energy
VSPP	Very Small Power Producer

W

WB	World Bank
WESM	Wholesale Electricity Spot Market
WTE	Waste-to-Energy

UNITS

ktoe	Kilotonnes of oil equivalent
kVA	1,000 Volt Amps
Mtoe	Million tonnes of oil equivalent
MWac	Megawatt alternating current
MW	Megawatt electricity
MWh	Megawatt-hour
MWp	Megawatt peak
toe	Tonne of oil equivalent
TWh	Terawatt-hour
W/m2	Watt per square meter

CURRENCIES

IDR	Indonesian Rupiah
MYR	Malaysian Ringgit
SGD	Singapore Dollar
THB	Thai Baht
USD	United States Dollar
VND	Vietnamese Dong
PHP	the Philippines Peso

San Lorenzo Wind Farm. Credit: DOE the Philippines

FOREWORD

ASEAN Centre for Energy (ACE)

The ASEAN Member States (AMS), through the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016 – 2025 has set an aspirational target to increase the component of renewable energy (RE) to 23% by 2025 in ASEAN total primary energy mix.

ASEAN has emerged as a key player in the global energy system parallel with the region's fast-growing need for energy, driven by economic growth and social development. Based on the results of the 4th ASEAN Energy Outlook (AEO4) published by the ASEAN Centre for Energy (ACE), compared to the year 2013, the ASEAN region is expected to require more than 2.7 times of its total energy demand by the year 2035. The AMS very much need sustainable ways to meet this increase in demand. RE policies employed should be able to critically address the key areas of RE supply and distribution, energy demand, project development, and environmental protection. Proper planning of these areas will help ensure the harmonisation of RE policies and programmes to support a reliable, secure, affordable and competitive RE development, which in consequence would drive the economic growth and the environmental sustainability of the region.

In recent years, a number of policies and regulations have been issued to promote RE development by the AMS, including RE selling tariffs/feed-in-tariffs, incentives and targets. Some AMS have undertaken significant efforts to set RE targets, and have been introducing supportive policy frameworks to attract private sector investment. Priority in the type of renewables varies considerably among the AMS, some countries focus on hydro, like Lao PDR and Myanmar; while some like Malaysia and Singapore focus on solar. However, most Member States have set ambitious targets in most of RE technologies for the medium and long terms.

The policy exchange among AMS is one of the important tools to bring awareness on RE policy and regional cooperation for energy security. This publication covers key elements of RE policies (i.e. target, tariff, incentive, financing, and technical) that will provide valuable information on its impact on RE development.

The ASEAN Renewable Energy Policies is part of ACE's effort to fulfil its function as a regional energy centre of excellence that continues to initiate a coherent, coordinated, focused and robust energy policy agenda and strategy for ASEAN. We hope that this publication could provide stakeholders with useful information on the current situation of RE policies development in ASEAN, to enhance cooperation towards energy security in the region.

Ir. Dr. Sanjayan Velautham
Executive Director - ASEAN Centre for Energy

FOREWORD

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Affirmed by the Joint Ministerial Statement of the 33rd ASEAN Ministers on Energy Meeting (AMEM) in Kuala Lumpur, October 2015 and 32nd AMEM (Vientiane, September 2014), the ASEAN Member States (AMS) exemplified that renewable energies (RE) are the key solutions to their dependence on fossil fuels and to ensure a more environmental-friendly and sustainable energy supply. The effort continues with the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016 – 2025 that determines the RE target to 23% by 2025 in the ASEAN Energy mix.

To support the action plan and to counter-measure the challenges, the Renewable Energy Support Programme for ASEAN (ASEAN-RESP)—a jointly implemented project by ASEAN Centre for Energy (ACE) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ)—conducted a study that covers key elements of RE policies (e.g. targets, tariffs, incentives, financing mechanisms and technical matters) in ASEAN. The Study of Renewable Energy Policies in ASEAN (ASEAN RE Policies) underlines the importance of sharing the national policy frameworks for RE among AMS in an engaging environment to create awareness and draw decisions that would increase RE implementation in their respective Member States. The purpose of this activity is to conduct a study on RE Policy in each of the ten AMS, update the policies and analyse the impacts of these policies in RE development in the AMS.

We hope that the results of this joint effort will be helpful for the AMS as a reference to set the policy frameworks in order to develop and deploy RE in ASEAN and their own countries. This study can also assist AMS' dialogue partners (DPs) to understand RE policies in ASEAN, and to provide a background to engage in future collaborations supporting the AMS' commitment to the APAEC 2016 – 2025 targets.

Maria-José Poddey
Principal Advisor for ASEAN-RESP, GIZ

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A workshop was held on 24-25 February 2016 in Bangkok, Thailand, attended by RE-SSN's representatives to verify the findings and analysis prepared by ACE and the technical consultant.

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- **RE-SSN Focal Points and workshop participants:** Mr. Abdul Matiin Hj Muhd Kasim, Mr. Abdul Salam Haji Abdul Wahab, and Ms. Noor Dina Yahya from Energy and Industry Department, Prime Minister's Office of Brunei Darussalam; Dr. Bun Narith, Mr. Toch Sovanna, Mr. Yim Sophy and Mr. So Veasna from Ministry of Mines and Energy of Cambodia; Mr. Chantho Milattanapheng, Mr. Syvang Xayyavong and Mr. Phetpuxay Khamchanh from Ministry of Energy and Mines of Lao PDR; Ms. Maritje Hutapea and Mr. Tony Susandi from Ministry of Energy and Mineral Resources of Indonesia; Mr. Wong Ting Song, Mr. Law Yen Yang and Ms. Ivy Yap from Ministry of Energy, Green Technology and Water of Malaysia, Ms. Azah Ahmad from Sustainable Energy Development Authority Malaysia; Dr. Win Khaing Moe from Ministry of Energy and Power, Dr. Cho Min Han from Ministry of Science and Technology Myanmar (now Ministry of Education), Col. Thoung Win from Myanmar Engineering Society; Ms. Marissa Cerezo from Department of Energy, the Philippines; Ms. Agnes Koh, Ms. Lyana Yeow, Mr. Brandon Loh, Mr. Shia Kang Yang and Mr. Law Gee Yong from Energy Market Authority of Singapore; Mr. Thammayot Srichuai, Mr. Yaowateera Achawangkul, Ms. Pisamai Sathienyanon, Ms. Patlada Sinsap, Passarin Petchumli and Suthisa Sanguantrakool from Ministry of Energy; Mr. Nguyen Ninh Hai, Ms. Nguyen Phuong Mai, Ms. Bui Thi Hien from Ministry of Industry and Trade of Vietnam and Mr. Nguyen Duc Cuong from Institute of Energy Vietnam.
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- **ACE - APAEC and Policy Research & Analytics team:** Beni Suryadi and Aloysius Damar Pranadi.
- **GIZ team:** Maria-José Poddey and Rizky Fauzianto.

San Lorenzo Wind Farm. Credit: DOE the Philippines

EXECUTIVE SUMMARY

The policy exchange among ASEAN Member States (AMS) is one of the important tools for bringing the awareness on renewable energy (RE) policy and regional cooperation on energy security. As part of the second phase of ASEAN-RESP, the Programme aims to conduct a study to review and update the RE policies in 10 (ten) AMS, analyse the impact of RE policies to RE development, provide conclusions and recommendations on the RE policies, and to share information procured from among AMS.

In this report, the impact of RE policies to RE development in each AMS has been analysed and assessed. A focus group discussion (FGD) was conducted to verify the collected AMS' RE policies, and analysed with the AMS RE Sub-sector Network (RE-SSN)'s focal points. In conclusion, each of AMS has been analysed in terms of its RE policy leverage to the RE development.

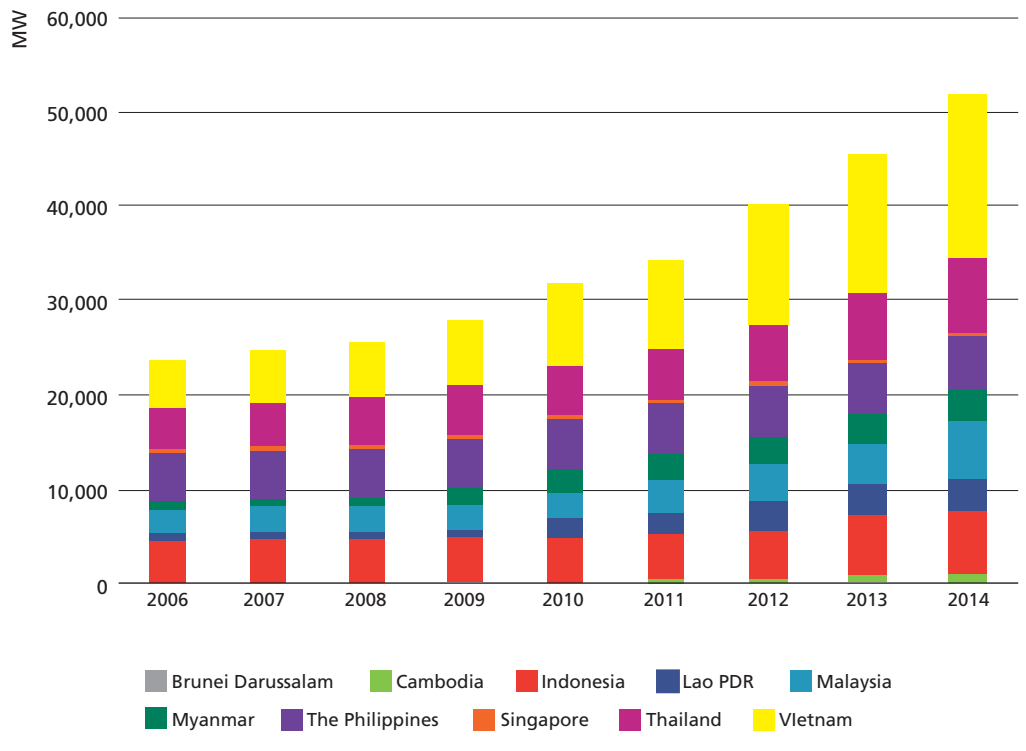
Increasing numbers of the AMS are implementing policy measures and dedicating funding to encourage the deployment of RE generation. The design and implementation of these incentives are country specific and so are the development trends. This report tracks the progress of RE development within the ASEAN region, as well as the policies and support mechanisms implemented to encourage this development.

A methodology was developed to assess the impact of RE policies to RE development. It includes:

- the study of the evolution of the installed capacity (in MW) of RE-based power plants from 2006 to 2014 based on data obtained from the ASEAN Centre for Energy and ASEAN RE Sub-Sector Network (RE-SSN);
- the historical review of RE-related policies;
- the identification of the key policy instruments which have the higher impact on RE development. These are the RE targets, the selling tariffs of electricity generated from RE sources, incentives and financing support, permits and licenses and technical issues (RE technical standards, grid connection codes, etc.).

The analysis of the impact of RE policies was then conducted. The installed power capacity (in MW) of RE-based power generation plants was used as the main indicator of RE development.

A Focus Group Discussion (FGD) was conducted on February 24-25, 2016 to verify the collected RE policies, and their analysis was done by the Consultant with RE-SSN Focal Points.



RE across the AMS had a cumulated installed capacity of around 23,650 MW in 2006. It continually expanded to reach 51,700 MW by 2014. Best practices throughout the region have been highlighted to promote further successful development in the ASEAN region.

The analysis shows positive impact of the key policy instruments on the total installed capacity of RE within the AMS. This relationship is particularly true when considering individual RE resources (e.g., wind, solar, biomass).

The analysis identifies several key RE policy factors that significantly contribute to increase the RE installed. They are (a) RE targets set by the governing body, (b) selling tariff of electricity from RE sources, (c) incentives for a developer to implement RE power generation, (d) financing support available to RE project developers, (e) permit and licensing structure for RE power generation and (f) other technical aspects, such as grid codes for RE power project connection.

Policy	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	The Philippines	Singapore	Thailand	Vietnam
RE Target	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selling Tariffs	No	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Incentives	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Financing support	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Permits and Licences	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Technical aspects	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

Indonesia, Malaysia, the Philippines, Thailand and Vietnam were identified as the most successful countries for the RE deployment. The analysis of the key policy instruments showed that all five countries had established medium to long-term RE Targets, specific feed-in tariffs (FiTs) for the different RE technologies, incentives for RE project implementers, financing schemes to support RE projects, permit and licenses mechanisms and technical standards, especially grid connection codes. This seems to be the successful package. Indeed, countries which do not address them all meet difficulties to gain momentum in effectively deploying RE solutions. The other countries have got some of these policy instruments, but none of them have got them all. One key instrument missed by all of them is the FiTs. There is a good opportunity for them to benefit from the other countries' experience in successfully implementing RE policies. They have already gained some good experience in implementing RE projects, but they will need to develop comprehensive RE policies, based on the lessons learned in the other countries.

Further research on each of these findings is needed. That would necessitate the development of more robust methodologies, including detailed statistical data analysis. However, it can be concluded that the top three policy instruments affecting the development/implementation of RE projects by attracting private sector investors are:

- An appropriate FiT system;
- Simplified permit procedures;
- Attractive incentives and financing support mechanisms.

There are many contextual factors, other than policies, that affect RE development. These include, but are not limited to: resource and technology availability, the economic context, land use and public perception issues, power transmission availability, and institutional structures. Understanding the contextual factors within which policies are placed is essential to defining the most appropriate policy features.

1. Introduction

The rapid and dynamic economic growth of the ASEAN member states (AMS) requires environmentally friendly, efficient energy solutions in order to be sustainable. Renewable energy (RE) is therefore among the region's growing sectors. Overall, the AMS are making efforts to reduce their dependence on fossil fuels and ensure a more environmentally friendly and sustainable energy supply.

The ASEAN Plan of Action for Energy Cooperation (APAEC) is a series of guiding policy documents to support the implementation of multilateral energy cooperation to advance regional integration and connectivity goals in ASEAN. It serves as a blueprint for better cooperation towards enhancing energy security, accessibility, affordability and sustainability under the framework of the ASEAN Economic Community (AEC) for the designated period. Under the APAEC 2016-2025, ASEAN set the aspirational target to increase the component of RE to 23% by 2025 in the ASEAN energy mix. The different starting points of individual Member States in terms of natural conditions (i.e. solar, wind, hydro, biomass and geothermal resources) and the country-specific political and regulatory frameworks are some of the challenges that face a uniform ASEAN energy policy and RE strategy.

The Renewable Energy Support Programme for ASEAN (ASEAN-RESP), a joint cooperation between the ASEAN Centre for Energy (ACE) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ), has played a vital role in the promotion of RE activities within ASEAN, as it supports the AMS to enhance the exchange of experiences, national and regional strategies, guidelines as well as policy development.

As the centre for regional cooperation, ACE plays an essential role as a catalyst for the energy development in the ASEAN region by initiating, coordinating, and facilitating regional joint activities on energy. By implementing ASEAN-RESP, ACE specifically supports the regional exchange to improve framework conditions for RE in the ASEAN region. At a strategic level, ASEAN-RESP is aiming on the one hand to encourage cooperation within the ASEAN region and on the other hand to support national processes in the 10 (ten) Member States. It is making specialist expertise available to critically examine the national frameworks for RE and develop approaches to improve these policy frameworks.

The project is encouraging the AMS to share expertise and experiences with one another and brings in international experiences. Following dialogue at regional level, recommendations on matters such as new support guidelines, technical standards or energy pricing are presented to ASEAN's Specialized Energy Bodies (SEB).

As the AMS are determined to meet the regional aspirational target of 23% RE share in the primary energy mix by 2025 as stated in the APAEC 2016-2025, efforts to support and accelerate RE development are being pursued. One of the initiatives in line with those efforts is the development of this ASEAN RE Policy study. The APAEC 2016-2025 will be implemented in two phases. Phase I will cover the period 2016-2020 for the implementation of short to medium-term measures to enhance energy security cooperation and to take further steps towards connectivity and integration. In 2018, there will be a stock take of the progress of Phase I, which will guide ASEAN in charting the pathways and directives for Phase II (2021-2025). Conducted by ASEAN-RESP, this study covers key elements of RE policies (e.g. targets, tariffs, incentives, financing mechanisms and technical matters) in ASEAN.

All ten AMS have different levels of development in their policies as well as in the execution of these policies. It is important to the RE development in the ASEAN region that the study and the ensuing report be shared among the AMS in an engaging environment to create awareness and, most specially, elicit decisions that would boost RE implementation in their respective countries.

This report includes:

- the review and update on the RE policies in each AMS;
- the analysis of the impact of RE policies on RE development in each AMS;
- a comparative analysis of all ten AMS RE policies;
- the feedback of Focus Group Discussions involving RE-SSN representatives that took place in Bangkok on February 24-25, 2016;
- a comparative analysis of the impact of RE policies on RE deployment in ASEAN;
- the formulation of conclusions and recommendations.

2. Methodology for RE Policy Impact Assessment

The methodology used to assess the impact of RE policies to RE development is shown in Figure 1.

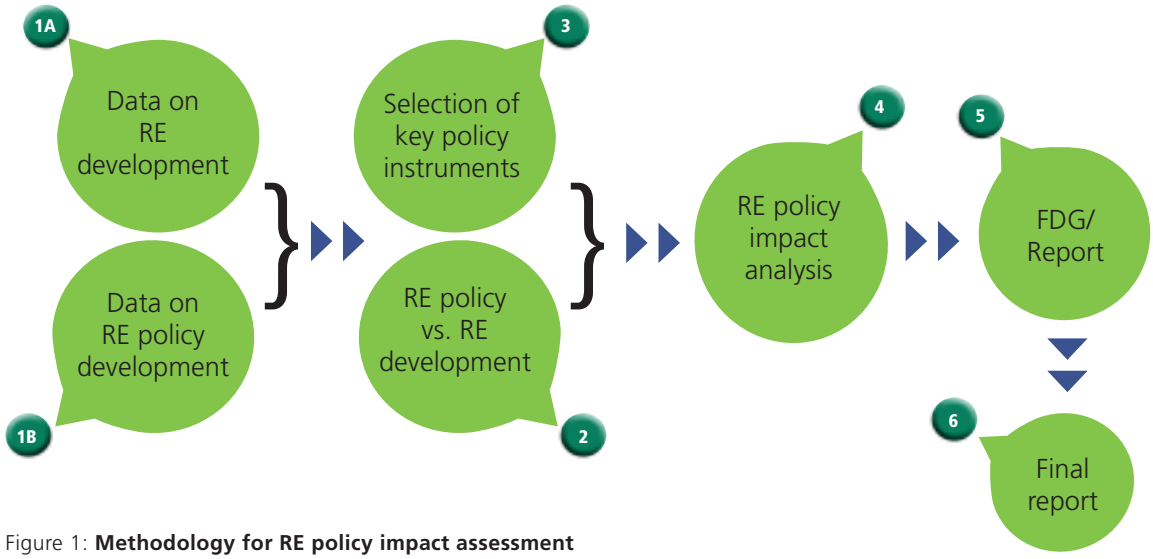


Figure 1: **Methodology for RE policy impact assessment**

First, the historical data of RE development are collected. It consists of the evolution from 2006 to 2014 of the installed capacity (in MW) of RE-based power plants (Step 1-A). This is mainly based on data obtained from the ASEAN Centre for Energy and ASEAN RE Sub-Sector Network (RE-SSN). In parallel, the RE-related policies are reviewed and presented in chronological order (Step 1-B).

Based on the review of historical data of RE development and RE policies, a graph jointly presenting RE policies and RE development is created (Step 2). Generally, there are several sets of policies that address the development of RE. Some RE policies might have higher impact on RE development than others. Therefore, the key policy instruments which have the higher impact on RE development are identified and selected (Step 3). The RE policy instruments selected for the assessment of the impact of RE policies on RE development includes:

- RE target;
- Selling tariffs of electricity generated from RE sources;
- Incentives;
- Financing support;
- Permits and licenses;
- Technical issues (RE technical standards, grid connection codes, etc.)

The detailed policy impact analysis is then carried out (Step 4). The analysis of the impact of RE policies (i.e. effectiveness of RE policies and their role) on RE development is conducted by 'comparing' the historical development of RE policies (timing of issuance and the instruments the policies addressed) and the RE development. In this study, the installed power capacity (in MW) of RE-based power generation plants is used as the main indicator of RE development. It should be noted that, for the purpose of the RE policy impact analysis on hydro development, only the installed power capacity of small hydropower plants will be considered even though large-scale hydro is also counted as RE sources in the ASEAN region.

A focus group discussion (FGD) was conducted on February 24-25, 2016 to verify the collected RE policies and their analysis done by the Consultant with government officers (RE-SSN's focal points) (Step 5). After verification with RE-SSN's focal points, the final report was developed (Step 6).

3. Country Reports on RE Policy Evaluation and Analysis

3.1 BRUNEI DARUSSALAM

Brunei Darussalam has set a nationwide target to reduce its energy intensity by 25% by 2030 from the base year of 2005. There is only one single document currently published regarding RE policy for the country. It is the Energy White Paper last updated in 2014. The target for electricity generation from RE sources of energy is set at 10% of the energy mix by 2035. This should be achieved by the implementation of the following measures:

- Introduce a Renewable Energy Policy and a Regulatory Framework;
- Scale-up the Market Deployment of Solar Photovoltaic (PV) and Promote Waste-to-Energy Technologies;
- Raise Awareness and Promote Human Capacity Development;
- Support Research, Development and Demonstration (R, D & D) and Technology Transfer.

10.8kW system at a Private Residence in Brunei. Credit: EIDPMO

3.1.1 Review of Existing Renewable Energy Policies

The priorities for RE development in Brunei Darussalam are outlined in the Energy White Paper promulgated in March 2014. In this document, three strategic goals were set for energy sector development:

- Strategic Goal 1: Strengthen and Grow Oil and Gas Upstream and Downstream Activities
- Strategic Goal 2: Ensure Safe, Secure, Reliable and Efficient Supply and Use of Energy
- Strategic Goal 3: Maximise Economic Spin-Offs from Energy Industry and Boost Local Content and Secure High Participation of Local Workforce.

Under these 3 strategic goals, 10 (ten) key performance indicators (KPI) have been developed. RE is addressed in KPI 6 of the Strategic Goal 2: Renewable Energy in Total Power Generation Mix.

KPI 6 consists of 4 Priority Initiatives:

- **Priority Initiative 1: Introduction of Renewable Energy Policy and Regulatory Frameworks** including (i) the establishment of RE policies and regulatory frameworks; (ii) the introduction of support mechanisms to stimulate private sector investments; and (iii) the establishment of clear market, grid access rules and procedures.

- **Priority Initiative 2: Scaling-up of Market Deployment of Solar PV and Promote Waste-to-Energy Technologies** including (i) the establishment of grid-connected solar development targets taking into account variable nature of the solar energy; (ii) the adaptation of the most efficient and state-of-the-art waste-to-energy (WTE) technologies taking into account source of waste generation, collection, sorting and recycling systems; and (iii) the creation of policy framework for public-private partnership to accelerate the implementation of solar and waste-to-energy projects.

- **Priority Initiative 3: Raising of Awareness and Promote Human Capacity Development** including (i) carrying out of public awareness programmes through roadshows, forums, exhibitions to increase the awareness concerning RE, (ii) utilising of Tenaga Suria Brunei (TSB) as a training facility for best practice project development to stimulate replication and scale up solar investments, and (iii) strengthening of higher learning institutions and industry stakeholders in promoting RE education, capacity building and entrepreneurships.

- **Priority Initiative 4: Support of Research, Development and Demonstration (RD&D) and Technology Transfer** including (i) the promotion of RD&D of RE Technologies that have potential for commercialisation in the country and for exports, and (ii) the promoting of transfer of technologies and the facilitation of linkage between international research institutions and private companies and local entities.

Key policy instruments in Brunei Darussalam are presented below.[1]

RE Targets

In its '2014 Energy White Paper', the Energy and Industry Department at the Prime Minister's Office (EIDPMO) laid out the goals of reaching 124 GWh of renewable power generation by 2017 and 954 GWh by 2035.

Selling tariffs of electricity generated from RE sources

Feed-in tariffs (FiT) for RE-based power projects are planned in Brunei Darussalam. Indeed, the EIDPMO is planning to introduce a FiT and net-metering policy to encourage investment in RE systems. In addition, Renewable Energy Certificates (RECs) for power generated by RE sources is considered to be applied by EIDPMO. One RECs will be worth 1 MWh of RE power generation, with the proposed fixed price at B$0.25 per kWh or B$250 per certificate REC. These policies are expected to help promote the development of RE-based power generation within the country, specifically to enable the distributed solar generators and homeowners with installed solar panels to sell their excess electricity back to the government.

There is currently no available information on incentives, financing support, permits and licenses and technical issues for RE projects.

3.1.2 Analysis of the Impacts of RE Policies on the RE Development

Review of RE Development

Brunei Darussalam implements a five-year economic development plan known as the National Development Plan. Currently, the National Development Plan 2014 is in force. In line with this plan, the country has also launched a long-term development plan, the Brunei Vision 2035. It states that the economy's major goal for the next three decades is diversification, along with strengthening of the oil and gas sector.

Due to the oil and gas focus in the national development plan, the utilisation of RE is still very limited in Brunei Darussalam. Table 1 summarises the installed capacity (in MW) of different RE technologies in the country between the years 2006 and 2014. As of 2014, there has been 1.24 MW of solar capacity installed in the country.

Table 1: **Installed power capacity (in MW) of different RE sources in Brunei Darussalam (2006-2014)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	-	-	-	-
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	-	-	-	0.01	1.21	1.22	1.23	1.23	1.2
Wind	-	-	-	-	-	-	-	-	-
Hydro	-	-	-	-	-	-	-	-	-
WTE	-	-	-	-	-	-	-	-	-
Total	**-**	**-**	**-**	**0.01**	**1.21**	**1.22**	**1.23**	**1.23**	**1.24**

Source: ACE

1 As of 16 June 2016, the exchange rate is 1 BND = 0.74 USD

Most of the current RE installed capacity in Brunei Darussalam comes from the Tenaga Suria Brunei Photovoltaic Power Generation Demonstration Project (TSB Project), a joint project between the local government and Mitsubishi Corporation. It is part of Brunei's commitment towards developing sustainable energy sources. The TSB solar system has a nominal capacity of 1.2 MW.

Historical Development of RE Policies

The most recent policy development has been the Energy White Paper 2014 highlighting some of the main priorities in regard to RE.

- August 2008, a memorandum of understanding (MoU) for a new demonstration project was signed
- On 23 June 2009, Brunei Darussalam became a signatory state of the International Renewable Energy Agency (IRENA).
- In 2011, the solar demonstration project reached completion.
- In 2014, the Energy White Paper was published.

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. The relation between key RE-related policies and RE development in Brunei Darussalam is illustrated in Figure 2.

Brunei Darussalam RE Policy Development vs RE Implementation

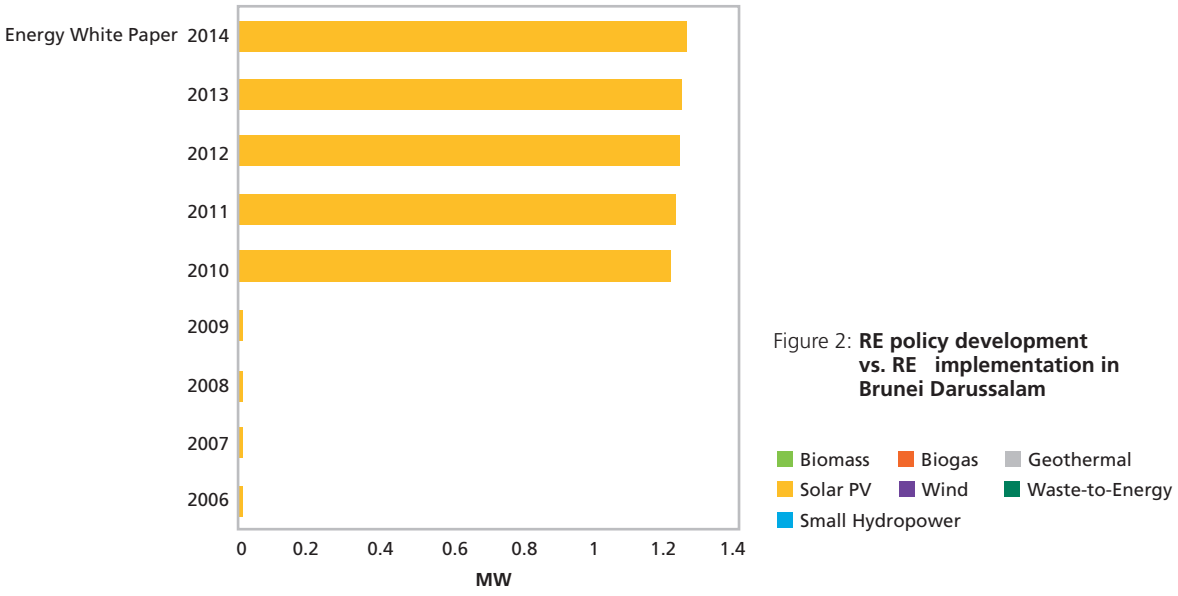


Figure 2: **RE policy development vs. RE implementation in Brunei Darussalam**

Results of Analysis

It is not yet possible to fully analyse the impact of RE policy on RE development in Brunei Darussalam as it is at the very early stage of policy development. The implementation of a demonstration project for solar should promote clean energy generation in the country by building interest and confidence in the technology. As Brunei Darussalam aims to increase its share of RE in the total electricity generation mix by 10% or 954 GWh by 2035, it is expected that more RE projects and policies will be put in place in the near future.

3.1.3 Conclusions

Although RE implementation is still very limited in the country, the Government of Brunei Darussalam is making some progress. In its '2014 Energy White Paper', EIDPMO laid out the goals of reaching 124 GWh of renewable power generation by 2017 and 954 GWh by 2035.

The implementation of a small solar power plant with an installed capacity of 1.2 MW is a first step towards a cleaner future. The country is abundant in RE resource although the country lacks hydro. If a FiT was to be introduced, the policy should support the development of distributed solar generation within the country.

3.2 CAMBODIA

3.2.1 Review of Existing Renewable Energy Policies

The Rural Electrification Master Plan adopted in June 2006 aims at the electrification of rural areas through RE in addition to other options. However, there is no specific target of how much RE will share in the total energy mix by a particular deadline.

The National Policy on Rural Electrification by Renewable Energy adopted in January 2007 provides a general strategy framework for promoting RE technologies (RET) for rural communities. The objective of this policy is to provide clean, reliable, safe and reasonable electricity prices in rural areas, based primarily on RE in a fair and equitable way.

The National Policy on Green Growth and the National Strategy Plan adopted in March 2013 aim to promote, enhance and ensure an effective implementation of green growth through mainstreaming green processes. The National Climate Change Strategic Plan 2014-2023 issued in October 2013 is a comprehensive national policy document that promotes the use of RET as mitigation to greenhouse gas (GHG) emissions.

The National Strategic Development Plan 2014-2018 issued in July 2014 has transferred the Rural Electrification Funds to Electricité du Cambodge (EDC) to promote equity in access to electricity supply services and encourage private sector to participate in investing in sustainable rural power supply services, in particular, encourage the use of new technologies and RE. The Ministry of Mines and Energy will foster the development of all types of RE such as biomass, biogas, biofuel etc., and enhance the energy efficiency through the use of energy-saving stoves, to reduce the use of fuel, firewood, charcoal, etc.

Key policy instruments in Cambodia are reviewed below.

- **RE targets**

Currently there is no specific RE target under dedicated energy or RE policy. However, the RE target for Cambodia are indirectly included in the rural electrification programme which has the following targets:

- by 2020, all villages in the country should have access to electricity and;
- by 2030, at least 70 % of the total households in the country should have access to quality grid electricity.

Achieving these two main targets depends indeed on the utilisation of all types of electricity sources including RE and the participation of relevant stakeholders.

In addition to that, under the Power Development Plan for the period of 2008-2021, to meet the electricity demand which is projected to reach 2,770 MW in 2020, Cambodia has set a target of 2,241 MW supplied by hydro.

- **Selling tariffs of electricity generated from RE sources**

There is still no FiT for the grid-connected RE systems to sell electricity to the grid. For off-grid systems based on RE (solar, biomass gasification), the selling tariffs are usually determined between project investors and direct consumers. Solar Home System (SHS) projects are also installed in a rent-to-own basis.

- **Incentives**

Several fiscal and investment incentives have been agreed upon for RE project developers through a 2003 Law. However, the way and amount companies can avail from these incentives is not clear. Also, information on reduced custom duties on RE equipment varies greatly.

Financing support

A subsidy of US$100 per system is being provided by the Government of Cambodia in order to reduce investment capital for the purchase and installation of RE systems. In 2014, EDC has provided a fund of US$6 million for the operation of the Renewable Energy Fund (REF) and implementation of three rural electrification development programmes consisting of (i) Power to the Poor (P2P) (ii) Solar Home System (SHS), and (iii) Assistance to Develop Electricity Infrastructure in Rural Areas.

There is a grant assistance of US$400/kWh for any mini/micro hydro project and US$300/kWh for other RE technologies.

Permits and licenses

The Electricity Law of 2001 provides guidelines for issuing power licenses by the Electricity Authority of Cambodia (EAC) that regards public interest and takes into consideration the capacity of licensees to operate according to prescribed technical, safety and environmental standards. In 2002, EAC adopted the necessary procedure for obtaining a license. Several procedures were also adopted to access the REF, investment incentives and clean development mechanism (CDM) approval.

Technical issues

The Government of Cambodia has issued a Grid Code last 2009, but it did not have specific provisions for RE integration.

3.2.2 Analysis of the Impacts of RE Policies on the RE Development

The installed power capacity (in MW) for different RE sources for the period 2006-2014 is provided in Table 2.

Table 2: **Installed power capacity (in MW) of different RE sources in Cambodia (2006-2014)**

RE type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	4.50	4.60	5.09	5.78	5.78	6.50	22.50	14.57	22.64
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	-	-	-	-	-	-	-	-	-
Wind	-	-	-	-	-	-	-	-	-
Hydro	12.96	12.96	13.39	13.35	13.33	207.06	225.43	682.10	929.43
WTE	-	-	-	-	-	-	-	-	-
Total	**17.46**	**17.56**	**18.48**	**19.13**	**19.11**	**213.56**	**247.93**	**696.67**	**952.07**

Source: ACE

Biomass: The biomass-based power generation technology has been adopted in Cambodia since 2006. The total installed power capacity of this technology increased from 4.50 MW in 2006 to around 22.64 MW in 2014.

Solar: A small amount of power capacity was implemented by solar home systems (SHS) in off-grid areas, although estimates are currently not available.

Wind: There is less than a MW of wind power installed by an NGO in the Central part of Cambodia (Prey Veng). It is utilised for water pumping.

Hydro: Hydro is fast developing in Cambodia. Considerable capacity has been commissioned in 2011 (193.73 MW), 2013 (456.67 MW) and 2014 (247.33 MW) which brought the total installed capacity of hydro plants from 12.96 MW in 2006 to 929.43 MW in 2014. Most of newly-constructed hydro plants were large-scale. Only a small hydropower (SHP) of around 1 MW has been operating at Ratanakiri Province since 1993.

Biogas, Geothermal and WTE: There are no available data on generating capacity for these RE technologies.

Koh Sla Cambodia Credit: ACE

Historical Development of RE Policies

As showed in Table 3, Cambodia has made several plans for RE implementation. Most of them are related to the implementation of rural electrification. Development of RE in Cambodia is still in its early stage. There is no concrete policy on RE targets, selling tariffs of electricity generated from RE sources, incentives, financing support, permits and other technical issues (RE technical standards, grid connection codes, etc.).

Table 3: **List of key RE-related policies of Cambodia**

Year	Policy issued
2006	• Rural Electrification Master Plan (REMP)
2007	• Power Development Plan 2008-2020 • National Policy on Rural Electrification by Renewable Energy
2009	• Cambodia Green Growth Roadmap 2010 • National Strategic Development Plan Update 2009-2013
2013	• National Climate Change Strategic Plan 2014-2023 • The National Policy and Strategic Plan for Green Growth 2013-2030 (2013) • National Strategic Plan for Green Growth 2013 • National Policy on Green Growth 2013
2014	• National Strategic Development Plan 2014-2018 • Programme for the Development of Rural Electrification of Electricité Du Cambodge (EDC) through the Department of Rural Electrification Fund

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. The relation between key RE-related policies and RE development trends is illustrated in Figure 3.

Cambodia RE Policy Development vs RE Implementation

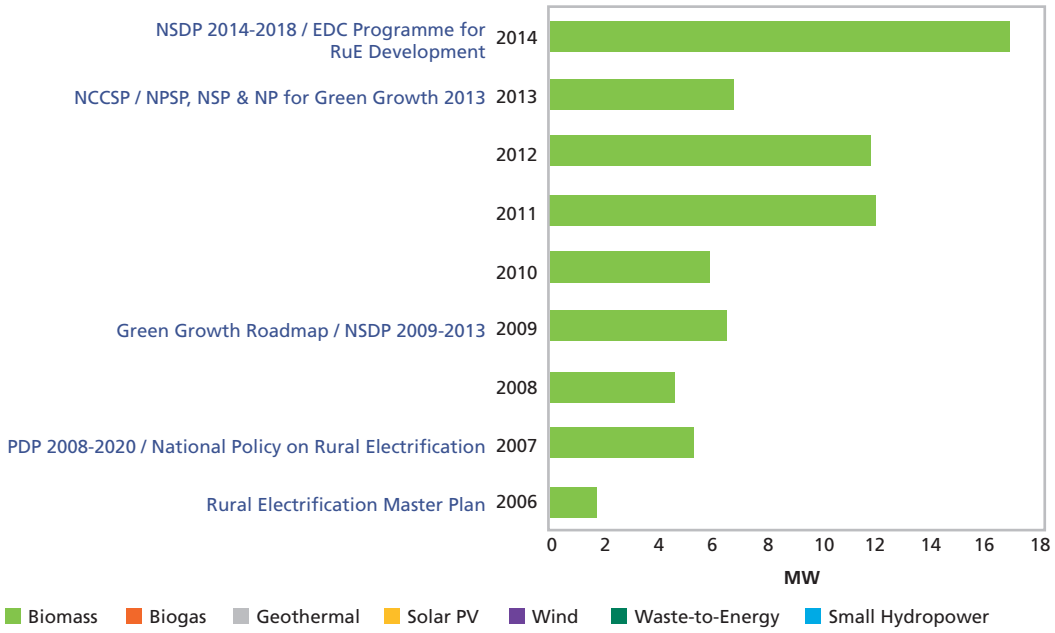


Figure 3: **RE policy development vs. RE implementation in Cambodia**

Results of Analysis

There are still no key policies for the promotion and implementation of RE sources in Cambodia. While several biomass gasification units were implemented, they are being used primarily by rice millers, brick makers and ice makers in rural areas. RE development in Cambodia was mainly financed from foreign countries in the form of donation or grant.

3.2.3 Conclusions

Cambodia is still in the early stage when it comes to the adoption of RE due to lack of technical and financial support, knowledge and experience, and skilled personnel. Cost of RE technologies is still considered expensive and hardly affordable in Cambodia.

There are more SHS projects implemented under the off-grid rural electrification development programme. Most of them have been funded by EDC while some others were installed by small private investors on a rent-to-own basis.

Over the period of 8 (eight) years (2006-2014), the total installed power capacity of RE sources (excluding large-scale hydro) in Cambodia has increased from 4.5 MW to 22.64 MW but this is solely attributed to the growth of biomass.

Cambodia can take advantage of lessons learned from other AMS for its RE development and the corresponding enabling policies and regulations.

3.3 INDONESIA

3.3.1 Review of Existing Renewable Energy Policies

The National Energy Policy was promulgated on 25 January 2006. It provides details of the energy programmes and targets of Indonesia. This was further elaborated in the "Blue Print - National Energy Management 2005 to 2025". The Energy Policy targets a combined share of RE and nuclear in the overall energy mix of the country in 2025 to have exceeded 17%. The policy has special emphasis on enhancing the share of New and Renewable Energy (NRE). NRE is expected to be made up of at least 5% biofuel, 5 % geothermal, 5% other NREs (biomass, nuclear, hydro, solar, and wind), and 2% liquefied coal share to make up the remainder of the primary energy mix by 2025.

The Clean Technology Fund (CTF), a multilateral fund set up by the World Bank (WB), the International Finance Corporation (IFC), the International Bank for Reconstruction and Development (IBRD) and the Asian Development Bank (ADB) aims to accelerate the country's initiatives to promote energy efficiency (EE) and RE and to help achieve the objective of increasing the electrification rate up to 90 % in 2020. Under a new US$400 million climate investment plan endorsed by the CTF, Indonesia's geothermal power capacity is set to nearly double. In March 2015, CTF of US$50 million was further reallocated to the Geothermal Energy Upstream Development Project of Indonesia.

Since 2012, several Feed-in Tariffs (FiTs) have been issued to accelerate the deployment of RE power projects, particularly for small and medium scale projects up to 10 MW. FiTs provide private investors with guaranteed and consistent revenue that can help make a viable business case for RE projects, which may have higher generation costs.

In 2012, the Ministry of Energy and Mineral Resources (MEMR) issued Regulation No. 04 to provide FiTs for biomass, biogas, municipal solid waste (MSW), hydro plants and excess power up to a generation capacity of 10 MW. Tariff for solar was issued by the MEMR Regulation No. 17 of 2013. Tariff for hydro was issued by the MEMR Regulation No. 12 of 2014 and later on the regulation was updated by the MEMR Regulation No. 22 of 2014. Both were replaced in the MEMR Regulation No. 19 of 2015. FiT for MSW was revised by MEMR Regulation No. 19 of 2013 while MEMR Regulation No. 27 of 2014 implemented new FiTs for biomass, biogas and MSW to make them more attractive to investors. The latest tariff issued for MSW power plants (MEMR Regulation No. 44 of 2015) allowed private sector participation up to 50 MW superseding the 10 MW ceiling of previous regulations.

Law No. 21 of 2014 on Geothermal (New Geothermal Law) was passed which introduced a new regime for geothermal business activities. The law aims to accelerate the development of geothermal activities as an alternative energy source, as Indonesia has significant geothermal resources which have been underutilised.

Last May 2015, the Government of Indonesia (GoI) issued a Roadmap for Accelerated Development of New and Renewable Energy (NRE) 2015-2025 to support energy resilience and shift towards NRE. A one-stop integrated investment information service is being implemented. It will consist of one spatial information system presenting the opportunities of NRE investment (water, biomass, geothermal, and solar) over Indonesia. This integrated service also provides comprehensive information on investment incentives to investors of various kinds of NREs, including the structure and implementation of well-targeted and rational incentives in terms of supporting investment and development efforts of the NRE sector with a long-term perspective. An NRE Cooperation Forum is also being developed that will provide network opportunities and will have potential for collaboration among agencies to accelerate the removal of obstacles that hinder the development of NRE.

The key policy instruments in Indonesia are reviewed below.

- **RE Targets**

The National Energy Policy revised in October 2014 set the NRE target to a minimum of 23% in 2025 and 31% in 2050. Based on Revision IV of the General Plan on National Energy of mid December 2015, the total capacity target for NRE power is shown in Table 4.

Table 4: **NRE targets of Indonesia (in GW)**

RE Source	2025	2050
Geothermal	7.1	16.5
Hydro	21.3	45.4
Diesel mixed with Biofuel	3.0	5.5
Biomass	5.4	32.7
Solar	8.0	45.0
Wind	1.5	24.8
Ocean	0.007	1.8
Total	**46.307**	**171.7**

Selling tariffs of electricity generated from RE sources

GoI has promulgated the tariffs of electricity sold to Perusahaan Listrik Negara (PLN) from small hydro plants, wind power plants, biomass-based, biogas-based and solid waste-based power plants in its MEMR Regulation No. 04 of 2012 on Electricity Purchase from Small and Medium Scale Renewable Energy and Excess Power (SMSRE) as shown in Table 5.

Table 5: **Tariff of electricity purchased from various RE sources in 2012 (up to 10 MW)**

RE source	Voltage	Feed-in tariff (IDR/kWh)	Territorial bonus (F)
Biomass and Biogas	Medium Low	975 1,325	Jawa, Madura, Bali and Sumatera Region: F = 1 Sulawesi, Kalimantan, Nusa Tenggara Timur (NTT) and Nusa Tenggara Barat (NTB) Region: F = 1.2 Maluku and Papua Region: F = 1.3
Hydro	Medium Low	656 1,004	Jawa and Bali Region: F=1 Sumatera and Sulawesi: F=1.2 Kalimantan, NTB, and NTT, F=1.3 Maluku and Papua Region, F=1.5
MSW with Zero Waste Technology	Medium Low	1,050 1,398	Jawa, Bali, and Sumatera region: F = 1 Kalimantan, Sulawesi, NTB and NTT regions: F = 1.2 Maluku and Papua region: F = 1.3
MSW with Sanitary Landfill Technology	Medium Low	850 1,198	

Exchange Rate: 13,793 IDR/USD as of December 2015

Indonesia energy renewable hybrid solar wind. Credit: ASEC

MEMR Regulation No. 22 of 2012 provides FiT for Geothermal at US$ 0.01 - 0.19/kWh depending on location and whether the power plant is connected to a high or medium voltage network.

MEMR Regulation No. 17 of 2013 provides a maximum price at USD 0.25/kWh. If using PV module with minimum 40 % of local content, the maximum price is USD 0.3/kWh. However, on 30 June 2014, the Supreme Court of Indonesia issued a decision which requires MEMR to revoke that regulation. The new regulation for solar PV FiT was issued on 12 July 2016 by the MEMR under Regulation No.19 of 2016. Under the new regulation, the local content should follow the requirement from Ministry of Industry and will be verified by official evaluator appointed by Ministry of Industry. The maximum quota for each area is 5 GW in which the FiT in each phase could be different. The detail tariffs for phase I are shown in Table 6.

Table 6: Tariff of electricity purchased from Solar PV

No	Area	Capacity Quota (MWp)	Feed in Tariff (US cent/kWh)
1	DKI Jakarta	Total: 150.0	14.5
2	Jawa Barat		14.5
3	Banten		14.5
4	Central Java and Yogyakarta		14.5
5	East Java		14.5
6	Bali	5.0	16.0
7	Lampung	5.0	15.0
8	South Sumatera, Jambi and Bengkulu	10.0	15.0
9	Aceh	5.0	17.0
10	North Sumatera	25.0	16.0
11	West Sumatera	5.0	15.5
12	Riau and Riau Archipelago	4.0	17.0
13	Bangka - Belitung	5.0	17.0
14	West Kalimantan	5.0	17.0
15	South Kalimantan and Central Kalimantan	4.0	16.0
16	East Kalimantan and North Kalimantan	3.0	16.5
17	North Sulawesi, Central Sulawesi and Gorontalo	5.0	17.0
18	South Sulawesi, South-East Sulawesi and West Sulawesi	5.0	16.0
19	West Nusa Tenggara	5.0	18.0
20	East Nusa Tenggara	3.5	23.0
21	Maluku and North Maluku	3.0	23.0
22	Papua and West Papua	2.5	25.0

MEMR Regulation Number 19 dated 4 July 2013 revised the electricity tariffs from MSW. They are shown in Table 7.

MEMR Regulation Number 27 dated 16 October 2014 provides tariffs on the electricity purchased by PLN from biomass and biogas power plant which are also shown in Table 7. It also regulates the 'Incentive for Load Follower' (ILF). Incentive is given to biomass-based and biogas-based power projects which follow local electricity base load. For medium voltage, ILF for biomass is IDR 80/kWh. It is IDR 70/kWh for biogas. For low voltage, ILF is IDR 100/kWh for biomass and IDR 90/kWh for biogas.

Table 7: Tariff of electricity purchased from biomass, biogas and MSW up to 10 MW

No	Energy	Feed in Tariff (IDR/kWh)	Remarks
Medium Voltage			
1	Biomass	1,150 X F	
2	Biogas	1,050 X F	Non MSW Power Plant
3	MSW	1,450	Zero Waste
4	MSW	1,250	Sanitary landfill
Low Voltage			
1	Biomass	1,500 X F	
2	Biogas	1,400 X F	Non MSW Power Plant
3	MSW	1,798	Zero Waste
4	MSW	1,598	Sanitary landfill

Note: F is an incentive factor based on the region where the power plant installed:

- Jawa Island: F = 1.00
- Sumatera Island: F= 1.15
- Sulawesi island: F = 1.25
- Kalimantan island: F = 1.3
- Bali Island, Bangka Belitung Island, Lombok Island: F = 1.5
- Riau archipelago, Papua and others: F = 1.6

New FiTs for hydro plants were issued through MEMR Regulation No. 19 of 2015 replacing MEMR Regulation No 04 of 2012. They are shown in Tables 8, 9 and 10.

Table 8: **FiTs of electricity purchased from run-of-river-based SHP plants**

No.	Generator Capacity	Region	Feed in Tariff (US cent/kWh)		
			1st to 8th Year	9th to 20th Year	F Factor
1	Medium Voltage (up to 10 MW)	Jawa, Bali, & Madura	12.00 x F	7.50 x F	1.00
2		Sumatra	12.00 x F	7.50 x F	1.10
3		Kalimantan & Sulawesi	12.00 x F	7.50 x F	1.20
4		NTB & NTT	12.00 x F	7.50 x F	1.25
5		Maluku & North Maluku	12.00 x F	7.50 x F	1.30
6		Papua & West Papua	12.00 x F	7.50 x F	1.60
7	Low Voltage (up to 250 kW)	Jawa, Bali, & Madura	14.40 x F	9.00 x F	1.00
8		Sumatra	14.40 x F	9.00 x F	1.10
9		Kalimantan & Sulawesi	14.40 x F	9.00 x F	1.20
10		NTB & NTT	14.40 x F	9.00 x F	1.25
11		Maluku & North Maluku	14.40 x F	9.00 x F	1.30
12		Papua & West Papua	14.40 x F	9.00 x F	1.60

Table 9: **FiTs of electricity purchased from dam-based SHP plants**

No.	Generator Capacity	Region	Feed in Tariff (US cent/kWh)		F Factor
			1st to 8th Year	9th to 20th Year	
1	Medium Voltage (up to 10 MW)	Jawa, Bali, & Madura	10.80 x F	6.75 x F	1.00
2		Sumatra	10.80 x F	6.75 x F	1.10
3		Kalimantan & Sulawesi	10.80 x F	6.75 x F	1.20
4		NTB & NTT	10.80 x F	6.75 x F	1.25
5		Maluku & North Maluku	10.80 x F	6.75 x F	1.30
6		Papua & West Papua	10.80 x F	6.75 x F	1.60
7	Low Voltage (up to 250 kW)	Jawa, Bali, & Madura	13.00 x F	9.00 x F	1.00
8		Sumatra	13.00 x F	8.10 x F	1.10
9		Kalimantan & Sulawesi	13.00 x F	8.10 x F	1.20
10		NTB & NTT	13.00 x F	8.10 x F	1.25
11		Maluku & North Maluku	13.00 x F	8.10 x F	1.30
12		Papua & West Papua	13.00 x F	8.10 x F	1.60

Table 10: **FiTs of electricity purchased from old SHP plants**

No.	Generator Capacity	Region	Feed in Tariff (US cent/ kWh)	F Factor
1	Medium Voltage (up to 10 MW)	Jawa, Bali, & Madura	9.30 x F	1.00
2		Sumatra	9.30 x F	1.10
3		Kalimantan & Sulawesi	9.30 x F	1.20
4		NTB & NTT	9.30 x F	1.25
5		Maluku & North Maluku	9.30 x F	1.30
6		Papua & West Papua	9.30 x F	1.60
7	Low Voltage (up to 250 kW)	Jawa, Bali, & Madura	11.00 x F	1.00
8		Sumatra	11.00 x F	1.10
9		Kalimantan & Sulawesi	11.00 x F	1.20
10		NTB & NTT	11.00 x F	1.25
11		Maluku & North Maluku	11.00 x F	1.30
12		Papua & West Papua	11.00 x F	1.60

MEMR Regulation No. 44 of 2015 for MSW power plants allows private sector investment up to 50 MW superseding the 10 MW ceiling of previous regulations. New FiTs are shown in Table 11.

Table 11: **FiTs of electricity purchased from MSW above 10 MW and up to 50 MW**

No.	Technology Type	Capacity	Feed in Tariff (US cent/kWh)
High Voltage			
1	Thermal Process Utilisation	Above 20 MW up to 50 MW	15.95
2	Thermal Process Utilisation	> 50 MW	13.14
High and Medium Voltage			
1	Methane Gas Utilisation	<20 MW	16.55
2	Thermal Process Utilisation	<20 MW	18.77
Low Voltage			
1	Methane Gas Utilisation	<20 MW	20.16
2	Thermal Process Utilisation	<20 MW	22.43

In addition to the above FiT policies, GoI is currently finalising new FiTs for solar (ground mounted and rooftop) and wind power.

Incentives

Tax incentives for RE-based power projects under Ministry of Finance (MOF) Regulation No. 21/PMK.011/2010 include:

- income tax exemption/reduction for 5 or 10 years;
- accelerated depreciation and amortisation;
- tax deduction per year for 6 years;
- exemption from VAT;
- accelerated depreciation of capital and fixed assets;
- import duty exemption for RE equipment.

Under MoF Regulation No. 139/PMK.011/2011, the government gives financial guarantee for RE plant projects through cooperation with Independent Power Producer (IPP) in the case of payment failure by PLN.

Financing support

The Geothermal Fund Facility (GFF), The Indonesia Infrastructure Guarantee Fund (IIGF) also known as PT Penjaminan Infrastruktur Indonesia Persero and loans at an interest rate lower than that provided by national banks are available to farmers, particularly for planting palm oil for biofuel.

The Clean Technology Fund (CTF) aims to accelerate the country's initiatives to promote energy efficiency (EE) and RE and to help achieve the objective of increasing the electrification rate up to 90% in 2020. Under a new US$400 million climate investment plan endorsed by the CTF, Indonesia's geothermal power capacity is set to nearly double. In March 2015, CTF of US$50 million was further reallocated to the Geothermal Energy Upstream Development Project of Indonesia.

Permits and Licenses

Electricity produced by Independent Power Plants (IPP) up to 10 MW will be sold to PLN at fixed FiTs (no price negotiation).

The New Geothermal Law introduces new licenses in relation to geothermal activities which removes it from the sphere of mining activities to reduce the difficulties with developing these resources. The law also allows geothermal plants to be developed in forest conservation. License for geothermal project development and tender of concessions, controlling and surveillance is now under the Central Government's authority.

Since January 2015, the government compiled the permit procedures of electricity power plant into the integrated one-stop service stationed in the Investment Coordinating Board (Badan Koordinasi Penanaman Modal/BKPM). The Temporary and Permanent Permit of Electricity Power Supply Business (IUPL), The Determination of Electricity Power Supply Business Area, and The Permit of Electricity Power Supporting Business Service (IUJPTL), of which the permit procedure services were previously provided in the Directorate General of Electricity office, are now available in BKPM's Integrated One-Stop Service, as well as the other permit procedures. Simplifying related permit and regulations is one of the government's priorities to further accelerate and streamline the permit procedures.

- **Technical issues**

PLN issued "Guidelines for Connecting Renewable Energy Generation Plants (REGP) to PLN's Distribution System" in July 2014. It aims to ensure connection and parallel operation of REGPs do not adversely affect the safety, reliability and power quality of PLN's power system.

It provides REGP developers with clear guidance in performing connection studies and technical requirements for early consideration in the REGP project planning and development stages, and useful reference of technical information on REGP engineering firms, equipment manufacturers, suppliers.

3.3.2 Analysis of the Impacts of RE Policies on the RE Development

- **Review of RE Development**

The installed power capacity (in MW) of different RE sources for the period 2006-2014 is provided in Table 12.

Table 12: **Installed power capacity (in MW) of different RE sources in Indonesia (2006-2014)**

RE Type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	-	-	-	-
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	850.00	980.00	1,052.00	1,189.00	1,192.75	1,209.00	1,343.00	1,345.40	1,405.00
Solar	-	-	-	-	0.19	1.16	4.09	9.02	9.02
Wind	-	0.10	0.26	1.06	0.34	0.93	0.93	0.63	1.12
Hydro	3,719.19	3,694.62	3,696.72	3,701.67	3,733.22	3,943.59	4,146.41	5,165.61	5,229.39
WTE	-	-	-	-	-	26.00	26.00	26.00	36.00
Total	**4,569.19**	**4,674.72**	**4,748.98**	**4,891.73**	**4,926.50**	**5,180.68**	**5,520.43**	**6,546.66**	**6,680.53**

Sources: ACE

Since 2006, there is a steady increase in the RE-based power capacity. The bulk of the increase is in hydro and in geothermal power. Other RE technologies such as solar, wind and WTE are still just in the early stage of implementation.

Biomass: Most existing biomass power plants are utilised for cogeneration in agro-industries (sugar and palm oil mills) to cover their own energy needs.

Geothermal: The first geothermal power plant was inaugurated in 1983, and subsequently expanded in 1987 to a capacity of 140 MW. By 2006, it had increased to 850 MW. Around half of the currently installed capacity of 1,405 MW is owned by the private sector. Most geothermal power plants are installed in West Java close to the capital city of Jakarta which is the load centre.

Solar: In the early days, solar systems were mostly used for rural electrification as solar home systems with as little as 50 Wp capacity each. In 2014, solar installed capacity reached 9.02 MWp. More solar plants have been implemented in 2015 to reach 80 MWp.

Wind: There has not been any substantial implementation of wind power due mainly to low wind speeds near the load centres.

Hydro: Being an archipelago, Indonesia has a large potential for hydro. In 2014, a little more than 5.2 GW has been installed. Based on the Handbook of Energy & Economic Statistics of Indonesia (HESSI) published by MEMR, the SHP plants have been utilised for small demonstration projects up to 6.7 MW in 2009. In order to boost rural electrification, more SHP projects were implemented from 2010 to reach a total installed capacity of 170.33 MW by the end of 2014.

Biogas: There is no official data on generating capacity for these RE technologies.

WTE: Starting in 2011, there were 26 MW of WTE plants installed in Indonesia consisting of small IPPs that mostly utilise landfill gas. MEMR Regulation No 04 of 2012 that provided FiTs on WTE helped increase WTE-installed capacity to 36 MW in 2014.

Historical Development of RE Policies

The historical development of RE policies in Indonesia is presented in Table 13. Indonesia has targeted that 23% of their energy mix will come from New and Renewable Energy (NRE) by 2025. In order to meet those targets, it has passed and implemented 13 (thirteen) key legal documents and policies such as those covering FiTs, purchasing policies from RE sources, licensing and permitting in the last four years alone (2012-2015).

Table 13: **List of key RE-related policies of Indonesia**

Year	Policy issued
2006	• National Energy Policy (NEP)
2008	• Determination of Work Area for Geothermal Mining
2009	• Law on Electricity
2010	• Tax and Custom Facility for Renewable Energy Resource Utilisation.
2012	• Investment General Plan • Amendment on Guideline for Geothermal Implementation • Amendment on List of Power Generation Development Project Acceleration using Renewable Energy, Coal and Gas and Related Transmission • Electricity Purchase from Small and Medium Scale Renewable Energy and Excess Power
2013	• Purchasing of Electricity by PLN from Solar PV • Purchasing of Electricity by PLN from Municipal Solid Waste
2014	• National Energy Policy (NEP) • Electricity Purchasing by PLN from Biomass Power Plant and Biogas Power Plant. • Law on Geothermal • Amendment on the Purchasing of Electricity by PLN from Hydro • Purchasing of Electricity by PLN from Geothermal
2015	• Regulation on Hydro • Regulation on MSW
2016	• Purchasing of Electricity by PLN from Solar PV

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. The relation between key RE policies and RE development trends is illustrated in Figure 4.

Indonesia RE Policy Development vs RE Implementation

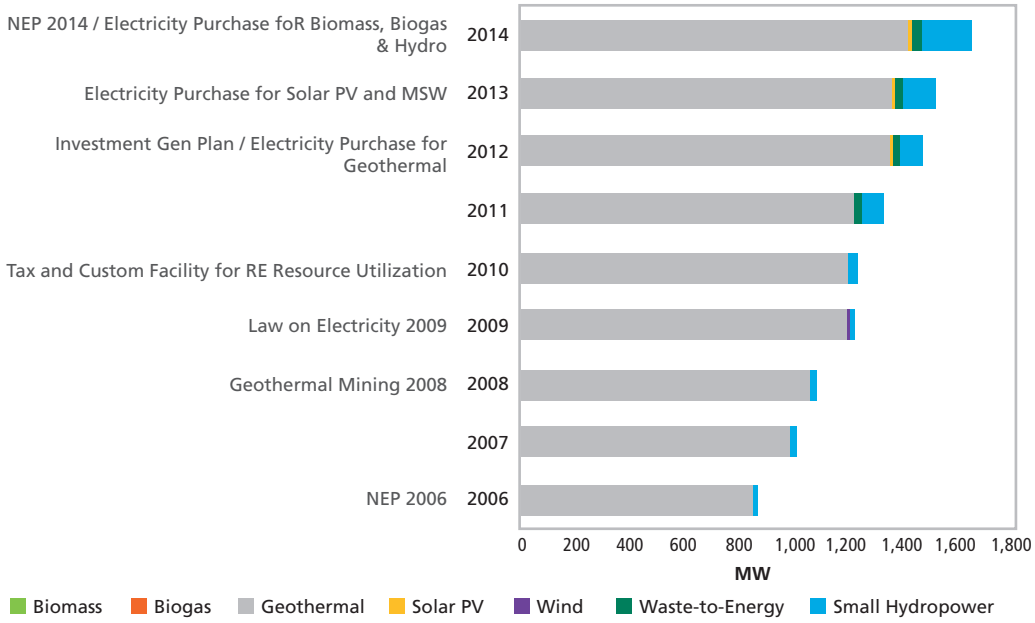


Figure 4: **RE policy development vs. RE implementation in Indonesia**

Results of Analysis

Biomass: Indonesia has an estimated potential of 34 GW from various biomass sources with the bulk coming from palm oil residues and sugarcane bagasse.

Several policies have been implemented since 2006. The key policies were the FiTs issued in 2012, 2014 and 2015 which stimulated investors. MEMR Regulation No. 27 of 2014 in particular had a big impact on the RE development by achieving additional biomass capacities based on the report of MEMR. Also, the capacity ceiling that has been increased from 10 to 50 MW could have a great impact on the volume of the projects. However, the impact will still be seen in the next 2-3 years' time. The non-policy main driver for the development of biomass power projects since 2006 was primarily cogeneration in palm oil mills.

The main constraints for the biomass power generation development are lack of financing sources for private biomass projects and lack of infrastructure to gather and deliver biomass. This includes getting access to transmission and distribution (T&D) infrastructure with most of these plants located in remote areas.

Geothermal: Indonesia is recognised as having huge potential reserves of geothermal energy estimated at 29 GW. There has been a steady increase in capacity since the first geothermal plant was installed in 1983 with the GoI giving priority in tapping the large geothermal resources to cover their growing energy needs. Since 2006, several policies have been implemented in order to fast track the construction of geothermal power plants.

Under the 2003 Geothermal Law, geothermal activities were regarded as "mining activities" which were forbidden to be carried out in conservation forest areas. The passing of the 2014 Geothermal Law separates geothermal activities from mining activities thereby allowing geothermal development in forest conservation areas and facilitating licensing and permitting. The Law also provides the avenue for the GoI to conduct geothermal power development and create a new state-owned company to manage it. However, the impact will only be felt in the next 2-3 years with several projects already in the pipeline. The GoI has also undertaken other efforts to make investments in geothermal energy more attractive. The Geothermal Fund Facility (GFF) provides support to mitigate risks and provides information regarding the relatively high upfront costs for geothermal development.

Solar: Solar power has the biggest potential estimated at 560 GW. However, the installed capacity of solar is still very low at 9.02 MWp by the end of 2014. Some of the increase in the capacity can be attributed to non-policy drivers such as declining investment costs, generally high solar irradiation in Indonesia and the ongoing rural electrification projects. The new promising FiT rates may benefit solar power development in the upcoming years. Presently, private sector has committed 305 MWp in the next 2-3 years.

Wind power: There is a large potential for wind power in Indonesia which is estimated at 107 GW. The eastern islands have suitable wind speeds for wind power production but lack the transmission infrastructure and the load demand since they are less populated. There are no enabling laws and policies promulgated but GoI is currently finalizing the policy on FiTs for wind power.

Hydro: According to PLN estimates, Indonesia has 75 GW of large hydro potential. Since 2010, the GoI and PLN have closely collaborated to ease the permit procedure. The issuance of FiTs in MEMR Regulation No. 04 of 2012 generated a significant increase of capacity in the last few years. Based on HESSI report, SHP had an installed capacity of 170.33 MW at the end of 2014. Due to another favorable FiTs issued in 2015, a substantial increase is expected in the next few years, with IPPs committed to 1,394.6 MW.

While hydro shows the highest potential and is picking up, most of the resources are located outside the main Jawa-Bali system and concentrated in areas that still have very low power requirement and low electrification rates.

WTE: In 2008, the GoI enacted the Municipal Solid Waste Law that laid the ground for environmentally-friendly waste management. The law obliges local governments to develop new sanitary landfills equipped with integrated processing facilities that avoid methane emissions. In 2010, the Ministry of Finance's regulation on 'Tax and Custom Facility for Renewable Energy Resource Utilisation' provided import duty exemptions on equipments for the development of RE power plants, which included those fuelled by solid waste. Other tax incentives were also made available for energy development projects. These policy instruments encouraged several small IPPs to build 26 MW of WTE power plants in 2011. In 2012, MEMR issued the FiTs for WTE which were later revised in 2014 and 2015. A new 10 MW was added in WTE plant capacity by 2014. Some projects have been developed so far after the revisions in the FiTs. Challenges for WTE growth include waste quality issues, revenue and cost barriers, technology risks and the commitment of local authorities.

Biogas: In 2012, MEMR issued the FiTs for biogas which were later revised in 2014 and 2015. However, very few projects have been developed so far. Feedstock availability is the biggest hurdle for developing these technologies and projects have further been delayed due to off-take negotiations.

3.3.3 Conclusions

Indonesia has established a policy framework for the development of the energy sector in general and RE in particular. It sets up the targets of RE development as well as the orientations and action plans to achieve these targets. The selling tariffs of electricity generated from different RE sources were also introduced. An incentive framework includes tax holidays, tax deductions, and VAT exemptions, accelerated depreciation of capital and fixed assets and import duty exemption for RE equipment.

Over the period of eight years (2006-2014), the total installed capacity of RE sources in Indonesia (excluding large hydro) has increased with an annual growth rate of around 22%, the bulk of the increase coming from geothermal which comprises 86.6% of the 2014 RE capacity. However, in spite of the potential of geothermal estimated at 29 GW, only 1,405 MW or only 4.8% is being utilised. Collectively, geothermal policies had small impact on the private sector investment. Slow growth was due to high upfront cost, project development and technical risks, land acquisition issues, limited information and awareness, need for more expertise, and limited access to T&D infrastructure. Other issues are the credit worthiness of the off-taker and contract structures. There are also local issues such as legal, social, environmental and even monetary and political risks, currency risk, changes in law (i.e. nationalisation), and pricing structures.

For biomass, the growth is more on non-policy reasons. There is an abundant quantity of biomass residues in palm oil and sugar mills which are used in cogeneration units. The main constraint for the overall biomass power generation development is lack of financing sources for private biomass projects and lack of infrastructure to gather and deliver biomass. Moreover, most of these mills are located in remote areas and inaccessible to T&D infrastructure.

The total installed power capacity of different RE sources is estimated at 1,621.47 MW in 2014 which accounted for only 3% of the total installed generation capacity of the national power system. Around 26 MW came from WTE, 1,405 MW from geothermal, 170.33 MW from small hydro, 9.02 MW from solar and 1.12 MW from wind power plants.

Indonesia had set the target of reaching 23% of RE sources in the total energy mix by 2025, which include hydro, biofuels, and other new energy sources.

The existing RE-related policy framework of Indonesia seems adequate for developing RE-based power generation projects. Without considering large hydro, only geothermal power has developed in recent years due to abundance of geothermal sites. With the latest policies and FiTs introduced in 2014 and 2015, it is expected that within 2 to 3 years there will be more RE projects implemented from geothermal as well as solar and small hydro sources. However, it is too early to assess any policy impact yet.

3.4 LAO PDR

3.4.1 Review of Existing Renewable Energy Policies

The Power Sector Policy and Targets of Lao PDR for 2020 indicates that the country is geared towards increasing the share of RE to 30% of the total energy consumption in 2025, in order to ensure adequate supply of energy, EE and conservation in the country, and to promote cultivation of fuel crops for biofuel production.

The Renewable Energy Development Strategy (2011-2025) details out the strategies needed to achieve the targets on RE. Some of the key priorities are as follows:

- Small power plant development for self-sufficiency and grid connection;
- Biofuels production and marketing;
- Development of clean energy in the country in order to reduce the import of fossil fuels;
- Promote cultivation of crops for biofuel production;
- Increase biofuel consumption in the transport sector by 10%.

The National Policy on Environmental and Social Sustainability of the Hydro Sector in Lao PDR was published in 2006. It was revised in 2013 by the Department of Energy Policy and Planning (DEPP) of the Ministry of Energy and Mines. This aims to include social, environmental, economic and regulatory aspects of building dams larger than 15 MW.

The policy is centred to hydro since it is the main source of the country's energy. The policy on Sustainable Hydro Development (2013) which is a revision of the National Policy on Environmental and Social Sustainability of the Hydro Sector in Lao PDR (2006) includes sections dealing with feasibility studies, economic and technical considerations, social and environmental impacts, information disclosure, public consultations, compliance monitoring and benefit-sharing.

At present, there is no electricity selling tariff regulations for RE in Lao PDR. The policies on RE targets, incentives, project financing, permits and licensing and technical issues are listed below.

The key policy instruments in Lao PDR are reviewed below.

RE targets

The Renewable Energy Development Strategy in Lao PDR has targets to increase the share of RE to 30% of the total energy consumption in 2025. Targets for the RE sources (in MW) are presented in Table 14.

Table 14: **RE targets of Lao PDR (2016-2025)**

RE Type	2016 - 2020	2021 - 2025
Electricity	**MW**	
Small hydro power	134	400
Solar	36	91
Wind	12	73
Biomass	24	58
Biogas	19	51
Waste-to-energy	17	36
Geothermal	0	0
Heat	**ktoe**	
Biomass	29	113
Biogas	44	178
Solar	22	109
Biofuels	**ML**	
Ethanol	106	150
Biodiesel	205	300

Nam Ngum hydroelectric power station in Lao PDR

Selling tariffs of electricity generated from RE sources

There is still no FiT for the grid-connected RE systems to sell electricity to the grid. The selling tariff of electricity generated from RE projects is currently based on negotiations between producers and power utility on the case-by-case basis. The Department of Energy Policy and Planning (DEPP) is in a process of preparing the policy on electricity selling tariffs for different RE sources.

Incentives

Under the Investment Promotion Law, incentives provided that can also support investment in RE are the following:

- Import duty free for production machinery, equipment and raw materials;
- Import duty free for chemical materials necessary for biofuels production within 7 years;
- Profit tax is divided into 3 categories according to investment promotion zones. In Zone 1 with no economic infrastructure (mainly mountainous remote areas), project investors are entitled to a profit tax exemption for 7 years and tax rate of 10% thereafter. In Zone 2 with a certain level of economic infrastructure (the geographic conditions of these zones is not as hard as Zone 1) suitable to accommodate investments to some extent, investors are entitled to profit tax exemption for 5 years and tax rate of 15% thereafter. In Zone 3, with good economic infrastructure to support investments, investors are entitled to profit tax exemption for 2 years and tax rate of 20% thereafter.
- Exemption from profit tax in the next accounting year, if the net profit derived from business activities is used for business expansion.

Additional incentives under the Investment Promotion Law for both large and small hydro-electricity generation are available, the Department of Energy Business (DEB) of the Ministry of Energy and Mines offering investors:

- Free access to land (including areas to be flooded),
- A waiver on land conversion fees (US$15,000 per hectare),
- A "reasonable" tax holiday,
- A waiver on withholding taxes on net repatriated profit,
- Waivers or reduced rates on import duty for materials, equipment and supplies,
- Unlimited use of foreign labour in both skilled and unskilled functions,
- Concession fix periods of 30 years,
- Waivers on other taxes and duties and offshore banking facilities
- Host government to adjust its fiscal policy in respect of government imposts to be imposed on project by project in order to help secure financial criteria of private parties.

Financing support

Under the Lao PDR's Law on Investment Promotion, domestic and foreign RE project investors can have access to loans from commercial banks and other financial institutions in Lao PDR and overseas in accordance with relevant laws and regulations.

Permits and licenses

Procedures for applying for licensing approval in electricity enterprise which is also applicable in RE sector consist of studies, cost estimates, preliminary assessment, investment proposals, proposal review, signing of agreements, surveys, economic technical analysis, environmental impact evaluation, licensing review, and related activities as specified under the directives of the Ministry of Industry and Handicrafts. The Government of Lao PDR may consider joint investment if such enterprise receives a licensing approval.

Applicants for licensing approval shall meet the following conditions:

- Applicants shall have sufficient funds and appropriate technical expertise;
- Applicants shall have good business history and sound reputation;
- The proposed project shall benefit the economy and society;
- The proposed plan shall concur with the national social-economic development and shall not bring detrimental damages to the environment.

Technical issues

The policy on Sustainable Hydro Development (2013) applies to all hydro projects larger than 15 MW throughout the project development process (planning, construction, operation, and transfer/closure stages) and incorporates technical, engineering, economic/finance, environment and social impacts aspects.

3.4.2 Analysis of the Impacts of RE Policies on the RE Development

▶ Review of RE Development

Table 15 shows the development of RE (in MW of installed power capacity) in Lao PDR from 2006 to 2014.

Table 15: **Installed power capacity (in MW) of different RE sources in Lao PDR (2006-2014)**

RE Type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	9.70	9.70	39.74	39.70
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	0.30	0.30	0.30	0.61	1.61	2.16	2.90	2.90	3.08
Wind	-	-	-	-	-	-	-	-	-
Hydro	679.50	679.50	679.50	755.50	1,930.50	1,936.45	2,960.65	3,216.15	3,305.27
WTE	-	-	-	-	-	-	-	-	-
Total	**679.80**	**679.8**	**679.80**	**756.11**	**1,932.11**	**1,948.31**	**2,973.25**	**3,258.79**	**3,348.05**

Source: ACE

Biomass: The implementation of some biomass power plants only started in 2011 while small scale solar plants have been in operation for more than a decade. The total installed power capacity of biomass power plants increased from 9.7 MW in 2011 to 39.7 MW in 2014. These biomass power plants are bagasse-based cogeneration plants in sugar mills.

Solar: A solar power plant with a small capacity of 0.3 MW was already in operation before 2006. The capacity increased to 3.1 MW in 2014.

Hydro: Hydro is the main source of energy in Lao PDR with a technical potential of around 26,000 MW for large hydro. Hydro plants were already in operation before 2006. There is a significant increase in installed capacity from 679.5 MW in 2006 to 3,305.3 MW in 2014. Based on the statistical data from IRENA, small hydro plants (<15 MW) have also increased from an installed capacity of 12 MW in 2006 to 38 MW in 2014.

Biogas, Geothermal, Wind and WTE: There is no available data on any generating capacity for these RE technologies.

▶ Historical Development of RE Policies

Lao PDR Electricity Law was enacted in 1997 by the national assembly. The Ministry of Planning and Investment created a National Policy on Environmental and Social Sustainability of the Hydro sector in Lao PDR in 2006. It was replaced by the Policy on Sustainable Hydro Development by the Department of Energy Policy and Planning (DEPP) in 2013. Table 16 summarises the key policies related to RE sector in Lao PDR.

Table 16: **List of key RE-related Policies of Lao PDR**

Year	RE Policy
1997	• Electricity Law
2006	• National Policy Environmental and Social Sustainability of the Hydro Sector in Lao PDR
2009	• Investment Promotion Law 2009
2011	• Renewable Energy Development Strategy in Lao PDR
2013	• Policy on Sustainable Hydro Development

▶ RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. Figure 5 illustrates the relation between the RE development and the key RE policies in the Lao PDR from 2006 to 2014.

Lao PDR RE Policy Development vs RE Implementation

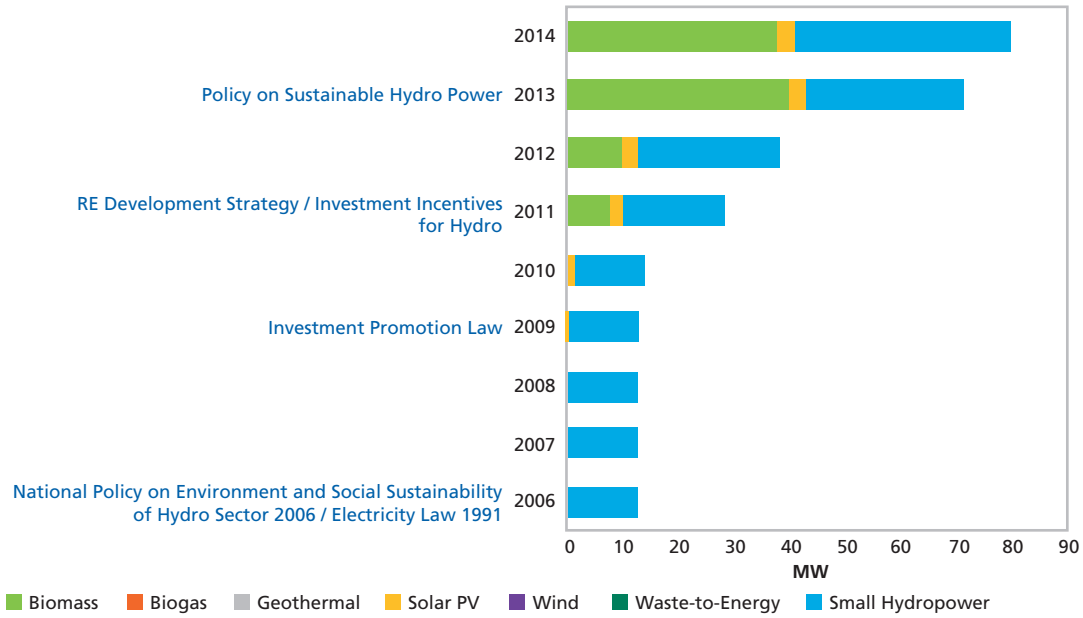


Figure 5: **RE policy development vs. RE implementation in Lao PDR**

Result of Analysis

Hydro: From the statistical data of IRENA, the installed capacity of small hydro plants (≤15 MW) has increased steadily since 2011. This increase can be attributed to the enactment of the National Policy on Environment and Social Sustainability in 2006 and to the Investment Promotion Law in 2009.

The enactment of the RE Development Strategy have further stimulated the implementation of such projects over the last two years.

Biomass: The implementation of biomass power projects in 2011 and 2014 can also be attributed to the Investment Promotion Law.

Solar: The Investment Promotion Law also triggered the implementation of the solar power from 2010.

3.4.3 Conclusions

Lao PDR has a few RE policies. The investment promotion law is focused on hydro generation wherein investors are given privileges such as free access to land, tax holidays and other benefits. This should help reach the target set in the Renewable Energy Development Strategy to increase the share of RE to 30% of the total energy consumption in 2025. Of the 30% RE sources target in 2025, small hydro accounts for 55%.

The total installed capacity of RE sources in Lao PDR has increased from 679.8 MW in 2006 to 3,348.1 MW in 2014. The increase is credited to the significant increase of large hydro plants in the country. Biomass power plants have also been installed since 2011. This may be attributed to the Investment Promotion Law. Funds from Electricité du Lao (EDL), a state corporation of Lao that owns and operates the country's electricity generation, electricity transmission and electricity distribution assets for off grid hydro with a maximum of 1 MW installed capacity may also have contributed to the rise of small hydro plants in Lao PDR.

Excluding hydro plants larger than 15 MW, the Lao PDR government installed capacity RE target in 2025 is 893 MW. From the installed capacity of 80.9 MW in 2014, there is a need for an additional capacity of around 75 MW per year on average to reach the target.

In order to reach the target installed capacities, Lao PDR still needs to develop its RE policies to further enhance the confidence of investors and developers.

3.5 MALAYSIA

3.5.1 Review of Existing Renewable Energy Policies

Malaysia supports RE programmes through the National Renewable Energy Policy, Renewable Energy Act, Sustainable Development Authority Act, Green Technology Policy and National Biofuel Policy. These policies aim to enhance the utilisation of indigenous RE resources, contribute towards national electricity supply security, sustainable socio-economic development and reduce the country's dependency on depleting fossil fuels.

Outgoing costs from the policy systems implemented are transferred onto the electricity consumers who pay an additional surcharge of 1.6% on top of their electricity bills. This charge is collected by the distribution licensees and deposited into the RE Fund. About 75% of domestic electricity customers who consume less than 300 kWh/month are exempted from contributing to the RE Fund.

Malaysia also implements the Green Technology Financing Scheme (GTFS) 2010 which is an effort to improve the supply and utilisation of Green Technology. Companies who are producers and users of green technology can benefit from the scheme. Further information is provided below.

The key policy instruments in Malaysia are reviewed below.

▶ RE targets

The RE targets under the Feed in Tariff (FiT) Renewable Energy Policy Action Plan 2010 for Malaysia can be summarized in Table 17 as follows:

Table 17: **RE Targets under FiT RE Policy Action Plan**

Year	Cumulative Biomass (MW)	Cumulative Biogas (MW)	Cumulative Mini-Hydro (MW)	Cumulative Solar PV (MW)	Cumulative Solid Waste (MW)	Cum. Total RE Grid-Connected (MW)
2015	330	100	290	65	200	985
2020	800	240	490	190	360	2,080
2025	1,190	350	490	455	380	2,865
2030	1,340	410	490	1,370	390	4,000
2035	1,340	410	490	3,700	400	6,340
2040	1,340	410	490	7,450	410	10,100
2045	1,340	410	490	12,450	420	15,110
2050	1,340	410	490	18,700	430	21,370

▶ Selling tariffs of electricity generated from RE sources

To benefit from FiTs, RE developers firstly need to secure a Feed in Approval (FiA) from the Sustainable Energy Development Authority (SEDA) Malaysia and conclude a RE Power Purchase Agreement at distribution levels.

The electricity tariffs in Malaysia are covered by the Renewable Energy Act. Malaysia has implemented a number of tariffs aimed at RE under the Renewable Energy Act 2011. Since its implementation, the tariff scheme has been updated three times, once in 2013, a second time in 2014 and most recently the geothermal FiT in 2015. The current RE FiTs available in Malaysia are outlined in the following documents:

- Renewable Energy (Allocation from Electricity Tariffs) Order 2011
- Renewable Energy (Feed-in approval and Feed-in Tariff Rate) Rules 2011
- Renewable Energy (Feed-in approval and Feed-in Tariff Rate) (Amendment) Rules 2013 (No. 1 and No. 2)
- Renewable Energy (Allocation from Electricity Tariffs) Order 2013
- P.U. (A) 70 Renewable Energy (Amendment of Schedule) Order 2014
- Geothermal FiT announced (2015)

The ranges for the FiTs in Malaysia effective 1 January 2016 (in MYR/kWh) are presented in Table 18.

Table 18: **FiT for RE projects in Malaysia**

Technology/Source	FiT Duration (years)	Rate of FiT Rates(MYR/kWh)
Biomass (palm oil waste, agro based)	16	0.27 - 0.31
Biogas (palm oil waste, agro based, farming)	16	0.28 - 0.32
Small Hydro	21	0.23 - 0.24
Solar (up to and including 4 kW)	21	1.11
Solar (above 4 kW, up to and including 24 kW)	21	1.09
Solar (above 24 kW, up to and including 72 kW)	21	0.9
Solar (above 72 kW, up to and including 1 MW)	21	0.88
Geothermal	N/A	0.45

Exchange rate: 4.11 MYR/USD as of May 2016
The FiT are available at SEDA's website http://seda.gov.my/

Incentives

RE incentives in Malaysia are covered in two national policies:

The Renewable Energy Act outlines the Renewable Energy (Feed-in approval and Feed-in Tariff Rate) Rules (2011). The FiT system is mature in Malaysia. The FiT rate is dependent on the type of RE generation being used. Furthermore, generators are rewarded for using local resources.

Corporate Investment Tax Incentives are available for RE project developers. For investments into solar system, the government has introduced additional benefits in terms of tax incentives. Under Capital Allowance, solar systems could be categorised as Plant & Machinery and are eligible for depreciation over the period of 6 (six) years. Capital Allowance (CA) is seen as a deduction from 'adjusted income' for certain types of capital expenditure provided under Schedule 3 of the Income Tax Act 1967. It comprises the following types of provisions for solar projects:

- Initial Allowance (IA – for the first year allowance),
- Annual allowance (AA - for subsequent years until the full amount is availed),
- Balancing allowance; and
- Balancing charge.

Financing support

The Renewable Energy Act outlines the terms for acquiring a distribution license needed to generate RE in Malaysia:

- Renewable Energy (Administrative Fees) Rules 2011
- Renewable Energy (Recovery of Moneys by Distribution Licensee) Rules 2014

The Green Technology Financing Scheme (GTFS) 2010 offers a 60% guarantee of the financing amount and a rebate of 2% on the interest/profit rate charged by the financial institutions. It aims to accelerate the expansion of green investments by providing easier access to financing from the private and commercial financial institutions. The Scheme is available until 31 December 2017, or upon reaching a total approved financing amount of MYR 3.5 billion whichever is earlier. It facilitates the growth of local green businesses and generates new markets and creates jobs.

Permits and licenses

There are a number of permits offered in Malaysia under the Renewable Energy Act.

- Renewable Energy (Feed-in Approval and Feed-in Tariff Rate) Rules 2011
- Renewable Energy (Feed-in approval and Feed-in Tariff Rate) Rules 2013

These rules and regulation documents outline the laws set in place in Malaysia related to RE generation and plant operations.

Technical issues

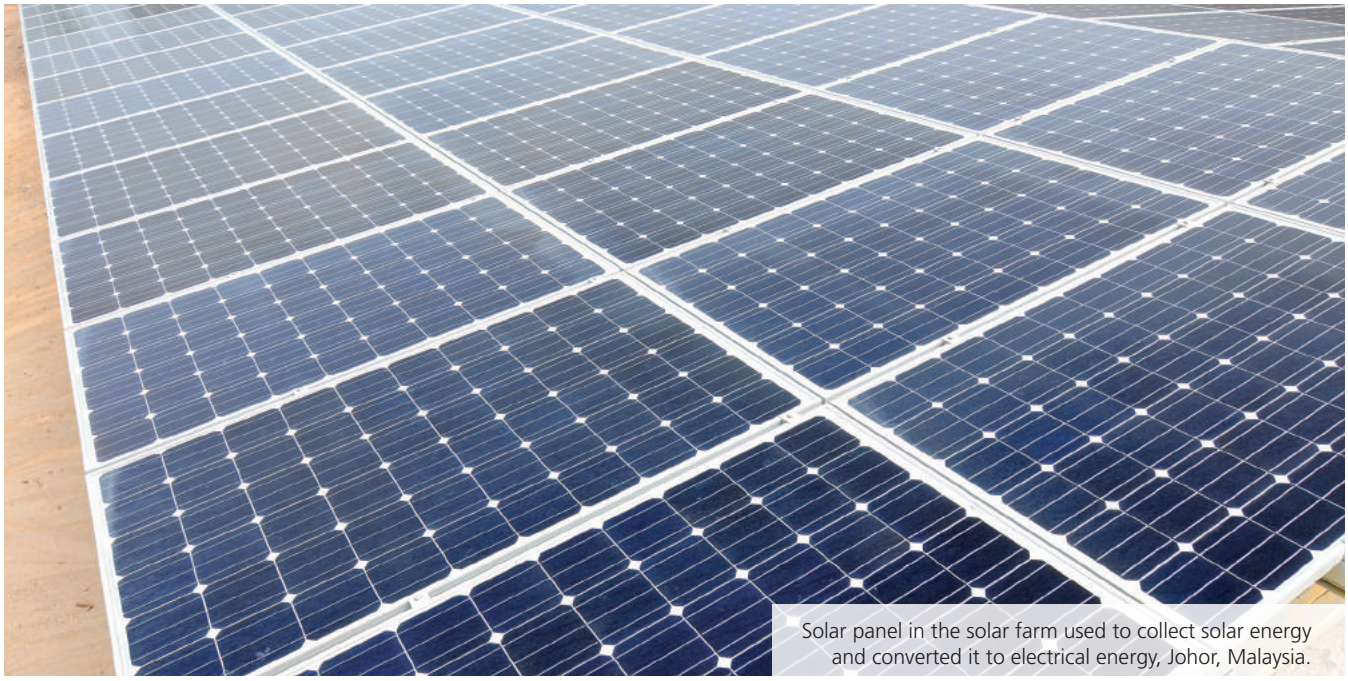
Same as the permits, the technical requirements are also outlined in the Renewable Energy Act 2011:

- Renewable Energy (Technical and Operational Requirements) Rules 2011
- Renewable Energy (Technical and Operational Requirements) Rules 2014.

The SEDA Act 2011 outlines a number of guidelines. These are regularly updated online via the SEDA portal and are enforced through registration system. SEDA reminded feed-in approval (FiA) applicants to comply with the mandatory requirements of registering and updating their profiles in the e-FiT online system.

The Renewable Energy Act also covers the criteria for RE resources, operational requirements and recovery of moneys by distribution licensing: energy generating, transmitting or distributing projects including those under the FiT with a capacity above 3 MW must obtain an Electricity Generation License from the Energy Regulatory Commission (ERC). Projects with a capacity under 1 MW do not need an ERC clearance and those between 1 MW and 3 MW must obtain an Electricity Permit from ERC, which is a streamlined license. The license is open-ended and must not be renewed.

The National Green Technology Policy has targets on zero or low GHG emissions and promoting the use of RE;
- One of its pillars—energy—seeks to attain energy independence & to promote efficient utilisation;
- Has short (2011-2015), medium (2016-2020) and long-term (2021-2025) goals.



Solar panel in the solar farm used to collect solar energy and converted it to electrical energy, Johor, Malaysia.

3.5.2 Analysis of the Impacts of RE Policies on the RE Development

Review of RE Development

As of 1999, the government of Malaysia had initiated RE policies to encourage industries and individuals to employ RE powered systems in power applications. However, the growth of the industry does not reflect the focus put on RE by the government. Solid biomass has been the predominant clean energy fuel used for RE generation in Malaysia while other forms of RE generation remained comparatively minimal. Table 19 displays the official statistics from ACE on the installed power capacity of different RE sources in Malaysia.

Table 19: **Installed power capacity (in MW) of different RE sources in Malaysia (2006-2014)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	424.43	480.63	535.18	611.45	619.80	687.79	712.54	918.34	836.21
Biogas	2.00	2.00	2.00	2.00	5.25	8.00	8.00	10.10	511.52
Geothermal	-	-	-	-	-				-
Solar	0.49	0.78	1.28	2.33	3.40	3.40	31.58	107.14	170.58
Wind									-
Hydro	2,106.00	2,083.00	2,083.00	2,110.00	2,114.00	2,888.00	3,317.00	3,317.00	4.768.00
WTE									
Total	**2,532.92**	**2,566.41**	**2,621.46**	**2,725.78**	**2,742.45**	**3,586.99**	**4,069.12**	**4,352.58**	**6,286.14**

Source: ACE

Biomass: The installed capacity of biomass in Malaysia has been steadily increasing year-by-year. It can be seen in Table 19 that between 2006 and 2014, the installed capacity of biomass has almost doubled, bringing up the installed capacity from 424.43 to 836.21 MW.

Biogas: Biogas had a very steady uptake in Malaysia up to 2013. However, in 2014 a substantial 500 MW of installed capacity was added.

Solar: Up to 2012, solar PV has been installed in Malaysia at a small scale. However, post 2012, solar has begun a rapid inflection, increasing its Installed capacity by 139 MW in just two years.

Hydro: Under the current policies implemented in Malaysia, hydro including SHP has remained steady, increasing by approximately 2,600 MW from 2006 to 2014. Based on the statistical data from IRENA, the total installed capacity of the small hydro plants in Malaysia increase from 32 MW in 2006 to 54 MW in 2014.

Geothermal, Wind and WTE: There are no available data on generating capacity for these RE technologies.

Historical Development of RE Policies

The Five-Fuel Diversification Policy was introduced in 1999 to include RE as the fifth fuel in the supply mix. Included in this policy was the target to contribute 5% RE to the electricity demand by 2005. In 2001, the Third Outline Perspective Plan (OPP) for 2001–2010 was introduced, including the Small Renewable Energy Power (SREP) programme to encourage the private sector to invest in small power generation projects utilising biomass, biogas, mini-hydroelectric, solar and wind energy.

In 2005, the National Biofuel Policy was introduced to promote the use of biofuels through incentives. In 2009, the National Renewable Energy Policy and Green Technology Policy were introduced too, as a step to rectify the failure of achieving the target of 5% RE in the energy mix. In 2010, the Green Technology Financing Scheme was introduced outlining 60% guarantee of the financing amount and a rebate of 2% on the interest/profit rate charged by the financial institutions.

In 2011, Malaysia introduced the Renewable Energy Act for the establishment of a special FiT Implementation of SEDA. This was the end of the SREP programme that was subsequently taken over by SEDA. SEDA produced the SEDA Act that included guidelines for project submission and regulations. Since 2011, SEDA amended the RE Act and SEDA Act including updates to guidelines and the FiT.

Table 20 presents a list of key RE policies of Malaysia.

Table 20: **List of key RE-related policies of Malaysia**

Year	Policy
1999	• The Five-Fuel Diversification Policy
2001	• Third Outline Perspective Plan (OPP) for 2001–2010
2001	• Energy Commission Act
2005	• National Biofuel Policy
2009	• The Renewable Energy Act • The National Renewable Energy Policy
2010	• Green Technology Financing scheme • Amendments to the Energy Commission Act
2011	• Renewable Energy Act • SEDA Act
2013/2014	• Amendments to RE Act and SEDA Act

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. Figure 6 illustrates the comparison between the RE development (in terms of RE installed capacity in MW) and the RE policy development in Malaysia from 2006 to 2014.

Malaysia RE Policy Development vs RE Implementation

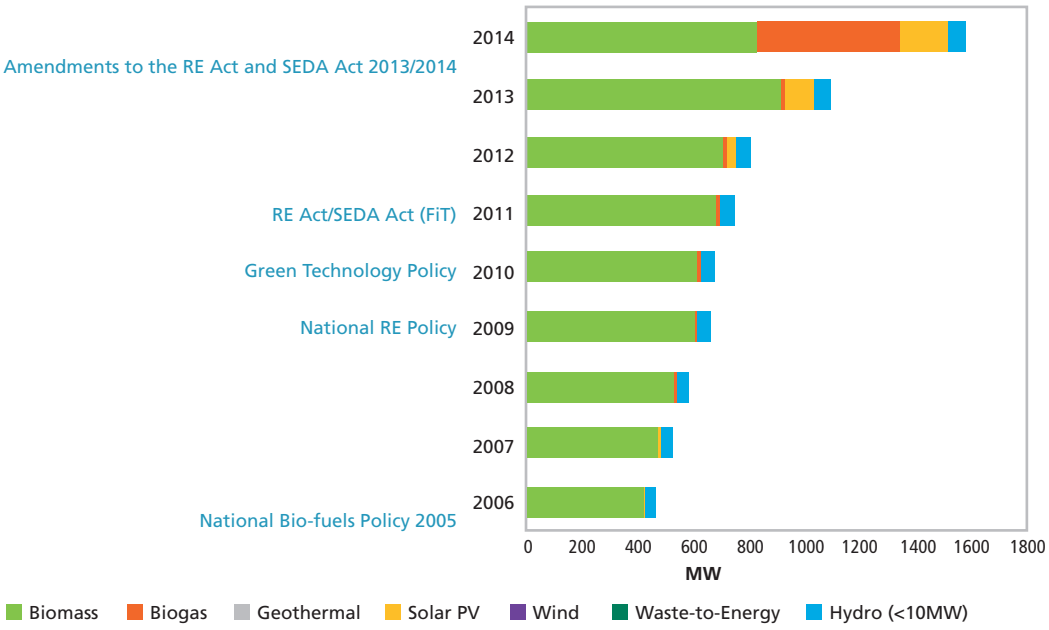


Figure 6: **RE policy development vs. RE implementation in Malaysia**

Results of Analysis

Biomass: Early in the RE policy implementation, there has been a clear focus on solid biomass through the National Biofuel Policy (in 2005). This led biomass to be the most popular form of RE generation that is still expanding today.

Solar: Since the focus has shifted towards other forms of RE in 2011-2012, there has been a clear increase of installed capacity post 2011. The most effective policy seems to have been the introduction of a FiT/financial incentive for all forms of RE implementation.

Biogas: The Malaysian government has set a target to have biogas facilities at all palm oil mills by 2020. This decree has brought about the very substantial increase in biogas-based installed power capacity. According to the Malaysian Palm Oil Board, as of July 2014, a total of 66 biogas facilities had been built by 2014 with further 11 (eleven) under construction and 150 (one hundred and fifty) in the planning phase. The significant increase of biogas is also due to the requirement of Ministry of Plantation Industries and Commodities, that obligates every new palm oil mill to have biogas facility to capture the GHG emission.

Hydro: The majority of hydro installed capacity in Malaysia is large scale. According to IRENA statistics, small scale hydro in Malaysia only accounted for 54 MW in 2014.

As many of the policies/rules/regulations produced by SEDA are fairly new, there needs to be some allowance for the market to adjust before real results are seen. Given time, it is likely that the RE situation will improve. Malaysia still has a lot of potential in order to fully utilise its natural RE resources.

3.5.3 Conclusions

The policies already implemented in Malaysia are comprehensive and broad. The development of the governing organisations has led Malaysia's RE industry to be developed in terms of policies.

The installed capacity in Malaysia does not reflect the maturity of the policies implemented. The national energy policy and strategies are already in place for the significant contribution of RE in the electricity generation mix. Challenges hindering the progress of RE implementation in the electricity generation mix when RE was first regarded as the fifth fuel during the period 2001-2010 should now be addressed with the enactment of RE Act 2011 and the introduction of SEDA.

By 2020, the target is for RE to comprise 11% or 2,080 MW of overall electricity generation in the country. Although ambitious, the target is feasible as the potential for biomass generation is vast.

Since the implementation of FiT in 2011, there has been a significant rise in solar PV implementation. The implementation of biomass has also increased and financial incentives seem to provide the boost that the industry needs.

3.6 MYANMAR

3.6.1 Review of Existing Renewable Energy Policies

Until 2015, the multiple departments of the Government of Myanmar (GoM) have involved in preparing RE policies for the country. Among them, the Energy Planning Department (EPD) had overall responsibility for energy policy formulation. Myanmar is currently undergoing a process of reform.

The newly-proposed structure is that the National Energy Management Committee (NEMC) will be the 'umbrella' committee to guide and coordinate the implementation of energy sector policy and to support all organisations/agencies as well as civil societies. The Energy Development Committee will then support the activities of NEMC. The main aims of the NEMC are to assess the appropriateness of institutional structure, to organise the setting up of various energy sector entities and to formulate a capacity building programme to fulfil the long-term needs of the sector.

The Cabinet and National Commission for Environmental Affairs (NCEA) is the main authority for decision making on environmental affairs and each ministry has responsibilities in each sector concerning energy. The Ministry of Energy is the coordinating body for all types of energy in Myanmar. The Ministry of Industries, Science and Technology and the Ministry of Agriculture are responsible for the RE sector, while the Ministries of Forestry and Agriculture deal specifically with the biomass sector. Furthermore, the National Commission for Environmental Affairs (NCEA), chaired by the Ministry of Foreign Affairs, is a key agency coordinating mechanisms for sustainable development.

The Ministry of Science and Technology (MOST)—now Ministry of Education—is currently pursuing to implement various rural electrification projects focusing on the complete range of RE options, including solar, small scale wind turbines, micro hydro and biomass energy. MOST's Research Department undertakes research on biogas, rice husk gasification, small wind turbines, solar and micro hydro. The priorities and interest on RE can be summarised as follows:

- Establish a central steering body to guide RE policy development;
- Formulate a long-term RE development plan;
- Set up a government support programme to include incentives such as tax exemption, tax holidays, and credit and loans for RE;
- Promote public-private partnerships in production, distribution, marketing, and research on RE development;
- Formulate projects that support RE development.

Hydropower, Nay Pyi Taw. Credit: ACE

As of Jan 2016, Myanmar does not have any policies that are specific to RE. However, some existing energy policies do relate to RE.

The Framework for Economic and Social Reforms (FESR) has two broad objectives for the medium-term (i) to move the ongoing reform process forward and make it irreversible so that Myanmar can become a modern developed nation that meets the aspirations of its people for a better life; and (ii) to accelerate Myanmar's greater integration with the international community. Some of the major planned reforms under the FESR include:

- Establishment of a new Directorate for Renewable Energy Resources Development;
- Establishment of a new Directorate for Energy Efficiency Improvement and Conservation Programme;
- Establishment of an independent regulatory body for the energy and power sector, (Myanmar Energy and Power Regulatory Authority- MEPRA).

National Energy Policy (NEP) had been prepared with the help of ADB and already promulgated by NEMC's Order No. 1/2015 dated 6th January 2015 (7 (seven) energy-related ministries are cooperating under the National Energy Management Committee, supervised by the vice president). The Myanmar National Energy Policy (2015) includes nine key points announced by the National Energy Management Committee. The main points related to RE development are:

- To implement programmes on a wider scale, utilising RE resources such as wind, solar, hydro, geothermal and bio-energy for the sustainable energy development in Myanmar;
- To promote Energy Efficiency and Energy Conservation;

Electricity Law (Ministry of Electric Power): On 27 October 2014, the Electricity Law was legislated by the Union Parliament replacing the old Electricity Law of 1984. The production of by-laws is ongoing. The Ministry of Electric Power has issued the policies. The most relevant policies to RE are:

- To promote the effective and efficient use of electricity for future energy sufficiency, reserves and sustainability in the country;
- To adopt environment-friendly ways in electricity generation, transmission and distribution;

National Electrification Plan: The aim of the electrification plan is to electrify the whole country in 2030-2031 fiscal years. The Myanmar National Electrification Plan was jointly prepared by the Ministry of Electric Power, the Ministry of Livestock, Fishery and Rural Development and the World Bank in June 2014. There are four components in the plan, the third one is particularly focused on RE development. This component provides support to MOEP and MLFRD to: (i) strengthen institutional capacity to implement the national electrification plan; (ii) improve the policy and regulatory framework related to electrification and RE.

The key policy instruments available in Myanmar are reviewed below.

RE targets

The government has not officially established RE targets, although the Ministry of Electric Power aims to develop around 472 MW (about 15% of total generation capacity) from small hydro plants by 2016. According to reports from The Asian Development Bank (ADB), the government also plans to use domestically produced biodiesel and bio-ethanol as substitutes for 10% of imported oil and gasoline by 2020.

Selling tariffs of electricity generated from RE sources

No official selling tariff has been published by the GoM. However, some small rural electrification projects are using fixed monthly fees pre-determined based on the expected power consumption. The fees are usually set for different levels so that consumers with higher demand buy a higher level and pay more. This method has been used in several off-grid biogas or biomass gasification projects in Myanmar.

Incentives

At present, Myanmar has no specific RE incentives but investors can draw on the incentives provided in the new Foreign Investment Law (2012). These incentives include the following:

- 5-year income tax holiday for foreign investors;
- exemption from a tax on profits if the profits are maintained in a reserve fund and reinvested in Myanmar within 1 year;
- for exported goods, income tax relief of up to 50% of the profits;
- deductions for R&D expenses;
- rights to carry forward a loss and offset against profits for up to 3 consecutive years from the year the loss is sustained;
- exemption or relief from customs duties for the import of machinery, equipment, instruments, machinery components, spare parts, and materials required for the enterprise.

Financing support

The off-grid RE-based rural electrification projects can have access to soft loans from domestic financing institutions and international donors. There are also some grants from the government for these rural electrification projects.

There is currently no available information on permits and licenses and specific technical issues for RE projects in Myanmar.

3.6.2 Analysis of the Impacts of RE Policies on the RE Development

Review of RE Development

The GoM's involvement in RE is a big step forward in terms of RE development in Myanmar. The government is now developing more focused targets and roadmaps that will be published shortly. By opening the country to foreign investment, Myanmar has become an attractive place to install RE projects. Currently only small power plants have been installed on a very localised basis. However, there are multiple larger projects in the pipeline for the near future. The installed power capacity of different RE sources in Myanmar is presented in Table 21.

Table 21: **Installed power capacity (in MW) of different RE sources in Myanmar (2006-2014)**

Technology	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	-	-	-	-
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	-	-	-	-	3.72	3.72	4.70	-	14.55
Wind	-	-	-	-	-	-	-	-	-
Hydro	771.00	803.00	947.00	1,654.00	2,559.34	2,693.34	2,813.33	3,004.00	3,189.84
WTE	-	-	-	-	-	-	-	-	-
TOTAL	**771.00**	**803.00**	**947.00**	**1,654.00**	**2,562.06**	**2,697.06**	**2,818.03**	**3,004.00**	**3,204.39**

Source: ACE

Solar: The current RE implementation in Myanmar is still relatively low. Myanmar has currently got 14.55 MW installed capacity from solar. These are small scale installations or SHS.

Hydro: Hydro including SHP has remained a steady increase from 771 MW in 2006 to around 3,190 MW in 2014. The large-scale hydro plants accounted for a majority part of these capacities. According to IRENA statistics, in 2014, Myanmar has an installed capacity of 34 MW from small hydro plants. Most of the capacity is implemented as off grid micro-plants supplying energy to rural areas.

Biomass, Biogas, Geothermal, Wind and WTE: There are no available data on generating capacity for these RE technologies.

Historical Development of RE Policies

To promote energy-related investment, the Electricity Law (1984) opened up generation projects to private sector participation. Public energy utilities formed joint ventures with foreign companies, especially for hydro projects and oil and gas development. The Myanmar National Energy Policy was amended in 2015 outlining current priorities in Myanmar in regard to RE generation. This document is a compilation of options for policy implementation. Table 22 presents a list of key RE-related policies of Myanmar.

Table 22: **List of key RE-related policies in Myanmar**

Year	Policy
1984	• Myanmar Electricity Law
2014	• Myanmar Electricity Law (amendment)
2014	• National Electrification Plan
2014	• National Energy Policy
2015	• Framework for Economic and Social Reforms

RE Policies vs RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. Because the institutional framework for RE in Myanmar is divided between multiple government organisations, Myanmar lacks a unified policy for promoting the development and use of its RE resources. Figure 7 illustrates the relation between the RE implementation (in MW of RE installed capacity) and the RE policy development in Myanmar.

Myanmar RE Policy Development vs RE Implementation

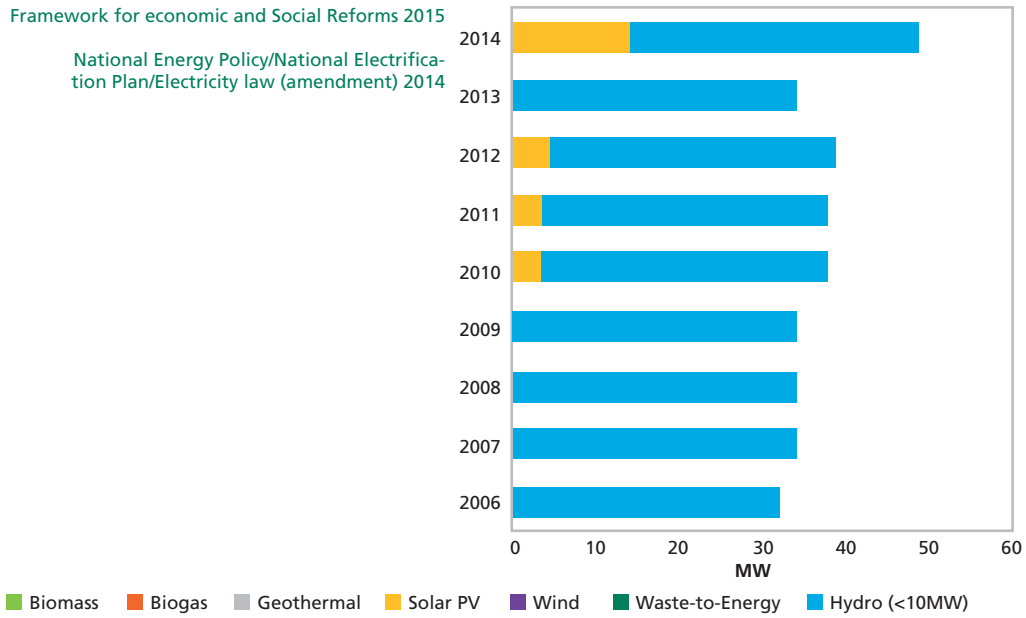


Figure 7: **RE policy development vs. RE implementation in Myanmar**

Results of Analysis

It is not yet possible to analyse the impact that Myanmar's policy framework has had on the implementation of RE. Under its new government, Myanmar has begun to develop more commercial scale RE projects such as solar and biomass. Due to the very high potential of RE resources in Myanmar, covering a variety of RE technologies, there is a strong interest in the region from foreign investors that will have a very positive effect on installed RE capacity in the near future.

3.6.3 Conclusions

The new GoM has introduced new political and economic reforms needed to support economic development. Furthermore, a new national development plan is being reviewed and drafted. In the last four years, foreign countries have begun to lift or ease economic sanction. Therefore investment in the energy sector, including the development of the country's RE sector in partnership with the private sector, is expected to drive forward the economy.

3.7 THE PHILIPPINES

3.7.1 Review of Existing Renewable Energy Policies

The Department of Energy (DOE) of the the Philippines is mandated by the Republic Act (RA) 7638 or the "Department of Energy Act of 1992" to prepare, integrate, coordinate, supervise and control all plans, programmes, projects and activities of the Government relative to energy exploration, development, utilisation, distribution and conservation. The RA 7638 remains the main policy that ensures a continuous, adequate, reliable, and economic supply of energy through, among others, the judicious conservation, renewal and efficient utilisation of energy, to keep pace with the country's growth and economic development. The Act is supported by the Philippines Energy Plan.

The Philippines Energy Plan (PEP): DOE Administrative Orders ensure a continuous, adequate, reliable and economic supply of energy through energy efficiency & conservation (EE&C) via the institutionalisation of the Government Energy Management Programme (GEMP) and the adoption of austerity measures for government offices (both for fuel and electricity), e.g. the use of energy efficient lighting systems in government facilities.

The guiding policy for the promotion of the development, utilisation, and commercialisation of RE resources and other purpose is part of the Biofuels Act of 2006 (R.A. 9367) and the Renewable Energy Act of 2008 (R.A. 9513).

Section 38 of the Republic Act No. 9136, also known as the "Electric Power Industry Reform Act of 2001" (EPIRA), created the ERC as an independent, quasi-judicial regulatory body. Under Section 43 of the EPIRA, the ERC is tasked to promote competition, encourage market development, ensure customer choice and penalise abuse of market power in the electricity industry. To carry out this undertaking, the ERC shall promulgate necessary rules and regulations, including Competition Rules, and impose fines or penalties for any non-compliance with or breach of the EPIRA, the Implementing Rules and Regulations of the EPIRA, and other rules and regulations which it promulgates or administers, as well as other laws it is tasked to implement/enforce.

From the National Renewable Energy Plans and Programmes (NREP) 2011 – 2030

- The RE Information Exchange shall be implemented to provide accurate and specialized RE resource and market information that are useful and readily accessible to target clients such as investors and policy makers. This will address the information barriers encountered.
- The Integrated RE Information Education and Communication (IEC) Plan: shall be developed and implemented to enhance public awareness on the benefits and advantages of RE, the RE law and the NREP. It aims to encourage private sector participation in the RE industry as well as to manage public perception on the impact of certain rules and regulations such as the FiT Allowance (FiT-ALL).
- The market assessment for new or emerging RE shall be developed to support sub-programme development.

The key policy instruments in the Philippines are reviewed below.

RE targets

From the data given by the Renewable Energy Management Bureau, the RE targets of the Philippines for 2011-2030 are separated into three periods. The target is 1,088 MW for 2011-2015, 5,096 MW for 2016-2020 and 3,746.8 MW for 2021-2030. The total target installed capacity for 2011-2030 is 9,931.3 MW. These targets are presented in Table 23.

Table 23: **RE targets (in MW) of the Philippines (2011-2030)**

Type of RE	2011-2015	2016-2020	2021-2030	Total (2011-2030)
Geothermal	220.0	1,100.0	175.0	1,495.0
Hydro	341.3	3,161.0	1,891.8	5,394.1
Biomass	276.7	0	0	276.7
Wind	200.0	700.0	1,445.0	2,345.0
Solar	50.0	100.0	200.0	350.0
Ocean Power	0	35.5	35.0	70.5
Total	**1,088.0**	**5,096.5**	**3,746.8**	**9,931.3**

▶ Selling tariffs of electricity generated from RE sources

To accelerate the development of emerging RE resources, a FiT system for electricity produced from wind, solar, ocean, run-of-river hydro and biomass is mandated according to the RA 9513. The FiT rules (no. 16 series of 2010) was introduced to establish the FiT system and regulate the method of establishing and approving the FiT and FIT-ALL. The ERC in consultation with the National Renewable Energy Board (NREB) adopted a resolution (no. 10 series 2012) approving the FiT rates. The FiT for solar was revised in April 2015 (resolution no. 6, series of 2015) and for wind in October 6, 2015 (resolution no. 14, series of 2015). The current FiT rates and targets are shown in Table 24.

Table 24: **Current FiT Rate and installation target of RE in the Philippines**

	Approved Rates (PHP/kWh)	Installation Target (MW)
Run-of-River Hydro	5.90	250
Biomass	6.63	250
Wind	7.40	400
Solar	8.69	500

Exchange rate: 47 PHP/USD as of May 2016

An ERC resolution (no. 24 series 2013) on the guidelines for the collection of the Feed-in Tariff Allowance (FiT-ALL) and Disbursement of the FiT-ALL Fund was established in February 2014 which consists of the following:

- FiT-ALL Determination,
- Collection of the FiT-ALL and Administration of the FiT-ALL,
- Disbursement of the FiT-ALL Fund,
- Roles of Stakeholders,
- Transitory Provisions.

FiT-ALL is a uniform charge billed (in PHP/kWh) to consumers who are supplied with electricity through the distribution or transmission network, for all on-grid areas in the Philippines. The proposed FiT-ALL rate for 2014 and 2015 is 0.04057 PHP/kWh.

Additional regulations on the tariffs:

- ERC on its resolution no. 18 series of 2014 prescribed to adapt the Renewable Energy Payment Agreement (REPA) Template and the Renewable Energy Supply Agreement (RESA) Template.
- List of guidelines for the Selection Process of Renewable Energy Projects under the Feed-In Tariff System and the Award of Certificate for Feed-In Tariff Eligibility.
- Net Metering rules and interconnection standards which were approved by ERC in May 2013.

Incentives

The Republic Act No. 7156 or the Mini-Hydro (≤10 MW) Law issued in 1991 provides the following rights and privileges to mini-hydro developers:

- The tax payable by developers/grantees to develop potential sites for hydro power and to generate, transmit and sell electric power at 2 percent of their gross receipts;
- Income tax holiday for 7 (seven) years from the start of commercial operations;
- Exemption from payment of tariff duties and VAT on importation of machinery and equipment (within 7 (seven) years from date of awarding of contract);
- For developers who buy machinery, equipment, materials and parts from local manufacturers, tax credit is given equivalent to 100 percent of value of VAT and custom duties that would have been paid to import similar machinery, equipment, etc;
- Realty and other taxes on civil works, equipment, machinery and other improvements of a registered mini-hydro developer shall not exceed 2.5 percent of their original cost;
- Exemption from payment of 10 percent VAT on gross receipts derived from sale of electric power whether wheeled via the National Power Corporation (NPC) grid or electric utility lines.

The current incentives for geothermal service contractors listed hereunder are enumerated under the Presidential Decree No. 1442, otherwise known as "An Act to Promote the Exploration and Development of Geothermal Resources" (1978).

- Recovery of operating expenses not exceeding 90 percent of the gross value in any year with carry-forward of unrecovered cost;
- Service fee of up to 40 percent of the net proceeds;
- Exemption from all taxes except income tax;
- Exemption from payment of tariff duties and compensating tax on the importation of machinery, equipment, spare parts and all materials for geothermal operations;
- Depreciation of capital equipment over a 10 (ten)-year period;
- Easy repatriation of capital investments and remittance of earnings;
- Entry of alien technical and specialised personnel (including members of immediate family).

Solar PV, the Philippines.
Credit: The Philippines DOE

According to the Republic Act 9513 (RE Act 2008) the following are the incentives for Renewable Energy Projects:

- 7-year income tax holiday (ITH);
- 10-year duty-free importation of RE machinery, equipment and materials;
- 1.5% special realty tax rates on equipment and machinery;
- Zero % VAT Rate;
- Accelerated depreciation;
- 10 % corporate tax rate after ITH;
- 7-year net operating loss carry-over;
- Cash incentive of RE developers for missionary electrification;
- Tax exemption of carbon credits;
- Tax credit on domestic capital equipment and services.

Financing support

Government financial institutions such as the Development Bank of the Philippines (DBP), Land Bank of the Philippines (LBP), Phil-Exim Bank and other government financial institutions shall, in accordance with and to the extent allowed by the enabling provisions of their respective charters or applicable laws, provide preferential financial packages for the development, utilisation and commercialisation of RE projects as duly recommended and endorsed by the DOE.

Permits and licenses

The establishment of a Renewable Energy One-Stop Shop was envisioned to serve as the contact point within the DOE for the processing of applications for RE Service/Operating Contracts. The One-Stop Shop would integrate the RE services from concerned government agencies, integrate web-based RE systems infrastructure and database and automate RE applications.

In lieu of the RE One-Stop-Shop at the current time, an Energy Virtual One-Shared System (EVOSS) is established for handling and processing service contracts issued by the DOE. Starting with the RE Sector, the EVOSS is a web-based platform aiming to facilitate and streamline the process of RE applications.

The evaluation process of the Renewable Energy Service Contracts (RESC) shall not exceed 45 (forty five) working days.

A resolution directing all distribution utilities (DU) to conduct a competitive selection process (CSP) in the procurement of their supply to the captive market was initiated by the ERC. According to this resolution, the power supply agreement (PSA) shall be awarded to the winning generation company following a successful transparent and competitive selection process or by direct negotiation with the DU after at least two failed CSPs. A CSP is successful if the DU receives at least two qualified bids from entities with which the DU is not prohibited from entering into a contract for power supply. This resolution can be applicable to off-grid RE projects such as solar and wind.

The DOE also issued the Department Circular No. 2015-07-0014 prescribing the policy for maintaining the share of 30% of RE resources in the country's installed capacity through the holistic implementation of the pertinent provisions of Republic Act No. 9513 or the RE Act on the FiT system, priority and must dispatch, among others.

Technical issues

An ERC resolution amended the Philippines Grid Code (PGC) to:

- establish the required minimum connection and operational requirements applicable to non-conventional or Variable Renewable Energy (VRE) Generators for integration in the Philippines Grid Code and
- provide direction for existing and new VRE developers and manufacturers, fabricators and suppliers of RE equipment by setting the technical standards for wind and solar energy projects.

The ERC also issued a resolution stating that the Battery Energy Storage System (BESS) be classified as a new source of Frequency Control Ancillary Services (FCAS), particularly as contingency reserve (primary reserve) and Frequency Regulation (secondary reserve).

The ERC also amended the rules to govern the interruptible load programme (ILP):

- to address the imminent power shortage and augment the limited power supply of any grid in the country,
- to minimise occurrence of manual load dropping caused by the power supply shortages,
- to incentivise reduction in demand and optimise available resources,
- to avoid or minimise system emergencies thereby cushioning its impact on the economy and the customers,
- to ensure the timely compensation and recovery of allowable expense related to the ILP administered by the NGCP and DUs,
- to ensure transparent and reasonable prices of electric power service in a regime of free and fair competition and to achieve greater operational and economic efficiency,
- to protect the public interest as it is affected by the rates charged by the NGCP and DUs and
- to help maintain the quality, reliability, security and affordability of the supply of electric power. This will be applied to solar rooftop power plants that are connected to the grid.

3.7.2 Analysis of the Impacts of RE Policies on the RE Development

▶ Review of RE Development

There is no significant growth in the RE sector in the Philippines between 2006 and 2014. It has even slightly declined in 2011 due to a capacity decrease in geothermal. Geothermal power constituted more than 37% of the RE generation in 2006. Its share declined to around 32% in 2014 due to the implementation of projects using other RE sources such as biomass, solar and wind. Another major source of RE is hydro. It constitutes around 62% of RE generation in 2006 and slightly decrease to 60% in 2014. Table 25 presents the installed power capacity (in MW) of different RE sources in the Philippines from 2006 to 2014.

Table 25: **Installed power capacity (in MW) of different RE sources in the Philippines (2006-2014)**

RE Type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-		29.30	38.60	82.80	119.00	119.00	131.00
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	1,977.69	2.027.27	1,972.07	1,972.07	1,972.07	1,783.00	1,848.00	1,868.00	1,918.00
Solar	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	23.00
Wind	25.00	25.00	33.00	33.00	33.00	33.00	33.00	33.00	282.90
Hydro	3,256.72	3,289.48	3,291.00	3,291.00	3,399.55	3,490.73	3,521.00	3,521.00	3,543.00
WTE	-	-	-	-	-	-	-	-	-
Total	**5,260.41**	**5,342.75**	**5,297.07**	**5,326.37**	**5,444.17**	**5,390.49**	**5,522.00**	**5,542.00**	**5,897.90**

Source: ACE

Biomass: At present, the country has utilised different types of biomass for power production. The most common is bagasse used as fuel in boilers for cogeneration in sugar mills. This system has been in use for decades with the generated electricity and heat auto-consumed by the sugar mills. Rice husk (or hull), coconut husk and shells and other crop residues are also being used in boilers or gasifiers. Some sugar mills have used higher efficiency systems to sell excess electricity to the grid. Biomass power plants started operation in 2009. Additional projects were implemented a few years later to reach 131 MW in 2014.

Biogas: There is no biogas power plant currently producing electricity in the Philippines. Biogas produced from animal waste or industrial effluents is being used for thermal purpose.

Geothermal: The total installed capacity of geothermal plants was 1,972 MW in 2010. The decrease in 2011 is mainly due to the decommissioning of more than 100 MW and to the privatisation and major rehabilitation of other plants. From 2011 to 2014, the installed capacity started to increase again to reach 1,918 MW in 2014.

Solar: A small solar project (around 1.0 MW) has been in operation in Mindanao for more than 10 years. Additional capacity was installed in 2014.

Wind: The first wind energy farm was commissioned in Ilocos Norte in 2005. A major increase was observed in 2014 to bring the total capacity to 283 MW.

Hydro: There has been a limited growth in hydro in the Philippines. Hydro plants were already in operation before 2006. Based on the statistical data from the Philippines' RE-SSN's focal point, small hydro or mini-hydro plants (≤ 10 MW) have grown from 98 MW in 2006 to 135.5 MW in 2014.

WTE: There is no available data on any generating capacity for this RE technology.

Historical Development of RE Policies

The Philippines Energy Plan was developed in 2003 and was updated in 2007 to include the RE Bill to promote the development, utilisation and commercialisation of RE resources such as geothermal, hydro, wind, solar and ocean. Private sector participation was also encouraged through the granting of additional fiscal and non-fiscal incentives. Since 2008, the Renewable Energy Act promotes the development, utilisation and commercialisation of RE resources. Rules and regulations (RA 9513) were implemented in 2009. In 2011, the Government of the Philippines launched the National Energy Programme (NREP) to steer the country in achieving the goals laid down under the RE Act of 2008. Table 26 summarises the main policies related to RE sector in the Philippines.

Table 26: **List of key RE-related policies of the Philippines**

Year	RE Policy Issued
1978	• RA to Promote the Exploration and Development of Geothermal Resources
1991	• Incentives to Mini-Hydro Electric Power Developers
2007	• Update on the Philippine Energy Plan 2005-2014
2008	• RA Promoting the Development, Utilisation, and Commercialisation of Renewable Energy Resources (RA 9513)
2009	• Rules and Regulations for Implementing Republic Act No. 9513
2010	• Feed-in Tariff Rules
2011	• Renewable Energy Plans and Programmes 2011-2030
2012	• Feed-In-Tariff Rates • Net-Metering Programme for Renewable Energy Guidelines for the Selection Process 2013 of Renewable Energy Projects Under Feed-In Tariff System and the Award of Certificate for Feed-In Tariff Eligibility • Guidelines on the Collection of the Feed-in Tariff Allowance (FiT-ALL) and the Disbursement 2014 of the FiT-ALL Fund • Availment and Disbursement of Cash Incentive to RE Developers Operating in Missionary Areas
2015	• Update on Feed-in Tariff for Solar and Wind

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. Figure 8 illustrates the comparison between the RE development in the Philippines (in MW) and the key RE-related policies from 2006 to 2014.

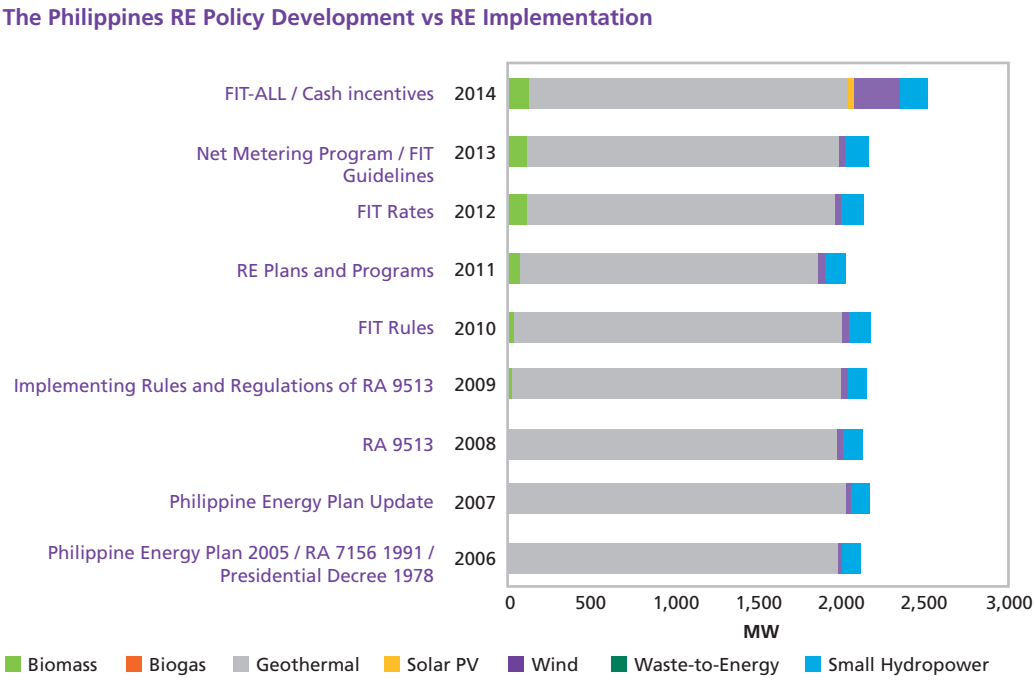


Figure 8: RE policy development vs. RE implementation in the Philippines

Result of the Analysis

Since the enactment of RA 9513 in 2009, an Act promoting the development, utilisation, and commercialisation of RE resources and the implementing rules and regulations in 2009, there was no significant growth in the total installed capacity of the RE up to 2014 as shown in Table 23 and Figure 8.

Wind: When the FiT rules and regulations for RE were promulgated in 2010 and the rates were announced in 2012, it had an impact for wind projects. These impacts can be seen in 2014 where the number of projects increased reaching and exceeding the short term target for wind.

Solar: The FiT rates also had an impact for solar power plant projects, although not significantly seen before 2014.

Geothermal: The government created the Philippines National Oil Corporation-Exploration Development Corporation (PNOC-EDC) in 1976 to develop geothermal power plants. The first geothermal power plant was commissioned in 1979 with a 160 MW installed capacity. In 1990, the eighth congress of the Philippines enacted the RA 6957, an Act authorising the financing, construction, operation and maintenance of infrastructure projects by the private sector. This Act allowed private entities including foreign ones to implement power plants for a defined period. Most of the geothermal power plants are now privatised and the geothermal exploration and development are spearheaded by the private sector taking on the risks involved in the development.

Hydro: Since the enactment of RA 7156 in 1991, an act granting incentives to small and mini-hydro projects (<10 MW) developers, the total installed capacity as of 2014 was 135.5 MW. The RA 7156 may have provided a boost since its enactment to the installation of hydro with less than 10 MW but based on Figure 8, there was a limited increase in hydro projects over the last 10 years. This may be due to the fact that there is not yet a FiT rate for hydro projects.

Biomass: Biomass power plants are mostly developed by the private sector in the Philippines. Sugar mills have started to implement high efficiency plants with multi-fuel systems to be able to sell excess electricity to the grid. Aside from sugar mills, other biomass power plants have also been implemented. With the promulgation of RE Act in 2008, the Feed-in Tariff Rules in 2009 and Feed-in Tariff rates in 2012, biomass power plants have started to increase.

Given the late introduction of policies, especially the FiT rates, the impact can only be fully assessed after 2 to 3 years which are needed in the project development and implementation of RE-based power generation projects. The impact of recent policies such as FiT could already be perceived in 2014 for RE sources, especially for solar, wind and biomass.

3.7.3 Conclusions

The Renewable Energy Act of 2008 is the foundation for RE policies in the Philippines. With its enactment, incentives for RE projects were provided, which includes tax benefits, FiTs, etc.

The total installed capacity of RE sources in the Philippines has increased from 5,260 MW in 2006 to 5,898 MW in 2014, an increase of around 1.5% per year. This increase is credited to solar, wind and biomass. It appears that the introduction of FiT rules in 2010 has had some impact on the development of these projects.

One of the large contributors of RE sources in the Philippines is geothermal power plants. These are rather old plants which were installed in the 1980s by the Government of the Philippines. Some have been decommissioned and others have been privatised and rehabilitated in 2011.

The Philippines set a target of 9,931 MW of installed capacity from RE sources by 2030. From the installed capacity of 5,898 MW in 2014, at least 255 MW of installed capacity must be added annually to reach this target.

The existing RE policies in the Philippines seem to play some role in promoting the implementation of RE-based power generation projects. Biogas and WTE sources have not yet been developed and no target for these sources has been set. Biomass, wind and solar have progressed over the last couple of years. This may be attributed to the FiT rate introduced in 2012. The full impact of the policies can only be assessed after 2 to 3 years which are needed for the development and implementation of RE-based power generation projects.

3.8 SINGAPORE

3.8.1 Review of Existing Renewable Energy Policies

The Electricity Act of Singapore came into operation in April 2001. It was revised and amended several times in 2002, 2003 and 2006. This is the main legislative tool to create a competitive market framework for the electricity industry, to make provision for the safety, technical and economic regulation of the generation, transmission, supply and use of electricity. Broadly, it:

- sets out licensing requirements;
- provides the Ministry with the power to issue a special administration order (whereby an electricity licensee shall be managed directly or indirectly by the Energy Market Authority);
- controls electricity licensees and entities with interests in transmission systems;
- establishes the wholesale electricity market;
- stipulates various offences.

Under the Electricity Act, the Energy Market Authority (EMA) of Singapore was established in 2001 to liberalise the electricity and gas markets and ensure the security, reliability and adequacy of the power system. EMA supervises the regulation of electricity, piped gas industries and district cooling. EMA is also overseeing the Energy Market Authority Act, the Electricity Act and the Energy Conservation Act.

In April 2007, the multi-agency Clean Energy Programme Office (CEPO), presently known as the Energy Innovation Programme Office (EIPO) was set up to implement and coordinate the various research and test-bedding public programmes, leveraging on the strengths of various government agencies for a comprehensive approach to develop the clean energy industry. Agencies include the Singapore Economic Development Board (EDB), the EMA, Building and Construction Authority (BCA), and the National Environment Agency (NEA). The EIPO is responsible for planning and executing strategies to develop the energy sector in Singapore.

Solar park, Singapore. Credit: ASEC

As the regulator and industry developer of the electricity and gas sectors, EMA regularly issues Consultation Papers to seek feedbacks and views from the industry and public on a wide variety of issues, such as changes to the regulatory framework for the energy industry or the code of conduct for licensees.

The key policy instruments in Singapore are reviewed below.

RE targets

Solar and waste-to-energy (WTE) were identified as most feasible RE sources in Singapore. Other RE sources such as hydro, geothermal and wind energy cannot be harnessed in Singapore due to its geographical and meteorological characteristics (generally flat, a small land area and low wind speeds).

According to the Sustainable Singapore Blueprint 2015, the target for solar power is 350 MWp by 2020. The total capacity of WTE plants will be increased from 7,740 tonnes of waste per day in 2013 to 10,140 tonnes per day by 2018.

Selling tariffs of electricity generated from RE sources

EMA has already made enhancements to the regulatory framework for intermittent generation sources (IGS) including RE, streamlining the process for IGS producers to easily receive payments for excess electricity exported to the grid. Net metering principle has been applied for embedded IGS.

Singapore does not provide a FiT through which IGS producers sell the electricity they produce. Instead of that, the market payments and charges are applied.

The market payments and charges for the different options for Contestable Consumers (CCs) with less than 1 MWac embedded IGS were provided in the Clarification Paper to the "Enhancements to the regulatory framework for intermittent generation sources in the National Electricity Market of Singapore" issued by EMA on 24 February 2015.

For the CCs with non-registered embedded IGS, they will not be paid for excess electricity exported to the grid.

For the CCs which register their embedded IGS with the Electricity Market Company (EMC) or with SP Services (SPS) under the Central Intermediary Scheme (CIS), they will receive payments for excess electricity sold to the grid, and are subject to the applicable market charges on the electricity generated (e.g. reserves cost, EMC fees, Power System Operator fees). The applicable payments and charges for CCs with less than 1 MWac embedded IGS registered with EMC/CIS are shown in Table 27.

Table 27: **Applicable payments and charges for CCs with less than 1 MW_{ac} embedded IGS**

Applicable payments and charges	Prices (SGD/kWh)
Energy generation (to be paid to the CCs based on net export of electricity to the grid)	0.12040
Energy consumption (to be charged to the CCs based on net import of electricity from the grid)	0.12153
Regulation charge, i.e. Allocated Regulation Price	0.00037
EMC fees	0.00027
Power System Operator fees	0.00022
Market Support Service Charge	0.00170
Monthly Energy Uplift Charge	0.00032
Hourly Energy Uplift Charge	-0.00104
Use of System Charge	0.05000

There is no available information on the payments and charges for embedded IGS with an installed capacity of 1 MWac or more, and for standalone IGSs which are installed solely for selling electricity into the market.

- **Incentives**

Tax incentives: Singapore offers a range of favourable tax incentives to all industry sectors, including the RE industry. The Singapore Productivity & Innovation Credit offers tax deduction/allowance and/or cash payout to encourage research and development (R&D) in green innovation. It provides 400% tax deduction on the first SGD 400,000 of qualifying R&D expenditure for each year of assessment, and 150% on expenditure in excess of SGD 400,000. From 2013, businesses may opt to convert up to SGD 100,000 of the qualifying expenditure into a non-taxable cash payout at the rate of 60%.

- **Other incentives: Singapore has a variety of non-tax incentives in place for RE projects.**

In August 2007, CEPO, presently known as EIPO, launched the Clean Energy Research and Test-bedding Programme (CERTP) to support local and foreign companies and organisations to test and implement clean energy technologies at suitable sites provided by the government agencies. The total budget of the Programme is SGD 17 million. The CERTP involves three key partners: R&D organisations, technology providers and implementers.

The Clean Energy Scholarship Programme (CESP) was launched by CEPO/EIPO in November 2007 to help build up local research capability and groom research leaders in key clean energy areas. With a total budget of SGD 25 million, CESP supports post-graduate and PhD studies in areas related to clean energy with major focus in solar fields with other possible options in fuel cells, energy efficiency and RE. Candidates can apply for scholarships for study and research in local and top foreign universities. Upon completion of their studies, the scholars are bound to work in Singapore (in the clean energy area) for a period of 3 years for local PhDs or 4 years for overseas PhDs.

In 2007, EMA established a SGD 5-million Market Development Fund (MDF) to facilitate test-bedding of nontraditional generation technologies (such as solar, wind, hydrogen and fuel cell) that have significant value in the electricity market and to support other ideas/technologies that have development potential in the energy market. The MDF was closed in March 2012.

The Energy Research Development Fund (ERDF) was established by EMA in 2009. With a budget of SGD 25 million, the fund provides financial support for the implementation of new and innovative energy solutions to diversify Singapore's energy sources and improve Singapore's energy security, help achieve Singapore's energy intensity reduction targets and develop Singapore's energy industry. This fund is intended to seek out projects that are close to deployment and have the potential to provide impactful and tangible results. Up to March 2015, about SGD 7.6 million had been disbursed.

In 2012, the Energy Innovation Research Programme (EIRP) was launched by EIPO. This Programme took over from the similarly focused SGD 50-million Clean Energy Research Programme (CERP) which ended in 2012. EIRP supports commercially relevant and viable research and development in the energy sector, including RE. The total budget of EIRP is SGD 140 million. The projects are selected through Call for Proposals. Up to May 2015, 13 (thirteen) grant calls had been released by EIPO under the EIRP.

In 2014, the Energy Training Fund (ETF) was set up by EMA. With a budget of SGD 20 million, the ETF co-funds the development of dedicated training programmes and training grants to build a strong core of Singaporean technical professionals in the power sector. The fund will co-fund up to 50% of qualifying costs for EMA-approved training providers to develop new power-related training programmes and up to 70% of course fees for local technical employees to attend the EMA-approved training programmes.

Financing support

In May 2008, the EDB launched the SGD 20-million Solar Capability Scheme to help companies install solar systems in new private commercial and industrial buildings. The eligible buildings must be certified with minimum Green Mark Gold Plus rating by the Building and Construction Authority (BCA) and the minimum solar system installed should be 150 kWp. The solar project developers can obtain financial support up to 40% of the project cost, capped at SGD 1 million per project.

Permits and licenses

The licensing framework for Intermittent Generation Sources was provided in the Energy Market Authority's paper on "Enhancements to the regulatory framework for intermittent generation sources in the National Electricity Market of Singapore" (2014). The summary of licensing requirements for intermittent generators is provided in Table 28.

Table 28: **Licensing requirements for intermittent generators in Singapore**

IGS installed capacity	Connected to the power grid?	Type of licenses
Below 1 MWac	Yes or No	Exempted
1 MWac or more but less than 10 MWac	Yes No	Wholesaler (Generation) License Exempted
10 MWac or more	Yes or No	Generation License

The licensing requirements for various classes of Licensed Electrical Workers (LEW) who are authorised to design, install, repair, maintain, operate, inspect and test the solar PV installations are provided in the "Handbook for Solar Photovoltaic Systems" published in November 2009 by EMA and BCA.

According to EMA, in order to accelerate the deployment of solar power in Singapore, several enhancements to the market and regulatory framework have been made in 2015. Some of the key enhancements included:

- Providing greater clarity on the licensing framework; and
- Streamlining market registration and settlement procedures (For instance, the Central Intermediary Scheme has been implemented in April 2015, which allows CCs to receive payment for selling excess solar energy to the grid through SP Services. Hence, they do not need to undergo the full registration and participation process with the market).

▶ Technical issues

The "Handbook for Solar Photovoltaic Systems" provides information on:

- technical requirements, and building and structural issues that are related to the implementation of solar systems in a building environment;
- new information on the installation requirements for solar systems, operations, and recommended preventive maintenance works;
- the use of the Code of Practice for Electrical Installations (Singapore Standard CP5:2008) as a safety standard for solar systems.

3.8.2 Analysis of the Impacts of RE Policies on the RE Development

▶ Review of RE Development

The installed power capacity of different RE sources in Singapore for the period 2006-2014 is provided in Table 29.

Table 29: **Installed power capacity (in MW) of different RE sources in Singapore (2006-2014)**

RE type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	-	-	-	-
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	-	-	0.40	1.90	3.70	5.80	9.80	15.00	33.10
Wind	-	-	-	-	-	-	-	-	-
Hydro	-	-	-	-	-	-	-	-	-
WTE	250.80	250.80	250.80	256.80	256.80	256.80	256.80	256.80	256.80
Total	**250.80**	**250.80**	**251.20**	**258.70**	**260.50**	**262.60**	**266.60**	**271.80**	**289.90**

Sources: ACE

In 2014, the total installed power capacity of Singapore was reported at 12,863.3 MW of which 289.9 MW (2.25% of the country total) were generated from RE (solar and WTE).

Solar: The total installed power capacity of grid-connected solar systems in Singapore increased from 0.4 to 33.1 MW during the period of 2008-2014. The installation of solar systems strongly increased in 2014, as the total installed power capacity of the grid-connected solar systems was more than doubled from 2013 through 248 newly installed systems. As of end 2014, there were a total of 636 solar installations across Singapore.

Waste-to-Energy: The use of solid waste for power generation in Singapore started in 1979 with the commissioning of the first 16 MW WTE incineration plant in Ulu Pandan. This plant was closed in 2009 after 30 years of successful operation. With the commissioning of the second WTE plant (46 MW Tuas Incineration Plant) in 1986, the third WTE plant (56 MW Senoko Incineration Plant) in 1992 and the fourth WTE plant (132 MW Tuas South Incineration Plant) in 2000, the total installed power capacity of the WTE power plants in Singapore increased to 250 MW. This total installed power capacity remained unchanged until 2008. In 2009, a 22-MW incineration plant was put in operation by Keppel Seghers (to replace the decommissioned Ulu Pandan Incineration Plant). By the end of 2009, the combined capacity of WTE (including biomass) power plants was 256.8 MW, unchanged until now.

Biomass, Biogas, Geothermal, Hydro and Wind: There are no available data on generating capacity for these RE technologies.

▶ Historical Development of RE Policies

The historical development of RE policies in Singapore is presented in Table 30. Fifteen key legal documents and policies related to RE development and implementation were issued by different government authorities of Singapore during the period of 2001 and 2015.

It can be seen that most important policy factors such as incentives, financial support for RE-based power projects were developed and promulgated during three years, from 2007 to 2009.

Table 30: **List of key RE-related policies of Singapore**

Year	Policy issued
2001	• Electricity Act 2001 (This Act was revised and amended in 2002, 2003 and 2006)
2007	• Clean Energy Research and Test-bedding (CERT) Programme • Clean Energy Research Programme (CERP) • Clean Energy Scholarship Programme • Market Development Fund (MDF)
2008	• Solar Capability Scheme (SCS)
2009	• Energy Research Development Fund (ERDF) • Handbook for solar photovoltaic (PV) systems
2012	• Energy Innovation Research Programme (EIRP) • Singapore's National Climate Change Strategy (NCCS)
2014	• Singapore's Third National Communication and First Biennial Update Report • Enhancements to the Regulatory Framework for Intermittent Generation Sources (Final Determination Paper) • Sustainable Singapore Blueprint 2015 • Energy Training Fund (ETF)
2015	• Enhancements to the Regulatory Framework for Intermittent Generation Sources (Clarification Paper)

RE Policies vs. RE Implementation

As stated in the methodology, for the purpose of analysis of the RE policy implementation, only SHP is taken into consideration. The relation between RE policy and the RE development trends is illustrated in Figure 9.

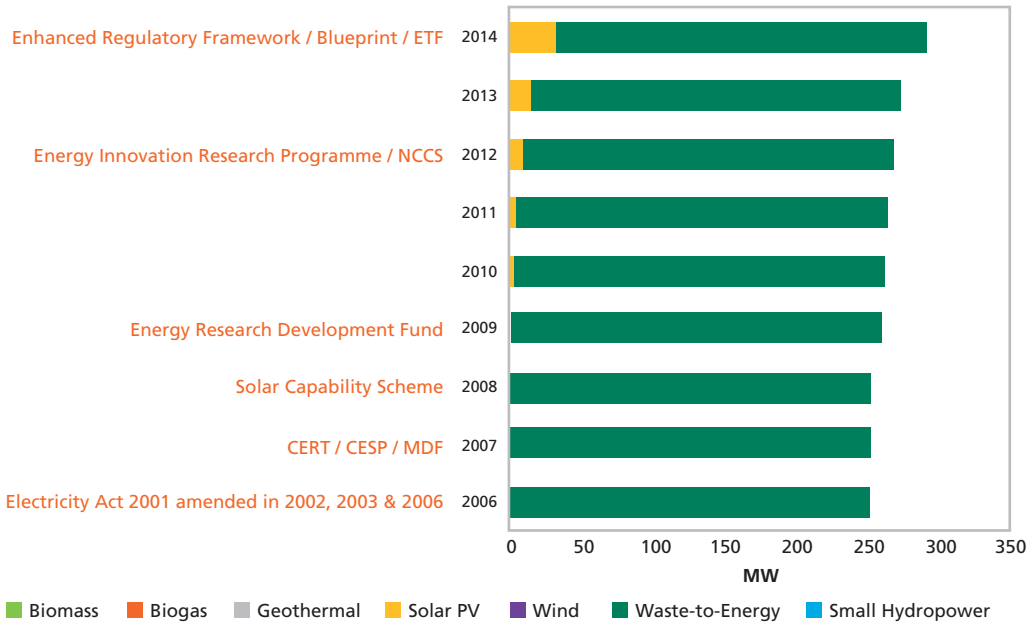


Figure 9: **RE policy development vs. RE implementation in Singapore**

Results of Analysis

Solar and WTE are the most feasible RE sources in Singapore.

WTE: As presented in section 1, WTE-based power generation had reached 250 MW of installed capacity in 2000 (around 97% of the current capacity) before the Electricity Act was promulgated in 2001. It seems that it was not the RE policies but rather environmental policies that had a significant impact on the development of the WTE power sector. To address the challenge of handling waste with limited land space, Singapore's National Environment Agency (NEA) has formulated an integrated solid waste management system in the past three decades that incorporates waste recycling, volume reduction and disposal. Singapore has been adopting WTE incineration as a method for waste volume reduction as this technology can reduce waste volume by up to 90%. The Singapore's goals towards zero waste and zero landfill did also boost the WTE projects.

Solar: The first grid-connected solar systems with a combined capacity of 0.4 MWp was implemented in Singapore in 2008. Since then, the total installed power capacity of grid-connected solar systems in Singapore has increased steadily. It seems like the introduction of the policies on incentives and financial support for the RE-based power generation projects during the period of 2007-2009 had a significant impact on the solar development. Several funds and programmes such as CERTP (2007), CESP (2007), MDF (2007), ERDF (2009) played a great role in encouraging R&D in the solar sector at its early stage of development. In particular, the Solar Capability Scheme launched by the Singapore EDB in 2008 had an important impact as it helped the investors by supporting up to 40% of the cost of installing solar systems in new private commercial and industrial buildings. Other funds and programmes launched later in 2012 (EIRP) and in 2014 (ETF) did also support the development of the solar sector. In addition, the enhancements to the regulatory framework for intermittent generation sources have been boosting the installations of solar plants, especially rooftop solar systems.

3.8.3 Conclusions

Singapore had published several strategies and plans on development of clean and RE sector. As solar and WTE are the most abundant RE sources in Singapore, these strategies and plans set up the targets of their development as well as the required policy framework and action plans to achieve these targets. Singapore does not provide a FiT through which IGS producers sell the electricity they produce. Instead, market payments and charges are applied. Tax and non-tax incentives were also established to promote R&D and investments in the RE sector, especially in the solar industry.

Over the period of 8 (eight) years (2006-2014), the total installed capacity of RE sources in Singapore has increased from 250 MW to 290 MW which accounted for about 2.3% of the total installed power generation capacity of the national power system.

Singapore had set an ambitious target to reach 350 MWp of installed capacity from solar energy sources by 2020. It means that an average of 53 MWp of solar-based generation capacity have to be added to the national power system every year until 2020. The total capacity of WTE plants will be increased by 30%, from 257 MW in 2014 to 334 MW by 2018.

The existing RE-related policy framework of Singapore seems to have an impact on the development of RE projects, in particular WTE and solar powers. However, in order to achieve the solar target of 350 MWp by 2020 (about 5% the projected peak power demand), Singapore needs a further improvement of its RE policy framework and market conditions to attract more investments in the sector.

EMA plans to work with the industry when designing the market and regulatory framework for solar power generation projects, whilst ensuring that the power system can handle further increases in solar deployment.

3.9 THAILAND

3.9.1 Existing Renewable Energy Policies

Thailand does not directly use the "renewable energy (RE)" term in its policies, but rather uses the broader "alternative energy (AE)" term. In 2015, the Ministry of Energy introduced parts of the new set of energy policies called Thailand Integrated Energy Blueprint (TIEB). The TIEB aligns its timeframe with the National Social and Economic Development Plan (2015-2036). It prioritises three main aspects of Thailand energy sector: (1) security (i.e. sufficiency of energy supply, fuel mix diversification, etc.); (2) economy (i.e. appropriate & affordable energy price/tariff, restructuring of fuel price, etc.); and (3) ecology (i.e. increased use of RE and clean energy technologies, etc.).

Under the TIEB, there are five separate plans, covering conventional energy resources as well as RE and energy efficiency & conservation (EE&C). They are (1) the Alternative Energy Development Plan or AEDP 2015, (2) the Thailand Power Development Plan or PDP 2015, (3) the Energy Efficiency Plan or EEP 2015, (4) the Oil Plan, and (5) the Gas Plan.

Key policies that are directly relevant to RE development and will be the focus of this report are the PDP and the AEDP. While the PDP addresses the role of RE in the power sector, the AEDP addresses the role of RE or AE in a broader aspect, covering all forms of energy.

The key policy instruments in Thailand are reviewed below.

- **RE targets**

Thailand RE targets were defined by the AEDP. The latest version is AEDP 2015, issued in September 2015 by the Department of Alternative Energy Development and Efficiency (DEDE) to replace AEDP 2012. Under the AEDP 2015, the RE targets are defined in three forms of energy utilisations: (1) electricity; (2) thermal energy; and (3) fuels. The overall RE target in Thailand is defined at 30% by 2036, in term of Total Final Energy Consumption (TFEC). The RE targets for individual energy form are defined in range, not as a fixed figures (see Table 31).

Wind turbines producing renewable energy, Thailand.

Table 31: **RE targets of Thailand**

Energy form	RE Share in Final Energy Utilisation in 2036 [%]
Electricity	15-20
Thermal energy	30-35
Bioenergy (fuels)	20-25
Total RE	**30**

RE utilisation in power sector

Thailand power sector relies significantly on natural gas. The PDP 2015 aims for the diversification of fuel mix in the electricity generation. Under the PDP, the share of natural gas can be reduced from 64% in 2014 to 30-40% by 2036. The AEDP 2015 projects the share of RE utilisation in Thailand power generation to be between 15-20% by 2036, which is equivalent to 19.7 GW of installed power capacity from RE sources. Majority of the RE installed capacity will come from biomass at around 5.6 GW by 2036 (see Table 32).

Table 32: **RE Targets (Power Sector)**

Energy Source	RE installed capacity target by 2036 [MW]
Municipal solid waste (MSW)	500
Industrial waste	50
Biomass	5,570
Biogas (produced from waste/wastewater)	600
Small hydro	376
Biogas (produced from energy crop)	680
Wind	3,002
Solar	6,000
Large hydro	2,906.40
Total	**19,684.40**

RE utilisation for heat application

RE utilisation for heat application is defined in term of kilotonnes of oil equivalent (ktoe). Based on AEDP 2015, around 25 Mtoe of thermal energy is expected to come from RE sources by 2036 (see Table 33). Similar to the power sector, biomass will play a crucial role, contributing around 22 Mtoe of thermal energy by 2036. The smaller portions will come from the use of biogas, solar thermal, municipal solid waste (MSW) and other sources.

Table 33: **RE Targets (RE utilisation for heat application)**

Energy Source	Target by 2036 [ktoe]
Municipal solid waste	495
Biomass	22,100
Biogas	1,283
Solar	1,200
Others	10
Total	**25,088**

RE-based fuels

Fuels produced from RE feedstock are mainly used in the transportation sector which relies significantly on petroleum products. Currently, biodiesel and ethanol-blended fuels are widely used in Thailand (so-called E10, E20, and E85). By 2036, the AEDP projects the use of biodiesel and ethanol to be around 14 million litres per day and 11.4 million litres per day, respectively (see Table 34).

Table 34: **RE Targets (RE-based Fuel Utilisation)**

Fuel	Target for 2036	
	[million litre/day]	[ktoe]
Biodiesel	14.00	4,404.82
Ethanol	11.40	2,103.50
Pyrolysis	0.53	170.87
Compressed Bio-methane Gas (CBG)	4,800	2,023.24
Other alternative fuels	-	10
Total	**-**	**8,712.43**

Selling tariffs of electricity generated from RE sources

Thailand introduced the adder Scheme in 2007 to promote the development of RE projects for power generation with a very attractive fixed amount on top of wholesale electricity tariff. The adder scheme was phased out in 2014-2015 and replaced by a FiT scheme.

Thailand's FiT can be categorised into two types based on the category of energy sources: (1) Natural Energy (i.e. wind, solar, hydro); and (2) Bio-energy (i.e. biomass, biogas, municipal solid waste).

In addition to the base FiT, the FiT premium (bonus) is applicable when a project meets some special conditions (e.g. project developed in the four southern provinces of Thailand, bio-energy project, etc.). The details of Thailand's FiT are as per Table 35 for the natural energy category and Table 36 for the bio-energy category.

Table 35: **Thailand feed-in tariff (Natural energy)**

RE Technology	FiT [THB/kWh]	Duration of support [yr]	FiT Premium - Southern provinces [THB]
Hydro (up to 200 kW)	4.90	20	0.50
Wind	6.06	20	0.50
Solar			
• Rooftop (0-10 kWp)	6.85	25	0.50
• Rooftop (>10 – 250 kWp)	6.40	25	0.50
• Rooftop (>250 – 1,000 kWp)	6.01	25	0.50
• Ground-mounted (all size)	5.66	25	0.50

Table 36: **Thailand feed-in tariff (Bio-energy)**

RE Technology	FiT [THB/kWh]			Duration [yr]	FiT Premium [THB/kWh]	
	Fixed FiT	Variable FiT	Total FiT		Bio-energy project	Southern Sprovinces
Municipal Solid Waste (integrated waste management)						
≤ 1 MW	3.13	3.21	6.34	20	0.70	0.50
1 – 3 MW	2.61	3.21	5.83	20	0.70	0.50
> 3 MW	2.39	2.69	5.08	20	0.70	0.50
Municipal Solid Waste (landfill)	5.60	-	5.60	10	-	0.50
Biomass						
≤ 1 MW	3.13	2.21	5.34	20	0.50	0.50
1 – 3 MW	2.61	2.21	4.82	20	0.40	0.50
> 3 MW	2.39	1.85	4.24	20	0.30	0.50
Biogas (waste water or solid waste)	3.76	-	3.76	20	0.50	0.50
Biogas (energy crop)	2.79	2.55	5.34	20	0.50	0.50

Incentives

The Announcement No. 2 (Year 2010) of the Board of Investment (BOI) introduced several investment promotion instruments for sustainable development industry activities. EE and AE are considered as priority activities under this BOI announcement. Therefore, in the implementation of such activities, the following incentives are provided: exemption of import duty (equipment), exemption of corporate income tax for 8 years, 50% reduction of corporate income tax on the profit generated from the investment, double deduction for transportation, electricity and water supply costs for 10 years, and deduction of infrastructure installation and construction cost from net profit in addition to normal depreciation.

Financing support

The Energy Conservation (ENCON) Fund was established in 1992 by the Energy Conservation Act 1992. The purpose of this fund is to provide financial support in introducing and promoting RE and EE&C technologies. The fund was built from levies on petroleum products.

The Energy Service Company Revolving Fund (ESCO Fund) was established in 2008 by DEDE with the objective to encourage investment in RE and EE&C projects. The fund can be used for the following activities: equity investment, equipment leasing, ESCO venture capital, GHG project facility, credit guarantee facility, and technical assistance. The fund has been managed by the Energy for Environment Foundation (E for E).

Permits and licenses

The Energy Industry Act 2007 is an important act that governs parts of Thailand energy industry. The Energy Regulatory Commission (ERC) was established by this act to oversee Thailand's electricity and natural gas market. Under this act, any energy industry operation, either with or without remuneration, must obtain a license from the ERC.

Technical issues

The Thai Industrial Standards Institute (TISI) has adopted several international standards (International Electrotechnical Commission) as national standards for solar energy equipments (e.g. solar panel, inverter, etc.). In October 2014, a MOU was signed between ERC and the Ministry of Industry to waive the requirement of factory permit for small PV installation (up to 1 MW).

Power utilities at transmission level (Electricity Generation Authority of Thailand - EGAT) and at distribution level (Provincial Electricity Authority - PEA, and Metropolitan Electricity Authority - MEA) are responsible to develop a grid code (transmission/distribution codes) to define the technical requirements in connecting, using, and operating the grid under the areas of their responsibility.

The ERC issued two Codes of Practice (CoP) to serve as guidelines for RE project developers in applying appropriate measures to prevent or reduce the impact of RE projects on environment (i.e. environmental checklist). They are CoP for PV projects development and CoP for biomass projects development (using solid fuel).

The AEDP 2015 has prioritised RE technologies in Thailand with a clear focus on bioenergy. Merit order of RE for electricity generation are defined as follows: (1) Municipal solid waste; (2) Biomass; (3) Biogas from waste/wastewater; (4) Small hydro; (5) Biogas from energy crop; (6) Wind; (7) Solar; and (8) Geothermal.

The Thailand Smart Grid Development Master Plan 2015-2036 was introduced in February 2015. It is under the PDP 2015 and plays an important role in preparing Thailand's grid infrastructure to be able to be operated more efficiently and to become more RE integration friendly. The master plan defines key activities/technologies and classifies them into 4 (four) phases with different time frames (i.e. preparation phase, short term, medium term and long term). Five strategic aspects were specified in the master plan: (1) Reliability; (2) Sustainability; (3) Service; (4) Interoperability; and (5) Economics (with Key Performance Indicators for each aspect).

3.9.2 Analysis of the Impacts of RE Policies on the RE Development

▶ Review of RE Development

Table 37 presents the installed power capacity (in MW) of different RE sources in Thailand. Since 2006, Thailand's RE sector has grown considerably at around 20-30 % annually. The growth slightly slowed down between 2008 and 2010 (2-5%). It started to grow again in the same pace in 2011. In 2014, the total installed capacity of RE in Thailand was around 4.5 GW. This is roughly 4.5 times of installed capacity in 2006.

The largest contributor for Thailand's RE is biomass, while solar electricity generation started to gain its important from 2012 onward.

Table 37: **Installed power capacity (in MW) of different RE sources in Thailand (2006-2014)**

RE type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	1,036.53	1,368.63	1,609.84	1,618.00	1,648.00	1,790.00	1,959.95	2,320.78	2,451.80
Biogas	-	-	45.70	69.80	103.40	159.20	193.40	265.23	311.50
Geothermal	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Solar	30.41	32.25	32.35	37.00	48.60	167.15	376.72	823.46	1,298.50
Wind	-	0.94	1.08	5.13	5.60	7.28	111.73	222.71	224.75
Hydro	3,451.94	3,448.97	3,457.78	3,464.40	3,464.72	3,476.72	3,508.15	3,524.34	3,548.40
WTE	-	-	5.20	6.60	13.10	25.50	42.70	47.50	65.70
Total	**4,519.52**	**4,851.97**	**5,152.25**	**5,201.23**	**5,283.72**	**5,626.15**	**6,192.95**	**7,204.32**	**7,900.95**

Sources: ACE

Biomass: As an agriculture-based economy, Thailand has a vast biomass resource potential which can be used in the energy sector. The installed capacity for biomass power projects was already around 1 GW in 2006. It increased steadily since.

Biogas: Although there were several biogas plants in Thailand before 2008, they were not implemented for power generation. The role of biogas in electricity generation started in 2008. This sector grew slowly compared to other sectors. However, the growth remains sustained and in 2014, there were 311 MW of biogas power projects in Thailand.

Geothermal: There is not much potential for geothermal energy in Thailand. A small geothermal power plant was built in 1989 in Fang (Chiang Mai) with an installed capacity of 300 kW. This is the only geothermal power plant in Thailand to date.

Solar: The Thai solar power sector was still very limited up to 2010. A rapid growth in this sector took place in 2013 when more than 200 MWp of solar PV was installed in that year. In 2014, the installed capacity of solar power plants in Thailand was close 1.3 GWp.

Wind: Only small wind turbines had been developed from 2007 to 2011. However, large wind farms were implemented in 2012 and 2013, bringing the total installed capacity to 224.5 MW.

Hydro: Hydro is the largest RE source in Thailand. Most of the installed capacity comes from large hydro plants owned by Electricity Generating Authority Thailand (EGAT). The installed capacity of hydro in 2006 was around 3.4 GW. However, the growth in this sector is now limited, due to difficulties associated to development of new sites. In 2014, the installed capacity remained around 3.5 GW.

WTE: The use of municipal solid waste to generate electricity in Thailand began in 2008. Due to difficulties in project development, the growth in this sector remained limited. In 2014, there were less than 66 MW of MSW power plant in Thailand.

Historical Development of RE Policies

Table 38 summarises key policies which are related to Thailand's RE sector in the past. The important policy for RE was introduced in 2002, when the very small power producer (VSPP) scheme came into effect in Thailand. However, an important foundational framework which contributed significantly to the success of RE implementation can be dated back earlier. The independent power producer (IPP) and small power producer (SPP) schemes, introduced in 1992, already allowed the private sector to participate in Thailand's power generation market.

Table 38: **List of key RE-related policies of Thailand**

Year	Policies
1992	• Independent Power Producer (IPP) Scheme • Small Power Producer (SPP) Scheme • National Energy Policy Act (Establishment of NEPC) • Energy Conservation Promotion Act (Establishment of ENCON Fund)
2002	• Very Small Power Producer (VSPP) Scheme
2007	• Thailand Adder Scheme (Footnote 1)
2008	• Renewable Energy Development Plan (REDP) 2008 - 2022
2010	• Thailand Power Development Plan (PDP) 2010 – 2030 • Thailand Power Development Plan (PDP) 2010 – 2030: Revision 1
2011	• Thailand Power Development Plan (PDP) 2010 – 2030: Revision 2 • Renewable Energy Development Plan (REDP) 2012 - 2021
2015	• Thailand Power Development Plan (PDP) 2015 – 2036 • Thailand Smart Grid Roadmap 2015 - 2036 • Alternative Energy Development Plan (AEDP) 2015 – 2036

Note 1: The adder scheme was officially approved in December 2006. The announcement and relevant regulations were issued in early 2007

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. The relation between key RE policies and RE development trends is illustrated in Figure 10.

Thailand RE Policy Development vs RE Implementation

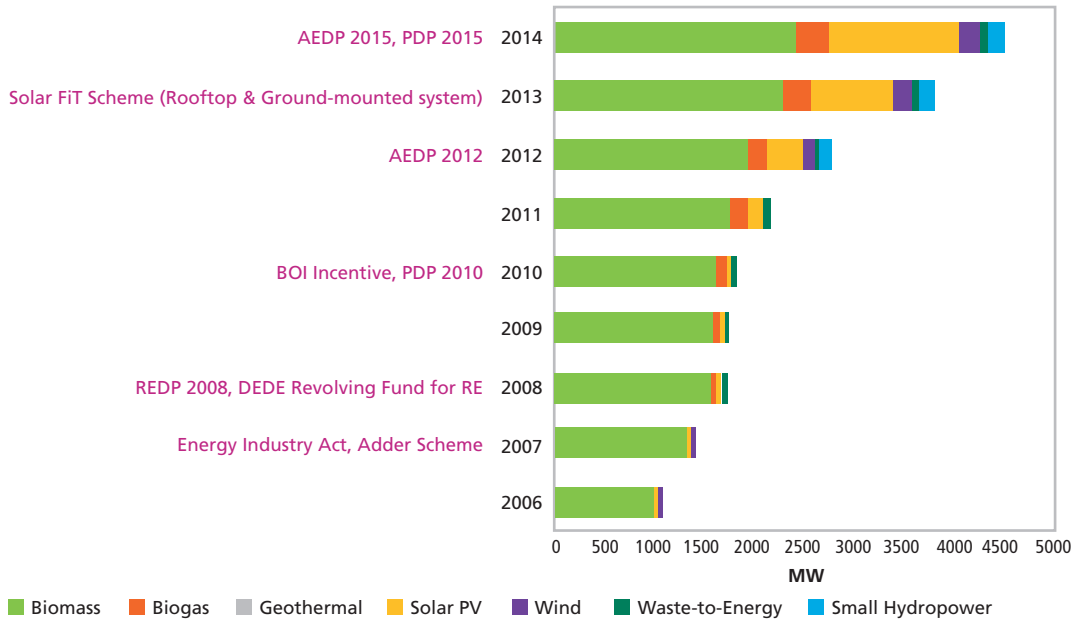


Figure 10: **RE policy development vs. RE implementation in Thailand**

Results of Analysis

RE development in Thailand has been successful due to the government's commitment to drive private sector's participation in power generation and to open access to financing.

The first set of RE policies in Thailand was introduced with a goal to increase the RE capacity and its RE portion in Thailand's energy mix. This boosted the country's RE installed capacity. However, RE project implementation has faced some difficulties as grid infrastructures in some areas were not yet in place to accommodate new RE-based power generation projects. This was taken into consideration when the government prepared the new set of RE policies. The new AEDP introduced in 2015 aims to promote RE but also take into account other relevant aspects such as RE zoning, prioritisation of RE technologies, etc. It sets a clear focus on biomass, biogas, biofuel, and municipal solid waste sector.

The RE sub-sectors are analysed below.

Biomass/Biogas: As an agriculture-based economy, Thailand has vast potential for energy generation from biomass. According to the DEDE assessment, the potential of power generation from biomass is 3.9 GW.

Some agro-industries have been traditionally using biomass residues from their process to cover their own energy requirements. The government provided some support to these industries willing to invest in biomass/biogas power generation projects.

The adder scheme introduced in 2007 attracted investors as they could sell electricity back to the grid at a very attractive price. That resulted in a significant increase in biomass installed capacity between in 2007 and 2008.

Based on the existing regulatory framework, the development of biomass/biogas projects will be more challenging as developers will have to follow a competitive bidding process. However, this process is expected to increase transparency in the overall implementation. At the moment, the support is only provided to biomass/biogas projects that will be developed in the 3 (three) Southern provinces of Thailand (Narathiwat, Yala, Pattani) and in 4 (four) districts of Songkla province. It is expected that the development of Thailand's RE sector in the near future will only be limited to these areas.

Hydro: The hydro sector in Thailand can be divided into two sub-sectors: large hydro and small hydro. There are no incentives provided for development of large hydro plants where EGAT is responsible for their construction and operation. The growth in this sector is limited as construction of new large hydro is extremely difficult due to public oppositions; from NGO and local communities.

A FiT is provided for small scale hydro projects. Many projects are being developed in the northern part of Thailand, especially in rural areas where hydro resources are still abundant. DEDE plays a significant role in the development of these small hydro plants.

WTE: Using of solid waste for energy generation is one of the main focus of the AEDP 2015. The AEDP 2015 sets the targets of 500 MW from municipal solid wastes (MSW) and 50 MW from industrial wastes. This MSW sector requires the support from local governments in term of organisation of feedstock collection and the formulation of a supportive regulation framework.

Solar energy: The development of solar energy was triggered by the introduction of the adder scheme. It indeed drew the attention of potential investors. A very attractive tariff caused an over-subscription for solar projects under the adder scheme. The government suspended new applications for solar power project since 2010, causing a slowdown in this sector.

A second set of solar power policies was introduced in 2013, in which solar rooftop was addressed for the first time. A fixed FiT was introduced to replace the adder scheme. Although it offered a less attractive tariff than the adder, the market's response was positive. This is due to long-time stagnation of Thailand's solar power sector since 2010. The solar rooftop installed target that were allocated for commercial and industrial sector at

100 MWp was fully subscribed. The installed target for residential solar rooftop was not fully subscribed during the first launch of the programme. The second round of residential solar rooftop applications was opened in 2015. It brought in more projects to the pipeline with the applications of around 93 MWp, above the 2nd round target (78.63 MWp).

Thailand is now considering a solar rooftop programme which will focus on captive use of solar power, i.e. for own consumption. However, as there will be no power sale to the grid, this programme may not get the expected success from potential investors.

Wind power: There is no dedicated wind power policy in Thailand. The relevant policy for wind power is part of the overall RE policy. The adder scheme has supported the development of wind power generation. However, due to the high upfront investment and wind resource assessment, the development of wind power is limited to large players. Wind power in Thailand is limited to some specific areas where a few large wind farms have been installed.

Other RE resources: The first geothermal power plant was built in Chiang Mai. However, there is no incentive or supporting mechanism for geothermal technology.

3.9.3 Conclusions

Thailand can be considered as a forerunner in RE development and utilisation in ASEAN. The private sector and financial sector have played crucial roles and contributed significantly to the growth of Thailand's RE sector. In 2014, the total installed capacity of RE in the power sector was around 4.5 GW.

Thailand Integrated Energy Blueprint (TIEB) is an important set of energy policy, covering conventional energy, AE, and addressing EE&C. It consists of five separated plans. The AEDP defines targets which cover all three forms of energy; electricity, thermal energy, and fuels. The PDP and the AEDP were developed to reflect each other. The PDP focuses mainly on the roles of RE in the power sector while the AEDP addresses the broader roles of RE in the overall energy sector.

As Thailand has an agricultural-based economy, bio-energy (especially biomass) is a key RE resource. Under the AEDP 2015, bio-energy will keep its dominant position among RE sources.

The key success factors of Thailand's RE policy are (1) high and attractive RE tariffs (with adder scheme) and (2) a supportive financial sector.

3.10 VIETNAM

3.10.1 Review of Existing Renewable Energy Policies

The Electricity Law of Vietnam was approved by the National Assembly on 3 December 2004 and took effect on 1 July 2005. It was amended in 2012 and came into effect on 1 July 2013. The Law provides regulations on planning and investment in the power sector, electricity savings, power market development, the rights and obligations of organisations participating in providing and consuming electricity, protection of electrical equipment, and power safety.

The Law provides the general scheme for developing wholesale and retail electricity competition. It requires power prices to be set appropriately to encourage market development, facilitate investors in achieving a reasonable profit, encourage energy savings, and protect the rights and benefits of electricity providers as well as consumers.

Can Tho Province, Vietnam. Credit: ESP GIZ MOIT

The Law also establishes a special regime for encouraging the exploitation of RE for electricity generation. RE-based power plants will receive incentives relating to investment, electricity tariffs and taxation.

In November 2007, the Prime Minister approved the Scheme on Development of Biofuels for the period, up to 2015 with an outlook to 2025. The objective of the Scheme was to increase the production and use of biofuels as an alternative to partially replace conventional fossil fuels. The Scheme set the target, main tasks and solutions for technology research and transfer, development of policy framework and technical standards, and promotion of biofuels production industry in Vietnam.

In July 2011, the Prime Minister approved the National Power Development Plan for the period 2011-2020 with an outlook to 2030. Under this Plan, the Government of Vietnam set the priority to develop RE for power generation and increase the percentage of renewable power in the total electricity generation from 3.5% in 2010 to 4.5% in 2020 and 6.0% in 2030. For rural electrification, the target is to supply electricity to most of rural households, of which around 600,000 households' electricity will be supplied by RE. The Plan suggested that the Government develops the policies on electricity prices and on investment and tax incentives to promote the development of new and RE sources.

On 25 November 2015, the Prime Minister approved the Decision No. 2068/QD-TTg on Vietnam Renewable Energy Development Strategy up to 2030 with an outlook to 2050. It set the strategic target as well as the mechanism and policies for RE development in Vietnam in the future.

On 18 March 2016, the Prime Minister issued Decision no. 428/QD-TTg to approve the revised National Power Development Master Plan for the period of 2011-2020 with an outlook to 2030. According to this Master Plan, the share of electricity produced from RE (excluding large- and medium-scale and pumped-storage hydro) will increase to 7% in 2020 and over 10% in 2030.

Vietnam already promulgated several legal documents to establish a pricing and incentive framework for RE-based power projects in general, and for small hydro, wind, biomass and solid waste-based power projects in particular. The key policy instruments in Vietnam are reviewed below.

RE targets

According to the National Power Development Plan for the period of 2011-2020 with an outlook to 2030, the total installed capacity of RE-based power plants will be 4,200 MW by 2020. The wind power and biomass-based power capacity will be 1,000 MW and 500 MW respectively. The balance of 2,700 MW will be produced from other RE sources such as small hydro, biogas, geothermal and solar.

The latest RE targets of Vietnam were set in the revised "National Power Development Master Plan for the period 2011-2020 with an outlook to 2030". This Master Plan was promulgated with the Prime Minister's Decision no. 428/QD-TTg dated 18 March 2016. According to this Master Plan, the total amount of electricity generated and imported will be 265-278 TWh in 2020; 400-431 TWh in 2025, and 572-632 TWh in 2030. The RE targets were set as follows:

- The total capacity of hydro sources (including small and medium, and pumped-storage hydro) shall increase from less than 17,000 MW at present to approximate 21,600 MW in 2020, 24,600 MW in 2025 (1,200 MW for pumped-storage hydro) and 27,800 MW in 2030 (2,400 MW for pumped-storage hydro). The electricity produced from hydro sources shall account for approximate 29.5% of total electricity generation (~78.2 TWh) in 2020, 20.5% (82.0 TWh) in 2025 and 15.5% (88.7 TWh) in 2030.

- Bringing the total wind power capacity from current 140 MW to about 800 MW in 2020, 2,000 MW in 2025 and 6,000 MW in 2030. The wind power shall make up about 0.8 % of total electricity generation (2.1 TWh) in 2020, 1% (4.0 TWh) in 2025 and 2.1% (12.0 TWh) in 2030.

- Development of biomass power sources: applying cogeneration method in sugar mills and food/foodstuff processing plants; co-combustion of biomass and coal in coal-fired power plants; electricity generation from solid wastes, etc. The share of electricity produced from biomass sources shall reach approximate 1% of total electricity generation (2.7 TWh) in 2020, 1.2% (4.8 TWh) in 2025 and 2.1% (12.0 TWh) in 2030.

- Accelerated development of solar power, including large ground-mounted and small rooftop systems: Bringing the total solar power capacity from the current negligible level up to approximate 850 MW in 2020, 4,000 MW in 2025 and 12,000 MW in 2030. The share of solar power sources shall account for about 0.5% of total electricity generation (1.3 TWh) in 2020, 1.6% (6.4 TWh) in 2025 and 3.3% (18.9 TWh) in 2030.

Table 39: **Targets of RE utilisation for electricity generation**

RE Source	2020		2025		2030	
	Amount (TWh)	Share	Amount (TWh)	Share	Amount (TWh)	Share
Hydro, including large hydro plants	78.2	29.5%	82.0	20.5%	88.7	15.5%
Wind	2.1	0.8%	4.0	1.0%	12.0	2.1%
Biomass	2.7	1.0%	4.8	1.2%	12.0	2.1%
Solar	1.3	0.5%	6.4	1.6%	18.9	3.3%
Total	**84.3**	**31.8%**	**97.2**	**24.3%**	**131.6**	**23.0%**

The target for biomass use for heat generation was set in the Vietnam Renewable Energy Development Strategy up to 2030 with an outlook to 2050 which was issued in November 2015. Under this Strategy, the targets of RE use for heat generation and for biofuel production are set as presented in Table 40.

Table 40: **Targets of RE utilisation for heat generation and biofuel production**

RE Source	2020		2030		2050	
	Amount (Mtoe)	Share (% of total final energy demand)	Amount (Mtoe)	Share (% of total final energy demand)	Amount (Mtoe)	Share (% of total final energy demand)
Heat generation from biomass	13.6	17%	16.8	14%	23.0	12%
Heat generation from solar energy	1.1	1.4%	3.1	2.6%	6.0	3.1%
Biofuels	0.8	1.0%	6.4	5.3%	19.5	10.2%
Total	**15.5**	**19.4%**	**26.3**	**21.9%**	**48.5**	**25.3%**

Selling tariffs of electricity generated from RE sources

Vietnam has promulgated the tariffs of electricity sold to the National Power Grid from small hydro plants, wind power plants, biomass-based and solid waste-based power plants.

According to Circular no. 32/2014/TT-BCT which replaced Decision no. 18/2008/QD-BCT of the MOIT, the price list of Avoided Cost Tariffs (ACTs) applicable for small hydro plants (≤ 30 MW) is set on the basis of the avoided cost on the national power system when electricity is generated for the distribution power grid from a substitute small hydro plant. ACTs are calculated according to time of use (TOU), season and region. The price list of ACTs is prepared and publicised every year by MOIT. The latest list of ACTs for 2015 was issued with MOIT Decision no. 12086/QD-BCT dated 31 December 2014 (see Table 41).

Table 41: **Price list of ACTs for 2015 for small hydro projects**

Region	Dry season			Wet season			
	Peak hour (VND/kWh)	Normal hour (VND/kWh)	Off-peak hour (VND/kWh)	Peak hour (VND/kWh)	Normal hour (VND/kWh)	Off-peak hour (VND/kWh)	Surplus electricity (VND/kWh)
North region	638	634	631	607	613	620	310
Central region	625	624	623	598	602	605	302
South region	663	662	661	632	636	639	320
Capacity price (for whole country)	2,158						

Note: Vietcombank's exchange rate was 22,215 VND/USD as of 28 Jan 2016

It should be noted that the ACTs provided in Table 41 do not include water resource tax, forest environmental service fee and VAT. The electricity buyers shall pay these above-mentioned taxes and fee to the power utilities.

The applied selling price of electricity for wind power projects is regulated by Prime Minister's Decision no. 37/2011/QD-TTg dated 29 June 2011. The electricity buyer, i.e. Electricity of Vietnam (EVN) and its authorised units shall pay wind power projects 0.078 USD/kWh (VAT-excluded) upon power delivery of which the State will provide support of 0.01 USD/kWh to the electricity buyer through the Vietnam Environmental Protection Fund.

For biomass-based power projects, Decision no. 24/2014/QD-TTg sets the selling price of excess electricity generated from cogeneration (combined heat and power) plants. For projects using biomass but generating

electricity only for sales to the grid, the ACTs will follow Circular no. 44/2015/TT-BCT dated 9 December 2015. They will be calculated and publicised every year by MOIT. The price list of ACTs for 2016 was published in MOIT Decision no. 942/QD-BCT dated 11 March 2016.

The selling prices of electricity generated from municipal solid waste-based power plants are regulated by Prime Minister Decision 31/2014/QD-TTg. According to this Decision, the electricity buyer shall pay 0.1005 USD/kWh (VAT-excluded) for the power plants directly combusting solid waste or 0.0728 USD/kWh (VAT-excluded) for the plants burning landfill gas.

The selling prices of electricity for different types of RE-based power projects are summarised in the Table 42.

Table 42: **Summary of selling prices of electricity for different types of RE-based power projects**

Type of RE sources	Technology	Capacity limits	Selling price of electricity (VAT-excluded)
Hydro	Power generation	≤ 30 MW	• 598-663 VND/kWh for electricity sales (depending on time of use, season and region) • 302-320 VND/kWh for surplus electricity (compared to contracted amount) • 2,158 VND/kWh for capacity sales (for whole country)
Wind	Power generation	No limit payment.	• 0.078 USD/kWh (on-shore) • 0.098 USD/kWh (off-shore) • The payment (VAT-included) will be processed monthly in VND which is calculated by using the foreign exchange rate of VND/USD (selling price) of the Vietnam Foreign Trade Bank at the time of
Biomass	Cogeneration	No limit	• 0.058 USD/kWh for excess electricity • The electricity selling price shall be adjusted to the fluctuations of VND/USD exchange rate
	Power generation	No limit	• 0.075551 USD/kWh for North region • 0.073458 USD/kWh for Central region • 0.074846 USD/kWh for South region • The electricity selling price shall be adjusted to the fluctuations of VND/USD exchange rate
Solid Waste (Garbage)	Power generation, direct combustion	No limit	• 0.1005 USD/kWh • The electricity selling price shall be adjusted to the fluctuations of VND/USD exchange rate
Landfill gas	Power generation	No limit	• 0.0728 USD/kWh • The electricity selling price shall be adjusted to the fluctuations of VND/USD exchange rate

A Standardised Power Purchase Agreement (SPPA) was issued and is applicable for biomass (Decision no. 942/QD-BCT), solid waste (Circular no. 32/2015/TT-BCT), hydro (Circular no. 32/2014/TT-BCT) and wind (Circular no. 32/2012/TT-BCT) power projects. Electricity of Vietnam (EVN), the sole electricity buyer has also published the regulations on the procedures for SPPA negotiation, signing and implementation.

The selling prices of electricity from the solar power projects (both rooftop and ground mounted) to the grid are being prepared by the Drafting Committee that was established by MOIT. The Institute of Energy is one of the members of this Committee.

Incentives

Tax incentives: On 26 December 2013, the Government promulgated Decree no. 218/2013/ND-CP, providing detailed regulations and guidelines for the implementation of the Law on Corporate Income Tax. According to this Decree, the exemption and reduction of corporate income tax are applied to the newly-established enterprises working on RE projects. These enterprises enjoy a preferential tax rate of 10% (instead of normal tax rate of 20% applicable since the 1st January 2006). On top of that, these enterprises enjoy additional tax incentives including tax exemption for the first 4 years and 50% tax reduction for the next 9 years. The corporate income tax rate for RE-based power generation enterprises can be summarised as follows:

~ 0% for years 1 to 4,
~ 5% for years 5 to 13,
~ 10% for years 14 to 15,
~ 20% for year 16 onwards.

The RE-based power projects are exempted from import tax on imported goods that would become fixed assets of the project and goods used as raw materials, input or semi-finished products that are not available on the domestic market for the project operation. This is according to the Law on Import and Export Taxes and other regulations on import and export duties.

Other incentives: According to the Prime Minister's Decision no. 130/2007/QD-TTg dated 2 August 2007, the Government offers the RE-based power projects implemented under Clean Development Mechanism (CDM) other incentives on income tax, import duties, land rent and use, subsidy for amount of electricity generated from the CDM projects.

The provincial People's Committee is responsible to allocate land to the investors to implement RE-based power projects in accordance with the Power Development Plans approved by the competent authorities. The compensation for and support to site clearance are carried out in line with the current Law on Land. RE plants, power lines and transformer stations connected to the grid are entitled to exemption and reduction in land rental fees in line with the current law and regulations applicable to investment projects with preferential treatment.

Financing support

According to the National Energy Development Strategies for Vietnam up to 2020 with an outlook to 2050 issued through the Prime Minister Decision no. 1855/QD-TTg dated 27 December 2007, the Government of Vietnam considers to establish an Energy Development Fund to support the development of RE projects. Under this Fund, the developers of RE-based power projects have access to investment credits from the State which provides loans at favourable interest rate. However, this EDF is not established yet.

Based on the "Vietnam Renewable Energy Development Strategy up to 2030 with an outlook to 2050", the Sustainable Energy Promotion Fund (SEPF) shall be established to support RE development. The fund will be financed by the State Budget, revenue from environmental fees levied on fossil fuels, various sources of funds and contributions from domestic and foreign organisations/individuals as well as other funding sources.

The Sustainable Energy Promotion Fund will provide the financial support to compensate the costs incurred by the power utilities on:
- the investment costs of independent power systems using independent RE-based power sources;
- the construction costs of a new power grid to connect with RE-based power sources, provided that these costs are unable to be paid back from the power transmission fees.

This Fund will also provide the grant to:
- the studies on the formulation of the standard and demonstration projects using RE sources;
- the development and implementation of RE-based projects in rural areas;
- the construction of independent RE-based power generation systems in remote/isolated areas and islands;
- the survey and assessment of RE sources and development of the information database;
- the R&D and promotion of domestic manufacture of RE equipment.

In August 2007, the Prime Minister issued Decision no. 130/2007/QD-TTg to promulgate some policies and financial mechanisms for CDM projects.

Permits and licenses

On 29 May 2015, MOIT issued Circular no. 10/2015/TT-BCT regulating the sequence, procedures for issuance, revocation and duration of Power Operation License applicable for all organisations and individuals working in the power areas. Based on this Circular, all RE-based power plants with an installed capacity of 50 kW and above have to obtain the Power Operation License.

Technical issues

MOIT has issued Decision no. 37/2006/QD-BCN dated 16 October 2006 to promulgate the detailed technical requirements for interconnecting power plants (including RE-based power plants) to the National Power Grid.

In 2010, MOIT issued Circulars no. 12/2010/TT-BCT and no. 32/2010/TT-BCT to specify the criteria, guidelines, basic rules, procedures, standards, responsibilities and obligations for the operation, maintenance and development of the Vietnam's power transmission and distribution (T&D) grid. Chapter V of both Circulars addresses the technical requirements for interconnecting all types of power plants to the T&D grid, including RE-based power plants.

On 18 November 2015, MOIT issued Circular no. 39/2015/TT-BCT to regulate power distribution grid operation. This Circular has separate articles to address specific technical requirements for interconnecting of thermal (including biomass, biogas and waste-to-energy), hydro, wind and solar power plants to the power distribution grid. On 1 December 2015, MOIT issued Circular no. 42/2015/TT-BCT to promulgate the regulations on measuring electricity in power buying and selling activities. This Circular specifies the technical standards and criteria for the electricity measuring system, and the responsibilities and obligations of the partners involved in the power buying and selling activities.

3.10.2 Analysis of the Impacts of RE Policies on the RE Development

Review of RE Development

The installed power capacity (in MW) for different RE sources for the period 2006-2015 is provided in Table 43.

Table 43: **Installed power capacity (in MW) of different RE sources in Vietnam (2006-2014)**

RE type	2006	2007	2008	2009	2010	2011	2012	2013	2014
Biomass	-	-	-	-	-	-	-	-	-
Biogas	-	-	-	-	-	-	-	-	-
Geothermal	-	-	-	-	-	-	-	-	-
Solar	-	-	-	-	-	-	-	-	-
Wind	-	-	1.50	9.00	18.00	32.00	36.00	52.00	68.00
Hydro	5,050.00	5,692.00	6,026.00	7,199.00	8,880.00	10,165.00	12,643.00	14,661.00	17,072.73
WTE	-	-	-	-	-	-	-	-	-
Total	**5,050.00**	**5,692.00**	**6,027.50**	**7,208.00**	**8,898.00**	**10,197.00**	**12,679.00**	**14,713.00**	**17,140.73**

Sources: ACE and Institute of Energy (for the data on wind)

Biomass: To date, only bagasse is used for combined heat and power generation (cogeneration) in 41 sugar mills. There is no operational power generation plant using other types of biomass.

Biogas: Biogas production plants have been broadly developed in Vietnam. However, biogas generated from these plants is mostly used as fuel for cooking in households or livestock farms or to replace fossil fuels (diesel oil, coal) in industrial boilers.

Geothermal: Up to now, there are no operational power plants using geothermal energy in Vietnam.

Solar: Some solar systems have been developed in Vietnam. However, most installed systems are small scale and have been used for off-grid electricity supply in buildings and households.

Wind: Based on a report published by GIZ, 48 wind power projects with a total capacity of around 5,000 MW had been registered by 2012. However, only three projects in Tuy Phong District (Binh Thuan Province), Phu Quy Island (Binh Thuan Province) and in Bac Lieu City (Bac Lieu Province) have reached the operating stage.

Hydro: The installed capacity of all types of hydro plants has dramatically increased from 5,050 MW in 2006 to 17,141 MW in 2014. Based on statistical data from the Institute of Energy, the total installed power capacity for small hydro plants (< 30 MW) increased from 140 MW in 2006 to 1,984 MW in 2014. In 2015, an additional capacity of about 193 MW was implemented.

Waste-to-Energy: There is only one operational landfill gas-based waste-to-energy plant producing electricity. This small-scale plant was commissioned in 2006 in Go Cat Landfill (Ho Chi Minh City).

Historical Development of RE Policies

The list of key RE policies in Vietnam is presented in Table 44. Twenty-five legal documents and policies related to RE development and implementation were issued by the Government of Vietnam and the MOIT during the period of 2004 to 2016.

it can be seen that the most important policies such as the RE development strategy, regulations on electricity selling tariffs and SPPA for RE-based power projects were developed and promulgated in the period of 2014 to 2016.

Table 44: **List of key RE-related policies of Vietnam**

Year	Policy issued
2004	• Electricity Law
2006	• Grid connection regulations
2007	• Financial mechanism for CDM projects • Development Scheme for Biofuels up to 2015 with an outlook to 2025 • National Energy Development Strategy (NEDS) up to 2020 with an outlook to 2050
2008	• Regulations on electricity selling tariff and SPPA for small RE-based power projects
2010	• Regulations on interconnecting power plants to power T&D grid
2011	• Supporting mechanism for wind power projects • National Power Development Plan (NPDP) up to 2020 with an outlook to 2030
2012	• Electricity Law amended. • Regulations on implementation of an SPPA for wind power projects
2013	• Corporate Income Tax for RE-based power projects
2014	• Supporting mechanism for biomass cogeneration projects • Regulations on negotiation, signing and implementation of the PPA for power generation projects • Supporting mechanism for solid waste-based power projects • Regulations on electricity selling tariff and SPPA for small hydro projects • Price list of electricity selling tariff for 2015 for small hydro projects
2015	• Regulations on issuance, revocation and duration of Power Operation License • Regulations on preparation, appraisal and approval of Biomass Energy Development and Utilisation Plans • SPPA for solid waste-based power projects • Renewable Energy Development Strategy (REDS) up to 2030 with an outlook to 2050 • SPPA for biomass power projects • Regulations on interconnecting power plants to power distribution grid
2016	• Price list of electricity selling tariff for 2016 for biomass-based power generation projects • Revised National Power Development Master Plan

RE Policies vs. RE Implementation

As stated in the study methodology, for the purpose of analysis of the RE policy impact on RE implementation, only SHP is taken into consideration for hydro. The relation between key RE policies and RE development trends is illustrated in Figure 11.

Vietnam RE Policy Development vs RE Implementation

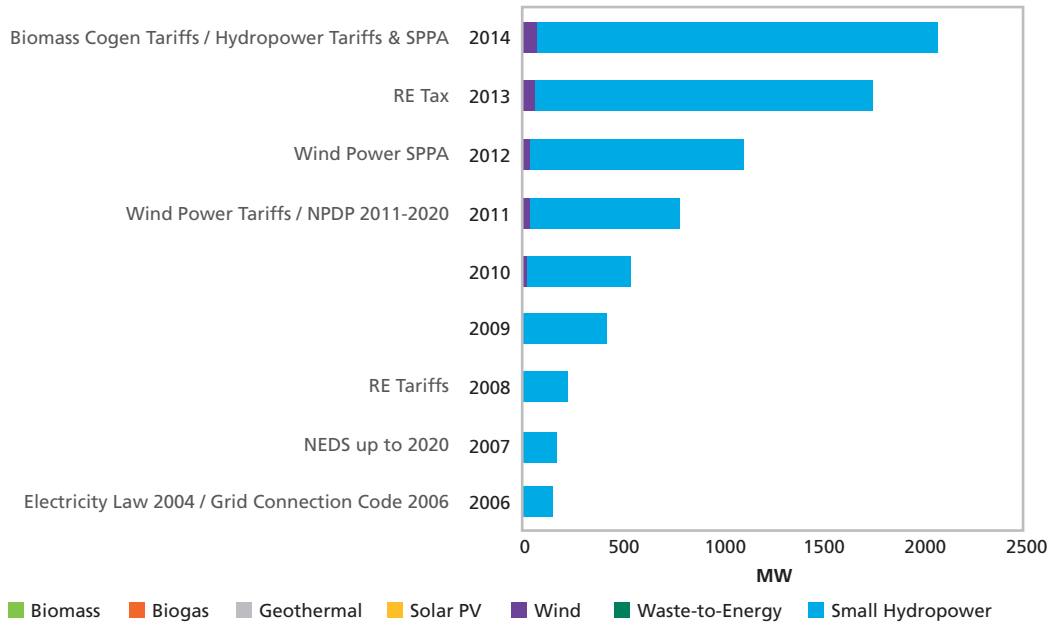


Figure 11: **RE policy development vs. RE implementation in Vietnam**

Results of Analysis

Hydro: The introduction of the regulations on electricity selling tariffs and SPPA for small RE-based power projects (Decision no. 18/2008/QD-BCT) in 2008 ("RE Tariff 2008") seems to have had a significant impact on the development of the small hydro projects. However, this policy had no impact on the growth of other types of RE. The main reason is that, even if the selling tariff of electricity, based on avoided cost was low, it was still attractive enough for small hydro plants (≤ 30 MW) as their average electricity production cost is lower when compared with other RE sources such as wind, solar and biomass. The incentives and other preferential treatments offered by the Government for the projects implemented in areas with difficult socio-economic conditions (e.g. the remote and mountainous areas) also stimulated the investments in small hydro projects.

Wind: It appears that the regulations promulgated in 2011 on the electricity selling tariffs (Decision no. 37/2011/QD-TTg) and in 2012 on the SPPA (Circular no. 32/2012/TT-BCT) for wind power projects has had a limited impact on the development of wind power projects in Vietnam. The construction of all three wind power projects in operation had started before the selling tariffs and SPPA for wind power projects were published. The analysis shows that the main drivers for the implementation of these three wind power projects were:

- the access to low-interest loans from the Vietnam Development Bank (VDB) and from the Export-Import Bank of the United States for the 99.2 MW offshore plant in Bac Lieu Province;
- higher tariffs, i.e., 0.13 USD/kWh specifically applied for the 6 MW project on Phu Quy Island and 0.098 USD/kWh for the 99.2 MW project in Bac Lieu.

The project developers and investors think that the current electricity selling tariffs (0.078 USD/kWh) applied for wind power projects in Vietnam are low. This makes investing in wind power projects unattractive. This slowed down the implementation of new wind power projects.

Other RE sources: The late introduction of the policies in 2014 and 2015 on other RE sources such as biomass and waste-to-energy does not show any impact on the development of these types of RE. Their impact can only be assessed after 2 to 3 years, which are needed for project development and implementation of RE-based power generation projects.

3.10.3 Conclusions

Vietnam had published several strategies and plans on the development of the energy sector in general and RE in particular. These strategies and plans set up the targets of RE development as well as the orientations, required policy framework and action plans to achieve these targets. The selling tariffs for electricity generated from different RE sources (except solar power) were also introduced. An incentive framework including preferential corporate tax rates, exemption from import tax on equipment and materials, accelerated depreciation rates, exemption and reduction in land rental fees, was also established.

Over the last eight years (2006-2014), the total installed capacity of the grid-connected RE sources (hydro and wind power) in Vietnam has increased from 5,050 MW to 17,140 MW with an annual growth rate of around 16.5%. However, hydro alone contributed to almost all that growth. It appears that the introduction of the regulations on electricity selling tariffs and SPPA for small RE-based power projects in 2008 ("RE Tariff 2008") has had a significant impact on the development of the small hydro projects.

The total installed power capacity of the grid-connected SHP and wind power plants is estimated at 2,052 MW in 2014 which accounted for about 5.9% of the total installed generation capacity of the national power system.

Vietnam had set an ambitious target by 2020 to reach 800 MW and 850 MW of installed capacity from wind and solar respectively. It means that an average of 120 MW of wind power capacity and 140 MW of solar power capacity have to be added to the national power system every year until 2020.

The RE policy framework of Vietnam is in place for promoting RE-based power generation projects. So far, only small hydro and, to a lesser extent, wind power have been developed. Low electricity selling tariffs currently applied for RE-based power projects in Vietnam make investment in RE projects not sufficiently attractive for potential project developers and investors. Policies on other RE sources such as biomass and waste-to-energy were only introduced in late 2014 and 2015. Hence, their impact on the development of these types of RE cannot be assessed yet, as it takes around 2 to 3 years for these projects to be developed and implemented.

4. Comparative Analysis of RE Policies of 10 AMS

4.1 SUMMARY OF RE IMPLEMENTATION IN 10 AMS

The level of RE development in all ten AMS from 2006 to 2014 is summarised in Table 45 and presented in Figure 12. It shows that, by 2014, there were already 51,700 MW of RE-based power capacity installed across the ASEAN region, including large hydro plants.

Table 45: **RE-based installed capacity (in MW) by AMS (2006-2014)**

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014
Brunei Darussalam	-	-	-	0.01	1.21	1.22	1.23	1.23	1.24
Cambodia	17.46	17.56	18.48	19.13	19.11	213.56	247.93	696.67	952.07
Indonesia	4,569.19	4,674.72	4,748.98	4,891.73	4,926.50	5,180.68	5,520.43	6,546.66	6,680.53
Lao PDR	679.80	679.80	679.80	756.11	1,932.11	1,948.31	2,973.25	3,258.79	3,348.05
Malaysia	2,532.92	2,566.41	2,621.46	2,725.78	2,742.45	3,586.99	4,069.12	4,352.58	6,286.14
Myanmar	771.00	803.00	947.00	1,654.00	2,563.06	2,697.06	2,818.03	3,004.00	3,204.39
The Philippines	5,260.41	5,342.75	5,297.07	5,326.37	5,444.17	5,390.49	5,522.00	5,542.00	5,897.90
Singapore	250.80	250.80	251.20	258.70	260.50	262.60	266.60	271.80	289.90
Thailand	4,519.52	4,851.09	5,152.25	5,201.23	5,283.72	5,626.15	6,192.95	7,204.32	7,900.95
Vietnam	5,050.00	5,692.00	6,026.00	7,199.00	8,880.00	10,165.00	12,643.00	14,661.00	17,072.73
Total	**23,651.10**	**24,878.14**	**25,742.24**	**28,032.06**	**32,052.83**	**35,072.06**	**40,254.54**	**45,539.05**	**51,633.91**

Source: ACE

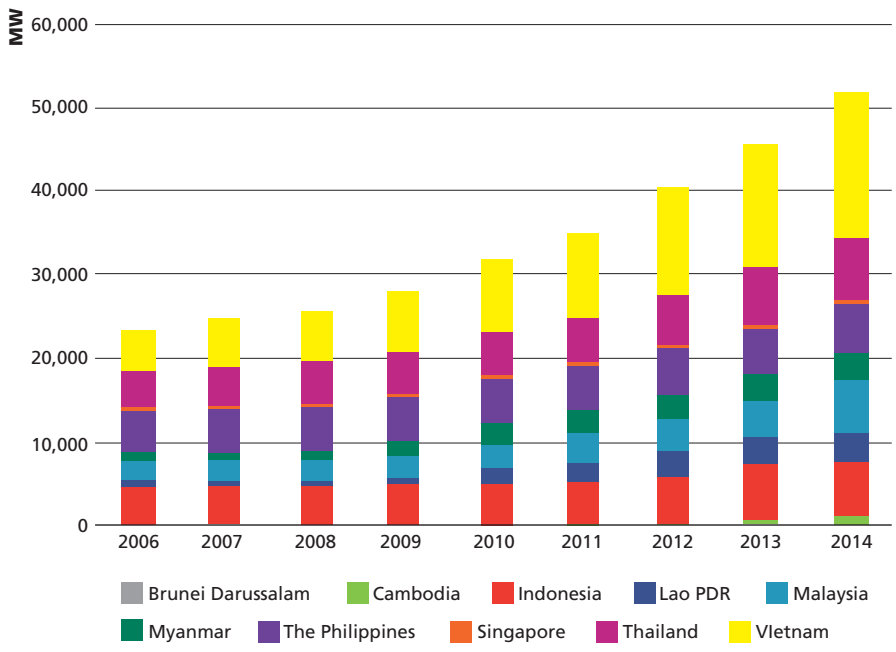


Figure 12: **RE installed power capacity by AMS (2006-2014)**

Table 46 presents the RE-based installed capacity by RE technology and AMS in 2014.

Table 46: **RE-based installed capacity (in MW) by RE technology and by AMS in 2014**

CoCountry	Biomass power	Biogas power	Geo-thermal power	Solar power	Wind power	Hydro	Waste-to-Energy	Total (MW)
Brunei Darussalam	-	-	-	1.24	-	-	-	1.24
Cambodia	22.64	-	-	-	-	929.43	-	952.07
Indonesia	-	-	1,405.00	9.02	1.12	5,229.39	36.00	6,680.53
Lao	39.70	-	-	3.08	-	3,305.27	-	3,348.05
Malaysia	836.21	511.52	-	170.58	-	4,767.83	-	6,286.14
Myanmar	-	-	-	14.55	-	3,189.84	-	3,204.39
The Philippines	131.00	-	1,918.00	23.00	282.90	3,543.00	-	5,897.90
Singapore	-	-	-	33.10	-	-	256.80	289.90
Thailand	2,451.80	311.50	0.30	1,298.50	224.75	3,548.40	65.70	7,900.95
Vietnam	-	-	-	-		17,072.73	-	17,072.73
Total	**3,481.35**	**823.02**	**3,323.30**	**1,553.07**	**508.77**	**41,585.89**	**358.50**	**51,633.91**

Source: ACE

- Thailand had close to 7,900 MW of RE installed capacity, coming mainly from hydro (45%) biomass (31%) and solar (16%) projects.
- Indonesia had 6,681 MW, with the largest share contributed by hydro (78%) and geothermal (21%) projects.
- The Philippines had over 5,898 MW, out of which 60% were hydro and 33% were geothermal projects.
- Vietnam had more than 17,140 MW implemented with almost 100% coming from hydro projects.
- Malaysia had 6,286 MW, mainly contributed by hydro (76%) and biomass projects (13%).
- Singapore had 290 MW, of which 89% were waste-to-energy and 11% were solar projects.
- Lao PDR (3,348 MW), Cambodia (952 MW), Myanmar (3,204 MW) and Brunei Darussalam (1.24 MW) had implemented some projects, mainly hydro, biomass and solar.

Figure 13 illustrates the repartition of RE installed power capacity by AMS in 2006 and 2014. In 2006 the top four countries in terms of RE installed capacity were the Philippines (22.2%), Vietnam (21.4%), Indonesia (19.3%) and Thailand (19.1%). By 2014, it had changed substantially with Vietnam (33.2%), followed by Thailand (15.3%), Indonesia (12.9%), Malaysia (12.2%) and the Philippines (11.4%).

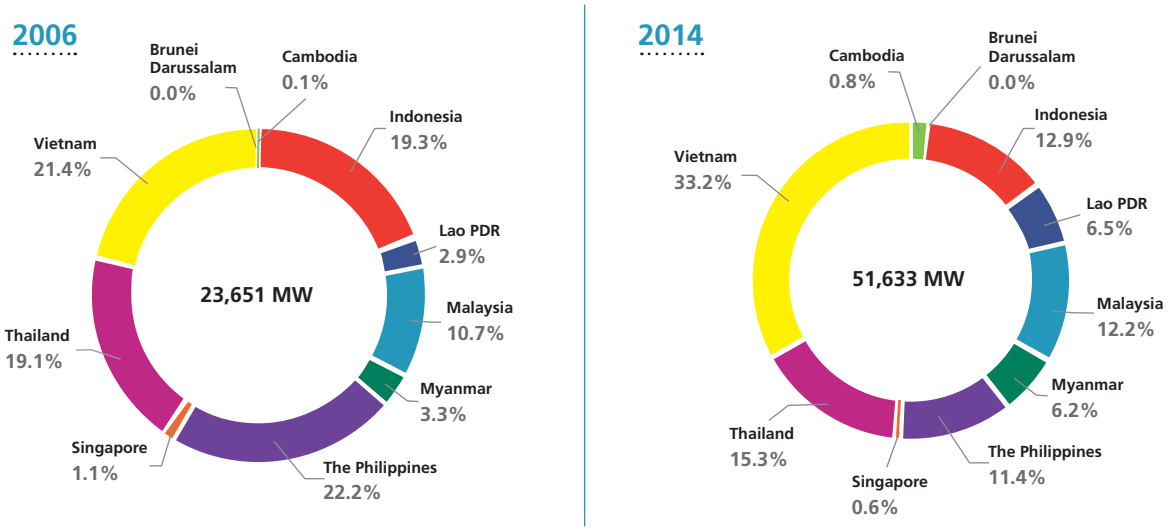


Figure 13: **RE installed power capacity by AMS in 2006 and 2014**

As shown in Table 47, some countries gained significant momentum over the last eight years. Indeed, the RE power installed capacity increased annually by 1,511 MW in Vietnam, 469 MW in Malaysia, 423 MW in Thailand, 334 MW in Lao PDR, 304 MW in Myanmar and 264 MW in Indonesia.

Table 47: **RE development momentum over the last eight years by AMS**

Country	RE installed capacity in 2006 (MW)	Total increase in RE installed capacity from 2006 to 2014 (MW) power	Average annual increase (MW/year)	Compounded Annual Growth Rate (%)
Brunei Darussalam	0.00	1.24	0.16	118.5%
Cambodia	17.46	934.61	116.83	64.8%
Indonesia	4,569.19	2,111.34	263.92	4.9%
Lao	679.80	2,668.25	333.53	22.1%
Malaysia	2,532.92	3,753.22	469.15	12.0%
Myanmar	771.00	2,433.39	304.17	19.5%
The Philippines	5,260.41	637.49	79.69	1.4%
Singapore	250.80	39.10	4.89	1.8%
Thailand	4,519.52	3,381.43	422.68	7.2%
Vietnam	5,050.00	12022.73	1502.84	16.5%
Total	**23,651.10**	**28,050.81**	**3,506.35**	**10.3%**

4.2 SUMMARY OF RE POLICIES OF 10 AMS

Defining a single common policy for the successful promotion of RE in electricity production for all ASEAN Member States (AMS) is complex, particularly due to many factors that are country specific. Hence, policies that have been developed in each of the AMS have been studied separately. They are summarised in the Table 48 and Table 49. These two tables provide policy data that help assess how successful RE policies have been to support RE project implementations in all 10 (ten) AMS. They are structured along six key factors:

1. The RE target set by the governing body for RE in each AMS;
2. The selling tariff of electricity from RE sources;
3. Any incentive for a developer to implement RE electricity generation within the country;
4. Financing support available to RE project developers;
5. The permit and licensing structure for RE power generation;
6. Other technical aspects such as grid codes for RE power project connection.

Following the methodology outlined in chapter 2 of this document, the data enable the reader to isolate information that serves as indicators for the development of RE market, and in particular, for the maturity of the existing supporting policies. Eventually, it is also important to notice potential barriers that exist in a country that might impede a successful promotion of RE or on the other hand, advance it. These barriers were discussed with the country representatives during the FGD held in Bangkok in February 2016.

Can Tho Province, Vietnam. Credit: ESP GIZ MOIT

Table 48: **Summary of RE policies in Brunei Darussalam, Cambodia, Indonesia, Lao PDR and Malaysia**

	Policy	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia
1	**RE Target**	Yes	Yes	Yes	Yes	Yes
	Target by RE technology	For all types of RE: -124 GWh by 2017 - 954 GWh by 2035	2020 target: -Hydro: 2 GW (minimum)	2025 target: - Biomass: 5.4 GW - Geothermal: 7.1 GW - Solar: 8 GW - Wind: 1.5 GW - Hydro: 21.3 GW - Ocean: 7 MW - WTE: 53 MW	2025 target: 30% RE share of total energy consumption: - Biomass: 82 MW - Biogas: 70 MW - Solar: 69 MW - Wind: 85 MW - SHP: 534 MW	For all types of RE: - 985 MW by 2015 - 2,080 MW by 2020 - 4,000 MW by 2030
	Current RE implementation status (2014)	- Solar: 1.24 MW	- Biomass: 22.64 MW - Hydro: 929.43 MW	- Geothermal: 1,405 MW - Solar: 9.02 MW - Wind: 1.12 MW - Hydro: 5,229.39 MW - WTE: 36 MW	- Biomass: 39.7 MW - Solar: 3.08 MW - Hydro: 3,305.27 MW	- Biomass: 836.21 MW - Biogas: 511.52 MW - Solar: 170.58 MW - Hydro: 4,767.83 MW
2	**Selling Tariffs**	No	No	Yes	No	Yes
	Type of tariffs	- No FiT	- No FiT - For rural electrification projects, selling tariffs are determined by investors and consumers - SHS projects are installed in a rent-to-own basis.	- FiTs for solar PV: by region - FiTs for geothermal: by region and by voltage - FiTs for biomass and biogas power projects: by voltage, capacity and type (Non MSW, Zero Waste, Sanitary Landfill) - FiTs for hydro plants up to 10 MW: by runoff river / dam / old; by voltage, by capacity (250 kW and 10 MW) and by region - FiTs for MSW by capacity (between 20 to 50 MW)	- No FiT - Fixed monthly fees are applied for off-grid RE-based rural electrification projects	FiT

	Tariffs by RE technology	N/A	N/A	- Solar PV (USD cent/kWh): 1 4.5 - 25 - Geothermal (USD cent/kWh): 1 - 19 - Biomass (IDR/kWh x F): 1,150- 1,500 - Biogas (IDR/kWh): 1,050- 1,400 - Hydro (USD cent/kWh): Run off River (7.50 - 14.40) x F; Dam (6.75 - 13.00); Old (9.30 - 11.00) - MSW (USD cent\kWh): 13.14 - 22.43	Specific tariff for different RET is under preparation	FiT in RM: - Solar: 0.4162 - 1.2124 - Biogas: 0.2787 - 0.4669 - Biomass: 0.2687 - 0.4866 - SHP <10MW: 0.24 - 0.26 - Geothermal: 0.45
3	**Incentives**	No	No	Yes	Yes	Yes
	Type of incentive	N/A of assets	N/A incentives for large and	- Income tax exemption and reduction - VAT exemption - Accelerated depreciation - Import duty exemption	- Free import duty on RE equipment - CIT exemption - Special investment small hydro projects (Free access to land, tax holiday, ...)	- CIT incentives for RE projects - Accelerated depreciation for solar projects
4	**Financing support**	No	Yes	Yes	Yes	Yes
	Type of support	N/A	- USD 100 per system by REF for rural development programmes - USD 400/kWh for mini/micro hydro project - USD 300/kWh for other RE technologies.	- Geothermal Fund Facility and Indonesia Infrastructure Guarantee Fund provide low interest loans - Clean Technology Fund	Access to loans from commercial banks and for foreign investors	Green Technology Financing Scheme offers a 60% guarantee of the financing amount and a rebate of 2% on the interest/profit rate charged by the financial institutions
5	**Permits and Licences**	No	Yes	Yes	Yes	Yes

Table 49: **Summary of RE policies in Myanmar, the Philippines, Singapore, Thailand and Vietnam**

	Policy	Myanmar	The Philippines	Singapore	Thailand	Vietnam
1	**RE Target**	Yes	Yes	Yes	Yes	Yes
	Target by RE technology	SHP: 472 MW by 2016 - Biomass: 276.7 MW	2030 target: 9,931MW for all types of RE. - Geothermal: 1,495 MW - Solar: 350 MW - Wind: 2,345 MW - Hydro: 5,394.1 MW - Ocean power: 70.5 MW	2020 target: - Only for solar: 350 MWp generation	2036 target: - 19,684 MW for total installed power capacity - 25,088 ktoe for thermal energy capacity - 8,712 ktoe for biofuel production. For power capacity: - Biomass: 5,570 MW - Solar: 6,000 MW - Wind: 3,000 MW - Other RE: 5,114 MW	2020 target: 31.8% RE shore of total country - Biomass: 2.7 TWh - Solar: 1.3 TWh (850 MW) - Wind: 2.1 TWh (800 MW) - Hydro: 78.2 TWh (21,600 MW)
	Current RE implementation status (2014)	- Solar: 14.55 MW - Hydro: 3,189.84 MW	- Biomass: 131 MW - Geothermal: 1,918 MW - Solar: 23 MW - Wind: 282.9 MW - Hydro: 3,543MW	- Solar: 33.1 MW - WTE: 256.8 MW	- Biomass: 2,451.8 MW - Biogas: 311.5 MW - Geothermal: 0.3 MW - Solar: 1,298.5 MW - Wind: 224.75 MW - Hydro: 3,548.4 MW - Others (WTE): 65.7 MW	- Wind: 68.0 MW - Hydro: 17,072.73 MW
2	**Selling Tariffs**	No	Yes	Yes	Yes	Yes
	Type of tariffs	- No FiT - Fixed monthly fees are applied for off-grid RE-based rural electrification projects	- FiTs for all RE - Net metering	- No FiT - Market payments and charges are applied	FiTs	FiTs are calculated based on avoided cost
	Tariffs by RE technology	N/A	Current FiT Rate (in PHP/kWh): - Run of river hydro: 5.9 - Biomass: 6.63 - Wind: 7.4 - Solar: 8.69	For solar systems with less than 1 MW, the payment to the power producers is SGD 0.1204/kWh	FiTs in THB/kWh: - Solar: 6.01-6.85 (rooftop), 5.66 (ground-mounted systems) - Biomass: 4.24-5.34 - MSW: 5.08-6.34 - Biogas: 3.76-5.34 - Wind: 6.06 - Hydro up to 200 kW: 4.90	FiTs in USD/kWh: - SHP: 0.027-0.030 for electricity sales and 0.097 for capacity sales - Wind: 0.078 (on-shore), 0.098 (off-shore) - Biomass: 0.058 (cogeneration), 0.073458-0.075551 (pure-power

					FiT premium is applied for the southern provinces and bio-energy projects exchange rate	generation) - MSW: 0.1015 (direct combustion), 0.0728 (landfill gas) Tariffs shall be adjusted to the fluctuations of VND/USD
3	**Incentives**	No	Yes	Yes	Yes	Yes
	Type of incentive	N/A	- CIT Holiday - Duty-free Import of RE equipment - Accelerated depreciation	- CIT reduction - Other incentives such as grants are also offered for project development, R&D and capacity building.	- CIT exemption or reduction - Import duty exemption	- CIT exemption for first 4 years, and reduced for the following years - Import tax exemption - Reduction in land rental fees
4	**Financing support**	No	Yes	Yes	Yes	Yes
	Type of support	N/A	Preferential financial packages from government financial institutions for the development, utilisation and commercialisation of RE projects	Financing support up to 40% of project cost (max. 1 million USD) for solar project developers	Energy Conservation Fund (ENCON Fund) and Energy Service Company Revolving Fund (ESCO Fund) provide financial support to RE projects	The State's investment credits with favourable interest rate
5	**Permits and Licences**	No	Yes	Yes	Yes	Yes
	Description	N/A	An energy one-shared system (EVOSS) was established to facilitate and streamline the process of RE applications	Generation license is required for grid-connected solar systems of 1 MWac or above	RE-based power plant operators must obtain licenses from the Energy Regulatory Commission (ERC)	RE-based power plant operators must obtain operation license from MOIT for plants of 50 kW or above
6	**Technical issues**	No	Yes	Yes	Yes	Yes
	Description	N/A	Technical standards for grid-connection of wind and solar projects	Handbook for Solar PV Systems was promulgated as a technical guideline for design, installation, operation and maintenance of solar systems	Grid connection codes and several other technical standards/guidelines are promulgated	Grid connection codes are promulgated

4.3 Inputs From Focus Group Discussions

ASEAN-RESP organised a FGD in Bangkok, Thailand, on 24 and 25 February 2016, with the specific objectives:

- To review and update RE policies in the 10 (ten) AMS;
- To share information among AMS on RE policy and enhance awareness on the RE Policy enforcement for boosting RE Implementation.
- To verify the analysis of the impact of RE policies on RE development in the 10 (ten) AMS.
- To formulate conclusions and recommendations on RE policies to be included in the report.

Detailed feedback from the participants of the FDG can be found in Annex 1.

4.4 RE Policies Impacts on RE Deployment in Asean

The reasons why some AMS were successful in promoting and implementing some specific RE projects were addressed in the individual country reports (sections 3.1 to 3.10).

Comprehensive RE policies that include essential tools such as attractive tariffs and incentives stimulate investment from the private sector. That was the case in Thailand where the adder policy (and now the FiT) made the tariffs attractive enough, especially in the early stage of the deployment of the RE technologies when the technical and financial risks were still perceived as very high by investors and lenders. The adder schemes were regularly adjusted to keep stimulating RE project investments, but without distorting the market. The success of Thailand in achieving almost 4,500 MW of implemented capacity in RE projects by 2014 (excluding large hydro) can also be explained by an early start of the RE projects implementation, especially biomass projects, when the SPP programme and the ENCON Fund were launched in 1992. The creation and use of the ENCON Fund helped to pioneer RE projects. As a result, by 2006, Thailand had already implemented more than 1,000 MW of biomass power projects.

By that time, the Philippines with over 2,000 MW and Indonesia with close to 1,800 MW (excluding large hydro) had even a larger amount of RE power projects than Thailand, but mainly geothermal projects implemented in the 1970s and 1980s. The government of both countries had indeed prioritised to tap the large geothermal resources to cover their growing energy needs.

Some interesting lessons can be drawn from the experience of Vietnam which over the last eight years has dramatically increased its RE installed capacity. That impressive growth was stimulated by the publication of the RE Tariffs in 2008. Even though these tariffs were considered low, they were attractive enough for SHP projects as the electricity production costs from that technology are low. As a consequence, SHP installed capacity jumped from 140 MW to 2,177 MW during that period. An adjustment of the FiTs for other RE technologies should help boost their installed capacity, especially for biomass and waste-to energy.

As far as Malaysia is concerned, the power installed capacity of biomass project has grown steadily thanks to the Fifth Fuel policy. The publication of the RE Act and the introduction of the FiT in 2011 has triggered the implementation a numerous solar projects with a total installed capacity jumping from 3.4 to 170 MW in just three years. The trend seems to continue. In 2014, Malaysia saw the implementation of biogas power plant increase by some 500 MW. This is due to a combination of FiT and a decision of the government to have biogas facilities at all palm oil mills by 2020.

It must be noticed that Indonesia, Malaysia, the Philippines, Thailand and Vietnam have all established:

- Medium to long-term RE Targets,
- Specific FiTs for different RE technologies,
- Incentives for RE project implementers,
- Financing schemes to support RE projects,
- Permit and licenses mechanisms,
- Technical standards, especially grid connection codes.

It seems like it is a successful package: AMS which do not address them all meet difficulties to gain momentum in effectively deploying RE solutions. It is obviously the case for Brunei Darussalam, Cambodia, Lao PDR and Myanmar. Some AMS have got some of these policy instruments, but none of them have got them all. One key instrument missed by all of them is the FiTs.

Singapore can be considered as a special case, as the country's priorities in terms of RE implementation were clearly defined: WTE in the past (with a unique successful experience in ASEAN for the implementation of WTE projects) and solar for the present and the coming years.

There is a good opportunity for Brunei Darussalam, Cambodia, Lao PDR and Myanmar to benefit from other AMS' experiences in successfully implementing RE policies. The four AMS have already gained some good experience in implementing RE projects, but they will need to develop comprehensive RE policies, based on the lessons learned in the other AMS.

From the above review and the FGD held in Bangkok in February 2016, it appears that the top three policy instruments affecting the development/implementation of RE projects by attracting private sector investors are:

- An appropriate FiT system;
- Simplified permit procedures;
- Attractive incentives and financing support mechanisms.

There are also non-policy factors affecting the successful implementation of RE projects. They are:

- The availability and easy access to financing sources;
- The availability of updated data on RE resources and other RE-related information (technology, economics, finance, etc.)
- RE market studies providing estimation of the size of the market.
- The ability of local stakeholders (developers, consultants, financers, manufacturers, Engineering, Procurement, and Construction or EPC contractors, etc.).

5. Conclusions & Recommendations

Based on the analysis of the RE policies impacts on RE development and on the feedback that was received from the participants of the FGD, the following conclusions for RE policy implementation can be drawn.

It must be noted that a pattern was noticed within the feedback of individual Member State in regard to effective policies: policies differ depending on the current status of RE development. Therefore, the conclusions have been divided into three levels: entry, intermediate and advanced levels.

▶ Entry Level

Entry level countries are those that currently have no specific RE policy or are at the very early stages of implementing policies to promote RE. In these countries, there is a need for:

- Attractive FiTs for pioneer investors;
- Capacity building for financial institutions/banks, technical specialists, local community/end-users, and others.
- Demonstration projects.
- Tax/fiscal incentives for international investors.
- International donor funding programmes.
- Rural development and electrification.
- Data/experience exchange with similar and more advanced countries.

▶ Intermediate Level

Intermediate level countries are those with a fair awareness of RE and its benefits, have developed a good investment environment and some policies have been issued. These countries still require:

- Attractive FiTs;
- RE project site identification and mapping;
- Specific technical training;
- Set up of a RE fund;
- Implement carbon taxes;
- Private sector capacity building and training.

▶ Advanced Level

An advanced level country has produced multiple policies specific to RE. Significant research and development has been undertaken to promote RE and some level of RE installed capacity has been implemented over a variety of renewable sources. In these countries, there is still a need for:

- Detailed, technology specific and regularly updated FiTs;
- Appealing financial/tax incentives;
- Set up of clear and straightforward permits and licences for RE generators.

The rice husk at Yin Pou Rice Mill, Kork Tunlap, Mongkul Borei, Banteay Mean Chey, Cambodia. Credit: GIZ Indonesia

ANNEX 1: INPUTS FROM FOCUS GROUP DISCUSSIONS ON ASEAN RENEWABLE ENERGY POLICIES

ASEAN-RESP organised a Focus Group Discussion (FGD) in Bangkok, Thailand, on 24 and 25 February 2016, with the specific objectives:

- To review and update the RE policies in the 10 (ten) AMS;
- To share information among AMS on RE policy and enhance awareness on the RE Policies enforcement for boosting RE Implementation.
- To verify the analysis of the impact of RE policies on RE development in the 10 (ten) AMS.
- To formulate conclusions and recommendations on the RE Policy to be included in the report.

The workshop participants were split into two focus groups where the following topics would be addressed:

- Policy experience,
- Barriers to RE development,
- Success factors to RE implementation.

Focus Group Discussion 1

During the first FGD, the following questions were answered by the participants:

- What policies have played a decisive role in the successful implementation of RE projects in your country?
- What are in general the types of policies that are most important for RE implementation? Tariffs, incentives, others? Why?
- What are the experiences/lessons learned from policy implementation in the different AMS (based on successful/failed projects)?
- What are the barriers to RE development and why?
- What are the success factors to RE implementation (policy and non-policy factors)?

The main outcomes of the discussions are summarised in the following table.

Table 50: Main outcomes of the FGD 1

Countries	Policy Experience	Barriers	Success Factor
Brunei Darussalam			
Cambodia	- Solar Home System (SHS) with government subsidy - Tax incentives for RE - Open policy for private sector investment in RE - 100% country wide electrification that includes use of RE	- Lack of knowledge in the operation of RE technology - Electricity procedures from RE is very high - Lack of financing support - Conflict in land use - Lack of available data that will show RE potential - Lack of knowledge on the benefits of using RE sources	- Subsidy for SHS
Indonesia	- Well designed, formulated and implemented RE policies - Involvement of the private sector - Clear and detailed RE implementing guidelines	- Low fossil fuel prices result in low cost of production from conventional sources making RE unviable - Lack of incentives for RE discourages RE investment and competition	- FiTs on various RE sources assure return on investment - Allowing IPP involvement on RE
Lao PDR	- Development of hydro technology that allows export to neighbouring countries following international standards - Successful on-grid system development but failure on off-grid systems - National electrification	- Lack of RE experts and experience in RE technology - Lack of financing support - Lack of knowledge sharing of RE experiences	- Support of the government in the RE development
Malaysia	- FiTs with guaranteed grid access and premium rates	- Different policies are required at different level of RE development	- Project viability - Government and financial institution support
Myanmar	- Small hydro for rural electrification - Lack of fully transparent institutions - Lack of policy guidelines - Opened market to the private sector	- Administrative bureaucracy in permitting and licensing - Lack of Financing - Lack of technical and experienced experts - Lack of awareness and appreciation of RE within the Government and Public sector	- Competent consultants
The Philippines	- FIT system for solar and wind and incentives for all types of RE technologies - Competing land use for solar power - Priority approval of host before award of project	- Absorption capacity of the grid for VRE - High technical and admin standards - Limited foreign equity	- Well-coordinated planning system for target setting & grid integration - Firm & consistent policy implementation
Singapore			
Thailand	- FiT or adder for solar farms - Investment by private sector - Easy O&M - Lack of skilled operators in rural areas	- Lack of grid connection - Lack of understanding of RE technology is rural areas - Lack of feedstock - PPA procedure is complicated and must be simplified - Lack of feedback from stakeholders due to top down policy making with no focus group discussions	- Access to electricity even in the remote rural areas
Vietnam	- Implemented FiT using avoided cost for SHP - Loans at low interest for RE projects in order to reduce investment cost	- Existing FiTs are too low for investors to come in	- Government should provide enabling environment on the following areas: Legal, Financial, Technological, HR Development, Regional and International Cooperation) for RE to develop.

Focus Group Discussion 2

The workshop participants were again split into two focus groups. The following topics were addressed:

- Past actual RE policy impacts on RE development,
- Future policies required for achievement of RE targets.

The following questions were answered by the participants:

- How did the policies actually impact on RE development in your country?
- What are the additional policies required for achievement of RE targets in your country? Why?

The main outcomes of the discussions are summarised in the following table.

Table 51: **Main outcomes of the FGD 2**

Countries	Past Experiences	Future Improvement
Brunei Darussalam		
Cambodia	- Foreign investment on small hydro (80% owned) - Private investment on biomass sources which are cheaper than diesel but complicated policy on permitting - Rural development policies encourage participation of private investors in SHS and biomass	- Policy on FiT for RE sources - Policy on RE promotion - Government tax exemption for RE equipment - RE investment is opened to the private sector - Capacity building on RE financing and technology
Indonesia	- FiTs for various RE technology increased commitment of IPP participation - IPP involvement in RE development	- Dedicated government budget to implement non-commercial RE projects
Lao PDR	- Financial support from EDL on rural electrification for hydro with <1 MW off-grid. - Technical assistance support are provided by the government - Access to electricity through Rural Electrification Fund (REF) increased rural development and created more jobs	- Investment promotion law revision to include RE - RE application on rural electrification - Revise RE strategy - Capacity building for government institutions on RE awareness, benefits and development - Revise REF to include tariffs for off-grid RE projects - Capacity building for financial institutions on RE projects
Malaysia	- Solar PV building integration in 2001 - Discount to Solar PV up to 70% - Introduction of FiT (2011-2012)	- Net metering mechanism for solar - Policy on RE awareness to community/society
Myanmar	- Tax incentive for foreign investment based on the National Energy Policy resulted to more than 1,200 MW of hydro plants implemented	- Revise National Electrification RE target to 27% by 2030 - Policy on incentives for RE (e.g. tax holiday) - Policy on electricity tariff - RE master plan - Lack of legal framework - Financing/banking support - Promote Biomass use for power - Support for RE Resource Mapping of biomass, wind and solar to stimulate RE development
The Philippines	- Geothermal power was owned and funded by the government but after the RE law in 2008, private investors comes in due to BOI and tax incentives - FiT for solar in 2012 at 0.18 USD/kWh for the first 500 MW installed and BOI incentives	- Policy on levelized cost of electricity (LCOE) for comparison with RE - Renewable portfolio standard (RPS) to distribution utility
Singapore		
Thailand	- Incentives (BOI, taxes) for RE projects - Grid connection policy which attract private sector investment - Energy Conservation Promotion Fund (ENCON Fund) increased RE development especially for Biogas with <10 M THB investment - Clear and effective procedure for project development - FiT and adder increased solar farms and biomass power plant capacity and production - Town and Country Planning Act increased opportunity for RE power plant construction especially MSW	- RPS to utility company - National carbon credit mechanism - Incentive for household RE producer - Incentive for RE heat application - Policy on promoting local equipment utilisation - Grid integration/capacity to accept RE in the grid - A lot of PPA applications were not implemented due to the change from adder to FiT - Definitions are unclear - Emphasis on focus groups
Vietnam	- FiT; avoided costs for SHP - GoV support in identifying and conducting detailed site planning/mapping for SHP dramatically increased capacity by six times	- Revise existing RE tariff policies and establish a new one for solar - Apply RPS to fossil fuel - Establish RE fund - Implement Carbon Tax - Develop RE Resource Mapping for all technology

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